E-learning

Vol. 9

Effective Development of Teachers' Skills in the Area of ICT and E-learning

Scientific Editor

Eugenia Smyrnova-Trybulska

Katowice – Cieszyn 2017

E-learning

Vol. 9

Effective Development of Teachers' Skills in the Area of ICT and E-learning

University of Silesia in Katowice,
Faculty of Ethnology and Sciences
of Education in Cieszyn

E-learning

Vol. 9

Effective Development of Teachers' Skills in the Area of ICT and E-learning

Monograph

Scientific Editor

Eugenia Smyrnova-Trybulska

Katowice - Cieszyn 2017

Technical editing and proofreading by: Andrzej Szczurek, Ryszard Kalamarz, Eugenia Smyrnova-Trybulska

Cover design by: Ireneusz Olsza

ISSN: 2451-3644 (print edition) ISSN 2451-3652 (digital edition) ISBN 978-83-60071-96-0

Published by: Studio NOA for University of Silesia in Katowice
Faculty of Ethnology and Sciences of Education in Cieszyn
Printed in Poland

The E-learning series is indexed in Journal Factor http://www.journalfactor.org/, Academic Research Index https://www.researchbib.com/, JIFACTOR.ORG, ceon.pl, Polska Bibliografia Naukowa https://pbn.nauka.gov.pl

The E-learning series web-sites: http://weinoe.us.edu.pl/nauka/serie-wydawnicze/seria-e-learning/seria-e-learning http://www.ig.studio-noa.pl/pubusc.html

Scientific publication co-financed by funds for scientific research in the years 2014–2017 granted by the Ministry of Science and Higher Education for the implementation of the co-financed international project IRNet and from statutory funds for research.
The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No 612536

TABLE OF CONTENTS

INTRODUCTION

The monograph *"Effective Development of Teachers' Skills in the Area of ICT and E-learning"* includes articles based on the best papers prepared and presented by authors from nine European countries and from more than twenty universities during the scientific conference entitled "Theoretical and Practical Aspects of Distance Learning", subtitled: "*Effective Development of Teachers' Skills in the Area of ICT and E-learning*", which was held on 16-17 October 2017, organized by the Faculty of Ethnology and Sciences of Education in Cieszyn, University of Silesia in Katowice, Poland.

The speakers from the Silesian University (Czech Republic), University of Extremadura (Spain), Constantine the Philosopher University in Nitra (Slovakia), Curtin University in Perth (Australia), Lisbon University (Portugal), Borys Grinchenko Kyiv University (Ukraine), Gdańsk Technical University (Poland), Herzen State Pedagogical University of Russia, St. Petersburg (Russian Federation), Dniprodzerzhinsk State Technical University (Ukraine), Jagiellonian University (Poland), Warsaw University (Poland), Silesian University in Opava (Czech Republic), University of Silesia in Katowice (Poland), University of Defence in Brno (Czech Republic), Maria Curie-Skłodowska University in Lublin (Poland), Lublin University of Technology (Poland), Kazimierz Wielki University in Bydgoszcz (Poland), Jan Ámos Komenský University Prague (Czech Republic), Cracow Pedagogical University (Poland), Lisbon Open University (Portugal), RMIT University, Melbourne (Australia), Centre for Innovation, Higher School of Economics in Katowice (Poland), University of Social Sciences and Humanities in Warsaw (Poland), Poznań University of Medical Sciences (Poland), Abant Izzet Baysal University, Bolu (Turkey), Adam Mickiewicz University in Poznań, (Poland), University of Social Sciences and Humanities in Warsaw (Poland), Ternopil University (Ukraine) and other educational institutions delivered lectures providing insights into interesting studies, presented their recent research results and discussed about their further scientific work.

The authors include well-known scholars, young researchers, highly trained academic lecturers with long experience in the field of e-learning, PhD students, distance course developers, authors of multimedia teaching materials, designers of websites and educational sites.

I am convinced that the monograph will be an interesting and valuable publication, describing the theoretical, methodological and practical issues in the field of the use of e-learning for societal needs, offering proposals of solutions to certain important problems and showing the road to further work in this field, allowing for exchange of experiences of scholars from various universities from many European countries and other countries of the world.

This book includes a sequence of responses to numerous questions that have not been answered yet. The papers of the authors included in the monograph are an attempt at providing such answers. The aspects and problems discussed in the materials include the following:

1. **Effective Development of Teachers' Skills in the Area of ICT and E-learning**
   - Computer training for prospective and practicing teachers in area ICT and e-learning,
   - Teachers' and learners' competences in distance learning and computer science.
   - Distance Learning and Lifelong Learning
   - Self-learning based on Internet technology
2. **E-learning and Intercultural Competences Development in Different Countries:**
   - Legal, social, human, scientific, technical aspects of distance learning and e-learning in different countries,
   - Psychological and ethical aspects of distance learning and e-learning in different countries,
   - Collaborative learning in e-learning,
3. **E-learning Methodology – Implementation and Evaluation:**
   - European and national standards of E-learning quality evaluation,
   - Evaluation of synchronous and asynchronous teaching and learning, methodology and good examples,
   - MOOCs – methodology of design, conducting, implementation and evaluation,
   - Contemporary trends in world education – globalization, internationalization, mobility.
4. **ICT Tools – Effective Use of Education:**
   - Selected Web 2.0 and Web 3.0 technology,
   - LMS, CMS, VSCR, SSA, CSA,
   - Cloud computing environment, Social media,
   - Multimedia resources and didactic materials, Video-tutorial design.
5. **Theoretical, Methodological Aspects of Distance Learning:**
   - Successful examples of e-learning,
   - Distance learning in humanities and science,

   – Quality of teaching, training programs and assessment,
   – E-learning for the disabled.

6. **E-learning in the Development of Key Competences:**
   – Key competences in the knowledge society,
   – Use of e-learning in improving the level of students' key competences,
7. **Alternative Methods, Forms and Techniques in Distance Learning:**
   – Simulations, models in distance learning,
   – Networking,
   – Distance learning systems,
   – M-learning.
8. **E-environment and Cyberspace**
   – E-environment of the University
   – Smart Technology in Education
   – Internet of Things

Publishing this monograph is a good example of expanding and strengthening international cooperation. I am very grateful for valuable remarks and suggestions which contributed to the quality of the publication. Here I especially want to thank Andrzej Szczurek and Ryszard Kalamarz for their assistance in editing this publication. Also, I would like to say 'thank you' to the authors for the preparation and permission to publish their articles. I wish all readers a pleasant read. Thank you.

Eugenia Smyrnova-Trybulska

I. EFFECTIVE DEVELOPMENT OF TEACHERS' SKILLS IN THE AREA OF ICT AND E-LEARNING

HOMO INTERNETICUS – FUNCTIONAL ILLITERACY OF CONTEMPORARY MAN

Wojciech Walat
University of Rzeszów, Faculty of Education
Rejtana Street 16c, 35-959 Rzeszów, Poland
walat@ur.edu.pl

Abstract: *In today's computer world traditionally understood reading skills are insufficient, there is an urgent need to introduce universal functional skills. At every turn we see functional illiteracy of philosophy, economy, social and others spheres of human life. This article shows an interpretation of homo interneticus as a new contemporary man and is his qualities, which are most important for the development of educational systems that can prevent increasing functional illiteracy.*

Keywords: literacy, functional illiteracy, homo interneticus, ICT in education

1. INTRODUCTION – FROM *HOMO ORALIS* TO *HOMO INTERNETICUS*

There is something unjust in modern education, because millions of Europeans and Americans – in spite of formal education – remain illiterate in the strict sense of the word and above all functional illiterate[1] – which means they can't reasonably use the acquired knowledge. The sources of this state of affairs are above all visible in

[1] *Literacy – educational activities aimed at acquiring literacy skills of reading, writing and counting. Functional literacy – literacy method combining learning to read and write with gaining knowledge by learners directly needed in life and work* [*Internet Encyclopedia PWN*, http://encyklopedia.pwn.pl/haslo/3867725/alfabetyzacja.html] (accessed: 20.07.2017).

network communication, which prevails today, and therefore modern man is connected with the Internet, namely: *homo interneticus* (or *internetus*)[2].

When you heard at the moment the words *homo interneticus* you may smile, because this is a relatively new term used to classify a man from a sociobiological perspective. In short, *homo interneticus* means a man connected to the global social network. It is assumed that this concept appeared for the first time on the BBC Two website in the section run by Alex Krotoski (2010). Taking into account expressions appearing mainly in popular science publications it can be stated that *homo interneticus* is a new form of human evolution, which is based on a high state of his communication skills – the foundation of vital functions is the connection to the network. The lack of connection not only makes it difficult, but even impossible for him to function in every dimension: personal, social and professional.

Taking the evolutionary point of view and emphasizing the unique communication skills of human (*homo sapiens*) four classifications can be determined: *homo oralis*, *homo literalis*, *homo typographicus* and *homo interneticus*.

2. ANALYSIS OF THE CHARACTERISTIC FEATURES OF HOMO INTERNETICUS

***Homo interneticus* – chaotically learns the world.** In anthropology the term homo sapiens refers to people who appeared more than 1.4 million years ago and using handmade tools, including communication tools, were able to record the course of events (e.g. perform cave drawings and decorations distinguishing and differentiating items according to their destination and social status – but without the accompanying story, narration – they are completely illegible, and their meanings can only be guessed). *Homo oralis* is defined as the human species with a narrative (talking) communicative mode, developing concurrently since the emergence of homo sapiens. It was linguistic communication, which was probably the only way of cultural transmission up to approx. 4-3 thousand years BC. Then appeared *homo literalis*, which is a term used to describe people efficiently communicating by writing. *Homo typographicus*, in turn, means people using a modern mode of mass communication, fully developed over the last 150 years .

Homo interneticus appeared with the invention of the World Wide Web . Surely, a human still speaks, writes and uses printed matter, but the creation and transmission of culture has changed fundamentally.

Homo typographicus right from the childhood had to deal with an endless string of real printed matter. He came into the world that was truly determined: every event, every action, every war and its outcome, every accident, every crime, a mistake or a wrong assessment, even every thought (state of mind) had specific causes which

[2] In the literature the names *homo interetus* and *homo interenticus* are used interchangeably.

could safely be tracked forwards and backwards. Education has always been built on this stability of the world narration – hence the foundation for literacy was to gain reading, writing and numeracy skills – today this is only the basis for functional literacy. Pre-existing *homo oralis* had also every reason to believe in fate, to think that every story has a certain form and only this one definite form, but in the oral culture there is less consistency in the story about the history and the causal relationship is less complicated – we move from one case to another (Goldhaber 2004).

To using the ability to communicate is always a key element of culture and when the mode of communication is changing, the culture is also changing. Everything which *homo interneticus* has to perform is always done by placing ten fingers on the keyboard. He has a sense of unlimited knowledge, memory, time and space, and this is because the Internet knows no distance, there is no spatial relationship in the network. Modern man is guided by involuntary attention in his action, because in the virtual world, people are placed in a personal perspective, which often differs radically from itself. His knowledge is uncertain, because in the virtual world, information is updated on a regular basis (in a continuous and permanent way), therefore appears the so called apparent knowledge, which is the basis of the apparent culture. There is a prevailing conviction that what you know today, tomorrow it may change. The basis for determining the identity is indeterminacy resulting from the ongoing changeability of the time and place of his existence.

Still developing electronized contemporary culture is not institutionally materialized, because people can manage it through the Internet, therefore there is no need to take notes and do printouts and hold in-person meetings (in the real world) are unnecessary. This culture of virtual communication affects human interaction. Attitudes towards objects and living organisms are very diverse. In the world of the Internet there is no distinction between gender and ethnic origin, because they can be also changed. Also, the human senses change with cultural changes. *Homo interneticus* is sensually distracted because his vital functions are carried out only apparently, and the Internet communication does not reveal facial expressions when interacting with other people.

Homo interneticus is constantly afraid that something will miss him, he is accompanied by a constant sense of discomfort due to the fear of missing out important information, the chance to experience something and establish social interactions. This is directly related to the spread of mobile devices and the development of social networking sites. The researchers of this phenomenon estimate that up to 70% of adults living in developed countries who are connected to the network and use it on a permanent basis suffer from this fear. The phenomenon was first named and described by D. Herman in the article The Fear of Missing Out (FOMO) (2010). The universality of the phenomenon can be proved by the fact that the slogan "FOMO" was added to the renowned Oxford Dictionary (2016) in 2013: The fear that the exciting and interesting event may be currently happening somewhere else, where I am not, the phenomenon often occurring in the social media. The basic reasons for the emergence of the phenomenon of FOMO are:

– social networking sites (e.g. Facebook) – flatter the ego of Internet user, the man feels that he is among his friends: nice and intelligent people ...

– on the Internet there is always readiness to provide all the answers ...

– and if you do not look to the Internet, then there is emptiness, longing for something ...

At all times homo interneticus – is always checking something on his phone and laptop and consequently he cannot concentrate on work – this makes him exhausted and depressed. Finally, he sees the psychiatrist – with neurosis and depression. Even at the time of rest, relaxation, when *homo interneticus* – orders a cup of coffee, puts a newspaper and a phone on the table ... he does not concentrate on what is going on around him, does not meditate – is overwhelmed by emptiness and chaos. He reaches for a cup of coffee, glances at the newspaper, but then picks up a phone, puts coffee aside, and after a while he reaches for coffee again, browsing Facebook simultaneously – newspaper is untouched – and at this moment he feels anxious because he should be reading a newspaper, but he isn't. So he glances at the title and further browses the phone contents... nothing happens, and he still feels the fear of what happens when he does not check it.

We can safely assume that from today's point of view this will pttspectively cause some significant changes in our culture, and particularly can change today's common-sensical view of the world. Certainly, in the future the cognitive abilities of man will even more evolve following the cultural changes. And we must be prepared for this, including school, which must be prepared for this situation.

***Homo interneticus* – „I do not think, but I am" not „I think, therefore I am".** Existing cognitive dispersion of contemporary man leads to the loss of value of knowledge in the strict sense, and thus the loss of comprehension, ability to associate facts or to build personalized, internally and externally consistent narration of the world – what counts is literalism and attractiveness of information transmission measured by the number of clicks (i.e. likes). *Homo interneticus* is convinced that this is naturally present in the environment and we do not have to strive for it, acquire and cultivate it – simply, we do not need to learn.

On the Internet there are numerous examples of this, like a web TV Matura to bzdura (MTB in short) – (Matura exam is a nonsense) provides "hits" showing deficiencies in basic knowledge and skills to use it: What is inflation? – a title of the movie with Leonardo Di Caprio ☺ (the interlocutor possibly mistook "inflation" for the famous film with the actor entitled "Infiltration"). Another example: On whose side did the Americans fight at Troy? – on our side (film remakes appearing on a regular basis on the Internet lead to the dysregulation of time and place of events happening – you can set any historical event at any time and place).

Today learning the facts, gaining the knowledge bases in school has become extremely difficult due to the fact that for students the basic source of knowledge - and the oracle as to its authenticity – has become the Internet. Everything is arranged here not according to the logical dependencies, hierarchical structures, and the principle of free hypertext associations, e.g. "1492" on the Internet is both the discovery of America by Christopher Columbus, and the title of the film "1492. Conquest of Paradise" – and depending on what kind of message is clicked, such will be the answer to the question: *What do you associate the year 1492 with?* In the second case, historical knowledge will come down to the plot of the film. Whereby, there are a lot more hypertext links to the film and they are more attractive, because they contain illustrations and further films…

Contemporary education does not feel confident in this world as in many opinion polls such nonsense is also spoken by the adults ... people who are usually holders of Matura Exam. On the one hand, curricula adhere to an objective, recognized and justified narration, depending on the adopted model (substantive correctness), on the other hand, students are regular members of the same narration present in the network subjectively (the objective truth has been replaced by a subjective truth – what I found true at the moment of clicking is true – this is what I liked at that moment). For this reason, millions of Europeans or Americans, despite finishing formal education, remain illiterate or functionally illiterate – they do not know how to make a rational use of the acquired knowledge.

The World Literacy Foundation, investigating this issue in 2015, estimated the global number of illiterates at 796 million, and the loss caused by this fact at 1.2 trillion dollars a year (in Poland "only" 15 billion). It was agreed that this problem affects 47% of Italians, 21% of Britons and 14% of Germans.

Poland is at the average level and does not somehow distinguish itself in such opinion polls. Many countries recognize the seriousness of the situation and try to deal with it in different ways, because it raises a basic questions: whether a society in which a large percentage of people remain at almost preschool level is able to govern wisely?

Ending we can ask: what is the point of democracy if so many voters do not understand basic economic terms, do not see the cause and effect relationships between events, do not understand the language of politics and the media, do not read and do not count well?

3. *HOMO INTERNETICUS* – A SPHERE OF ILLITERACY – THE CHALLENGE FOR SYSTEMS OF EDUCATION

Functional illiteracy of philosophy is embedded around the problem of being a well-read person and it is not about reading paper books only, but books in general, not only blogs and online hypertext, because this text, without the knowledge of the canon of the reading material, leads to chaos in thinking. This is clearly evidenced by the study of the state of readership in Poland in 2015, conducted by the National Library (Rakoski 2015). It shows that as many as 63% of Poles had no contact with the book, and 37% read only one book.

Spanish BBVA Foundation in 2014 checked the scientific knowledge of the Europeans using 22 questions. The Poles gave an average of 11 correct answers, Italians and Spaniards were ranked behind us, the leaders – Danes, Germans, Dutch – knew the answers to 15 questions. Copernicus and Maria Skłodowska-Curie "saved" Poles from "a great shame" – only 7 percent of Poles believe that the Sun revolves around the Earth (in some countries this belief is shared by up to 20% of respondents).They were asked about the names of world-famous scientists, and only every fourth Pole could not mention any (only in Poland the Nobel Prize winner – Maria Skłodowska-Curie won this kind of ranking by beating Albert Einstein). The other results were poor. Half of Poles believe that people lived as early as in the era of dinosaurs. Two-thirds claimed that antibiotics fight viruses. Only 30 percent were able to select the right of the four answers to the question: what may a genetic disease in the family result in? (in Denmark, up to 80 per cent). Although Poles were generally in favor of scientific progress, they broke the record when it comes to distrust towards scientists, most often stating that scientists cross ethical limits. More than half of respondents thought that way. Every third expressed the belief that scientists are lying and are dangerous.

The test also examined the numerical relationship between those who are in favour of evolutionism and the advocates of creationism in each country. On average, 63% of EU citizens believe that the man and the world are rather the result of evolution, 25% claim that this is the work of God (the rest did not give a definite response). In Poland, 37% of respondents leaned towards the evolution and 45 percent opted for the creationist view. In this respect, this is an exception, because even in traditionally Catholic Italy and Spain more than half of the respondents declared evolutionism. Only the Americans turned out to be more creationistic (where the ratio was from 30 to 60 percent). At the same time, Poles are the most optimistic when it comes to the ability to reconcile the truths of faith with scientific knowledge.

The Poles are doing quite well in reconciling faith with non-scientific beliefs. According to the CBOS[3] research (Report 2011) 33% believe in reincarnation (transmigration of souls), 61% in destiny (bad, good fortune). Much more often

[3] Public Opinion Research Center

these people declared themselves as practicing Catholics than non-believers. More than half of Poles believe in superstitions. The most religious (practice several times a week) are two times more superstitious than non-practicing. The ranking of superstitions heralding success is as follows: keeping one's fingers crossed, a chimney sweeper, a four-leaf clover, a talisman, the number 7. Among bad omens are a broken mirror, a black cat, a handshake across the threshold, the number 13, getting up on the wrong side of the bed. This could, of course, be considered as a nice cultural characteristics.

People who are completely mentally healthy, less educated, or with a higher education degree, cannot handle the reality that surrounds them. Small problems that can be solved on a regular basis with minimum funds grow rapidly to the size of a powerful tsunami in life. The man is ineffectual, helpless, confused, but .... when the frustration appears he often becomes demanding, impulsive, postulative and more and more steeped in aggression. Such functional and life illiterates cannot articulate what problem they need to struggle with, do not understand it and are looking for a kind of help, everywhere showing aggression and a demanding attitude(Functional illiteracy ... 2015).

Functional illiteracy of economic. In studies conducted by Millward Brown for the Institute of Freedom and Raiffeisen Bank in 2014 (Report: *The state of economic knowledge*...) surprising is not only a belief in the power of numbers seven and thirteen entwined with the lack of distinction by a Polish bank loan borrower between a percentage and a percentage point (this applies to 92% of respondents). Moreover, only one in three Poles knows that in our country there are two tax thresholds now, and barely one in five understands the principle that the entry into a higher threshold does not change the calculation of tax for all income earned in a given year. Every fourth respondent gave the correct level of last year's inflation.

The results of the research presented in the report prepared by the DB Maison (for the Kronenberg Foundation) (Report: The state of financial knowledge ... 2009) found that at least the awareness of the economic ignorance is big in Poland – and although we are aware of that, we do not do anything to increase this knowledge significantly. Only 1% of respondents rated their knowledge as very high, and 4% as high. 62% admitted that it is poor and very poor. The consequences are probably annoying in the sense of the individual, because eight in ten Poles frankly confess that they do not know how to plan their expenditure in order to achieve economic goals, e.g. to save a certain amount. The social consequences of economic illiteracy are also visible. When CBOS (Report: The obligations of the state ...) asked the Poles in 2013, what obligations they have towards the state, paying taxes was mentioned by 76%. Even in 1999, 87% gave this answer.

In reality there are already social problems resulting from the economic illiteracy, for example, the Spanish Association of Entrepreneurs suggested that unskilled workers should be earning below the minimum allowable wage (...) In Spain, a million people do not have any preparation for the job, and yet they have to be paid as qualified people. Over the years of the economic boom, thousands of students abandoned education to work in construction industry or services and earn up to two thousand euros per month. Now they belong to the so-called “neither-nor generation” – young people who neither work nor learn. It is because of them, among other things, that the level of youth unemployment exceeded 50 percent in Spain. The Association of Entrepreneurs proposes that they were paid the lowest of all. *People who are 25-30 years old now and did not finish school in childhood, cannot be paid at the same level as those prepared for the job* – says Monica de Oriol, the president of the Association of Entrepreneurs (Portal: Forsal.pl, 2014).

Functional illiteracy of social is undoubtedly rooted in a massive and rapid development of telecommunication services. It's not just the Internet, but above all the mobile network, especially smartphones. The statistics are as follows: in 2002 only 19% of the world's population had mobile phones (1,174 billion people). The Internet was used by only 631 million (10% of the population). At the end of 2011 the number of mobile phone users reached 6 billion inhabitants of the earth. More than 2,3 billion people had access to the Internet, while in most cases it was a mobile access. At the end of 2011 Facebook community was the third largest “country” of the world, just behind China and India.

Modern "illiterates", often with a university degree, cannot meet the demands of competence of the twenty-first century. In the new, post-industrial reality it is no longer enough just to know the alphabet and be able to read and write. It's far too little. Reading texts and searching for data in the network is far different from "traditional" work with the book. Network resources are interconnected through millions of links and references. Conducting research and gathering information has become simple, fast, and available as never before in history. And here comes the problem (Rymszewicz 2016).

Computerization of society focused only on quantitative changes showed clearly that changes in quantity did not lead to changes in quality, because, paradoxically, an easy access to the network and its unlimited resources of knowledge has become one of the main causes of specific retrogression in terms of literacy, especially in terms of disappearance of the ability to understand written texts and their critical analysis. The man who is afflicted with the so-called functional illiteracy can read and write, but is devoid of critical thinking skills and analytical understanding of the messages, and thus remains closed within a limited circle of his own rigid beliefs and points of view. He remains unable to change the perception and understanding of the surrounding social world – is a social illiterate and has trouble with reading of not only bus and flight timetables, but does not understand what is privacy or a good self-image and the image of other people in the network. In the twenty-first century, social illiteracy simply means the inability to efficiently function in the world without borders or rigid resources of knowledge and without the behaviour according to set patterns.

CONCLUSION – MAIN INDICATORS OF *FUNCTIONAL ILLITERACY*

The basic source of functional illiteracy is primarily cyberspace of virtual world, which gives the illusion of not only communication with the real world and learning this world (not just reading, writing, counting) but also the illusion of understanding and living in this quasi-real world.

Among the most frequently occurring functional illiteracy indicators are:

– reading fewer than a few-a dozen or so books a year;

– lack of knowledge of a foreign language;

– inability to write precise, concise e-mails, reports, statements;

– proclamation of arguments full of aggression and personal attacks instead of substantive discussions;

– ignorance to produce cultural and substantive commentaries on texts and statements;

– misunderstanding of written texts: instead of doing reliable analyses and drawing conclusions, carrying out pseudo-interpretations, saying popular formula "because I guess so"; "because I think so", and "because it is on the Internet".

There is therefore a great challenge for education in the era of the dominant and widely accepted functional illiteracy of *homo interneticus*.

REFERENCES

Cichomski, B., 2003: *Literacy or illiteracy?* Sprawy Nauki, the Bulletin of the Ministry of Science and Higher Education. [http://www.sprawynauki.waw.pl/?section=article&art_id=418]. (accessed: 20.07.2017).

Functional illiteracy – the surrealism of postmodernism. [http://napolowe.blogspot.com/2015/01/analfabetyzm-funkcjonalny-surrealizmem.html] (accessed: 20.07.2017).

Goldhaber, M., *The mentality of Homo interneticus: Some Ongian postulates* [http://firstmonday.org/ojs/index.php/fm/article/view/1155/1075#author] (accessed: 20.07.2017).

Herman, D., *The Fear of Missing Out (FOMO) 2010* [http://www.danherman.com/The-Fear-of-Missing-Out-(FOMO)-by-Dan-Herman.html] (accessed: 20.07.2017).

http://info.cern.ch/

Krotoski, A., *Virtual Revolution. Homo interneticus?* BBC Two. Archived version of a 2010 web page. [http://www.bbc.co.uk/programmes/b00n4j0r] (accessed: 20.07.2017).

Lib, W., 2015: *Language as a creator of culture – the role of school in the development of technical language and technical culture*, Kwartalnik Edukacyjny. No 4, pp. 18-29,

Oxford Dictionary [http://www.oxforddictionaries.com/definition/english/fomo] (accessed: 20.07.2017).

Portal, 2014: *Forsal.pl. Spanish way to handle crisis – the minimum wage only for educated*. [https://odyssynlaertesa.wordpress.com/tag/analfabetyzm-ekonomiczny/] (accessed: 20.07.2017).

Portal: *Wikipedia. Tim Berners_Lee* [https://pl.wikipedia.org/wiki/Tim_Berners-Lee] (accessed: 20.07.2017).

Report (July 2013): *The obligations of the state towards the citizen and the citizen towards the state*. CBOS, Warszawa [http://www.cbos.pl/SPISKOM.POL /2013/K_104_13.PDF] (accessed: 20.07.2017).

Report (July 2014): *The state of economic knowledge of Poles – The Report of the Institute of Freedom and Raiffeisen Polbank*. The report based on research conducted by Millward Brown. [http://www.instytutwolnosci.pl/images/ raporty/stan_wiedzy_ekonomicznej_Polakw.pdf] (accessed: 20.07.2017).

Report (October 2011). *Superstitions still alive*. CBOS report, Warszawa, [http://www.cbos.pl/SPISKOM.POL/2011/K_130_11.PDF] (accessed: 20.07.2017).

Report (September 2009): T*he state of financial knowledge of Poles*. The report of quantitative research for The Kronenberg Foundation at City Handlowy. DB Maison. [http://www.citibank.pl/poland/kronenberg/polish/files/fk_ badania_01.pdf?zoom_highlight=raport+wiedza+ekonomiczna+Polak%C3%B 3w#search=%22raport%20wiedza%20ekonomiczna%20Polak%C3%B3w%22] (accessed: 20.07.2017).

Rymszewicz, V., *Are we illiterate?* Portal: Na temat [http://rymszewicz.natemat.pl/57047,czy-jestesmy-analfabetami] (accessed: 20.07.2017).

Walat, W., 2017: *Educational use of hypermedia.* Wyd. UR, Rzeszów.

World Literacy Foundation – *The Economic & Social Cost of Illiteracy – September 2015* [https://worldliteracyfoundation.org/wp-content/uploads /2015/02/WLF-FINAL-ECONOMIC-REPORT.pdf] (accessed: 20.07.2017).

Note: I hereby confirm that the manuscript to be published in the Monograph is my own original work, and it has not been printed before in any other sources.

SKILLS AND CAPABILITIES IN THE KNOWLEDGE SOCIETY

Danuta Kaźmierczak
Pedagogical University of Cracow
danuta.kazmierczak@wp.pl

Abstract: *Information technology sets the directions and pace of social development. It creates new opportunities and challenges for individuals, groups, communities and whole societies. The paper discusses the nature of the knowledge society, its needs for successful growth, challenges and skills the worker should possess to prosper and contribute. It also presents different classifications of the sets of skills as well as proposes another one built up on neurodidactic concepts. Theoretical and practical solutions derived from neurodidactics and LMS tools are suggested as the effective methods and techniques for an educational process so fundamental for well-being of the knowledge society.*

Keywords: knowledge society, knowledge workers, skills, ICT technologies

INTRODUCTION

Information has always been important for humans, yet, it is IT systems for storage, transferring and processing that has increased its value. For the information society information was a main asset. The IT systems and information data determined the structure of employment, GNP and development (Sienkiewicz, 2002).

In the 1950s Fritz Machlup identified the sector of the US national economy, the knowledge industry, which accounted for nearly 29 percent of the US gross national product, and the proportion of the labour force employed in the knowledge economy raised from 11 to 32 percent between 1900 and 1959. The transformation to a knowledge economy started and continued throughout the rest of the century (Machlup, 1973).

Following Don Clark, data and information are about the past, are static. The next level of understanding is knowledge and as the timeline shows, it deals with the present. It is dynamic and built on experience through interaction. However, when we gain wisdom, we can deal with the future. (Clark, 2015). (Figure 1).

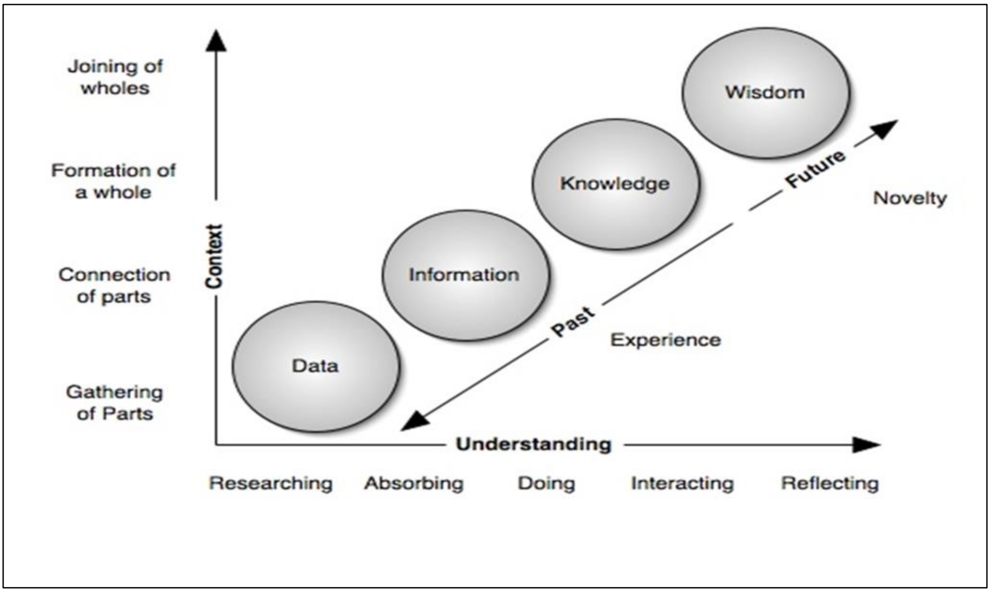

Figure 1. Understanding and performance
Source: http://www.nwlink.com/~donclark/performance/understanding.html (30 June 2017)

1. NATURE OF THE KNOWLEDGE SOCIETY

Knowledge is about the present – present time, society, economy.

Reflecting upon selected definitions available listed in Table 1, the knowledge society may be understood as a natural successor of the previous phase, the “information society” (IS), which in turn followed the “industrial society” and consequences of technological advances fostering effective use of collective (explicit) knowledge through innovations leading to personal, national and global growth.

Table 1.

Selected definitions of the knowledge society

Definitions of the knowledge society
A new society formed as a result of the contemporary societal change pushed by technological innovation and institutional transformation, which is not only about technological innovations, but also about human beings, their personal growth and their individual creativity, experience and participation in the generation of knowledge. The primary role of cities in a knowledge society is to ensure that their knowledge sources are passed on and advanced by each generation (Yigitcanlar, 2015) (Knowledge-Based Urban Development)

A wider concept of information society; entails commitment of persons as knowers. (The Information and Communication Technology (ICT) Competence of the Young)
In an evolutionary view, it can be seen as the successor of a previous phase, the "information society" (IS), which in turn followed the "industrial society". IS was so called because of the huge flow of information that was triggered by the advent of computers, data processing systems and communications. In the knowledge society, knowledge, and not mere information, is the most valuable asset. It is what is in the head of people (tacit knowledge) and what can materialize tangibly in the physical world, as print, or human exchanges (explicit knowledge). It is what drives the economy in the new millennium. (Ambient Intelligence)
An association of people who have similar interests, be they social, economic, political, cultural and so on and by making effective use of their collective knowledge in their areas of interest thereby contributing to further knowledge that will lead to national progress and global development. (Computer Communication and ICT Attitude and Anxiety Among Higher Education Students)
Advanced societies reaching a stage of development predominantly based on production and utilization of knowledge. (Modelling Knowledge Society)
A society where main of the prosperity and well-being of its people came from the creation, sharing and use of knowledge. (Use of E-Collaboration Technologies Among Students of Management)
Knowledge Society is understood as the ability that people have in the face of information, to develop a reflective competence, relating its multiple aspects, according to a particular time and space, with the ability to establish connections with other knowledge and use it in their everyday lives (Pelizzari et al., 2002), (Information, Knowledge, and Learning Society)
Developed society based on the access to knowledge. (Strategic Crowdsourcing as an Emerging Form of Global Entrepreneurship)

Source: https://www.igi-global.com/dictionary/knowledge-society/16456 (29 June 2017)

This effective use of knowledge is just ability to establish connections with other knowledge. Thus, the knowledge society may be also perceived as the social network, i.e. "the interpersonal linkages created by the sharing of information in the interpersonal communication structure" (Rogers, 1986). Its nature is dynamic, non-hierarchical. The growth is triggered by more and more advanced technologies and communication tools.

Yet, the network is not only naturally growing but also scaling, responding when its size changes. The increasingly large and complex social systems, cities, corporations and governments are continuously evolving and adapting like living systems (West, 2014).

The metabolic theory of ecology predicted that, from cells and whales to community structures, the pace of life gradually slows down with increasing size, and that this is accompanied by increasing economies of scale. Yet, as it comes to community structures, the cities – G. West's theoretical example – obey these if related to their infrastructure. But they invert them when it comes to social factors, where the network effect of having a lot of people in one place, plays its role: "The bigger you are, the more interactions take place, the more we talk, and the more we can create more wealth, new ideas, and so on." This holds true also globally. The one thing that stops growth - and the reason we wouldn't be better off living in one planet-wide city of 8bn people – is the limitation of natural resources. At this point G. West agrees with Thomas Malthus' theory of natural selection. The solution to this problem is technological innovation. However, as G. West puts it: "but the more energy hungry we get, the faster those innovations have to come to keep things moving. The only question that arises is, if as socio-economic beings we are able to stand the pace" (West, 2014).

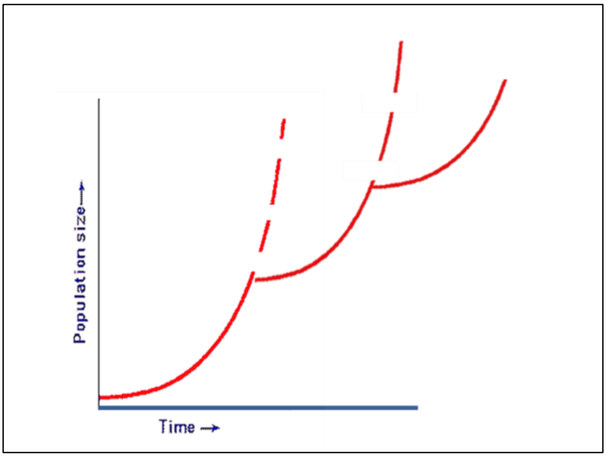

Figure 2. Unbounded growth requires accelerating cycles of innovations to avoid collapse

Source*: Elaborated on the work of G. West: The surprising math of cities and corporations https://www.youtube.com/watch?v=XyCY6mjWOPc (30 June 2017)*

Innovation is defined as creativity, novelty, the process of devising a new idea or thing, or improving an existing idea or thing (http://www.econlib.org/library/Enc/Innovation.html). Innovation seems to be not only the output of the effective use of knowledge but sine qua non for network structured society to sustain and avoid collapse.

The innovation, as Guy Kawasaki claims, needs to make meaning to the world, change it and make a technological breakthrough. It must be deep, with lots of features and functionalities, intelligent, total and empowering to jump to the next curve of the exponential growth. (Kawasaki, 2014). Figure 2 demonstrates the curves of unbounded (exponential) growth by G. West.

The process by means of which innovation causes a free market economy to evolve; this jump to the next curve of exponential growth is, as Joseph Schumpeter named it, *creative destruction*. Creative destruction occurs when innovations make long-standing arrangements obsolete, freeing resources to be employed elsewhere, leading to greater economic efficiency (Joseph Schumpeter, http://www.econlib.org/library/enc/innovation.html, (2 July 2017)).

2. KNOWLEDGE SOCIETY SKILLS – VARIOUS APPROACHES

The condition of the society determines the condition of labour market by technology, automation and creativity.

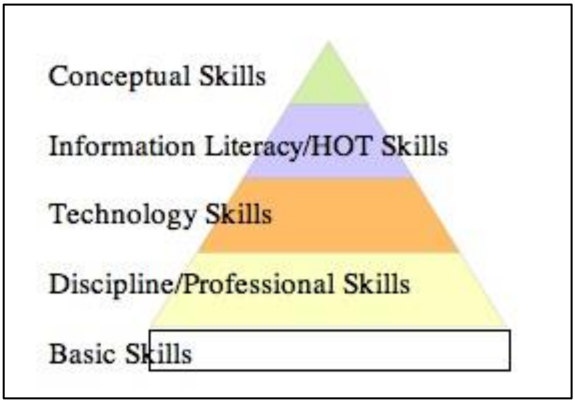

Figure 3. Johnson's Hierarchy of "Knowledge Worker Skills"
Source: Johnson D., (2005), Skills for the knowledge worker http://www.doug-johnson.com/dougwri/skills-for-the-knowledge-worker.html (3 July 2017)

The worker will need a particular set of skills and capabilities to adapt, survive, and what is more, contribute to the well-being of the community.

Skill should be understood as an ability and capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carry out complex activities or job functions involving ideas (cognitive skills), things (technical skills) and/or people (interpersonal skills), (Business Dictionary, http://www.businessdictionary.com/definition/skill.html)

Capability – measure of the ability of an entity (department, organization, and person, system) to achieve its objectives, especially in relation to its overall mission (Business Dictionary, http://www.businessdictionary.com/definition/skill.html).

Dough Johnson proposes, as he calls it, the Maslovian-type Hierarchy of Knowledge Worker Skills, skills that need be mastered prior to the acquisition and application of "higher order" skills. They are the following: Basic Skills, Discipline/Profession Specific Skills, Technology Skills, Information Problem-Solving/HOT Skills, and Conceptual Skills. Figure 3 (Johnson, 2005).

LEVEL ONE: The Basics Skills

reading for understanding, interpreting visual information, writing comprehensibly and, solving numeric problems

LEVEL TWO: Discipline/Profession Specific Skills

"cultural literacy" - a base of knowledge in history, social science, science, literature, and both physical and cultural geography followed by core skill sets and body of knowledge of science, law, education, architecture, medicine, computer science, engineering, accounting, and other professions

LEVEL THREE: Technology Skills

Technology skills are omnipresent and may be considered actually as "knowledge work," or even a new "basic skill."

LEVEL FOUR**:** Information Problem-Solving Skills and Higher Order Thinking Skills

Working with and developing technology require one of broader set of skills which is successful information problem-solving.

LEVEL FIVE: Conceptual skills

Johnson proposes in here Daniel Pink's (2005) idea of developing and using the right-brain abilities of high concept (seeing the larger picture, synthesizing information) and high touch (being empathetic, creating meaning).

Pat Sine (2008) draws up the whole spectrum of skills the extended professional of the 21st century should possess (Figure 4).

I CATEGORY:

- CORE SUBJECTS: English, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics.
- 21ST CENTURY INTERDISCIPLINARY THEMES: global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health literacy.

II CATEGORY:

- LIFE AND CAREER SKILLS: flexibility and adaptability, initiative and self-direction,
- SOCIAL & CROSS-CULTURAL SKILLS are: productivity and accountability, leadership and responsibility.

III CATEGORY:

- LEARNING AND INNOVATION SKILLS: creativity and innovation, critical thinking and problem solving, communication and collaboration.

IV CATEGORY:

- INFORMATION, MEDIA & TECHNOLOGY SKILLS: information literacy, media literacy, ICT literacy.

Figure 4. The 21st Century Skills

Source: Pat Sine, from 20th Century Instruction to 21st Century Learning, Office of Information technology, University of Delaware, USA, 2008 https://www.slideshare.net/psine/from-20th-century-instruction-to-21st-century-learning-presentation?next_slideshow=2, (2 July 2017)

Another skills classification presents the profile of the knowledge worker from the practical perspective and provides very detailed description of single skills. The skills fall into 7 groups. (Figure 5)

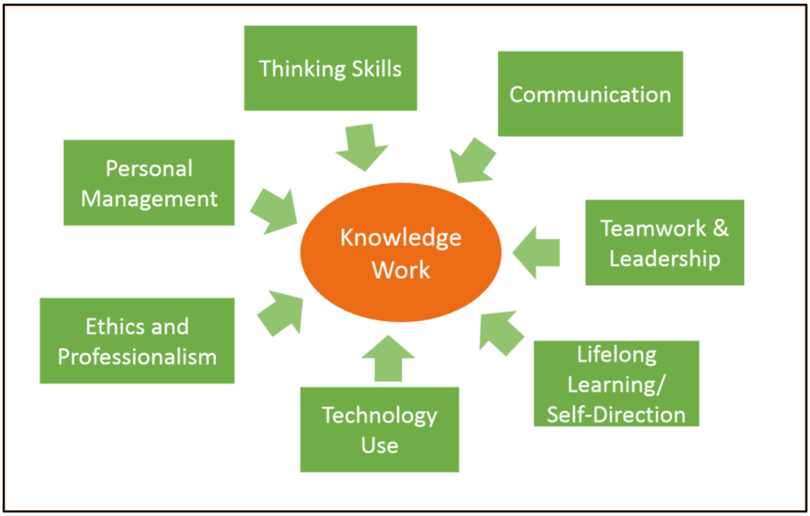

Figure 5. 7 Skills of Knowledge Work
Source: Gardner J., 2014, The 7 Skills of Knowledge Work http://joelleegardner.blogspot.com/2014/10/the-7-skills-of-knowledge-work.html (2 July 2017)

THINKING SKILLS - the ability to work with information effectively to solve problems, performs tasks, and design solutions. Thinking skills include:

- *critical thinking* - drawing appropriate conclusions based on data
- *systems thinking* - seeing the big picture, including how parts of a system affect and influence one another
- *analysis skills* - breaking down information and technologies into pieces to understand and categorize individual parts. Identifying the root cause of a problem.
- *problem solving* - identifying solutions to complex issues.
- *creativity* - using imagination to combine existing knowledge into new knowledge to fulfil a need.
- *design* - planning out the implementation of solutions to learning and performance problems.

COMMUNICATION - the ability to understand and share ideas effectively. This includes the following:

- Understand and interpret complex information from multiple sources through divers media.
- Communicate effectively and appropriately in a variety of formats, including visual, verbal, written, both face-to-face and in digital formats.

TEAMWORK AND LEADERSHIP - the ability to work with others to achieve a common goal. This includes the following:

- collaborating and working effectively with others to achieve goals.
- motivating others through appropriate strategies.
- working effectively with team and individual strengths to maximize the effectiveness of the whole.
- leading people to positive outcomes through persuasion, empathy, and effective management.

LIFELONG LEARNING AND SELF-DIRECTION -continual self-improvement through the constant knowledge acquisition, setting one's own direction in learning and growth. This includes the following:

- Development of general skills like those in this list.
- Development of field-specific skills.
- Gaining formal education, which to increase ability to sustain success in the knowledge society.

TECHNOLOGY USE – uses of technology to accomplish goals or tasks.

- Select the right tools and technologies for tasks and problem solving.
- Use tools and technologies to appropriately complete tasks and solve problems.
- Learn quickly how to use a new technology and be willing to adapt new technologies continuously.

ETHICS AND PROFESSIONALISM - is accountable for their own actions and work.

- Have good work habits and perform assigned work consistently.
- Interact with others in a professional manner.
- Work effectively and professionally with people of diverse backgrounds.

PERSONAL MANAGEMENT - manage habits to maintain health (physical, mental, emotional, and spiritual), which means maintaining balance in all areas of life (family, work, personal, community).

Gardner explains also how these skills should be actually utilized in the working environment to ensure further development for both workers and organizations (Table 2).

Table 2.

Organizations and Leaders in the Knowledge Society

Skills	Organizations and Leaders Should…
Thinking Skills	Share and give access to relevant, useful knowledge.
	Create systems and processes for knowledge sharing.
	Teach and communicate regularly with employees.
	Encourage and establish systems for knowledge sharing.
Communication	Continually communicate new knowledge to employees.
	Provide professional development opportunities to improve communication skills.
	Provide continuous opportunities to practice the skills of communication.
Teamwork and Leadership	Provide leadership and guidance in effective teamwork.
	Provide opportunities to practice leadership teamwork.
	Provide professional development opportunities to improve leadership and teamwork skills.
Lifelong Learning and Self-Direction	Provide many opportunities for learning and professional development.
	Provide career coaching and development opportunities.
	Provide access to relevant industry knowledge.
Technology Use	Utilize and demonstrate effective use of appropriate technologies.
	Provide professional development opportunities to improve employee technology capacities.
Ethics and Professionalism	Establish standards of ethical, professional behaviours through word and example.
	Hold employees accountable for their professionalism.
Personal Management	Provide opportunities for development of personal management skills.
	Provide a healthy working environment.

Source: Gardner J., 2014, The 7 Skills of Knowledge Work http://joelleegardner.blogspot.com/2014/10/the-7-skills-of-knowledge-work.html (2 July 2017)

McKinsey predicted the increasing demand for knowledge workers performing interactive jobs (McKinsey Global Institute report, *Digital America: A tale of the haves and have-mores*, 2016).

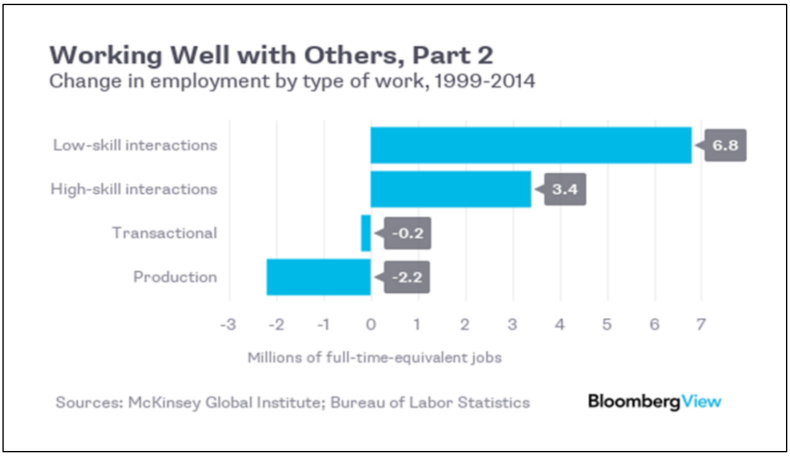

Figure 6. Change in employment by type of work 1999-2014
Source: McKinsey Global Institute; Bureau of Labour Statistics Report, 2016

The figures presented in Figure 3. demonstrate strong demand for high and low skill work: 6.8 and 3.4 m full-time positions respectively.

Production jobs are those that transform one resource into another, such as assembly work in the manufacturing sector. Transaction work is a routine, clerical task with clear rules to follow, for example the one performed by cashiers. Interaction work refers to occupations that involve customer engagement, team discussions, and creative thinking. These kinds of work comprise high-skill (such as doctors and scientists) and low-skill (such as retail salespersons and restaurant servers) (Fox, 2015).

The nature of work will change as processes are automated, yet it will not be clear cut division into automated and interactive occupations. Only a small percentage of occupations can be fully automated by adapting current technologies. Majority of occupations are made up of a set of activities with different potential for automation. For example, small shop owners will spend some time interacting with customers, serving them at the till, stocking shelves. They will need different skills for each of these activities to perform effectively and efficiently. (McKinsey, 2016)

Workers will need intrinsically human capabilities to perform activities which are complementary to those done by machines. Thus, policy makers, managers and future workers will need to focus more on identifying required skills and providing or taking proper education and training.

These intrinsically human skills are: logical thinking and problem solving, social and emotional capabilities, providing expertise, coaching and developing others, and creativity. (McKinsey Global Institute, *A future that works: Automation, employment, and productivity*, 2016)

2.1. A neurodidactic perspective on knowledge society skills

The concepts of knowledge society skills presented above include all possible skills a human can acquire and develop. They seem to be overlapping rather ran complementary. Yet, the way of their categorization puts more emphasis or importance on one or another set. Johnson's hierarchical arrangement stresses the order in which the skills should be mastered in the academic environment and as the last to develop, because most complex, are conceptual skills.

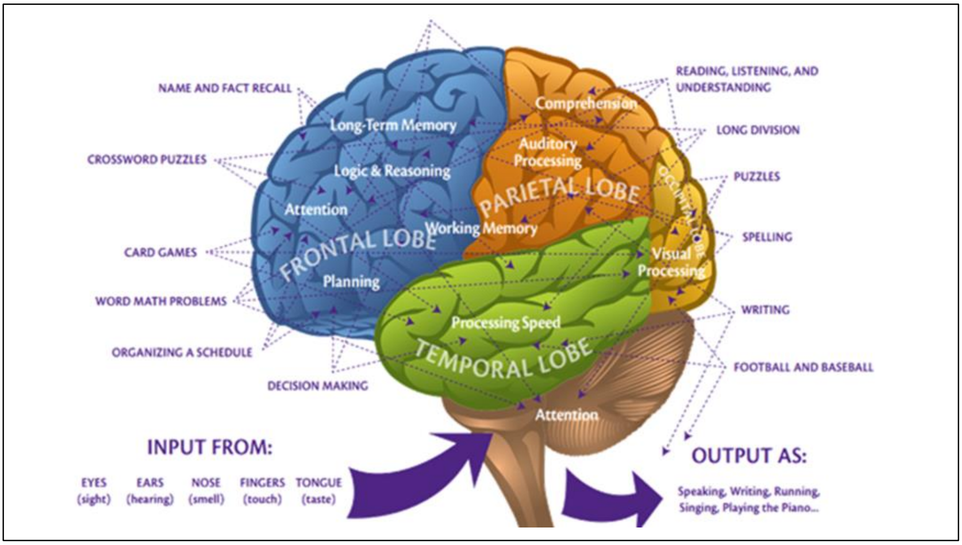

Figure 7. The parts of the human brain

Source: https://www.quora.com/Neuroscience-What-are-the-most-important-parts-of-the-human-brain

P. Sine distinguishes among others, 21st century interdisciplinary themes that include global awareness, civic literacy and health literacy.

Gardner focuses on business environment identifying personal management as the separate category of skills and arranges them in a circle together with other skills without attributing special importance to any category.

McKinsey emphasizes intrinsically human capabilities.

Referring to neurodidactics, we can further elaborate on knowledge society skills basing on the concept of the brain as a network.

The brain acts as a dense network of fibre pathways consisting of approximately 100 billion (10^{10}) neurons. The brain consists of three principal parts – stem, cerebellum and cerebrum. The cerebrum is divided into specific areas: frontal lobe, occipital lobe, parietal lobe and temporal lobe which specialize in different functions - sight, hearing, speech, touch, short-term memory, long-term memory, language and reasoning abilities. And the cerebrum is where higher-ordered functions like memory and reasoning occur (cognitive skills) (Ford, 2011; Żylińska, 2013). The parts of the human brain and its functions are illustrated in Figure 7.

As defined by Pascale Michelon, cognitive abilities are brain-based skills we need to carry out any task from the simplest to the most complex. They have more to do with the mechanisms of how we learn, remember, problem-solve, and pay attention, rather than with any actual knowledge. For instance, answering the telephone involves perception (hearing the ring tone), decision taking (answering or not), motor skill (lifting the receiver), language skills (talking and understanding language), social skills (interpreting the tone of voice and interacting properly with another human being)

Another example shows that to carry out goal-directed movements, your motor cortex must first receive various kinds of information from the various lobes of the brain: information about the body's position in space, from the parietal lobe; about the goal to be attained and an appropriate strategy for attaining it, from the anterior portion of the frontal lobe; about memories of past strategies, from the temporal lobe. (http://thebrain.mcgill.ca/flash/d/d_06/d_06_cr/d_06_cr_mou/d_06_cr_mou.htm)

The analysis of brain functions and skills by P. Michelon is provided in Table 3. (P.Michelon, *What are Cognitive Abilities and Skills, and How to Boost Them?*; https://sharpbrains.com/blog/2006/12/18/what-are-cognitive-abilities/, accessed 18 December 2006).

We need to learn and we do so, not single skills in a hierarchical order but practice and master rather a wide spectrum of different skills to perform even simple automated tasks working with robots in a factory or complex ones like elaborating on business strategy.

Bresslor and Menon's large brain network research (2010) also suggests that cognitive functioning is the result of interactions or communication between different brain systems distributed throughout the brain. When performing a particular task, just one isolated brain area is not working alone. Instead, different areas of the brain, often distant from each other within the geographic space of the brain, are communicating through a fast-paced synchronized set of brain signals (McGrew, 2011). The effectiveness of brain activity highly depends on the synchronization of signals flows (M. Żylińska, 2013). These signals run through paths creating "a large-scale functional network which is as a collection of interconnected brain areas that interact to perform functions" (Bresslor and Menon, 2010).

Table 3.

Cognitive abilities and brain functions

Cognitive Ability/ Brain Function	Skills involved
Perception	Recognition and interpretation of sensory stimuli (smell, touch, hearing, etc.)
Attention	Ability to sustain concentration on a particular object, action, or thought, and ability to manage competing demands in our environment.
Memory	Short-term/ working memory (limited storage), and Long-term memory (unlimited storage).
Motor skills	Ability to mobilize our muscles and bodies, and ability to manipulate objects.
Language	Skills allowing us to translate sounds into words and generate verbal output.
Visual and Spatial Processing	Ability to process incoming visual stimuli, to understand spatial relationship between objects, and to visualize images and scenarios.
Executive Functions	Abilities that enable **goal-oriented behaviour**, such as the ability to plan, and execute a goal. These include: **Flexibility:** the capacity for quickly switching to the appropriate mental mode. Theory of mind: insight into other people's inner world, their plans, their likes and dislikes. **Anticipation:** prediction based on pattern recognition. **Problem-solving**: defining the problem in the right way to then generate solutions and pick the right one. **Decision making:** the ability to make decisions based on problem-solving, on incomplete information and on emotions (ours and others'). **Working Memory:** the capacity to hold and manipulate information "on-line" in real time. **Emotional self-regulation**: the ability to identify and manage one's own emotions for good performance. **Sequencing**: the ability to break down complex actions into manageable units and prioritize them in the right order. **Inhibition:** the ability to withstand distraction, and internal urges.

Source: *elaborated on P. Michelon, What are Cognitive Abilities and Skills, and How to Boost Them?; https://sharpbrains.com/blog/2006/12/18/what-are-cognitive-abilities/, 18.12.2006.*

This way, Bresslor and Menon, (2010) distinguished three main networks that explain human behaviour.

1. The default mode (DMN) or default brain network is what a brain does when not engaged in specific tasks. It is a system for autobiographical, self-monitoring and social cognitive functions - processing, storing, and applying information about other people and social situations (social interactions).

It is also responsible for REST (rapid episodic spontaneous thinking) i.e., when not working on a specific task or, completing a task that is automatized (e.g., driving a car) the mind starts to wander and produce spontaneous thoughts (which can be both positive creative thinking and distracting thoughts).

The researchers at the University of California Irvine’s Center for the Neurobiology of Learning and Memory (Ford, 2011) explained that automatization/ subconsciousness of task performance with the concept of learning and memorizing formation. Learning and memorizing are formed by the strengthening and weakening of connections among brain cells. In experiments with mice, they observed how the brain was learning a new task. It appeared that when two neurons frequently interact, they form a bond along which they transmit more easily and accurately. This helps to create more complete memories and easier recall.

They also support this concept with the example of the daily commute: *You don't really need to think consciously about how to get to work, because it is a trip you have taken so many times that the memory of how to navigate is ingrained. The neurons that control this memory have communicated so often, they have formed a tight bond* (D. J. Ford, 2011).

The neuronal paths created in the childhood are often used over the lifetime. This is how we gain the experience (Żylińska, 2013).

2. The salience network is a controller or network switcher. It monitors information from within (internal input) and from the external world, which is constantly bombarding us with information. The brain can process almost 100 megabytes of information per second into signals (Spitzer, 2007). This controller selects urgent, task relevant information, distributes it for processing in other areas of the brain.

The research at the University of Michigan’s Biopsychology Program (Ford, 2011) also proves that the brain behaves selectively about how it processes experiences that enter through our five senses. The brain seems to be highly attentive to any novelty or unusual experience. It compares between the new information brought through the senses and existing information stored in the brain's long-term memory. When the brain finds a match, it eliminates the new memory as redundant.

When new information contradicts what's already stored in memory, the brain works to explain the discrepancy. If the new information is useful it becomes a permanent memory that can be retrieved later. While learning new information, we estimate if it is useful and its source reliable. If they are not, we forget it or even reject it altogether, depending on the information we already possess.

3. The central-executive network (CEN) "is engaged in higher-order cognitive and attentional control", when engaged in working on a problem (McGrew, 2011) (Figure 8).

This can also be exemplified by D. J. Ford's experiment (2011). He contrasted our daily commute described above with the experience of driving to a completely new location. To make this trip, our brain works much harder for us to get directions, write them down or print them and then concentrate on road signs along the way. In this case, the neurons involved in navigating to this new destination have not communicated. They need to form new connections within the brain, which results in greater conscious effort and attention on our part.

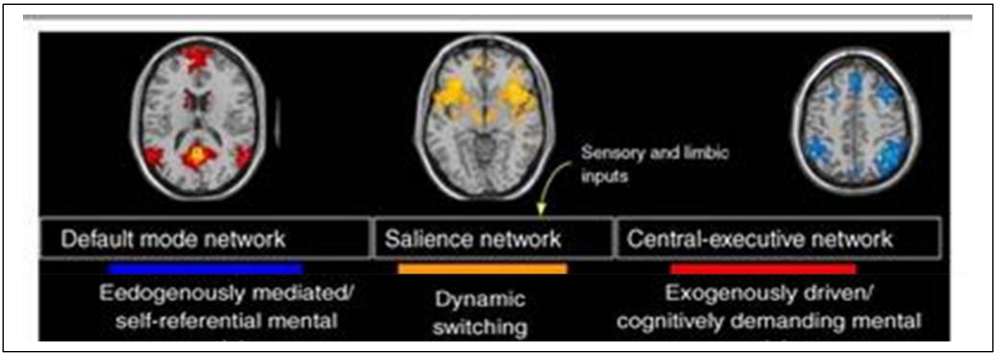

Figure 8. The large-scale functional networks
Source: *elaborated on McGrew K. (2011), The Brain as a Network: Focusing Your Network http://www.creativitypost.com/psychology/the_brain_as_a_network_ focusing_your_network (4 July 2017)*

Following Bresslor and Menon's neuroscientific concept that cognition is the result of a number of large scale brain networks that require efficient brain rhythm or synchronization (McGrew, 2011) the system of skills of knowledge society may be perceived as a holistic and networked and build up around the large-scale function networks of the brain.

Default skills → social interaction, creative thinking

Salience skills → selecting, analysing and organizing information

Central-executive skills → problem solving, critical thinking

All other skills are derivative or specific from of the main ones. The example classification is presented below. (Figure 9).

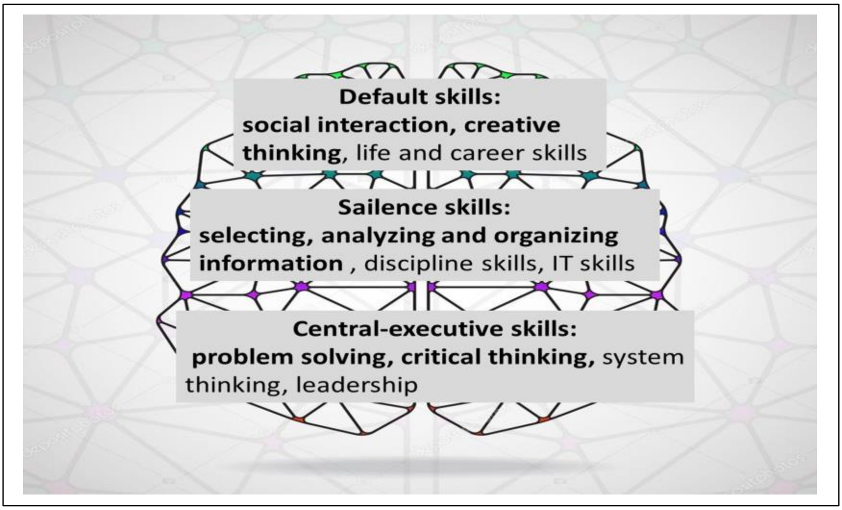

Figure 9. Knowledge Society Skills
Source*: Own Work*

In everyday life from the very beginning as a child and along the whole life we use and practice all skills of course at different level of complexity and responsibility. Although, it can be disputable weather the level of responsibility for a task performed perceived by a child and an adult is different.

Children acting *a mom and dad* role play use the following skills:

- default skills: social interaction, creative thinking: partnership, cooperation, creativity/imagination of various situations while involving their "children – dolls", earning a living,
- salience skills: comparing and selecting information for making right choices, telling the difference between good and bad information, acceptable or not for a child, a spouse
- central-executive skills: management (of family), strategic thinking, planning a day, the future, running (governing) a household, critical thinking: bringing up children, correcting their behaviour (quality of education)

Playing a strategic *war game*, usually boys, practice the following skills:

- default skills: social skills: partnership, cooperation with allies, creativity/imagination of possible dangerous situations
- salience skills: comparing and selecting right information for risk estimation, IT skills to use supportive applications (BPM applications)
- central-executive skills: command and control at the battlefield, strategic thinking, planning the operation,

There can be much more skills identified, I just limited the examples to the basic ones. These skills, although generally divided, are strictly interconnected. For example, cooperation or partnership, as social skills (default skills), are complementary to leadership skills which in this classification falls into central-executive skills category. Salience skills like collection and selection of information seem to be fundamental and supportive for other skills, e.g. the commander needs right information from the battlefield to draw a right strategy and right information about soldiers to communicate with them successfully. The quality and quantity of information we possess, determine our decisions and actions. At this point it seems appropriate to quote McGrew (2011): *This controlling network (salience functional network) must suppress either the default or executive networks depending on the task at hand. It must suppress one, and activate the other. Needless to say, this decision making and distribution of information must require exquisite and efficient neural timing as regulated by the brain clock(s*)

Analogy of the children plays can be easily identified in the adult life as a mature family members and managers we use and practice the same skills. Of course the children rather imitate the adults' behaviour and modify it with their own initiatives whereas adults have the opportunity to draw on experience in some situations.

For practicing and developing these skills in adulthood we employ role plays, games straight from the children world as a company training activities. Methods widely and successfully used are:

- Discussions: different roles give opportunity to develop different skills.

  The observers exchange thoughts, ask questions (select information, compare), cooperate in some sense

  The leader of the discussion explains differences, monitors exchanges of opinions

  Members of the cooperate and contributes to discussion by communicating their ideas, are open, tolerant and persuasive (social skills)

- Role plays: acting out specific role learns particular behaviours in different situations, find different options (critical thinking), selection, cooperation, communication of the problem and solving is based on the experience

- Simulations out or mimicking an actual or probable real life condition, or situation to find a cause of a past occurrence (such as an accident), or to forecast future effects (outcomes) of assumed circumstances or factors. A simulation may be performed through (1) solving a set of equations (a mathematical model), constructing a physical (scale) model, (3) staged rehearsal, (4) game (such as wargames), or a computer graphics model (such as an animated flowchart). Simulations are very useful tools that allow experimentation without exposure to risk.

(http://www.businessdictionary. com/definition/simulation.html, 15 August 2017)

- Case study - documented study of a specific real-life situation or imagined scenario. Students or trainees are required to analyse the prescribed cases and present their interpretations or solutions, supported by the line of reasoning employed and assumptions made (http://www.businessdictionary.com/definition/case-study.html, accessed 15 August 2017).

  The skills involved are collecting and selecting information, analytic and synthetic (critical) thinking, creative thinking, finding new solutions, decision making, communicating own ideas, justifying and reflecting. (Andrzejczyk, 2010)

While thinking about knowledge society skills it one should think not about single skill to be practiced but about capabilities (as McKinsey calls inherent human capabilities), since performing and completing a given task involves usually a few different skills. This performance is controlled by brain functions which are not exclusively located in specific brain areas acting independently (the right or left hemisphere).

3. AN EDUCATIONAL MODEL FOR THE KNOWLEDGE SOCIETY

Educational systems have not met labour market expectations. According to McKinsey survey of young people and employers in nine countries, 40 percent of employers point to lack of skills whereas 60 % - not adequate preparation for the world of work. There are gaps in technical skills such as STEM subject (science, technology, engineering and mathematics) degrees but also in soft skills such as communication, teamwork, and punctuality. (http://www.mckinsey.com/global-themes/employment-and-growth/technology-jobs-and-the-future-of-work, accessed May 2017).

Since the nature of the knowledge society, its labour market needs, the knowledge worker profile, and educational inadequacies have been identified, naturally the question how to satisfy these needs arises.

To provide successful education it is necessary to define the profile of the learner first and then apply the right methods and techniques to reach desired goals.

The learner of the knowledge society is born from 1996 to the present.

At the Center for Generational Kinetics, the researchers call them the generation after Millennials "Gen Z or iGen.” and define them as cloud natives rather than digital natives.

Gen Z feel more digitally free, they use more peer-to-peer social media and messaging apps, such as Snapchat, Vine and Instagram. They may even have anonymous accounts to share their experiences without fear of online reputation repercussions. The recent study showed that nearly 25% of 13- to 17-year-olds left Facebook, as being for "older generation". This shows that apps that are more instantaneous, use less personal information and are more visually appealing to users are gaining popularity.

This could have profound implications for everything from their relationships and how they learn to virtual reality training and problem-solving.

Their world is "iEverything." As a result, they tend to live most of their lives from interacting with friends and family to making major purchases—online and via their smartphones.

They live using new communication technology on a daily basis, which changes their lifestyle, habits including learning habits and working environment (http://genhq.com/generations-gen-y-millennials-research/).

They have changed as learners and so should the teaching methods to be effective.

3.1. Neurodidactic foundations

Neurodidactics seems to offer theoretical base as well as practical solutions. It encourages the management and process of learning, in a stress-free, reliable, social learning context. (Anastasia, 2016)

Learning is not simply memorizing knowledge to be tested and graded, but communication and an enhancement of performance. The process of learning is affected by the emotional state of the learner, motivation and the memory functions.

The brain is a "social organ", constantly seeking for cooperation, relationships that carry it forward, a friendly and relaxed state that inspires trust, and not fear of failure or faults, since trust enhances creativity. These characteristics make learning attractive and enhance personal willingness towards it. Rewarding and fun in team work, are more important than performance.

This is why we refer to the brain's neuron plasticity and mirror neurons, reflecting our relationships with our surroundings. When for instance we watch another individual perform a task, we also perform it intuitively. They allow us to communicate and find a mutual, social agreement and form the neuron-biological foundation for learning according to one model (Anastasia, 2016).

In neurodidactics, motivation is the student's curiosity for learning. Learning in the form of a game, causes improved perceptive abilities and experimentation with social roles. A child learns not passively, via ready knowledge, but by actively investigating the unknown. The room becomes a field of experimentation and innovation.

Information to which we pay attention and which we process, reaches the long-term memory. Transfer of information from the short-term to the long-term memory, is not a passive process. Information we learn, is abundant of associations to already stored sections in our memory. The storage process is the formation of associations between learning impulses and the long-term memory contents. For instance, the organization of a complex material makes its storage simpler. Grouping vocabulary using certain criteria with regard to its content or phonetics can also help. There are similar options for the recalling process, reducing its demands and using external impulses-guidelines, which may be verbal or visual.

3.2. 3.0 learning and the extended 70:20:10 framework

The integrated, interactive environment is a key element of 3.0 learning model, based on the concept of emergent learning," which means that we create new knowledge continuously as we interact with a number of people and resources." (Taylor, 2011) In emergent learning the learners organize and determine both the process and to some extent the learning destinations, both of which are unpredictable." (Williams, et al. 2011).

Figure 10 shows how the 3.0 learning model interaction pattern differs from previous models 1.0 and 2.0.

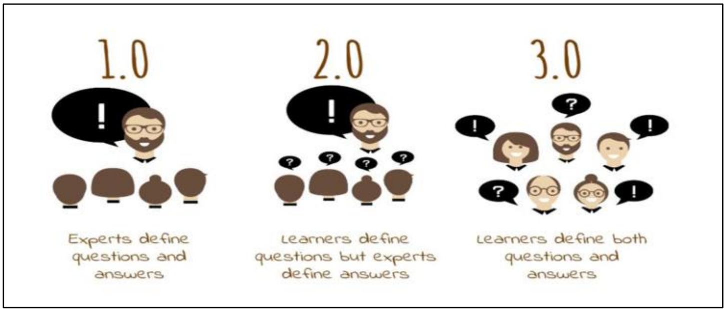

Figure 10. Learning types

Source: Pimentel, M., Learning 3.0 – Re-learning to Learn using the Learning Canvas, (2016) https://elabor8.com.au/learning-3-0-re-learning-to-learn-using-the-learning-canvas/ (2 July 2017)

Aberdeen Group did more research on 3.0 learning and extended the 70:20:10 framework. The traditional 70:20:10 model divides sources of learning into 3 categories: 70% - experienced based, 20% - coaching, developing through others, 10% - formal learning. The researchers broke down social category into 2 different compounds: referential and relational. Referential refers to the prior conception of learning from others. Relational takes place in a social context, through participation in activities (on or off – line), collaboration, is relationship-based (Figure 11). However, these elements should not be thought of as a separate one. Actually they are interdependent and their proportions are defined by the environment the learning happens.

3.0 learning encourages integration of formal and social learning through social learning management systems (LMS). It stresses value of user-created video content, social learning via online social networking, blogs, and wikis.

The modalities of 3.0 learning model include gamification, micro-learning, simulation/role play.

Gamification applies game mechanism to non-game context to teach new or enhance present behaviours.

Micro-learning makes learning tolerable as it delivers short but targeted content to the learner to elaborate on within 4 minutes.

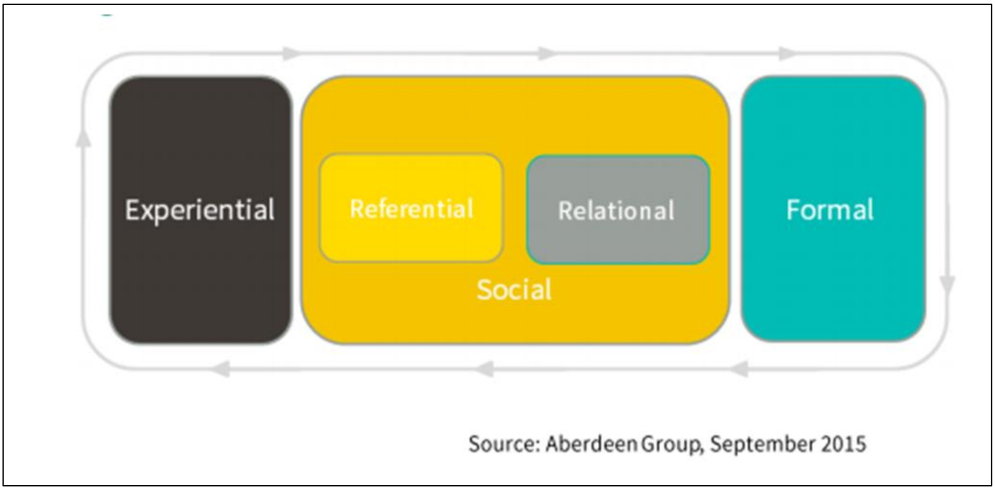

Figure 11. The new 70:20:10 framework

Source: Aberdeen Group, 2015, The New 70:20:10 - The Changing Face of Learning, www.aberdeengroup.com

Simulation/role-playing develops decision making and strategic planning skills and collaboration through creating the risk-free environment where the student deals with workplace like or life like situation.

3.3. Technologically integrated learning environment

Neurodidactics emphasizes the importance of the environment for learning process. For iGen this learning environment should be technologically integrated to optimize and maximize social interactions if it is to feel natural.

Technology integration means using technology to support new models of learning, including opportunities for students to collaborate and construct knowledge (Protheroe, 2005).

The social learning platforms can organize learning environment in a way that students can create and share the content. They support learner to progress, give opportunities to practice rich conversations and reflect on their achievements. The platforms can also serve as the repositories for that knowledge.

Learning through many and varied methods including just-on-time, social and informal learning provides student with the diverse spectrum of learning experience and create learning opportunities and content which is accessible, targeted and continuous.

Docebo Company developed the four stage model of technology-enhanced 70:20:10 learning, which is to learn, coach and share the knowledge.

Here's an example of instructions for activities to perform at a given stage:

1. RECORD & UPLOAD

- capture a video (for example, recording a new procedure) by using mobile recording devices such as smartphones, wearable devices

- upload that video to a "Knowledge Hub" using mobile or desktop devices.

2. DISTRIBUTE

- categorize and tag the content (the video) to share it within the organization through the appropriate channels, e.g.: a Knowledge Library, Learning Object within a course, CMS etc.

3. PEER REVIEW VALIDATION

- peers validate the uploaded video through a peer review process, which ensures that the content is trustworthy and valuable, for example, for employees required to perform similar tasks.

- edit, curate (with notes or tooltips) and made available for publishing in a Knowledge Library.

4. SOCIAL & COACHING

- peers may engage the 'experts' (SMEs, or subject matter experts) and ask questions about the content,

- or, they can also be coached on the topic to improve their understanding and ability to perform.

Integration is defined not by the amount or type of technology used, but by how and why it is used.

Research institutions recommend tools for technology integration assessment. One of them is Levels of Technology Assessment (LoTi). LoTi instrument measures eight specific stages of technology implementation: Awareness, Exploration, Infusion, Mechanical Integration, Routine Integration, Expansion, and Refinement. The idea behind the LoTi framework is that teachers will progress from low levels of technology integration, which are teacher-centred, to higher levels of use, which are learner centred (Summaka, et al., 2010) (Figure 12).

While building a successful learning strategy no matter if for one class or a long course and implementing any ICT tools, the basic thing is to understand the end user/ student. Different learners respond differently to digital learning, they demonstrate different learning styles and preferences. Learning materials should also be designed for specific media and adapted to organizational competencies.

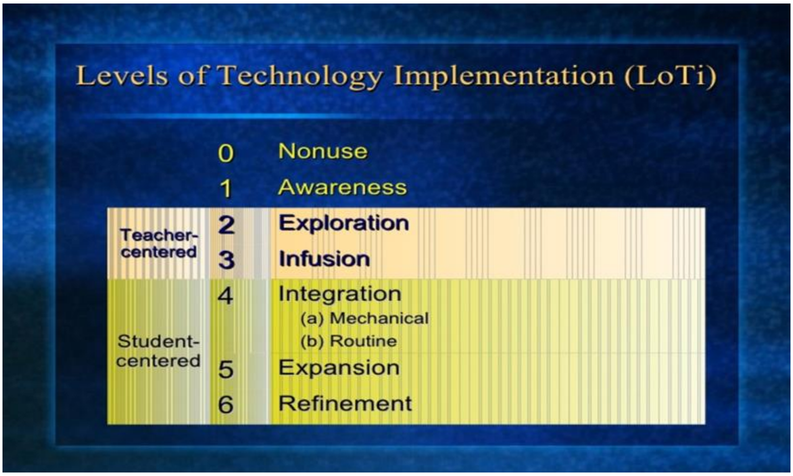

Figure 12 . Levels of Technology Implementation (LoTi)
Source: Sine P., 2008, From 20th Century Instruction to 21st Century Learning, Office of Information technology, University of Delaware, USA;https://www.slideshare.net/psine/from-20th-century-instruction-to-21st-century-learning-presentation?next_slideshow=2, (2 July 2017)

CONCLUSION

Development of new technology creates new social, technological, demographic and environmental trends are dramatically changing the structure and functioning of the society to create knowledge society. This society is defined by the effective use of knowledge, which means ability to establish connection with knowledge through the network of integral communicative structures. The social network is growing in an unbounded (exponential) manner, which lead to collapse. This collapse may be avoided by innovations that help to jump to the next curve.

Thus, the society needs a particular set of skills (capabilities) both to function in automated environment and create innovations. These are called intrinsically human (cognitive) skills, and can be classified from different perspectives, academic or business one. The research in neuroscience and neurodidactics led to new concepts about functioning of the human brain. We need to learn and we do so, not single skills in a hierarchical order but practice and master rather a wide spectrum of different skills to perform even simple automated tasks working with robots in factory or complex ones like elaborating on business strategy. This performance is controlled by brain functions which are not exclusively located in specific brain areas acting independently (the right or left hemisphere). The research based concepts of the holistic, synchronized and network structured functioning of the brain gave foundations for the author' attempt to suggest another perspective and classify (build up) the sets of skills by the Bresslor and Menon's large-scale function networks of the brain: default, salience and central-executive.

Neuroscience provides also theoretical and practical base for the educational model putting emphasis on integrated and interactive, relaxed leaning environment for iGen. 3.0 learning and the new 70:20:10 framework encourage integration of formal and social learning through LMS and ICT tools. This technological integration should be defined by how and why it is used, and how student centred it is. This can be measured with specially designed tools like LoTi measurement tool.

Mastering the defined skills in a well-organized learning environment should ensure that the knowledge society will move successfully to another stage of development – wisdom stage.

REFERENCES

Aleksandrowicz, T.R., 2014: *Świat w sieci. Państwa, społeczeństwa, ludzie*, Warszawa, Difin, ISBN 978-83-7930-390-8

Anastasia, C., 2016: *The Social Framework of Learning via Neurodidactics. Creative Education*, 7, 2175-2192 [online] at http://dx.doi.org/10.4236/ce.2016.715215 (accessed 30 June 2017)

Andrzejczyk, A., 2010: *Projektowanie i analiza szkoleń*, Warszawa, PWN

Bressler S.L. and Menon V., 2010: *Large-scale brain networks in cognition: emerging methods and principles*, Trends in Cognitive Sciences Vol.14 No.6 [online] at http://www.iapsych.com/articles/bressler2010.pdf (accessed 25 December 2017)

Clark, D., *Understanding and Performance* [online] at http://www.nwlink.com/~donclark/performance/understanding.html (accessed 30 June 2017)

Cleveland, H., 1982: Information as Resource, *The Futurist*, December 1982

Cochran, G. R., & Ferrari, T. M., 2009: *Preparing youth for the 21st century knowledge economy. Afterschool Matters*, Learning Landscapes, Vol. 5, No. 1, Autumn 2011

Docebo, 2015, The New 70:20:10 - The Changing Face of Learning, Docebo [online] at https://www.docebo.com/2015/10/21/download-the-report-the-new-702010-the-changing-face-of-learning/ (accessed 25 December 2017)

Elledge J., *Geoffrey West. The theoretical physicist with the grand unified theory of cities* [online] at http://www.citymetric.com/horizons/geoffrey-west-theoretical-physicist-grand-unified-theory-cities-387 (accessed 1 July 2017)

Ford, D.J., c.p.t. *How the Brain Learns,* [online] at https://www.trainingindustry.com/content-development/articles/how-the-brain-learns.aspx (accessed 20 July 2011)

Fox, J., 2015: *Knowledge Work Has Had Its Day The No. 1 job skill in the future? Talking to one another* [online] at https://www.bloomberg.com/view/articles/2015-12-17/robots-and-computers-will-never-be-great-co-workers (accessed 1 July 2017)

Gardner J., 2014: *The 7 Skills of Knowledge Work* [online] at http://joelleegardner.blogspot.com/2014/10/the-7-skills-of-knowledge-work.html (accessed 2 July 2017)

IGI GlobalDisseminator of Knowledge, *What is knowledge society*, [online] at IGI Global Disseminator [online] at https://www.igi-global.com/dictionary/knowledge-society/16456 (accessed 29 June 2017)

Johnson D., 2005: *Skills for the knowledge worker* [online] at http://www.doug-johnson.com/dougwri/skills-for-the-knowledge-worker.html (accessed 1 July 2017)

Kawasaki G., 2014: Guy Kawasaki at TEDxBerkeley 2014*: Rethink. Redefine. Recreate.* His talk is titled *"The Art of Innovation* [online] at https://www.youtube.com/watch?v=Mtjatz9r-Vc&t=952s (accessed 3 July 2017)

Machlup .F, 1973: *The Production and Distribution of Knowledge in the United States*, Princeton University Press ISBN: 9780691003566

McKinsey Global Institute Report, Manyika J., 2017, *Technology, jobs and the future of work* [online] at McKinsey & Company http://www.mckinsey.com/global-themes/employment-and-growth/technology -jobs-and-the-future-of-work (accessed 25 December 2017).

McKinsey Global Institute, *A future that works: Automation, employment, and productivity*, Report January 2017 [online] at McKinsey & Company https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/Digital%20Disruption/Harnessing%20automation%20for%20a%20future%20that%20works/MGI-A-future-that-works-Executive-summary.ashx. (accessed 25 December 2017).

McKinsey Global Institute Report, *Digital America: A tale of the haves and have-mores,* released Dec. 16. [online] at http://www.nwlink.com/~donclark/performance/understanding.html (accessed 2 July 2017)

Network theory and analysis https://www.utwente.nl/en/bms/communication-theories/sorted-by-cluster/Communication%20and%20Information%20Technology/Network%20Theory%20and%20analysis_also_within_organizations/ (accessed 1 July 2017)

McGrew, K., 2011: *The Brain as a Network: Focusing Your Network* [online] at http://www.creativitypost.com/psychology/the_brain_as_a_network_focusing_your_network (accessed 4 July 2017)

Michelon, P., 2006, *What are Cognitive Abilities and Skills, and How to Boost Them?*; [online] at SharpBrains an independent market research firm https://sharpbrains.com/blog/2006/12/18/what-are-cognitive-abilities/, (accessed 25 December 2017).

Pimentel, M., 2016: *Learning 3.0 – Re-learning to Learn using the Learning Canvas* [online] at https://elabor8.com.au/learning-3-0-re-learning-to-learn-using-the-learning-canvas/ (accessed 3 July 2017)

Pink D., 2005: *A Whole New Mind: Moving from the Information Age to the Conceptual Age*, Riverhead Books, ISBN 1-57322-308-5

Protheroe, N., 2005: *Technology and Student Achievement*, Principal - Effective Intervention - Research Report » Volume 85 Number 2, November/December 2005 » page(s) 46-48 https://pdfs.semanticscholar.org/a0ea/0a8245080f32dffebb0001c88e5e64f492a8.pdf (accessed 25 December 2017)

Ridler, B., 2017: *The Secret Source of Right Answers*, [online] at Results.com, https://www.results.com/blog/the-secret-source-of-right-answers (accessed 25 December 2017)

Rodriguez A.I., Riaza B.G., 2016: *Learning Goes Mobile: Devices and APPS for the Practice of Contents at Tertiary Level* In: Handbook of Research on Applied E-Learning in Engineering and Architecture Education, 472-496, IGI Global

Schumpeter J., *Capitalism, Socialism, and Democracy*, 3d ed. (New York: Harper, 1975), chap.7, [online] at: Library of Economics and Liberty, http://www.econlib.org/library/enc/innovation.html, (2 July 2017)).

Sine, P., 2008: *From 20th Century Instruction to 21st Century Learning*. [online] at https://www.slideshare.net/psine/from-20th-century-instruction-to-21st-century-learning-presentation?next_slideshow=2, (accessed 2 July 2017)

Spitzer, M., 2007: *Jak uczy się mózg*, Warszawa: Wydawnictwo Naukowe PWN

Spitzer, M., 2009: *Schule und was sie heute leisten sollte (What School currently should offer)* CD, Galila audio-book. Germany [online] at http://www.itongue.net/images/pdf/n-info-learrning-processes-in-the-light-of-neurological-research (1 July 2017)

Summaka M. S., Samanciolub M., Balibel M., 2010: *Technology integration and assessment in educational settings* In: Procedia Social and Behavioral Sciences 2 (2010) 1725–1729

Taylor M. M., 2011: *Emergent Learning for Wisdom*, Royal Roads University, Canada.

The Center for Generational Kinetics, USA, *Top 10 Gen Z Questions Answered* [online] at http://genhq.com/igen-gen-z-generation-z-centennials-info/ (accessed 1 July 2017)

The brain from top to bottom [online] at http://thebrain.mcgill.ca/flash/d/d_06/d_06_cr/d_06_cr_mou/d_06_cr_mou.html (4 July 2017), http://a.advancedbrain.com/news/brain_areas.jsp (1 July 2017)

The parts of the human brain [online] at Pictures: Human brain parts and their functions https://www.google.pl/search?q=parts+of+human+brain+and+function&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwidoobt9qXYAhWHLlAKHb64DPsQsAQINw&biw=1366&bih=588#imgrc=abSai5xA8LWeyM

The Concise Encyclopedia of Economics, Sandefur T., Innovation, [online] at Library of Economics and Liberty, http://www.econlib.org/library/Enc/Innovation.html (accessed 25 December 2017)

The New 70:20:10 - The Changing Face of Learning. Docebo Report pdf [online] at www.docebo.com

WebFinance Inc., Business Dictionary [online] at WebFinance Inc., [online] at http://www.businessdictionary.com/definition/case-study.html, (accessed 15 August 2017).

West, G., 2014: *Scaling: The surprising mathematics of life and civilization, Foundations & Frontiers of Complexity*, Santa Fe Institute [online] at https://medium.com/sfi-30-foundations-frontiers/scaling-the-surprising-mathematics-of-life-and-civilization-49ee18640a8 (accessed 4 July 2017)

Williams R., Karousou R., Mackness J.,2013: *Emergent Learning and Learning Ecologies in Web 2.0", IRRODL Vol 12, No 3 (2011)* [online] at http://www.irrodl.org/index.php/irrodl/article/view/883 (accessed 2 July 2017)

Żylińska, M., 2013: *Neurodydaktyka*, Toruń: Wydawnictwo UMK

Note: I hereby confirm that the manuscript to be published in the Monograph is my own original work, and it has not been printed before in any other sources.

DESIGNING THE SYLLABUS OF THE COURSE “INTERNET TECHNOLOGIES IN TRANSLATION” WITH THE REFERENCE TO THE TRANSLATION COMPETENCES AND CHALLENGES OF THE MARKET

Iryna Sekret
Abant Izzet Baysal University
Gölköy Yerleşkesi 14300 Bolu, Turkey
irenesekret@gmail.com

Abstract: *The paper is aimed to shed the light upon problems of designing the content and syllabus of the course “Internet Technologies in Translation”. By the method of the literature review the study discusses several research questions concerning the key competences of the effective translator, market demands to translators to perform professionally applying ICT tools, milestones in developing technologies for the purposes of the professional translation, enhancing digital competences of the pre-service translators in the context of the formal education. Based on the analysis of the recent publications and successful practices of other institutions the tentative syllabus is designed and presented in the paper. The conclusion of the article discusses solutions for the research questions as recommendations for defining the content and designing the course aimed to develop digital competences of pre-service translators.*

Keywords: translator’s key competences, digital competence, syllabus, ICT tools in translation, Internet technologies in translation.

INTRODUCTION

ICT have already firmly placed themselves in each area of our everyday and professional lives. Translation is not an exception in a view of the rapid development of applications which facilitate conveying a message from one language to another.

While translation ICT tools are numerous and an indispensable part of the Internet users’ routine all round the world, the problem of ICT tools in the professional translation remains to be under the discussion due to the requirements to correlate real professional needs of translators, translation competences and ICT advances which have been developed of the purposes of translation (e.g. translation project management, text analysis) and market demands.

In usual practice the usage of ICT tools for different professional purposes are not commonly and systematically taught within the professional training programs, and the acquittance with ICT tools and their implementation into the professional routine often occur through informal exchange of information and experience among colleagues, or when facing the urgency to solve some professional tasks with certain technology. As a result, the implementation of ICT tools carries quite a chaotic character that can affect the quality of performance and cause the rigidness in the professional strategies when coping with the text and its translation. Considering the circumstances, the implementation of the course “Internet Technologies in Translation” in the program of training translators is of special need in order to systematise students’ ideas about ICT and computer-assisted translation (CAT) and empower them with the knowledge and skills of selecting and using ICT tools to perform in the profession effectively.

Regarding the actuality of the topic the paper deals with the problems of designing the content and the syllabus of the course “Internet Technologies in Translation” which is going to be implemented in the undergraduate program of training pre-service translators.

In developing the content of the course the main reference is to the translators’ key competences and challenges which they have to deal with in their professional life. Together with that the analysis of the ICT advances in the area of translation is presented with the correlation to the market demands which are put forward to the translators to perform effectively in the modern globalised and ICT-enhanced working environment.

The study is conducted with the application of the literature review methods concerning the problems of a) the translators’ key competences and the role of the digital competence in the system of the required literacies; b) development of technology in the area of translation and its effects on the specifics of the profession; c) the market requirements to translation and translators, ICT tools in the translators’ professional routine, d) contents of the translators’ training programs regarding the development of the digital competences of pre-service translators, appropriate teaching methods.

The speculations based on the findings from the literature allows to develop ideas of how to overcome the gaps between the market demands, required translation competences, ICT advances and current practices in the area of translation. Based on the research conducted, the syllabus is laid out in the complexity of the aims, content, learning outcomes, and methods of teaching.

The research questions of the study include:

1) What are the key competences of the professional translator nowadays?

2) What are the market demands to translators to perform professionally applying ICT tools?

3) What are the milestones in developing technologies for the purposes of the professional translation?
4) How is the digital competence of the pre-service translators developed in the context of the formal education?
5) What are the key issues to be taught, discussed, and acquired within the course "Internet Technologies in Translation" in order to prepare pre-service translators for the market demands?
6) What methods of teaching should be applied in the course "Internet Technologies in Translation" to facilitate developing required digital competences?

1. TRANSLATOR'S KEY COMPETENCES AND ICT ADVANCES

1.1 Digital Competences in the System of the Translator's Professional Competence

1.1.1 Translator's Key Competences in Focus

Translation is a complex activity which involves knowledge of many fields, no matter what type of translation it belongs to, there are two phases: comprehension and presentation (Qingjun L., et al. 2012).

The problems of the translator's key competences are widely discussed nowadays and approaches to define the content of the translation competences vary to great extent. As Pym (2012) mentions, most of the currently dominant models of "translation competence" are multi-componential. An important example is the model developed for the European Masters in Translation (EMT), where it is argued that the "translation service provider" (since this mostly concerns market-oriented technical translation) needs:

- competence in business ("service provision"),
- languages,
- subject matter ("thematic"),
- text linguistics and sociolinguistics ("intercultural"),
- documentation ("information mining"), and
- technologies ("technological") (Pym, 2012).

Al-Hadithy (2015) argues for supporting Tan's model (2008) which focuses on the "person-oriented" approach to the translator' competency and training a translator as a 'whole person'. Tan's fundamental sub-competences integrate to create a "whole-person" in the translation student including: cognitive competence, communicative competence in the relevant language pairs on the linguistic level, communicative competence in the relevant language pairs on the pragmatic level, transfer competence, technological competence, and instrumental competence. As Al-Hadithy (2015) states, the whole-person translator competence concept is inspired by the whole-person education which aims to make students develop cognitively, intellectually, technologically, psychologically, and physiologically: "During the various stages of their tertiary translation education, they grow as translators/translation specialists in their cognitive competence, bilingual communicative competence, transfer competence, instrumental competence and other competences" (Tan, 2008; Al-Hadithy, 2015).

To stress upon the thematic component in the translator's professional competence Qingjun L., et al. (2012) argue that usually the difficulties of translation are not caused by the incomprehensible words, but due to the lack of background knowledge, especially when translating unfamiliar materials. Considering the situation when the translator's personal knowledge and information may be limited to interpreting the text properly, the digital competences in abilities to use effectively reference materials, such as encyclopaedias, dictionaries, etc. can come in use.

1.1.2 Technology in the Context of the Translator's Profession Nowadays

The Internet has transformed translation from a paper-based activity to a computer-based activity, as a result of which the market now demands faster, more competitive and versatile translators (Byrne, 2007; Gümüş, 2017). In its turn the integration of the technology into the translation teaching has changed the way a translator follows during the translation process, which as a result influenced the skills expected of them (Odacıoglua & Kokturk, 2015). With the arrival of CAT (Computer-Assisted Translation) tools such as translation memories, electronic corpora, terminology databases, translation management systems or Internet based applications like Nubuto, translators have hugely started benefiting from these resources even before they finalize the translating process, so have the translation students.

According to Gil & Pym (2006), translation, like general text production, becomes more like work with databases, glossaries, and a set of electronic tools, rather than on complete definitive source texts. Emerging electronic tools that extend human capacities in certain ways fundamentally affect - 1) communication (the ways translators communicate with clients, authors, and other translators), 2) memory (how much information we can retrieve, and how fast), and 3) texts (how texts now become temporary arrangements of content):

1. Translator-client communications. Via Internet tools, professionals from all over the world can be in regular contact by email or various forms of instant messaging. Work can be sent and received electronically, across national and cultural borders.

2. Translation memories. Translation memories (TMs) are programs that create databases of source-text and target-text segments in such a way that the paired segments can be re-used. These tools are invaluable aids for the translation of any text that has a high degree of repeated terms and phrases. The memories do not put translators out of work; they ideally do the boring routine parts of translation.

3. Hypertexts or "Texts without ends". The way translators work is also being affected by the nature of the texts. Hypertexts are texts that have automated cross-references (links) to other documents, which enable the reader to jump from one text to another. The use of these links means that there is now no clear beginning or end to texts, and that readings are no longer expected to be linear. The digital support has radically extended the role of this kind of text. A major extension can be seen in content management systems. These are computer programs designed to manage databases comprising "information chunks" (generically known as "content"), which are combined and updated to create several customized texts according to the user's needs. The information chunks are regularly updated and re-labeled. This means that there is no final text, but a constant flow of updated, rearranged, re-sized and user-adapted provisional texts based on a large database of content in constant change (Gil & Pym, 2006).

Qingjun L., et al. (2012) note that with the rapid development of Internet and the swift growth of network information, the network search engine has obtained more and more favour of translators. With the network technology, the translator can find related information to get a general understanding of the related subject through search engines, online encyclopedia, electronic dictionary, online terminology and online newspapers and magazines. As a result, the translation quality can be improved by reducing understanding errors.

According to the findings of Gümüş (2017), graduates of the translation departments report on five purposes of using technology in their work: 1) word-processing tools to type a translation, 2) Internet to seek information, 3) social media to remain up-to-date on both global events and progress in the translation world, 4) technologies to communicate with and exchange information with clients and colleagues, 5) using specifically translation technologies.

Gümüş (2017) notes that graduates employed in more competitive settings, i.e. on the freelance market and in translation agencies, apply translation technologies such as CAT tools or translation memories (TMs).

At the same time translators' employers/professionals (owner and project managers of a translation company) argue that the most important requirements of the translation market today are quality and speed. Translators need translation technologies and advanced word-processing skills to achieve both speed and quality to complete a translation task. The employers suggest that every student planning to be a translator should receive advanced word-processing training to be able to solve problems when working with different file formats (Gümüş, 2017).

1.2 Development of Technology for the Purposes of Translation: A Brief Insight into the History of the Problem

According to Esselink (2006), machine translation (MT) is probably the translation technology with the most sway over the popular imagination. The first serious attempts to create MT systems date from the late 1940s. However, the early approaches were based on quite sophisticated concepts of code-breaking, and there is little evidence that the aim was to produce high-quality output that would be of immediate use. The main limitations of the day were on the capacity to store and retrieve huge amounts of lexical, morphological, syntactic and semantic information. Several generations later, MT is readily available and relatively functional, MT systems start producing high quality translations in very restricted contexts. However, it can be achieved by limiting the lexical and grammatical structures of the source text (controlled language) and fine-tuning the system to work only with a specific text type. Therefore, it should be stated that machine translation systems are not replacing human mediators, first of all, because the prime use of MT is only to locate the texts and fragments requiring human translation. In order to use MT output professionally, it requires human revision. The better MT systems work, the more texts will be processed, and the more work will be created for human translators.

As Esselink (2006) indicates with the introduction of desktop computers in the 1980s, and computer technology slowly started to make its way to users who did not necessarily have a background in computer programming or engineering. The shift of computer hardware and software use away from corporate or academic computing departments to “normal” users’ desks called for a shift in product features and functionality. Not only did desktop computer users now need software that would enable them to do their work more efficiently, but the software also had to reflect business processes in tune with local standards and habits, including local language.

Technological changes brought about a series of new terms for the language industry. Most prominently, from the 1980s the need to translate and adapt software to new markets led to common use of the term “localisation” rather than “translation”(Gil & Pym, 2006). This term has been defined by LISA (the Localisation Industry Standards Association) as follows: “Localisation involves taking a product and making it linguistically and culturally appropriate to the target locale (country/region and language) where it will be used and sold” (Esselink, 2006; Gil & Pym, 2006).

Technology, through the Internet and access to a world-wide market, has played a major part in the birth of the localization industry. It has made large corporations aware of cultural details that mainly remained unseen until the end of the 1980s (Drouin, 2006).

Software publishers increasingly realized that localization was not part of their core business and should ideally be outsourced to external service providers.

One of the first companies to realize there was a service offering to be built around this need was INK, a European translation services network established in 1980. INK became one of the first companies in the world to offer outsourced localisation services. In addition to translation into all languages required by software publishers, this service included localisation engineering and desktop publishing and, most importantly, the project management of these multilingual localisation projects. INK was also one of the first companies to create desktop translation support tools, called the INK TextTools, the first technology commercially developed to support translators.

In 1987, a German translation company called TRADOS was reselling the INK TextTools and a year later released TED, the Translation Editor plug-in for TextTools. Shortly thereafter, TRADOS released the first version of its Translator's Workbench translation memory (TM) product. Throughout the 1990s, a large number of localisation service providers were born, many of which were little more than rebranded translation firms (Esselink, 2006).

Apart from localisation, internationalisation refers to the adaptation of products to support or enable localisation for international markets. Key features of internationalisation have always been the support of international natural language character sets, separation of locale-specific features such as translatable strings from the software code base and the addition of functionality or features specific to foreign markets. Without internationalisation, localising a product can be very challenging (Esselink, 2006; Gil, Pym, 2006).

By the end of the 1990s the Internet had changed many things in localisation, such as the introduction of globalisation management systems (GMS). Riding the dot-com wave, various companies offered revolutionary new ways of managing translation and localisation projects, storing and publishing multilingual content and fully automating localisation processes.

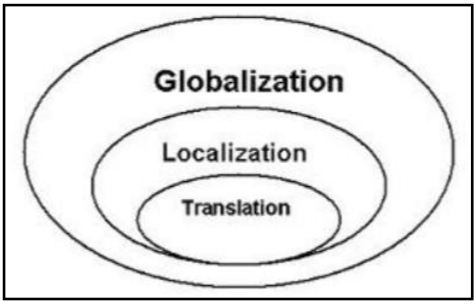

Figure 1. Interrelation between globalisation, localisation and translation
Source: after O' Hagan, 2006

Although this new technology had some impact on existing outsourcing models and processes in the localisation industry, it became rapidly clear that although a GMS could be useful for content globalisation programs (for example multilingual

Web sites), the world of software localisation still required a lot of “traditional” expertise and dedicated teamwork.

With Web sites containing more and more software functionality and software applications increasingly deploying a Web interface, we can no longer make a clear distinction between software and content when we discuss localisation. The traditional definition in which localisation only refers to software applications and supporting content is no longer valid. Today, even producing a multilingual version of an on-line support system, e-business portal or knowledge base could be defined as a localisation project (Esselink, 2006; Gil & Pym, 2006).

Thus, localisation is closely linked to the technology that is enabling new kinds of content such as computer software and web pages. The content imposes the use of new technology, i.e. localisation tools, if it is to be localised adequately. This industrial process was developed more or less independently of traditional translation and directly in response to market needs (O’Hagan, 2006).

While Machine Translation (MT) has not yet made a significant contribution to localisation, tools such as translation memories (TM) and content management systems have affected the entire workflow in which the translation process has to fit.

With the connection to the translation memory, the project Translation Memory for the Acquis Communautaire, DGT-TM, launched by the European Commission in 2007, should be mentioned (DGT-Translation Memory, 2007). It is publicly accessible in order to foster the European Commission’s general effort to support multilingualism, language diversity and the re-use of Commission information. According to the description, provided at the official website, DGT’s Translation Memory as the extraction of aligned sentences can be used to produce a parallel multilingual corpus of the European Union’s legislative documents (Acquis Communautaire) in 24 EU languages. The aligned translation units have been provided by the *Directorate-General for Translation* of the European Commission by extraction from one of its large shared translation memories in EURAMIS (European advanced multilingual information system). This memory contains most, although not all, of the documents which make up the Acquis Communautaire, as well as some other documents which are not part of the Acquis (DGT-Translation Memory, 2007).

1.3 Developing Digital Competences of Pre-Service Translators in the Context of Formal Education

1.3.1 Programs, Contents and Methods

As Altanero (2006) indicates, academia is often responsive to industry needs. New curricula now pay more attention to the industry’s needs for multilingual skills. According to O’Hagan (2006), for any students who are hoping to work in a commercial translation environment, at least an awareness of what localisation entails is essential. This is not only because students are necessarily going to be involved in localisation projects but also because various dimensions of the localisation model (e.g. translation tools, workflow, etc.) are spreading into the translation industry in general. So, a certain basic knowledge of localisation is becoming more and more relevant. Therefore, as O'Hagan emphasises, at least a general overview of the localization industry and what localisation entails should be part of the curriculum for translators. Tools such as TMs and terminology management systems are becoming widespread in the translation industry as a whole and therefore should ideally be taught as part of translator programs. On top of being able to manage these tools, basic computing knowledge is important, such as different file formats, file management, tags and character sets that are essential for localisation.

Due to Drouin (2006), we need to familiarise students with the specific challenges of the new media (software interface, websites, multimedia documents, etc.). This type of translation has challenges and constraints— mainly the tools used in the process—just like audiovisual translation or interpretation, which we usually include in a standard curriculum.

Thus, localisation tools should obviously play an important part in the curriculum. However, as Drouin (2006) notes, teaching students how to handle specific localisation tools is not the most important aspect, as these tools and the technical aspects of the material to be translated continuously evolve. We should help students understand the capabilities and, more importantly, the limits of such tools. It is also crucial that they understand when, and in which context, they should or should not use electronic tools. This view is shared by Bernardini (2004), pointing that the role of technology is crucial but not that straightforward. Practice in the use of the latest electronic tool or translation aid should not be considered as a means toward the educational goals. The educational aims are defined as:

- Awareness, an ability to see through language to the ways in which messages are mediated and shaped, to construct the meaning and mediate the culture;
- Reflectiveness, a capacity to practice, store and use specific strategies and procedures involved in translation;
- Resourcefulness, an ability to exploit finite resources indefinitely to cope with new and unexpected challenges, to acquire new resources autonomously, as the need arises (Bernardini, 2004).

In the close stream with the positions expressed above is the message of Pym (2010): "This is a very basic message that comes from general experience, current educational philosophies of life-long learning, and the recent history of technology: whatever tool you learn to use this year will be different, or out-of-date, within two years or sooner. So students should not learn just one tool step-by-step. They have to be left to their own devices, as much as possible, so they can experiment and become adept at picking up a new tool very quickly, relying on intuition, peer support, online help groups, online tutorials, instruction manuals, and occasionally a human instructor to hold their hand when they enter panic mode (the resources are to be used probably more or less in that order). According to Pym, specific aspects of this "learning to learn" might include: 1) ability to reduce learning curves (i.e. learn fast) by locating and processing online resources; 2) ability to evaluate the suitability of a tool in relation to technical needs and price; 3) ability to work with peers on the solution of learning problems; 4) ability to evaluate critically the work process with the tool.

Stressing on the importance of collaboration of education and industry, i.e. theory and practice, O'Hagan (2006) notes that the industry can feed vital information about practice into academia, where the theorisation of practice can take place. In the long run, theorisation could help practice to advance, as well as help train people in the most effective manner. The industry needs to obtain immediately useful graduates, which are adept at the constant changes that face the industry. The objective in education is to incorporate a long-term view to give students the ability to cope with changes effectively.

In the line of openness of learning and discussing current methods of training translators, Al-Hadithy (2015) criticises traditional classrooms, which are characterised as being teacher-centered, uncreative, rigid, and out of date. Under these conditions the learner passively absorbs the passed on knowledge rather than becomes actively engaged in the learning process, learner's autonomy and self-confidence are sapped by this focus on the translation product rather than the translation process. Referring to the positions of Zhong (2002) and Kiraly (2000), Al-Hadithy (2015) claims that students are usually trained to be 'accurate language facilitators' rather than 'thinking translators', the 'non-thinking' teaching environment shackles them to follow blindly a set of standards and criterions, the traditional teacher-centered and exercise ridden classroom alone "cannot equip translators-in-training with the wide range of professional and interpersonal skills, knowledge and competence they will need to meet the requirements of an increasingly demanding language mediation market" (Kiraly, 2000; Al-Hadithy, 2015).

Considering the methods of assessments, Al-Hadithy (2015) stresses the importance of rethinking traditional approaches and procedures which focus on the accuracy of the translation product but to implement and use more broadly the methods of a learner-centred approach to assessment that incorporates high-order thinking and life-long learning. Such assessment procedures can include teacher's observation records, student's documentation (linguistic and extralinguistic) records, student self-assessment records, translation diaries (in which the student keeps a record of the problems encountered, errors, documentation sources used, time invested, global evaluation of results), online discussion boards to create a forum of real-time formative feedback.

As Al-Hadithy (2015) notes, many studies on translator education point out that today's translation training programs should go above and beyond improving students’ linguistic-cultural skills, university-trained translators should be equipped with IT skills, documentation, desktop publishing skills, problem-solving, and marketing skills.

Analysis of the recent publications dwelling on the educational practices in the area of localisation and developing digital competences of pre-service translators allows to highlight strong tendencies for increasing implementation of specially designed programs and courses in the context of the formal education. As Altanero (2006) mentioned, from practically no programs in 1995, there are now many institutions offering courses on localisation, primarily in North America and Europe. As the core of localisation revolves around language, translation and international business, institutions specialising in such areas have integrated localisation topics into their language curricula. Although the focus is still on translation, from the second year onwards localisation is explored in greater detail, alongside pure translation issues and in all translation courses and assignments. Students are trained in specific translation techniques for localisation and become familiar with a number of software applications.

Due to O’Hagan (2006), in the case of Dublin City University, Software Localisation is offered in the second semester as an optional module for Graduate Diploma/MA in Translation Studies course. The backgrounds of the students in this course are varied in terms of professional experience, which is reflected in their computing skills as well as knowledge of translation. However, a Translation Technology module is compulsory and is taught in the first semester. This formula seems to work well, as the students who take the Software Localisation module are those who have particular interest in localisation. They may consider they are able to cope with its technical aspects because they have previously done the Translation Technology module, which touches on some generic aspects of localisation.

Drouin (2006) notes that in the University of Montreal there are two localisation programs, one at the graduate level, the other at the undergraduate level. The graduate program is targeted at translators who want to acquire good knowledge of what localisation is and what it involves. The undergraduate program is geared towards people who have been trained in translation, computer sciences or project management. There is a core group of classes in which students with different backgrounds learn to work together.

It is also stressed that the biggest challenge for the institution is obtaining localisation tools to train the students. The tools are expensive and budgets tend to be very small. In the University of Montreal the solution was found through establishing relationships with small vendors of localisation tools than with the well-established ones. In this way the vendors save money by not providing training institutions with their technology, but the university students, who once they hit the market, would want to keep using the tools on which they had been trained (Drouin, 2006).

In this respect the initiative “Translate Online” provided by the European Commission should be mentioned as well (Translate Online, 2016). MT@EC is an online machine translation service provided by the European Commission (EC). If one works in public administration in an EU country, Iceland or Norway, or in an EU institution or agency, they can use this product free of charge until the end of 2020. Apart from individual users, the MT service is also available to EC information systems and online services. The features of the product are 1) high security - all data processed by the system stay within the Commission's firewalls and can't be seen by outsiders; 2) translating from and into any official EU language; 3) working best with texts on EU-related matters; 4) free of charge. eTranslation is officially launching on 15 November 2017.

Considering the ways of integrating localisation into the translator training program, Austermuhl (2006) focuses on three areas (Figure 2).

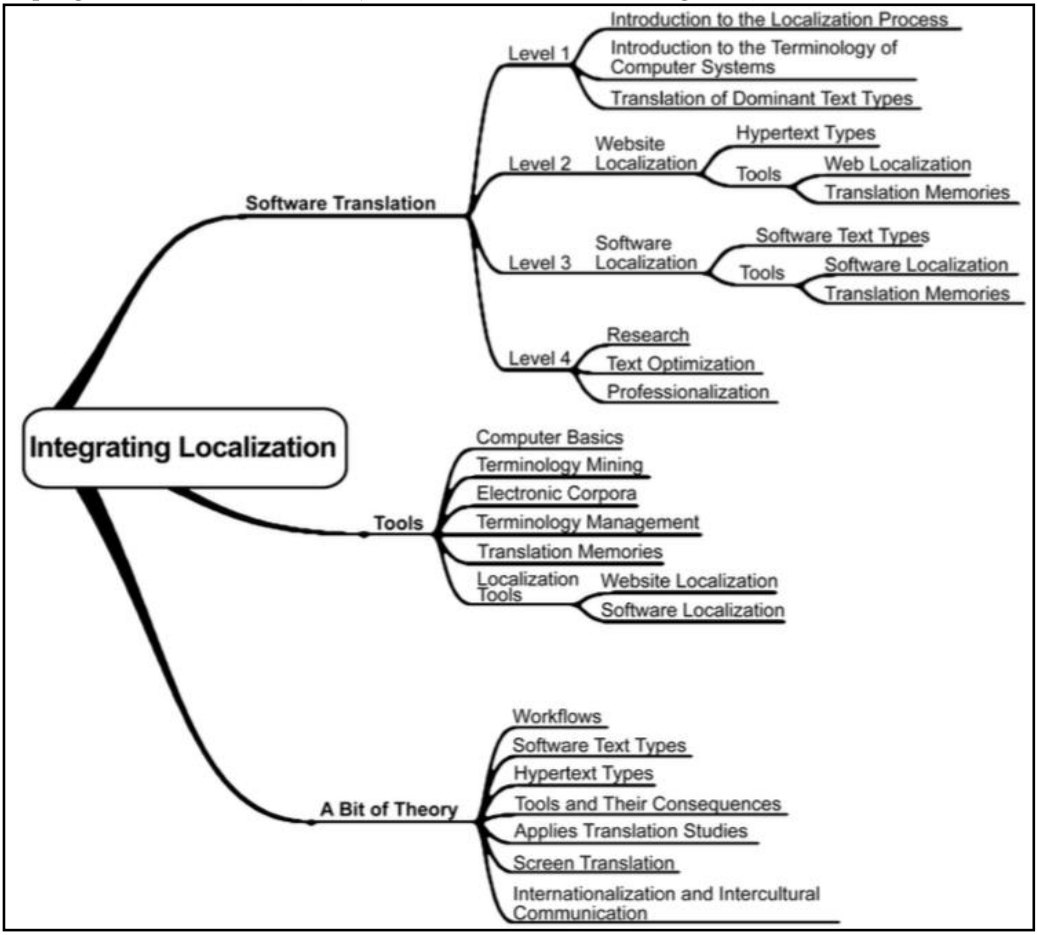

Figure 2. Integrating localisation - General Approach
Source: after Austermuhl, 2006

1. Translation for localisation, takes place within traditional translation practice classes and focuses on software and website localisation.
2. The second type deals with electronic tools for translators.
3. The third part of the general approach on introducing localisation regards seminars dealing with theoretical issues of localisation, e.g. workflow analyses, text typologies or translational constraints derived from, for example, the use of content management systems, translation memories, or localisation tools.

One of the goals of these more theory-oriented courses is to find ways of applying existing translation studies paradigms (for example Skopos theory or Holz-Mänttäri's Theory of Translational Action) to localisation. Courses in the theory part of the model also deal with issues of internationalisation (Austermuhl, 2006).

While researchers from the European countries and USA report on significant advances in the area of teaching localisation and developing digital competences of translators in the context of the university education, the findings by Gümüş (2017), based on the research in Turkey, demonstrate different situation. Thus, according to the study on training translators to meet needs for the market in Turkey, recent and older graduates of the translation departments are not completely satisfied with the provision of the technological training at their departments. The complains concern the following issues:

1) the lack of computer laboratories (noted by older generations of graduate);
2) technology-related knowledge was limited to the knowledge of the instructors, no systematic training on technology was offered;
3) they needed to acquire basic technology skills during the training in order to enter the market more confidently and not to waste time gaining basic skills after being employed, - employers or colleagues in the work place are usually reluctant to help novice translators learn these skills (Gümüş, 2017).

Considering the issues mentioned, Gümüş (2017) notes that a four-year training program may not guarantee the inclusion of the technological component in the curriculum of the translator training program, due to lack of competent trainers or time constraints related to the curriculum. However, trainers should at least inform students that this is one of the main requirements of the modern translation market. At the same time it is stated that translator-training programs are expected to teach the basics of translation-specific technologies, including translation memories and terminology management software. They can also teach how to make effective use of the Internet in the translation process and for secondary purposes such as seeking work, communicating with colleagues or self-improvement through online programs.

2. DESIGNING THE SYLLABUS OF THE COURSE “ICT IN TRANSLATION”

Considering findings, ideas, and recommendations of the recent publication, the tentative syllabus of the course “Internet Technologies in Translation” can be presented as in Table 1.

Course Description	“Internet Technologies in Translation” is an elective course for the fourth year students of the undergraduate program of the department “Translation and Interpreting”. The course is delivered during the autumn and spring terms. The main aim of the course is to develop digital competences of pre-service translators in the context of their professional area. The course is designed as a combination of theory and practice in order to develop abilities: 1) to learn and translate by locating and processing online resources; 2) to evaluate the suitability of the ICT tool in relation to professional needs and price; 3) to work with peers on the solution of learning problems; 4) to evaluate critically the translation process with the application of ICT tool.
Course Organisation	The course is going to be delivered in two parts - “Internet Technologies in Translation I” (the autumn term) and “Internet Technologies in Translation II” (the spring term). Both terms last approximately for 14 - 15 weeks including weeks of the midterm and final examination. The classes are given 3 hours per week.
Course Learning Outcomes	By the end of this course students are expected to know: • basic terminology of the course and operate it when discussing related issues; • place and role of the digital competences in their profession; • how technologies have been developing through time to meet the needs of professional translation; • what is internationalisation and localisation; • the role of culture and strategies of localising the product according to the cultural context; • how to localise websites, software, and other products which require localisation when entering the market; • how to manage translation project; • specifics of freelancing in translation. Students will be able to:

	• test, evaluate and analyse ICT tools for different professional purposes; • apply ICT tools effectively to facilitate translation and speed up the process; • use ICT tools for effective professional communication. Students will get skills in: • managing translation memories; • applying tools of machine translation; • using electronic corpora for translation purposes; • using ICT tools for processing texts of different formats; • managing the tools of terminology mining and terminology databases; • managing translation projects; • applying social media for professional purposes.
Methods of Teaching	Methods of teaching within the course are purposed to reinforce student-centeredness of learning, by constructing dialogical and interactive learning environment. Interactivity and constructive knowledge formation are going to be organised in the following strata: 1. Peers interactivity. By the fourth year of the university education and being exposed to translation as a process and a professional activity, the students are expected to have certain level of the digital literacies together with the experience of using ICT tools for translation purposes. Therefore, it is intended to provide opportunities for the students to share their experiences with peers, learning from each other and preparing to learn about new ideas and practices in the area of ICT tools for translation. 2. Lecturer-students interactivity. Theoretical material is going to be provided in a form of interactive lectures which implies discussion of technological advances and professional challenges in the area of translation, testing ideas and theoretical assumptions through interacting with ICT technologies and professional communities. 3. Technological interactivity. The students are supposed to interact with ICT tools by testing and evaluating their capacities and specifics in solving professional tasks of translation. While practically interacting with several ICT tools designed to solve the same or similar tasks, the students will gain skills of managing the tools together with the skills of the critical analysis of the ICT technologies on their applicability and appropriateness to solve certain types of

	problems in order to be able in to find the best decision among the existing varieties. 4. Interactivity with the professional communities and markets of the translation services. In order to gain a broader idea of the real market demands, specifics of the professional communities functioning, and to develop a sense of the place of ICT technologies in the real professional settings, it is intended to provide the students with the opportunities of interacting with translation experts, translation managers, and other translation stakeholders via organising project works and mini case studies.
Learning Environment and Means of Communication	The main learning environment is face-to-face teaching, enhanced with the computer equipment and Internet connection for demonstrations of ICT tools functioning, practicing and evaluating them. The interaction with outer communities is supposed to be conducted via social media tools and professional forums for the purposes of the project works and mini case studies. The classroom interactivity is going to be reinforced with the interactivity through emailing and establishing online group in one of the social media tools according to the choice of the classroom participants.
Project Works and Case Studies	The topics and specific aims of the project work and case studies are going to be conditioned by the content of the course, level of the students' digital literacies, and learning needs. In the most general terms the project work is going to be targeted to the following problems: • Localisation: comparing websites / advertisements / goods / services / etc in English and Turkish in order to find out strategies of localising the product; • Language Corpora: How it can be used for the purposes of translation? (research on language items, translation solutions, translation analysis, etc); • ICT tools in professional translation: Which ICT tools are the most favourable among in-service translators in different subject areas? • Analysing capabilities of ICT tools: Comparing and evaluating similar ICT tools designed to solve the same translation problems, defining plusses and minuses in their functioning; • Terminology databases: How are they applied? What is their place in the real professional world of translators? • ICT tools in managing a professional translation project: Which tools are applied? How do they function?

	Which tools are dominating in the market? • Demands and expectations of the market: What are the requirements of the employers to translators and interpreters? What is the place of the ICT competences in the whole system of expectations and demands? • Social media tools in translation: How social media is used by professional translators? What tools are the most preferable? What are the purposes of applying social media tools? What are the most effective strategies of managing social media tools to reach professional purposes?, etc
Evaluation	The evaluation of the course is intended to be a combination of the formative and summative approaches. The students are going to have midterm and final exams in a form of tests to evaluate their knowledge of the subject. Together with that they are going to be evaluated on their participation in the classroom discussions, fulfilment of the project work and case studies, and other activities which will be developed due to the learning needs.

TENTATIVE COURSE CALENDER

Week	Autumn Term: Topics
1	Introduction to Course I: Syllabus Overview
2	Digital Competences in the System of the Translator's Professional Competence
3	Development of the Translation Technologies and Modern Advances
4	Internalisation, Intercultural Communication and Internet Technologies
5	Translation and Localisation
6	Overview Discussion
7	**Midterm Exam**
8	Computer Basics
9	Localisation Tools
10	Machine-Based Translation
11	ICT tools of processing the text

12	ICT tools of processing video and audio texts
13	Translation Memories
14	Overview Discussion
	Final Exam
	Spring Term: Topics
1	Introduction to Course II: Syllabus Overview
2	Electronic Corpora
3	Terminology Mining
4	Terminology Management
5	ICT tools in Managing a Translation Project
6	Overview Discussion
7	**Midterm Exam**
8	Website Localisation
9	Software Localisation
10	Advertisement Localisation
11	Freelancing in Translation
12	ICT tools in professional translators' communication
13	Social Media in Profession of a Translator
14	Overview Discussion
	Final Exam

Source: Own work

CONCLUSION

Based on the analysis of the recent publications and considerations on designing the syllabus of the course "Internet Technologies in Translation" it is possible to conclude the following:

1. Despite the diversity of the approaches to defining the content of the translator’s key competences the common issues for the most of the studies are highlighting the necessity to train translators according to the needs of the market, and stressing that the professional translator’s competences reach beyond the language proficiency and include thematic, cultural, social and managerial components. The indispensable part of the translator’s professional competence is the digital competence which cover abilities not only to use some ICT tools to facilitate translation but to be able to evaluate ICT applications in order to find the most effective decision concerning the requirements to translation and available means.

2. The market of nowadays require from translators quality and speed together with an ability to respond to the customers’ needs for different types of translation. It implies flexibility and openness to life-learning in order to be able to follow the pace of the technological advances and changes at market. The context of professional translation require mostly skills: 1) to operate word-processing tools to type a translation, 2) to seek and critically process information on the Internet, 4) to remain up-to-date on both global events and progress in the translation world through social media, 5) to operate technologies for communication and exchange information with clients and colleagues, 6) to use effectively specific translation technologies.

3. The milestones in developing technologies for the purposes of the professional translation can be presented as a chain of the events and processes: machine translation in the 1940s - introduction of desktop computers in the 1980s and development of CAT tools - localisation of software - availability of the Internet and localisation bringing to internationalisation - networking and hypertexts - translation databases and other Internet-based technologies.

4. The formal education put considerable efforts to meet the needs of the market concerning the skills and competences of translators to function effectively. Translators training programs include courses designed to develop necessary technical skills and digital competences of pre-service translators. Though the endeavours of academicians are accompanied with certain problems, among them: 1) scarcity of the computer equipment, 2) unavailability of ICT tools for practicing due to their high costs, 3) lack of the required digital competences among instructors and their inability to teach recent trends in the area of translation technologies, 4) scarcity of the course hours for developing digital competences among students till the required level, 5) rather theorising than practicing with ICT tools; etc.

5. The content of the course aimed to develop digital competences for the professional purposes of the translators should reflect on the market demands, competences required for the professional translator to perform effectively at work, successful education practices of other institutions and modern technological advances. Due to the rapid changes at the market of ICT tools the

course should not target the skills of operating specific tools but to develop students' abilities: 1) to learn and translate by locating and processing online resources; 2) to evaluate the suitability of the ICT tool in relation to professional needs and price; 3) to work with peers on the solution of learning problems; and 8) to evaluate critically the translation process with the application of ICT tool.

6. The teaching methods in the course designed to develop digital competences of pre-service translators should follow the principles of student-cantered learning, providing opportunities for different types of interaction within the class and with the outside communities in order to facilitate social construction of targeted knowledge and skills.

ACKNOWLEDGEMENTS:

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/under REA grant agreement No. PIRSES-GA-2013-612536.

REFERENCES

Al-Hadithy, T., 2015: *The Traditional Vs. The Modern Translation Classroom: A Need For New Directions.* The UAE Undergraduate Translation Programs. 2nd GLOBAL CONFERENCE on LINGUISTICS and FOREIGN LANGUAGE TEACHING, LINELT-2014, Dubai – United Arab Emirates, December 11 – 13, 2014. Procedia - Social and Behavioral Sciences 192 (2015) 180 – 187 [online] at http://ac.els-cdn.com/S1877042815034977/1-s2.0-S1877042815034977-main.pdf?_tid=6e40f778-883d-11e7-aea8-00000aab0f6b&acdnat=1503518488_f3e3578db6b2d35b9b1c08519b223a56 (accessed 23 August 2017)

Altanero, T., 2006: *The Localization Job Market in Academe.* Translation Technology and its Teaching. A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

Austermühl, F., 2006: *Training Translators to Localize.* Translation Technology and its Teaching. A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

Bernardini, S., 2004: *The Theory Behind the Practice.* Translation in Undergraduate Degree Programmes. K. Malmkjer (Ed.). John Benjamins Publishing Company. Amsterdam / Philadelphia. ISBN: 90 272 1665 7 (Eur.) / 1 58811 600 X (US) (Hb; alk. paper)

Byrne, J., 2007: *Translation and the Internet: Changing the face of an industry*. Translation Technologies and Culture. I. Kemble (Ed.), Portsmouth: University of Portsmouth, p. 23-34, 2007, [online] at: http://www.jodybyrne.com/169 (accessed 9 February 2017)

DGT-Translation Memory [online] at https://ec.europa.eu/jrc/en/language-technologies/dgt-translation-memory (accessed 23 August 2017)

Drouin, P., 2006: *Training for localisation (replies to a questionnaire)*. Translation Technology and its Teaching. A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

EMT Expert Group, 2009: Competences for professional translators, experts in multilingual and multimedia communication [online] at http://ec.europa.eu/dgs/translation/programmes/emt/key_documents/emt_competences_translators_en.pdf (accessed 23 August 2017)

Esselink, B., 2006: *The Evolutionof Localization*. Translation Technology and its Teaching. A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

Gil, J., Pym, A., 2006: *Technology and Translation (a pedagogical overview)*. Translation Technology and its Teaching, A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

Gümüş, V., 2017: *Training Translators for the Market in Turkey: What Should We Teach to Future Translators?*. International Journal of Comparative Literature & Translation Studies. Vol. 5 No. 1; January 2017. Australian International Academic Centre, Australia, [online] at http://www.journals.aiac.org.au/index.php/IJCLTS/article/view/3073/2542 (accessed 21 August 2017)

Kiraly, D., 2000: *A social constructivist approach to translator education: empowerment from theory and practice*. Manchester and Northampton: St. Jerome Publishing, ISSN: 0026-0452 (imprimé), 1492-1421 (numérique)

Odacıoglua, M., Kokturkb, S., 2015: *The effects of technology on translation students in academic translation teaching*. 7th World Conference on Educational Sciences, (WCES-2015), 05-07 February 2015, Novotel Athens Convention Center, Athens, Greece.Procedia - Social and Behavioral Sciences 197 (2015) 1085 – 1094 [online] at http://ac.els-cdn.com/S1877042815043505/1-s2.0-S1877042815043505-main.pdf?_tid=2bb9128c-882e-11e7-a58d-

00000aab0f27&acdnat=1503511934_f23a4a4b431ede9d94a6fecf74cfabb4 (accessed 23 August 2017)

O'Hagan, M., 2006: *Training for localization (replies to a questionnaire).* Translation Technology and its Teaching. A. Pym, A. Perekrestenko, & B. Starink (Ed.), Tarragona, 2006 [online] at http://www.intercultural.urv.cat/media/upload/domain_317/arxius/Technology/translationtechnology.pdf#page=13 (accessed 22 August 2017)

Pym, A., 2012: *Translation skill-sets in a machine-translation age,* [online] at http://usuaris.tinet.cat/apym/on-line/training/2012_competence_pym.pdf (accessed 23 August 2017)

Tan, Z., 2008: *Towards a whole-person translator education approach in translation teaching on university degree programmes*. Meta, 53 (3), 589-608 [online] at https://www.erudit.org/en/journals/meta/2008-v53-n3-meta2400/019241ar/ (accessed 17 September 2017)

Translate Online, 2016: Machine translation for public administrations — MT@EC [online] at https://ec.europa.eu/info/resources-partners/machine-translation-public-administrations-mtec_en (accessed 23 August 2017)

Qingjun L., Lina L., Caiyun G., 2012: *The Application of Internet Technology in Translation.* Advances in Electrical Engineering and Automation. Advances in Intelligent and Soft Computing, A. Xie, X. Huang. (Ed.), vol 139. Springer, Berlin, Heidelberg [online] at https://link.springer.com/chapter/10.1007/978-3-642-27951-5_19 (accessed 22 August 2017)

Zhong, Y., 2002: *Transcending the discourse of accuracy in the teaching of translation: theoretical deliberation and case study.* Meta, 47 (4), 575-585, [online] at https://www.erudit.org/fr/revues/meta/2002-v47-n4-meta688/008037ar.pdf (accessed 17 September 2017)

Note: I declare that it is my own original work, that before not printed in other sources in the same form.

DISTANCE LEARNING TOOLS AT THE SERVICE OF MULTILINGUAL COMPETENCE DEVELOPMENT

Ewa Półtorak, Aleksandra Serwotka
Institute of Romance Languages and Translation Studies,
University of Silesia, Katowice, Bankowa 12
ewa.poltorak@us.edu.pl, aleksandra.serwotka@gmail.com

Abstract: *The Web environment provides its users with a large variety of tools which can play a significant role in both learning and teaching a new language, including all of its components, such as pronunciation, lexical items, and grammatical structures. Certain websites and applications offer a number of opportunities for language teachers (in terms of content creation and implementation), as well as for language learners (to support the individual learning process). The aim of this paper is to analyse and describe selected online tools that can be used in order to enhance multilingual competence among students learning French as their second foreign language after English.*

Keywords: language competence, multilingualism, cross-linguistic influence, new technologies, e-learning

INTRODUCTION

The development of new information and communication technologies has made an impact on practically every sphere of contemporary human activity. Needless to say, it has also influenced the language teaching-learning process in which modern educational technologies (in the broad sense of this term) are becoming more and more widespread. Therefore, it comes as no surprise that this kind of support is likely to be appreciated by all the actors of the didactic process. Both teachers and students are increasingly willing to use the Internet and multimedia devices at various stages of language training, as well as to apply them when trying to accomplish different linguistic and communicational goals. These may include, among others, the improvement of language skills affected by context- or learner-dependent problems during the acquisition of a new language system. In practice, the language system in question can be the learner's first or subsequent foreign language, which (as it has been demonstrated by research revolving around multilingualism) may entail certain more or less apparent differences in acquisition. The purpose of this paper is to explore the possible use of new technologies in order to overcome specific difficulties faced by second/subsequent language learners (or, in other words, to develop their multilingual competence), with a particular focus on the process of teaching-learning French as a third language after English in the academic context. To avoid confusion, in the following sections the term *third language* (L3) will be used in reference to the language acquired after the native language (L1) and the first foreign language (L2).

1. THE QUESTION OF MULTILINGUALISM IN THE CONTEXT OF RESEARCH ON FOREIGN LANGUAGE DIDACTICS

1.1 Multilingualism and multiculturalism

Nowadays, the ability to communicate in foreign languages is one of the most fundamental skills expected from prospective employees. What is more, employers tend to *hunt for* candidates who are fluent not in one, but in at least two foreign languages. In addition, certain geopolitical factors (such as, for example, open borders and favourable immigration policy undertaken so far by a number of governments) have fostered different kinds of cross-linguistic and cross-cultural contacts that have taken place over the last few decades. As a consequence, multilingualism has become a clear desideratum for the contemporary language policy promoted at the institutional level by the Council of Europe or, for instance, by the authors of the *Common European Framework of reference for language learning, teaching and assessment*. As it is observed by Zygierewicz , the members of the European Commission recognise multilingualism as one of the most significant European values, on the one hand defined as "the knowledge of a number of languages", and on the other as "the co-existence of different language communities in a given area" (2010:5). However, Cenoz and Gorter (2013, cited by Pawlak, 2016) note that the phenomenon of multilingualism can be understood in several different ways, depending on three major factors: its individual and social dimensions, the number of languages known or taught to a given person, and the level of proficiency in these.

Multilingualism and multiculturalism (mutually completive and practically inseparable) constitute a major area of interest within the field of modern language didactics, and, as a result, they are frequently described and analysed from various points of view: linguistic, psychological, sociocultural, and even neurobiological (cf. Mackiewicz, 2005; Widła, 2007, Chłopek, 2011). The following part of this paper moves on to address the phenomenon in question in the context of cross-linguistic influence.

1.2 Cross-linguistic influence in third/subsequent language learning/teaching

When one takes into account its specific and multidimensional nature, the development of multilingual competence (or linguistic multicompetence) is without a shade of doubt one of the most striking challenges faced by language didactics. It cannot be denied that the process of learning a third/subsequent language differs from the acquisition of a first foreign language (L2). Prior linguistic knowledge has a significant impact on the acquisition and development of further language systems. In the subject literature, this phenomenon is most frequently referred to as cross-linguistic influence or language transfer, even though certain specialists do not claim these terms to be perfect synonyms, the first one being considered as hyperonymous to the other (cf. Chłopek, 2011). However, terminological discrepancies (interesting as they may seem) are beyond the scope of this paper, in which for reasons of clarity both terms will be used interchangeably.

From a theoretical point of view, cross-linguistic influence can be defined as any kind of "interaction between (at least) one language (interlanguage) and any other language (interlanguage)" which, depending on the speaker's intention or the lack of it, may be conscious or unconscious (unintentional; Chłopek, 2011:141).

Moreover, depending on the direction of the influence, it is possible to distinguish proactive transfer (from previously acquired languages to those being acquired at the moment) and retroactive transfer (the opposite situation, cf. Komorowska, 1980).

Cross-linguistic influence can be both positive and negative in nature. It is said to be positive when previously mastered language skills facilitate the acquisition of a new language system, and negative – when they constitute some kind of obstacle to the successful acquisition of further language skills (cf. Cuq, 2003). It has to be stressed that there is a growing body of literature devoted to negative transfer, which, since the apparition of contrastive studies, has been referred to as interference (cf. Widła, 1999).

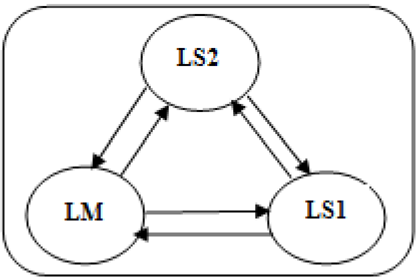

Figure 1. Possible interlingual influences in a trilingual person's mind. The scheme does not take into account the fact that certain languages could have been acquired simultaneously.
Source: own work based on Chłopek, 2011.

Both kinds of language transfer (positive and negative) can be interlingual (when two or more language systems interact with one another), but also intralingual (when transfer appears within a single language system; Arabski, 2007). Numerous observations have indicated that the latter case is not as rare as it may seem, especially in the context of learning a new language, when newly acquired rules are constantly influenced not only by previously learnt languages, but also by certain rules of the very language (interlanguage) whose acquisition is in progress (cf. Półtorak, 2015).

It is also worth mentioning that the nature of cross-linguistic influence can be determined by a whole variety of factors, including formal/genetic relationship between given languages, the level of proficiency in them, their level of activation, their status, as well as the methods, context and order of acquisition.

To conclude, taking into consideration the previously mentioned elements, which are likely to have a strong impact the nature of cross-linguistic influence, the process of learning a third/subsequent language is highly individualised. Particularly in the initial phase it can (but does not have to) be reflected in the speed of acquisition, as well as in the progress of its particular stages. This may require the use of additional, context-adapted exercises, enabling the learner to practise new structures and to concentrate on the most problematic communicational and linguistic units at different levels of language competence. Standard in-class sessions do not always facilitate the task because of various organisational and curricular constraints. This is why the widely understood e-learning tools, if properly selected and adapted, are likely to constitute a possible solution to certain problems generated by this kind of obstacles.

2. THE USE OF DISTANCE LEARNING TOOLS IN THE PROCESS OF THIRD LANGUAGE TEACHING/LEARNING

2.1 Theoretical framework

Since the apparition of the first computer applications and Skinner's teaching machines, new technologies have been systematically evolving and gradually broadening the repertoire of proposed language learning-teaching methods and techniques. At present, it can be stated that the Internet and multimedia devices constitute significant elements of the didactic process, during which they may serve multiple functions (see for example Mangenot, Louveau, 2006; Półtorak, 2008; Ollivier, Puren, 2011). What is more, the immense variety of tools available provides teachers and learners with practically unlimited possibilities of application in language training, offering them both ready-made solutions (such as series of interactive exercises) and toolkits allowing each user to create their own multimedia didactic content (e.g. self-prepared e-learning courses and modules).

In the lines that follow, we shall examine the possible use of new technologies in the process of third language learning-teaching. The context of learning-teaching French as a third/subsequent language after English will act as a point or reference for our analysis. The emphasis will be put on selected online applications, taking into account their accessibility, multifunctionality, diversity and adaptability to various contexts. Our purpose is to demonstrate how certain distance learning tools could be employed in order to consolidate newly acquired language structures, as well as to eliminate certain difficulties that are likely to appear at the initial stages of learning French.

3. A SURVEY OF SELECTED DISTANCE LEARNING TOOLS FOR FRENCH TEACHERS AND LEARNERS

3.1 Pronunciation

3.1.1 FrenchPod101.com

FrenchPod101.com is a distance learning course for English-speaking French learners at all levels. After having completed the registration process, the user chooses one of the four levels available: absolute beginner, beginner, intermediate or advanced. Although the toolset is based on paid services, it offers a free seven-day trial in order to enable the learner to compare different learning plans and choose the one that they consider the most appropriate. Among the large variety of didactic materials (including culture classes, vocabulary lessons, and grammar notes) it includes a well-developed introductive part with a section entirely devoted to the most pertinent aspects of French pronunciation: vowels, consonants, accent, silent letters and final letters, liaisons, and French rhythm.

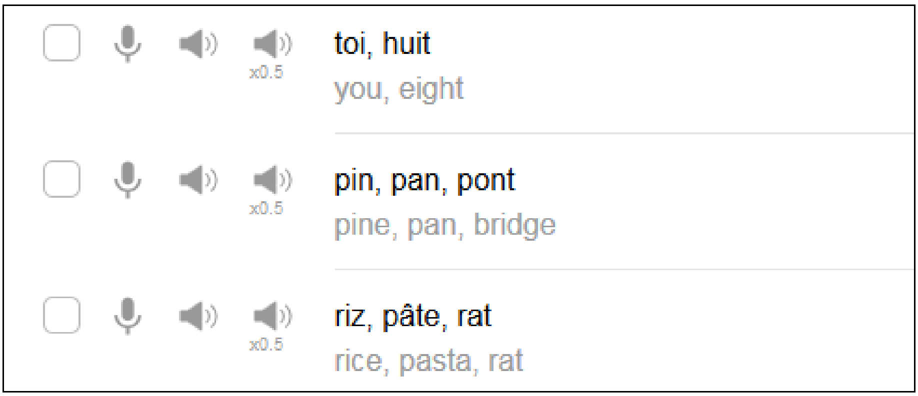

Figure 2. Phonological contrasts with recordings and English translations. The microphone icon allows the user to record their voice.
Source: https://www.frenchpod101.com/2010/11/22/pronunciation-1-french-vowels/

Each sub-section contains an audio lesson recorded by an English speaker and a native French speaker who, in form of a dialogue, describe the most important grammatical notions, including numerous comparisons between French and English pronunciation (taking into account the fact that the course is addresses to English-speaking learners). Lessons include phonological contrasts which may be considered difficult by English speakers, accompanied by recordings that can be played at a lower speed. The site also offers a voice recording tool allowing the user to compare their pronunciation to this of a native French speaker. Along with listening to the podcast, the learner can read a full lesson transcript. Taking into consideration the fact that both English and French phonological systems are more vowel-dominated than the Polish one, the pronunciation section can also be found useful by Polish native speakers who, having already mastered English, are learning French as their third language. The tool can be recommended by teachers in order to motivate their students to successful error correction and self-assessment in terms of French pronunciation. Moreover, the difficulties highlighted by the authors of the course could (and even should) be emphasised when teaching French after English, as they may underlie numerous pronunciation mistakes stemming from cross-linguistic influence between the second and the third language.

3.1.2 French Spanish Online: Learn French with Pascal

Learn French with Pascal is a free-of-charge series of distance learning courses, available in several languages (including English) addressed mainly to beginners. It contains two sections devoted to pronunciation: *Basic French with Recorder* and *Pronunciation Tips*. The first one contains a number of rudimentary French lexical elements (such as greetings and numbers). They are pronounced by a native speaker, and their use is explained by means of multimedia presentations. Like in the case of the previously described tool, the learner can record their voice, then play it and compare it to the professional recording. The presentations include short notes comparing English and French pronunciation of selected items. The content, addressed mainly to absolute beginners, is highly interactive and seems reasonable to be used in the individual learning process.

Figure 3. French for Beginners – basic words and pronunciation notes.
Source: https://www.frenchspanishonline.com/learn/hello-in-french.html

The part called P*ronunciation Tips* is divided into thematic sections devoted to the pronunciation of selected grammatical and lexical items. Each lesson is presented in English by a native French speaker (Pascal, the author of the course) in a

YouTube video embedded into the website and accompanied by notes, emphasising the most important rules and aspects to be remembered. The videos focus on some more particular aspects of French pronunciation, such as the pronunciation of the future tense forms (*future simple*), possessives and the *liaison*. This allows the learner to avoid certain mistakes whose source may lie in the influence of the English language, which is often very difficult to notice. Frequent mistakes are enumerated and described. Moreover, the author also concentrates on everyday speech, comparing the neat, formal pronunciation to more current forms used when speaking faster. This aspect, although incredibly important to successful communication, tends to be neglected during standard in-class lessons.

Figure 4. Pronunciation tips concerning everyday speech in French.
Source: https://www.frenchspanishonline.com/magazine/pronunciation-tips-in-french-future-tense/

3.2 Vocabulary and phrases

3.2.1 Memrise

Among the websites and learning platforms described in this paper, *Memrise* seems to be the most multidimensional and developed one, from the point of view of both the teacher and the learner. This is why the present section is slightly more extensive than those devoted to other distance learning tools analysed here. As the authors of the website claim it, *Memrise* puts into practice the concept of *effortless learning* based on three ingredients: *science*, *fun* and *community*. Not only is it a language teaching/learning platform, but it also offers a huge variety of courses referring to other domains such as History and Geography, Mathematics and Science, Business and Finance, or even Medicine and Healthcare. It is available as a browser-based tool, but also as a mobile application for Android and iOS. Although it can be used to develop basically all sub-competences of a foreign language, in our opinion its efficacy is at its best when it comes to lexical training. The very name of the tool refers to *mems*, understood as anything that can help to engrave a given item in the learner's long-term memory. This is why the method employs interactive flashcards accompanied (among others) by photos, videos, or example sentences. The site is available in both free and premium versions, and can be used by learners as well as by teachers (enabling them to create and manage didactic content). Various courses elaborated by the authors of the platform and community members can be accessed by all the users, which means that everyone can create a course depending on their needs. Moreover, the site is available in a number of languages, which may be particularly useful in the process of language learning and teaching.

When accessing the learner's mode, the user selects the language they speak (which means: the language in which they will study) and the language they would like to learn. After completing this step, it is possible to browse among courses labelled either with the level of proficiency (for example: A1, beginner) or with the theme, which is a relatively good solution when it comes to vocabulary, hence allowing the user to learn or master lexical items belonging to a given field. Among the courses available on the platform one can find content referring to English-French false friends (words having the same or similar form in both languages, but different in meaning). This aspect is notably significant in teaching French after English, as these two language systems share a number of lexical units of this type (cf. Widła 2007, Serwotka 2016).

Figure 5. The Memrise learning mode: the word *coin* has a different meaning (as well as pronunciation) in English and in French.
Source: https://www.memrise.com/course/1436807/false-friends/

Each course contains a preview of all its components. At this step, the user can pick the items they would like to ignore during the learning process, hence skipping the words with which they are already familiar. As the learners obtains gratification points in the learning process, it is also possible to view the so-called *leaderboard* (a list of the users who scored the most points in a given course), which can be considered an additional motivating component. In the premium mode (PRO version), one can mark selected words as difficult, which means that they will receive particular attention during the lesson. In the settings part, the user is allowed to choose the number of words they would like to study in a single learning session (5, 10, 15, 20), or the number of words to master during a revising session (5, 10, 25, 50, 100).

In the learning mode, a given word is displayed in the target language and accompanied by its equivalent and/or definition in the source language (the language of the course). In most cases, the user hears a recording with the correct pronunciation, but it is also possible to mute the audio if desired. The option *help me remember this* permits the user to choose a given *mem* or to create one (be it an image, an example sentence, a pun, or a combination of these). If added by the author of the course, certain attributes of a given word, such as grammatical category (noun, verb, adjective etc.) or gender are distributed.

Figure 6. A *mem* referring to the word *coin*.
Source: https://www.memrise.com/course/1436807/false-friends/

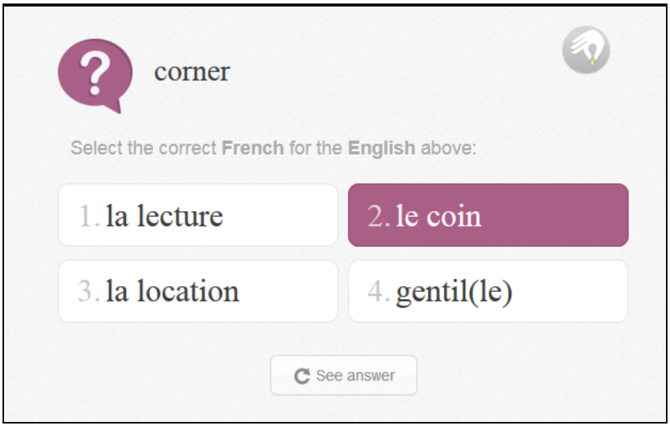

Figure 7. Memrise: testing.
Source: https://www.memrise.com/course/1436807/false-friends/

The knowledge acquired during the learning session is later tested in both configurations (from the source language to the target language and the other way round). When the user chooses or types the appropriate meaning of an item, they receive a specific number of points. When the answer is incorrect, the word and the previously selected *mem* are displayed once again. The session can be paused at any time. The acquisition of a given item is visualised in the process of planting a flower. When the flower is fully grown, the word is memorised and will then have to be watered (revised). The intervals between revision sessions of given items become longer and longer depending on the learner's progress. This system allows the words to be transferred from short-term to long-term memory.

As it has already been suggested, *Memrise* proposes also a set of tools that can be used by language teachers. As the creator of a course chooses all the parameters by themselves, it is possible to adjust the didactic content to a specific learning/teaching context, such as a particular combination of languages known or taught to the learner. This is why this tool is likely to make a valuable contribution when it comes to (for instance) teaching French as a third language after English. In the course edition mode, the user can add words in a selected order and divide them into a given number of levels. Items can be added manually or selected from proposed databases. Moreover, it is possible to include alternative versions of words, which may reveal itself useful in teaching English and French, as it allows to include a noun with a definite/indefinite article, as well as to accept an answer without any article. The edition mode allows cooperation between teachers, for it is possible to add one or more contributor(s) to the course, who will later be able to modify the content. In the context of learning French, it enables various teachers to take into consideration specific lexical difficulties (which may result from cross-linguistic influence) that they have observed in their students.

3.2.2 Internet Polyglot

Internet Polyglot is another website (available also for Android and iOS) offering a number of possibilities for language students, as well as for teachers. Like *Memrise*, it is based on common memorising techniques and its primary objective is to help learners remember new vocabulary in a selected language. The user can chose a particular vocabulary theme or themes (among the courses created by the community) or create their own course. All words are accompanied by speech synthesiser recordings, demonstrating their pronunciation, and pictures referring to their meaning. There are five learning modes referred to as games: *Picture Game*, *Guessing Game*, *Typing Game*, *Matching Game* and *Word Search*. Unlike in the case of *Memrise*, only one learning mode can be applied during a single studying session. The authors have put emphasis on the social component of learning: it is possible to add other users as friends and to communicate with them via messages.

In the *Picture Game*, the user can see a word in the target language, and a number of pictures accompanied by their equivalents in the source language (swapping words and translation is also possible). The task consists in selecting the picture referring to the meaning of the word displayed. All the correct and incorrect answers are counted, but the scoring system is not as developed as in the case of the tools offered by *Memrise*. When the answer is wrong, the user has to try again and choose the right meaning of the item. The *Guessing Game* is based on a very similar pattern. However, in this case the user does not select a picture, but only the meaning of a given word/expression. After choosing the correct answer, the pronunciation recording is played, which may be found useful by student preferring the auditory learning style to the visual one. In the *Typing Game*, the meaning of a word has to be written by the learner. In case of difficulties, it is possible to show first letters of the equivalent required. The *Matching Game* requires ordering a set of vocabulary items so that they are placed next to their translations. Finally, in the *Word Search* mode the user is to find indicated words within a grid of scattered letters. In all cases, incorrect items can be posted to the website administrator.

Figure 8. Internet Polyglot: Picture Game.
Source: https://www.internetpolyglot.com/picture_game

As it has already been mentioned, it is also possible to create one's own vocabulary sections (courses). This content-creating mode can be employed by teachers willing to provide their students with well-adapted learning supports enabling them to revise or to become familiar with selected materials. After choosing the language configuration and the level, the user creates a glossary of terms which are later displayed in selected games. Unfortunately, the website is not free from drawbacks: for the time being it is not possible to upload photos (and hence, to create picture games), and to add recordings, which means that all the options offered by the authors are only available in case of already existing lessons. The website interface is also less intuitive in use than the one available on *Memrise*.

3.2.3 Learnalanguage.com

Like *Internet Polyglot*, the *Learnalanguage.com* toolset uses a gaming mode in order to teach words and phrases in a selected language. However, it is not possible to choose a desired language combination: the source language is always English, as the website is addressed to Anglophones. Nevertheless, as it has previously been suggested, using English in the French teaching process can constitute a valuable point of reference for language learners, thus enabling them to avoid fossilization resulting from the *foreign language effect*, whereby the influence of a previously acquired foreign language can be particularly strong. The learner can choose between three language games: *Learning Lounge*, *Memory Machine* and *Lingo Dingo*.

The *Learning Lounge* is a tool aiming at familiarising the learner with lexical items from a selected category, their meaning in English and appropriate pronunciation in the target language. It is possible to browse between a number of categories addressed to beginners (e.g. body parts, colours) and more advanced learners (e.g. car parts, government). Each vocabulary section includes an English-French glossary. Selected items are displayed in an interactive presentation serving as a set of flashcards accompanied by recordings and animated pictures. The equivalent in the target language can be shown or hidden depending on the user's preferences. What is important in the context of learning-teaching French after English, the pronunciation of particular words in both languages can be compared, which may be useful in case of items sharing the same graphic form in English and in French.

Figure 9. Learnalanguage.com: Learning Lounge.
Source: http://www.learnalanguage.com/learn-french/french-words/furniture.php

As the very name suggests, the *Memory Machine* is supposed to help learners memorise previously learnt words. In the game a word in English is displayed and accompanied by four different translation propositions in the target language, as well as by an animation. The task consists in choosing the right equivalent. As in most games, the points are scored, which may enhance the learner's motivation.

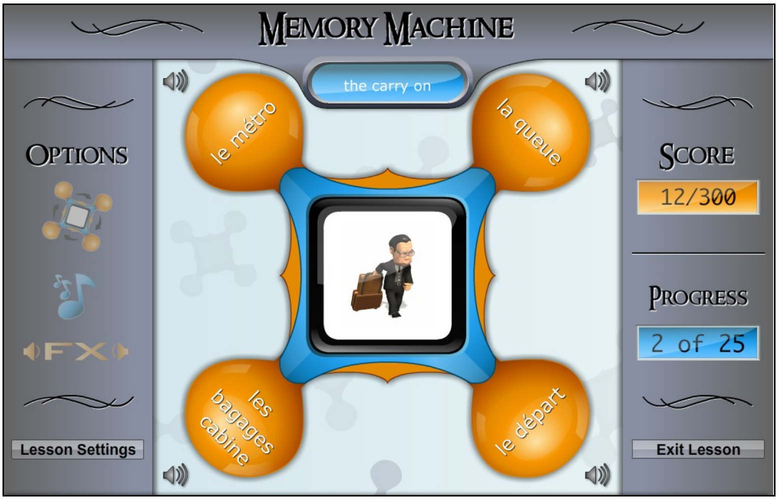

Figure 10. Learnalanguage.com: Memory Machine.
Source: http://www.learnalanguage.com/learn-french/french-words/travel.php

Figure 11. Learnalanguage.com: Lingo Dingo.
http://www.learnalanguage.com/learn-french/french-words/military.php

The last one of the three, *Lingo Dingo*, bears a resemblance to an arcade game. The user chooses the level of difficulty: *easy*, *difficult*, *crazy* or *impossible*. Then, one of more words in English are displayed. The learner has to type their target language equivalents before they reach the top of the screen. Missed and correctly typed words are counted and contribute to the final score.

3.3 Grammar and spelling

3.3.1 Word Reference Forum

The contact with native speakers of a given language is immensely important when it comes to assessing the correctness of a language form. What is more, certain grammatical constructions, while seeming perfectly correct at a first glance, may provoke confusion or sound unnatural (or *less idiomatic*). This is why the *Word Reference Forum* constitutes a valuable source of information for language teachers, learners and translators-to-be. The platform is divided into specific language combinations (such as French-English, Spanish-English) and subcategories (for example vocabulary, grammar, specialised terminology). Users can view the questions that have already been asked, or submit their own questions in order to obtain comments/answers from native speakers of a selected language. In the *French and English Grammar* section one can find numerous comparisons between the two language systems in terms of both similarities and differences. The correctness of statements and expressions is evaluated by native speakers. The forum also contains links to various other grammatical resources which may be found useful by learners.

3.3.2 Banque de dépannage linguistique

Banque de dépannage linguistique (*Linguistic Troubleshooting Bank*) is a website in French and a database provided by the Quebec Board of the French Language (*Office québécois de la langue française*, OQLF) whose objective is to eliminate the most frequent and apparent grammatical, spelling, and lexical mistakes committed in French, and particularly those resulting from the *contamination* caused by the influence of the English language (this problem is especially noticeable in Quebec taking into account the geographic and sociocultural conditions of this Canadian region). However, this didactic support is addressed to all speakers and learners of French eager to improve their language skills, as well as to ensure grammatical correctness of their (both spoken and written) statements. It is possible to view the articles divided into grammatical categories, displayed in alphabetical order, and also to search for specific questions and items. From our perspective, one of the most interesting and advantageous categories is the one referring to Anglicisms (*les anglicismes*) subdivided into a number of thematic sections: Integral Anglicisms, Hybrids, Semantic Anglicisms, Syntactic Anglicisms, Morphological Anglicisms, and Phraseological Anglicisms. The articles refer to the most frequent interferences caused by the influence of the English language. The content may be found useful by learners (who can find answers to troubling questions about similarities and/or differences between the two language systems) and teachers, for whom the website may serve as a base to create grammatical exercises for students mastering French after English, as it puts emphasis on both conspicuous and less apparent difficulties in this language configuration. The website enumerates the most frequent mistakes and provides the users with correct versions of given statements.

Avec

La préposition *avec* peut indiquer différents rapports : l'accompagnement, le moyen, la manière, etc.

Exemples :

- Je suis allée voir ce spectacle **avec** ma sœur.
- On fait des miracles **avec** un bon outil.
- Il s'en est sorti **avec** brio.
- Nous sommes arrivés **avec** le soleil.
- **Avec** le temps, on s'habitue à tout.

On utilise parfois à tort *avec* dans certaines expressions directement calquées de l'anglais, alors que le français exigerait une autre préposition : ainsi *to be with (a society)*, *to be satisfied with* ou *to help somebody with*, entre autres, donnent lieu à des tournures fautives que l'on corrigera en s'inspirant des exemples suivants.

Exemples fautifs :

- Jean travaille avec la même société depuis vingt ans.
- Êtes-vous satisfait avec ce produit?
- Heureusement qu'elle m'a aidé avec mes devoirs, je n'aurais rien compris!

On écrira plutôt, par exemple :

- Jean travaille **pour** la même société depuis vingt ans.
- Êtes-vous satisfait **de** ce produit?
- Heureusement qu'elle m'a aidé **à faire** mes devoirs, je n'aurais rien compris!

Figure 12. Banque de dépannage linguistique: a section devoted to the word "avec" ("with"), including the most frequent calques from English.
Source: http://bdl.oqlf.gouv.qc.ca/bdl/gabarit_bdl.asp?id=2528

3.3.3 Lyricstraining

The Web-environment provides its users with certain tools enabling them to practise spelling in a selected foreign language. It is worth mentioning that the spelling aspect is particularly challenging in learning French after English, taking into consideration the differences between the phonic and graphic level in the two languages, together with a huge number of cognates (words of common origin). *Lyricstraining* is an unusual solution for teachers and students, allowing them to leave behind traditional dictations and to teach/master spelling and word-recognition skills in a more ludic way. It is available in both teacher and student mode.

In the student mode, the user chooses a YouTube video with a song belonging to a particular genre in the target language, whose lyrics will later serve as a kind of dictation. There are four levels of difficulty: beginner, intermediate, advanced or expert. The number of blank spaces in the song depends on the level selected (at the expert level, the learner has to type all the lyrics of a particular song while listening to it). Points are counted in order to display the final score at the end of the song. When the user does not manage to type a word or an expression correctly, the problematic extract is played once again. The website has also the function referred to as *karaoke*, allowing its users to practise pronunciation.

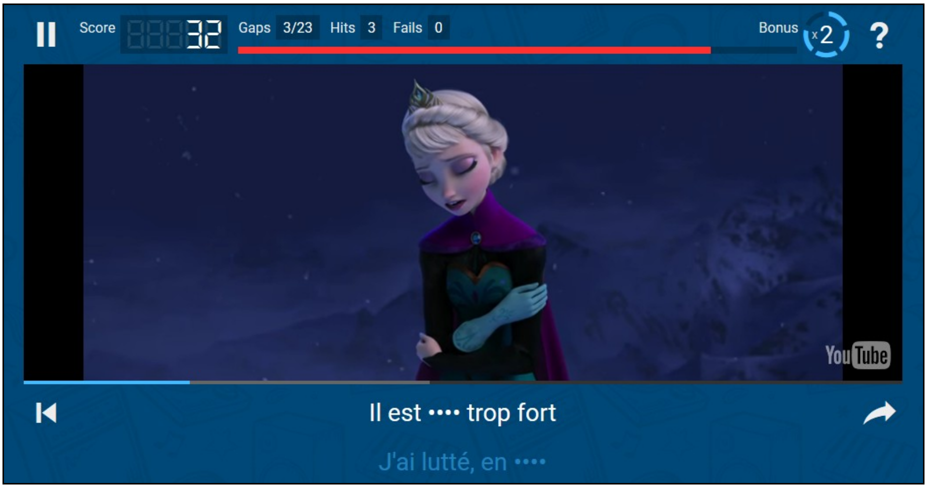

Figure 13. Lyricstraining: the learner mode.
Source: https://lyricstraining.com/fr/play/anais-delva/liberee-delivree/H5ofqYN195

The tool can also be taken advantage of by teachers, enabling them to create their own exercises. It is possible to add a song with a music video, or to choose one of the numerous songs already added to the website. Next, the user can select words to be filled, listen to particular extracts of a given song several times, adjust input modes (*write* or *choice*) and preview the exercise.

CONCLUSION

As it has already been suggested, the development of new technologies, particularly in the field of the Internet, has opened a whole new horizon for language learners at teachers. The functionalities offered by numerous websites and applications can be employed in order to properly adapt didactic materials to the context, to specific language configurations, as well as to the learners' needs/preferences, which is of a particular importance when it comes to the acquisition of a third/subsequent foreign language, as this process is conditioned by a number of both context- and individual-dependent variables. The immense diversity of distance learning tools offered by the World Wide Web makes it possible to refer to multiple learning styles. Therefore, users are able to find and/or create exercises and multimedia lessons putting emphasis on practically all the constituents of a selected language system, including pronunciation, lexis, grammar, and spelling; and taking into consideration all kinds of individual didactic and linguistic needs. Moreover, the form of online didactic supports, frequently interactive and diversified, is likely to enhance the motivation component, immensely significant to the process of acquiring a new (subsequent) language system (cf. Chłopek, 2011). Finally, multiple functionalities offered by the above-mentioned websites refer to various learning preferences: they enable the students to revise the content in given intervals (e.g. Memrise), they join together learning and the ludic component (e.g. Learnalanguage.com, Lyricstraining), and they allow the learners to verify linguistic information (Banque de dépannage linguistique), as well as to communicate with native speakers of a selected language (e.g. Word Reference Forum). All of these aspects may have an immense impact on the effectiveness of both teaching and learning a second/subsequent language.

REFERENCES

Arabski, J., 2007: *Transfer międzyjęzykowy*. In: Kurcz I. (dir.): Psychologiczne aspekty dwujęzyczności. GWP, Gdańsk, 2007, pp. 341–351, ISBN: 978-83-60083-11-6.

Chłopek, Z., 2011: *Nabywanie języków trzecich i kolejnych oraz wielojęzyczność. Aspekty psycholingwistyczne (i inne)*. Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław, 2011, pp. 139-266, ISBN: 978-83-229-3224-7.

Cuq, J.-P. (dir.), 2003 : *Dictionnaire didactique du français langue étrangère et seconde*. CLE International, Paris, 2003, ISBN: 978-2-09-033972-7.

Komorowska, H., 1980: *Nauczanie gramatyki języka obcego a interferencja*. WSiP, Warszawa, 1980.

Mackiewicz, M., 2005: *Dydaktyka języków obcych a kompetencja kulturowa i komunikacja interkulturowa*. Wydawnictwo Wyższej Szkoły Bankowej, Poznań, 2005, ISBN: 978-83-720-5220-9.

Mangenot, F., Louveau, E., 2006: *Internet et la classe de langue*. CLE International, Paris, 2005, ISBN : 978-2-09-033069-4.

Ollivier, C., Puren, L., 2011: *Le web 2.0 en classe de langue. Une réflexion théorique et des activités pratiques pour faire le point*. Éditions Maison des langues, Paris, 2011, ISBN: 978-2-35685-077-5.

Pawlak, M., 2016: *Wielojęzyczność i międzykulturowość w polskim kontekście edukacyjnym – realistyczne cele czy mity edukacyjne?* Neofilolog, nr 46/2, 2016, pp. 153-172, ISSN: 1429-2173.

Półtorak, E., 2015: *L'impact des nouvelles technologies sur les pratiques évaluatives en langues vivantes*. Wydawnictwo Uniwersytetu Śląskiego, Katowice, 2015, ISBN: 978-83-8012-341-0.

Półtorak, E., 2008: *Wykorzystanie programów narzędziowych w procesie nauczania/uczenia się języka obcego*. Neofilolog, nr 31, 2008, pp. 59-69.

Serwotka, A., 2016: *Le rôle de l'évaluation formative dans la création du matériel didactique en fonction des besoins spécifiques des apprenants: exemple de l'enseignement/apprentissage du français – langue troisième*. In: Gabryś-Barker D., Kalamarz R. (red.): Ocenianie i pomiar biegłości językowej. Wybrane aspekty teoretyczne i praktyczne. Wydawnictwo Uniwersytetu Śląskiego, Katowice, 2015, pp. 61-80, ISBN: 978-83-226-3053-2.

Vogel, K., 1995: *L'interlangue : la langue de l'apprenant*. Presses Universitaires du Mirail, Toulouse, 1995, ISBN: 978-2-85816-226-0.

Widła, H., 2007: *L'acquisition du français – langue troisième. Problèmes méthodologiques et implications pratiques*. Wydawnictwo Uniwersytetu Śląskiego, Katowice, 2007, ISBN: 978-83-226-1740-3.

Widła, H., 1999: *Influence de la langue seconde sur la langue maternelle. Les traces du français dans le polonais des résidents polonais en France. Approche statistique.* Wydawnictwo Uniwersytetu Śląskiego, Katowice, 1999, ISBN: 83-226-0893-4.

Zygierewicz, A., 2010: *Wielojęzyczność Unii Europejskiej*. Analizy BAS, nr 3 (28), 11 stycznia 2010, pp. 1-6, ISSN: 1899-1114, [online] at http://orka.sejm.gov.pl/WydBAS.nsf/0/F99EF5235DDB7266C12576A8002A93E4/$file/Analiza_%20BAS_2009_28.pdf (accessed 4 July 2017).

NETOGRAPHY

Banque de dépannage linguistique, https://www.oqlf.gouv.qc.ca/ressources/bdl.html, (accessed 1 July 2017).

French Spanish Online: Learn French with Pascal, https://www.frenchspanishonline.com/, (accessed 1 July 2017).

FrenchPod101.com, https://www.frenchpod101.com/, (accessed 1 July 2017).

Internet Polyglot, https://www.internetpolyglot.com/, (accessed 1 July 2017).

Learnalanguage.com, http://www.learnalanguage.com/, (accessed 1 July 2017).

Lyricstraining, http://lyricstraining.com/, (accessed 1 July 2017).

Memrise, http://www.memrise.com, (accessed 1 July 2017).

Word Reference Forum, https://forum.wordreference.com/, (accessed 1 July 2017).

TEACHERS' SKILLS AND ICT COMPETENCIES IN BLENDED LEARNING

Magdalena Roszak, Barbara Kołodziejczak
Department of Computer Science and Statistics
Poznan University of Medical Sciences
79 Dąbrowskiego St, 60-529 Poznań, mmr@ump.edu.pl

Abstract: *Distance learning in its various forms (e-learning, blended learning, m-learning) is entering the education system at all levels. When planning its implementation, one should be aware of the ICT (Information and Communication Technologies) skills required of teachers as necessary for handling this education mode, particularly for teaching with an educational portal. The paper presents the analysis of teachers' skills and ICT competencies necessary for teaching in a blended learning environment and for organizing the learning process that involves university e-courses. The areas of special importance include: learning materials, organization of learning groups, organization of knowledge evaluation, one-to-one communication, as well as communication with a learning group. The authors review the areas, pointing to certain essential components which are necessary for the teaching process with an LCMS. This topic is particularly important in the case of non-technical and non-IT-oriented universities. This paper is based on the authors' experience in the field of organization and implementation of blended learning at a medical university.*

Keywords: ICT competencies, teachers' skills, ICT, distance education, e-course, blended learning, e-learning

INTRODUCTION

Based on the diversity of knowledge taught to students, one should deliberate on whether distance learning is the optimum method in terms of knowledge acquisition. A competent decision can only be taken by a subject teacher who is familiar with e-learning methodology and capable of making a selection from diverse teaching methods, choosing those which are the best match for mastering the theoretical and practical knowledge of the subject matter. Obviously, a teacher who is not aware of technological options offered by an LCMS or of student engagement methods is not willing to use these in practice. Therefore, the authors place a great emphasis on the continuous improvement of teachers' qualifications in the field of methodologies, methods and technologies applied in distance learning and blended learning (blended learning = traditional + distance learning).

In Poland, the number of teaching hours at full-time or part-time university studies implementing distance education methods and techniques cannot exceed 60% of the overall volume of teaching hours specified in the syllabus for each particular field of study and education level (Regulation 2011).

TEACHERS' SKILLS AND ICT COMPETENCIES

Distance learning requires its participants (knowledge suppliers and recipients) to meet certain initial criteria, i.e. to have the right competencies specified for a particular educational role (Morze, Kuzminska 2017) and to prepare a hardware and software environment (including an LCMS) for implementation. The authors focus on the analysis of teachers' skills and ICT competencies necessary for teaching according to blended learning methodology, and for organizing the learning process involving e-courses at a university education level.

The primary functionality of a learning portal (LCMS) consists of the building, collecting and distribution of courses, as well as sharing various types of resources. Thus, every e-teacher must be able to handle their course learning materials, because today the majority of such materials contain multimedia and interactive components. Moreover, the teacher should be able to edit these resources in their digital format and to publish them in an e-course. There are certain tools integrated in learning portals that make them fit for versatile implementation in the learning process organization. The areas of special importance include: organization of learning groups, organization of knowledge evaluation, one-to-one communication, as well as communication with a learning group (Roszak, Kołodziejczak, Kowalewski, Ren-Kurc 2016; Noskova, Pavlova, Yakovleva 2017). Teachers' skills and ICT competencies in these fields are therefore indispensable for the efficient performance of blended distance learning and for the proper organization of education for university students. This issue is particularly important at non-technical faculties, e.g., at medical universities or faculties of humanities, where the ICT competencies of the teaching staff are often neglected and marginalized.

In their earlier publications, the authors would frequently point out certain aspects of ICT competencies in distance education, relevant to knowledge recipients and knowledge suppliers. In this paper, the authors re-examine the matter from the perspective of four years' experience with blended learning at a medical university, taking into account the advancement of e-learning technologies, a generational change among university teachers, and younger students coming in, for whom Internet resources are accessible on a daily basis, and the use of such resources is as obvious as the use of electricity (Mokwa-Tarnowska 2016).

The authors review the specific areas mentioned above, pointing to certain essential components concerning the teachers’ skills and ICT competencies which are necessary for the teaching process structured around an LCMS (Mokwa-Tarnowska 2015).

Organization and management of learning groups

A learning group plays an important role in distance education, and its good portal management ensures smooth and effective distance learning in practice. Therefore, one should always review the documentation of the LCMS portal being implemented, in terms of the learning group functionality available.

In distance learning, creating a community of learners is very important. Course participants can be members of more than one group (at their own faculty or elsewhere), while a teacher can teach one or more subjects to different groups (including inter-faculty groups). Some learning portals offer the options of grouping learning groups into larger organization units, which are called learning areas (Figure 2). Learning areas are frequently introduced when a teacher teaches the same subject at different faculties, or to students in different years (Kołodziejczak, Roszak, Ren-Kurc, Kowalewski, Bręborowicz, 2014).

An LCMS is usually fitted with mechanisms for allocating class participants to study groups. Such allocation typically takes place on the portal administrator or course teacher level, so that learners can be grouped into various study groups, according to the needs of the specific subject. In addition, the portals offer mechanisms for self-registration for selected courses; this involves prior distribution of a course access key (password) by the teacher (Roszak, Kołodziejczak, Kowalewski, Ren-Kurc 2016).

Figure 1 shows a sample group structure for teaching a course in Pathophysiology for the 2nd year students of the Faculty of Medicine. Group ALL-4_2017 (lecture group) comprises all the 4MD Program students who attend this course in 2017. The students were assigned to that group by the portal administrator according to the list received from the Dean's Office. The students belong to 10 different practice groups (P1-4_2017, P2-4_2017, ... , P10-4_2017) and to 4 seminar groups (S1-4_2017, S2-4_2017, S3-4_2017, S4-4_2017). The remaining groups, namely: final test, retake, and integrative were created by the teacher for the purpose of final knowledge evaluation organization (exam and overall course assessment). Students register themselves for the test date of their choice, upon meeting the pass criteria for the course. Registration was also restricted to appropriate course or seminar groups at a specified time.

Group management
Administration
All learning groups
All learning areas
All members

List of all learning groups in this course

25 Entries — Learning area filter: Show all groups

Name »	« Description ↓ »	« Edit »	« Delete
ALL-4_2017	4MD 2016-17	Edit	Delete
extra	4MD 2016-17	Edit	Delete
P10-4_2017	4MD 2016-17	Edit	Delete
P1-4_2017	4MD 2016-17	Edit	Delete
P2-4_2017	4MD 2016-17	Edit	Delete
P3-4_2017	4MD 2016-17	Edit	Delete
P4-4_2017	4MD 2016-17	Edit	Delete
P5-4_2017	4MD 2016-17	Edit	Delete
P6-4_2017	4MD 2016-17	Edit	Delete
P7-4_2017	4MD 2016-17	Edit	Delete
P8-4_2017	4MD 2016-17	Edit	Delete
P9-4_2017	4MD 2016-17	Edit	Delete
S1-4_2017	4MD 2016-17	Edit	Delete
S2-4_2017	4MD 2016-17	Edit	Delete
S3-4_2017	4MD 2016-17	Edit	Delete
S4-4_2017	4MD 2016-17	Edit	Delete
S5-4_2017	4MD 2016-17	Edit	Delete
Final test - 13.07 at 10.45am	Final test	Edit	Delete
Final test - 13.07 at 9am	Final test	Edit	Delete
Retake 1 - july 20 at 9am	Final test - retake 1	Edit	Delete
Retake 1 - july 14 at 9am	Final test - retake 1	Edit	Delete
Retake 2 - july 27 at 9am	Final test - Retake 2	Edit	Delete
Integrative 4	Grupa dla Integrative 4 z 20.07.2017	Edit	Delete
integrative3	Grupa na 13.07 at 9am	Edit	Delete
Integrative	Grupa utworzona dla testu Integrative	Edit	Delete

[Pages]

Figure 1. Group structure for a course in Pathophysiology at the Faculty of Medicine

Source: *Own Research*

Learning group management (Figure 2) by the teacher, i.e. group formation, division into smaller units or combining into learning areas, is a significant aspect of distance learning organization. Visibility and access to different tools and activities, read or write permissions are dedicated to a group and not to individual users. It is also the group that has the right to use the given learning resources at the given time in the portal, including courses, tests, surveys, thematic forums, etc.

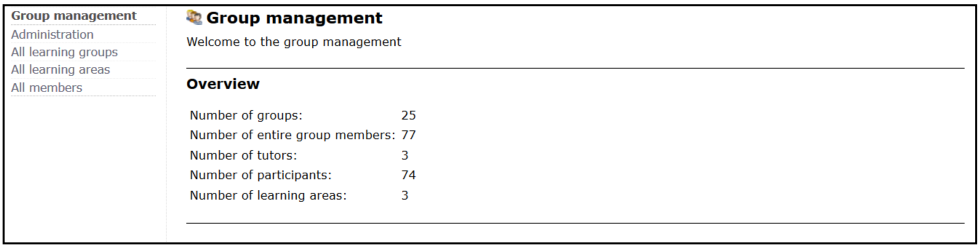

Figure 2. Group management in Pathophysiology course

Source: *Own Research*

Summing up, the administrator's ability to create and manage learning groups is therefore a very important aspect of distance learning, and every e-teacher should have advanced skills and ICT competencies to be capable of doing it.

Electronic knowledge evaluation

Electronic knowledge evaluation, i.e., the examination and self-study (self-testing) process, is an important component of the overall learning process. Portals offer a set of tools for building closed-ended tests and open-ended tasks. Knowledge evaluation and self-learning should be archived automatically, and their basic statistical analysis should immediately rate the student's achievements. Therefore, the electronic evaluation of students' knowledge should be based on the QTI (Question and Test Interoperability) knowledge testing standard by the international organization IMS (Instructional Management Systems Global Learning Consortium), including the process of archiving these resources. The standard offers an appropriate knowledge evaluation methodology and options for exchanging examination databases between schools and other education units. The originally produced databases are used for several years thereafter - a period of 5 years is assumed as the professional life cycle for learning contents. A teacher who participates in the organization and implementation of knowledge evaluation activities on a learning portal should have the knowledge about this issue (Roszak, Kołodziejczak, Kowalewski, Ren-Kurc 2014).

The teacher's personal experience as a participant in online testing, along with their awareness of the fact that the questions and answer options are randomly assigned to each student, the time and the number of answers to each question is limited and controlled automatically, and the participant can see their result after the end of the test, while their score is immediately published in the collection of all the evaluated tests and tasks. Thus, an e-teacher should be well familiar with the student side of the electronic knowledge evaluation process related to their specific subject, as well as its actual realization in an LCMS.

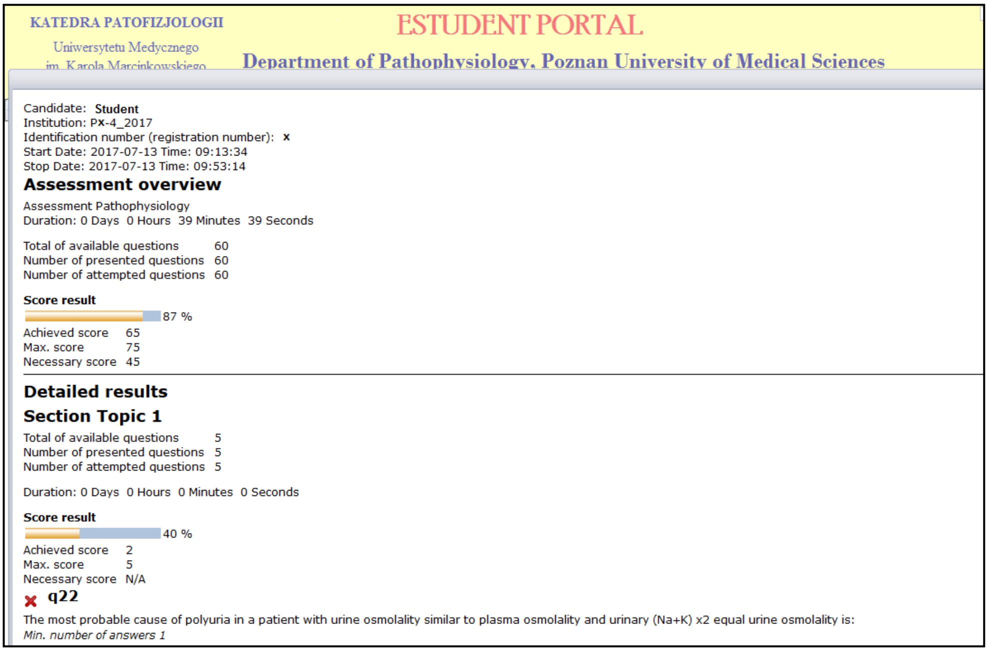

Figure 3. Student test results in Pathophysiology course

Source: *Own Research*

Figure 3 presents a sample test in Pathophysiology, passed by 2nd year students of the Faculty of Medicine, Poznań University of Medical Sciences, which conforms to the requirements specified above. The test consists of theoretical questions as well as practical problems (medical cases) randomly drawn out of 10 topical sections available in the database. The figure below shows the following data: test time (start and stop date), time taken by student to complete the test (39 minutes 39 seconds), number of questions in the test (60), student's results (65 points = 87%), pass threshold (45 points) and maximum score (75 points); the next part of the figure presents the detailed results of the first theoretical section (Section Topic 1) consisting of 5 questions, 40% of which were answered correctly by the student, who received 2 out of 5 available points; below there is also a part of the first question (q22) in this section (questions in each of the 10 sections are drawn randomly for the person taking the test in the specific section).

The teacher must always bear in mind that their students track their learning results on the learning portal, using self-test databases and other refresher resources, and therefore the teacher needs proficiency in analysing these processes and awareness of their execution.

The final stage of knowledge evaluation, which is very important, is the archiving of portal resources. Archiving student knowledge evaluation on the portal involves the automatic gathering of assignment files (tests, tasks, etc.), which are saved in folders according to group allocation. The function of file gathering allows one to manage the above mentioned duties automatically. Work results are usually structured in directories, which can be easily reached through selecting a given group of students. At the same time, the system enables creating various reports, summaries and statistics.

Archiving functions are always available in the database system, yet its proper portal implementation often requires expert knowledge, particularly if scripts need to be written to streamline the process (Roszak, Kołodziejczak, Kowalewski, Ren-Kurc 2016). The teacher should be aware of the significance of this stage (regularly archiving the resources) and should be able to export the test results outside the LCMS.

Summing up, the teachers' skills and ICT competencies relevant to student knowledge evaluation involve primarily creating and updating questions in exam and refresher databases, as well as implementing the knowledge evaluation process on an LCMS , and they are as follows:

- Customizing the progress of a specific test/exam/self-test;
- Choosing the right knowledge testing methodology, including establishing a pass threshold,
- Organizing the testing process on the portal for a group or groups of students at a specified time (more than one option),

- Analysis of a single student's or a group of students' accomplishments, archiving all the knowledge evaluation components.

Communication in distance learning

Communication is an essential part of distance learning, no matter whether an e-learning or blended learning environment is taken into account (Mokwa-Tarnowska 2015; Kołodziejczak, Roszak, Ren-Kurc, Kowalewski, Półjanowicz 2015; Watts 2016). A feeling of isolation and lack of support from the teacher demotivates the learner and often discourages them from carrying out a distance learning project (Pulak 2015). Therefore, the course author and the teacher face an important task of planning and thereafter implementing such course communication methods that will help accomplish the intended learning goals and enhance the learner's satisfaction. This, on the one hand, requires the teacher to be familiar with the communication tools available on the e-learning portal they use, and on the other hand it requires them to anticipate at which course practice stage the learner may need their help. When support is planned properly, unnecessary communication can be avoided, as it may be an excessive burden on the teacher. In addition, the time needed for the learner to wait for suggestions is shortened, and the learner can proceed with the self-learning process.

Learning portals usually offer several communication tools, generally divided into synchronous (e.g. chat, voice communication, videoconferencing) and asynchronous (e.g. forum, e-mail). It can be claimed that the more communication options are available for the teacher within the course, the easier and more efficient it is for the teacher to organize the learning process (Kołodziejczak, Roszak, Ren-Kurc, Kowalewski, Półjanowicz 2015, Noskova, Pavlova, Yakovleva 2017).

Synchronous communication enables course users to communicate in real time. Depending on the portal, this communication can proceed in text, voice, virtual board format, or as video transmission (Lim 2017). The above specified communication channels, particularly videoconferencing, further strengthen the impression of participating in traditional classes and direct contact. However, the simultaneous presence of the teacher and all the course participants can be burdensome for professionally active people, or people in different time zones. In order to engage in voice communication (Voice over IP) and videoconferencing, the teacher must understand the fundamentals of audio/video streaming, and must therefore have more advanced ICT competencies. This is particularly important if any problems occur in setting up the communication - the teacher should be able to diagnose the problem and help the learners overcome certain minor issues, such as a video camera or microphone off, adjusting sound settings in the system.

The advantage of **asynchronous communication** tools is their accessibility anywhere at any time. It provides students with more time to prepare and reflect on topics for discussion. The modern learning management systems offer various asynchronous communication tools to obtain evidence of collaboration which might be a part of the grading system (Lim 2017).

A forum can be presented in different formats (e.g. as a simple, single-thread discussion, or a question & answer forum, or a blog layout forum), and can serve various purposes in a course, e.g. consulting a teacher or expert, sharing thoughts and views on a specific subject, communicating organizational issues, or socializing (Kołodziejczak, Roszak, Ren-Kurc, Kowalewski, Półjanowicz 2015). The teacher should become familiar with all the options offered by that tool in the actual learning portal, so that they can make an informed decision on the planning of the place and functions of the forum in the actual course. If the students can subscribe to the forum, its functionality range expands further. Typically, posting or moderating a discussion is quite intuitive, not requiring any special ICT competencies of the teacher.

E-mail is currently the most popular way of communicating between participants of the learning process. The best option is when such a service is offered on the learning portal the students use. It will then largely facilitate the organization of message exchange. There is no need to create distribution groups in e-mail software or to use networking site services, as all the necessary information is available in the learning portal databases. The course author should offer e-mail contact options with the portal administrator, the teacher and the learning group, e.g., the study year, seminar group or project group. Using the e-mail client in the portal is usually quite simple, yet certain problems may occur with searching for a specific student or student group and with adding them as message recipients. Therefore, course teachers should be trained in using the portal to improve their competencies in this respect.

Another less frequently used method of communication with an e-learning group in a course is **Calendar**. The knowledge of the options offered by that tool will strongly facilitate the organization of the learning process. Therefore, it would be reasonable to find out the options offered by the portal chosen to manage the learning process. Portals usually offer individual and group calendars for scheduling important events on a course. Instead of distributing such information as exam dates, deadlines for the submission of semester papers, the teacher can publish these items in the calendar in due advance. In this way, the learners can manage their time more efficiently to avoid the accumulation of problems. If the calendar also has the notification function to indicate the approaching deadlines, it becomes even more functional. When a calendar is not available on the portal, one should see whether a **notification** function exists, preferably with a subscription option. Learning new skills in handling group communication tools would significantly facilitate and streamline the teacher's work on a distance learning course.

Learning materials in distance learning

Learning materials are more and more frequently available in multimedia format (Kołodziejczak, Roszak, Kowalewski, Ren-Kurc 2014). These can be audio, video or animation files. Embedding them in the course is the task of the portal administrator or course author. However, it is the user's role to learn to play a specific multimedia resource. The user's knowledge is not always sufficient to handle this task. Therefore, it is important to publish precise hardware and software requirements in a prominent place in the course (necessary device drivers, codecs, players), operating instructions, and the contact information for help. If support is provided by the university or school, the support organization is responsible for resolving any problems with using multimedia materials. Without outside support, the teacher must have the necessary ICT competencies to offer help to their learners. To do this, the teacher must be generally familiar with the current technologies and their limitations.

RECOMMENDATIONS FOR BLENDED LEARNING

In this part of the article, the Authors present their recommendations for the key issues in the process of improving teachers' skills and ICT competencies necessary for effectively pursuing the teaching process on the basis of a course published on an LCMS portal.

Using specific application

The teacher plans the knowledge conveying and student evaluation process optimizing the time needed, including the preparation of distance learning classes. Every aspect of distance learning must be taken into account, and the use of the selected LCMS to run a blended or e-learning course must be carefully planned to achieve a successful integration, (Kuźmicz, Skrzydlewski, 2012). The organization of the educational process also includes scheduling student communication and, naturally, a strict timeline for testing, ways of submitting open tasks and projects. For example, if the students are required to write an essay, we have to define how their files will be transmitted to LCMS resources. We should also prepare the information about how to successfully transfer a file, as well as specify the deadline for assignments and feedback. Technically speaking, the whole process depends on the LCMS configuration and as such needs to be learned.

Disadvantages of synchronous and asynchronous communication

Chat is a popular communication channel, particularly among young people. Text messengers are integrated in every networking system and can be conveniently used on mobile devices as well. The popularity of chat in daily unrestrained communication does not automatically translate into its usefulness in distance learning. Even a carefully scheduled chat, with the date and time frame for communication and the discussion topics defined significantly in advance, can fail to accomplish a specific learning task. The reason is the difficulty in focusing the attention of a larger group of users on the problems being discussed. Digressions, e.g., regarding course organization aspects, effectively distract recipients from the professional discussion. Discipline and focus on the subject-matter can only be maintained in small groups of 2-3 members, e.g., project groups or seminar groups.

Then, a chat becomes a discussion of a problem and as such can be successful in the learning process. On the other hand, dividing big online classes into smaller groups may lead to an intensive time commitment for online teachers. Furthermore, technical failures and poor internet connectivity may affect the quality of communication. Additionally some e-learning portals do not have tools for synchronous communication, e.g., OLAT (Online Learning And Training).

The basic limitation of asynchronous communication tools is a long waiting time for feedback. It is difficult to get immediate response to e-mails or forum posts, especially on a course for large groups.. This leads to the students being reluctant to participate in the discussion. They are also more likely to copy and paste some content from the internet which, in turn, may result in plagiarism.

Continuous training

The improvement of teachers' skills and ICT competencies in producing learning materials, and teaching online courses is an obvious necessity (Kołodziejczak, Roszak, Kowalewski, Ren-Kurc, Bręborowicz 2015; Malach, Kostolányová, Chmura, 2015; Noskova, Pavlova, Yakovleva, Smyrnova-Trybulska, Morze 2016). The competency improvement process is slow, and therefore training programmes and courses should be both continuous and regular. As soon as a recipient of distance education acquires the requisite ICT competencies, they can switch to the role of a distance teacher (Przybylska 2007), which was often emphasized by the authors in their prior publications and which the authors still consider to be important. Regular teacher training courses and sessions should be a mandatory part of an e-teacher's job, as distance teaching is not for inexperienced and poorly qualified educators.

Practice in distance learning

A vast majority of academic teachers have not yet had an opportunity to participate in distance learning as students. Thus, for highly qualified experts in their specific fields, it would be valuable to participate on a mandatory basis in an e-learning course on any topic. By doing it, they could gain practical experience and appropriate skills necessary to successfully engage in e-learning (communication, activation in conveying knowledge, multimedia, broadly defined knowledge evaluation).

Poland does not have unambiguous official guidance concerning **continuous training** and **practice in distance learning**. Most Polish universities have published internal regulations regarding the requirements and competencies of a teacher applying for the opportunity to teach a distance education course.

CONCLUSION

In order to teach in an e-learning or blended learning environment, a teacher needs to have certain additional competencies, based on the nature of the learning portal. In addition to the professional and organizational competencies, which are indispensable for a teacher in a traditional classroom, there are certain ICT competencies and competencies related to the legal aspects of working on an e-learning portal. They are as follows:

1. Compilation and publication of professional materials, including multimedia resources;
2. Preparing knowledge evaluation, particularly in the form of tests; analysis of results, notifications to students;
3. Various options of effective student - teacher communication;
4. Archiving learning resources, knowledge evaluation results, contents published on the forum.

The competencies enumerated under point 1 can be supported by IT departments at universities or other education units. However, the activities listed in points 2 to 4 take place in real time (including the archiving process) and as such must be handled by the teacher themselves.

REFERENCES

Kołodziejczak, B., Roszak, M., Kowalewski, W. and Ren-Kurc, A., 2014: *Educational multimedia materials in academic medical training*. Studies in Logic, Grammar and Rhetoric on Logical, Statistical and Computer Methods in Medicine, No.39(52), 2014, pp. 105-121. ISBN: 978-83-7431-428-2, ISSN: 0860-150X

Kołodziejczak, B., Roszak, M., Kowalewski, W., Ren-Kurc, A. and Bręborowicz, A., 2015: *Participants academic distance education - case study*. Technics, Technologies, Education, Management, Vol. 10, No. 2, 2015, pp. 242-249. ISSN: 1840-1503, e-ISSN: 1986-809X

Kołodziejczak, B., Roszak, M., Ren-Kurc, A., Kowalewski, W. and Bręborowicz, A., 2014: *Management of groups in distance education*. E-learning and Intercultural Competences. Development in Different Countries, Sc. ed.: Smyrnova-Trybulska, E., Published by Studio Noa for University of Silesia, Katowice-Cieszyn, 2014, pp.423-437. ISBN: 978-83-60071-76-2

Kołodziejczak, B., Roszak, M., Ren-Kurc, A., Kowalewski, W. and Półjanowicz, W., 2015: *Communication tools on e-learning portals*. IT tools - good practice of effective use in education, Sc. ed.: Smyrnova-Trybulska, E., Published by Studio Noa for University of Silesia, Katowice-Cieszyn, 2015, pp. 63-80. ISBN: 978-83-60071-82-3

Kuźmicz, K., Skrzydlewski, W., 2012: *Methodological context of e-learning research*. Media - Edukacja - Kultura, Ed.: Skrzydlewski, W., Dylak, S., Polskie Towarzystwo Technologii i Mediów Edukacyjnych, Poznań, 2015, pp. 81-102, ISBN: 978-83-924173-0-9 [In Polish]

Lim, F.P., 2017: *An analysis of synchronous and asynchronous communication tools in e-learning*. Advanced Science and Technology Letters, Vol. 143, 2017, pp.230-234, [online] at http://onlinepresent.org/ proceedings/vol143_2017/46.pdf, (accessed 20 September 2017)

Malach, J., Kostolányová, K. and Chmura, M., 2015: *Academic Scholars' View on the Contribution of ICT to the Enhancement of Distance Learning Element of University Studies.* IT tools - good practice of effective use in education, Sc. Ed.: Smyrnova-Trybulska, E., Published by Studio Noa for University of Silesia, Katowice-Cieszyn, 2015, pp. 159-188, ISBN: 978-83-60071-82-3

Mokwa-Tarnowska, I., 2015: *E-learning and Blended Learning in Academic Education: Teaching Aspects*. GUT Publishing House, Gdańsk, 2015, ISBN: 978-83-7348-613-3 [In Polish]

Mokwa-Tarnowska, I., 2016: *Ensuring quality in the classroom: Evaluating technology enhanced learning.* E-learning Vol. 8, E-learning Methodology – Implementation and Evaluation, Sc. ed.: Smyrnova-Trybulska, E., Vol. 8. Published by Studio-Noa for University of Silesia, Katowice-Cieszyn 2016, ISSN: 2451-3644 (print edition) ISSN: 2451-3652 (digital edition), pp.389-408. ISBN: 978-83-60071-86-1

Morze, N., Kuzminska, O., 2017: *Blended learning in practice of e-learning managers training*. Distnce Learning, Simulation and Communication (DLSC2017), Proceedings (Selected papers), Ed.: Hrubý, M., University of Defence, Brno 2017, pp. 121-126, ISBN: 978-80-7231-415-7

Noskova, T., Pavlova, T. and Yakovleva, O., 2017: *Electronic communication in education: a study of new opportunities*. Distance Learning, Simulation and Communication (DLSC2017), Proceedings (Selected papers), Ed.: Hrubý, M., University of Defence, Brno 2017, pp. 127-135, ISBN: 978-80-7231-415-7

Noskova, T., Pavlova, T., Yakovleva, O., Smyrnova-Trybulska, E. and Morze, N., 2016: *Modern education quality requirements and information technologies in academic teachers' activities*. J. Continuing Engineering Education and Life-Long Learning, Vol. 26, No. 4, pp.434-459, DOI: 10.1504/IJCEELL.2016.10001922. ISSN 1560-4624

Przybylska, E., 2007: *Education of adults learning's moderators - Blended Learning.* E-mentor, No.3(20), 2007, pp.54-61, ISSN: 1731-6758 [In Polish]

Pulak, I., 2015: *Preparing students for the use of e-learning in higher education.* IT tools - good practice of effective use in education, Sc. Ed.: Smyrnova-Trybulska, E., Published by Studio Noa for University of Silesia, Katowice-Cieszyn, 2015, pp. 189-200. ISBN: 978-83-60071-82-3

Regulation of the Minister of Science and Higher Education of 2 November 2011, Journal of Laws No. 246, concerning the prerequisites for teaching university courses with the use of distance education methods and techniques, [online] at http://www.cko.us.edu.pl/images/stories/cko/prawo/D20111470.pdf, (accessed 04 November 2017) [In Polish]

Roszak, M., Kołodziejczak, M., Kowalewski, W. and Ren-Kurc, A., 2014: *Academic blended learning – competences and tools*. Int. J. Continuing Engineering Education and Life-Long Learning, Vol. 24, No. 3/4, 2014, pp.286-301, DOI: 10.1504/IJCEELL.2014.063100. ISSN 1560-4624

Roszak, M., Kołodziejczak, M., Kowalewski, W. and Ren-Kurc, A., 2016: *Implementation of e-learning portal for academic education and lifelong learning*. Int. J. Continuing Engineering Education and Life-Long Learning, Vol. 26, No. 2, 2016, pp.135-152, DOI: 10.1504/IJCEELL.2016.076011. ISSN 1560-4624

Watts, L., 2016: *Synchronous and asynchronous communication in distance learning: a review of the literature*. The Quarterly Review of Distance Education, Vol. 17(1), 2016, pp. 23-32. ISSN: 1528-3518

GLOSSARY OF TERMS FOR ICT AND E-LEARNING: COMPARE THE POLISH, SPANISH AND RUSSIAN APPROACH

Eugenia Smyrnova –Trybulska, Maria Stec, **Anna Studenska**
University of Silesia in Katowice, Poland
esmyrnova@us.edu.pl, maria.stec@us.edu.pl, anna.studenska@us.edu.pl

Tatiana Noskova, **Tatiana Pavlova**, **Olga Yakovleva**
Herzen State Pedagogical University of Russia, icsto@herzen.spb.ru

Sixto Cubo Delgando
University of Extramadure, Spain, sixto@unex.es

Abstract: *The development of information technology creates new opportunities for teachers and learners. An increasing number of educators and students benefit from e-learning. However, there is scarcity of publications devoted to terminology describing e-learning process. Participants of the IRNet project recognized the need to investigate terminology used in e-learning. Therefore, the purpose of the article is to select notions connected with e-learning, group them and present their definitions in the form of a glossary. Twenty-nine notions were selected. They were divided into four groups. These were concepts connected with information, competence, education and-e-learning. Definitions of ten notions regarded as basic were gathered from Russia, Poland and Spain and compared. It is hoped that the work will be useful both for e-learning courses creators and students.*

Keywords: e-learning, glossary, distance learning terminology, online education

1. INTRODUCTION

Rapid technological advancement allowed for the development of e-learning. The value of e-learning market in 2015 reached the annual growth value of 9,2%. It is estimated that in 2019 as much as 50% of classes will be provided to students online (iMod Education, 2016). However, various terms and their definitions can be found in the subject literature (Szabłowski, 2011).

Use of new technologies in education is described by numerous notions with a various range of meanings, such as online education, computer-mediated communication (CMC), computer assisted learning, virtual classrooms or e-learning.

Definitions focus on different aspects, roles and functions of modern technologies in the teaching-learning process (Guri-Rosenblit, Gross 2011). For example, the notion of e-learning is understood broadly as "all activities supporting educational process which use tele-informational technologies (Hyla, 2016). Still, several definitions stress either kind of technology used, the function of e-learning in communication support or learner–centeredness (Guri-Rosenblit, Gross 2011). The notion of distance education is also used. It is defined as education which is an institutionally based process during which learners and teachers are separated to share learning experiences in the form of data, voice and video through interactive telecommunication technology (Schlosser et al. 2010). However, some authors claim that distance learning may be realized without new technologies (Guri-Rosenblit, Gross 2011).

Accessibility to definitions of the most important terms connected with e-learning may be important and beneficial both for designers of courses available online and students benefiting from this form of education. Therefore, participants of the IRNet project recognized the need of forming glossary of terms regarded as the most important for e-learning.

2. PURPOSE, BASIC ASSUMPTIONS AND RESEARCH QUESTIONS

The main purpose of the study was to select notions connected with e-learning, group them and present their definitions in the form of a glossary.

E-learning encompasses various issues: new technologies, learning and teaching methods and self-education (Szabłowki, 2011) Therefore, it was assumed that the notions that would be selected for the glossary should refer to information technologies, student's and teacher's competences, teaching methodology and student–centeredness of learning-teacher process. A group of basic terms was established. For the basic notions, an attempt was made to collect and compare definitions from different parts of Europe. It was decided that definitions from Russia, Poland and Spain will be highlighted, reflecting eastern, central and western parts of the Continent. Three basic research questions were formulated:

- How can the terms selected be grouped?
- Are there differences in Russian, Polish and Spanish explanations of basic terms?
- How do the terms differ in Russian, Polish and Spanish explanation?

3. PROCEDURE

To select terms for the glossary various resources were used. The most important were:

- Government online resources, for example, Russian Federal Education Standards portal, Russian federal laws online versions or Spanish Education Ministry websites.
- Official e-learning handbooks like "Przewodnik po e-learningu" (E-learning guide-book) or *Teaching Materials and the Roles of EFL/ESL Teachers".*
- Glossaries and dictionaries, for example Russian Pedagogical terminology dictionary, or Polish "Glosariusz terminów i pojęć używanych w europejskich programach współpracy w dziedzinie edukacji" (Glossary of terms and notions used in European programmes of educational cooperation)
- Specialised dictionaries devoted to e-learning available online, like "Słownik e-learningu" (E-learning dictionary) or SKILLTOM e-learning dictionary.

After the initial selection of terms was completed, the terms were inserted into a table which was distributed among IRNet project Partners to complete. Definitions were then gathered and grouped. The ways in which the basic terms are understood in Russia, Poland and Spain were compared.

Results

The results concern both the glossary of terms and comparison of their definitions from Russia, Poland and Spain. The following ten terms were regarded as elementary ones: information educational environment, information resources, informatization, competence, informational competences, key competences, teacher professional adequacy, portfolio, distance learning technologies and e-learning.

3.1 Glossary of terms

Twenty-nine terms connected with e-learning were collected. They were divided into four groups. The groups concerned concepts related to information (3 terms), competence (5 terms), education (10 terms) and e-learning (11 terms).

3.1.1. Concepts related to information

Information Educational Environment (informacyjne środowisko edukacyjne)

Russian Definition - software telecommunications environment, which provides technological means to conduct the educational process, its information support and documentation in the Internet to any number of educational institutions, regardless of their professional expertise and level of education (Concept of creation and development of information educational environment of open education system of Russia).

Polish Definition - software which intermediates between a teacher and a learner. It is an application which contains data base, teaching content, discussion forum, repository of tests and a system of logging in for learners. (Szabłowski 2011: 14-15).

In Spain, the concept is not generally used.

Information resources (zasoby informacyjne)

Russian and Spanish definition - collection of data organized to obtain reliable information, documents and arrangement of documents in information systems. (GOST 7.0-99)

Polish definition - data needed for an organization to function; A collection of valuable information generated by human activities. In a broader sense, it also includes related equipment, personnel, and capital.

Informatization (informatyzacja)

Russian definition - integrating social, economic, scientific and technical process of creating optimal conditions to meet the information needs and rights of citizens, public authorities, local governments, organizations, public associations based on the formation and use of information resources (Federal Law "On information, informatization and information protection", 25 January 1995).

Polish definition - usage of data already introduced to information systems in most effective way by other information systems https://pl.wikipedia.org/wiki/Informatyzacja; usage of new methods of information processing in economy, engineering etc. (Słownik języka polskiego PWN)

Spanish definition - applying the methods of Informatics to business, project, etc. (Spanish Language Royal Academy)

3.1.2. Concepts connected with competences

Competence (kompetencja)

Russian definition – the notion of competence is understood in two basic ways 1) Ability to use actively the resulting personal and professional knowledge and skills in a practical or scientific activity. Competencies in various fields are distinguished. The following competences are mentioned: education, common cultural, social and labour, information, communication, competence in the field of personal self-determination, etc. (Online portal “Federal Education Standards” 2) Integrative personal characteristic, reflecting the willingness and ability of the individual to carry out activities (including professional) in accordance with accepted in society the norms and standards (Kozyrev, Radionova 2004). 3) Set of specific knowledge and skills, in which a person must be knowledgeable and have practical experience (Online portal "Federal Education Standards")

Polish definition - individual potential to adjust to environmental conditions, to act effectively; individual potential to introduce creative modifications (Męczkowska 2003: 693-697)

Spanish definition - combination of knowledge, capacities and attitudes adequate to a context. (Education Ministry).

Informational competences (kompetencje informacyjne)

Russian definition – a set of interrelated abilities (knowledge, skills, ways of life) which allows to use real objects and information and communication technologies in order to search for, analyse and select relevant information, organize, convert, store and transmit it. (Trishina, Khutorskoy 2004).

Polish definition – ability to use technologies of information society (TSI) skilfully and critically. Informational competences form basic skills in the framework of informational and communicational technologies (Zalecenia Parlamentu Europejskiego i Rady 2006/962/WE). Informational competencies as all other competencies consist of cognitive, motivational, normative, voluntary and social components. They should be analysed holistically in terms of skill and fluency in knowledge usage, solving problems and accept challenges (S. Juszczyk 2002)

Spanish definition - Use of computers to obtain, evaluate, store, produce, present and exchange information, and communicate and participate in Internet web networks. (Competencias clave para el aprendizaje permanente. 2007)

Key competences (kompetencje kluczowe)

Russian definition - competences necessary for any professional activity, are associated with the success of the individual in a rapidly changing world. They are manifested primarily in the ability to solve professional problems using information and communicating, including foreign language use; they also include socio-legal framework of individual behaviour in a civil society (Zimnaya, 2003)

Polish definition - the ability to read, write and count. Presently, they may also include new basic skills such as computer literacy, learning to learn skills, ability to cooperate with others and linguistic skills (Glosariusz, 2004: 32, 51)

Spanish definition - All the competences that people need for their personal development and realization, as well as for active citizenship, social inclusion, and employment (Education Ministry).

Teacher informational competence - ICT competence (kompetencje informacyjne nauczyciela)

Teachers` ability to apply relevant tools and use them effectively for learning purposes. Teachers access the available videos, documents and exercises for the courses (Obidniak, 2002:67-71). UNESCO promotes ICT-CFT (Competency Framework for Teachers). ICT– CFT involves understanding ICT in education, curriculum and assessment, pedagogy, ICT, organisation and administration, teacher professional learning with three approaches. These are technology literacy (enabling students to use ICT to learn more efficiently), knowledge deepening (enabling students to acquire in-depth knowledge of their school subjects) and knowledge creation (enabling students to create the new knowledge) (UNESCO, 2011:7-12).

Teacher's professional adequacy (kompetencje zawodowe nauczyciela)

Russian definition - 5 major groups of professional activities characterizing the experience of solving the basic pedagogical problems are allocated: 1) See the child (pupil) in the educational process; 2) build the educational process focused on achieving the goals of a concrete level of education; 3) establish interaction with other subjects of the educational process, the school partners; 4) create educational environment (school space) and use it for educational purposes; 5) design and implement professional self-education (Balakireva 2008) .

Polish definition - teacher's key competences required in curriculum statement and national education, general teaching competences, subject specific competences and didactic competences. He or she should develop professionally (talents, skills and potential) as well as reflect on one's achievements in the classroom, do research, share experience and evaluate courses (Komorowska, 2002:11-14).

No specific Spanish definition was provided.

3.1.3. Concepts related to education which are relevant to e-learning

Adaptive learning (przystosowawcze uczenie się) – instruction in which the level of learning material is adjusted to the level of the learner`s knowledge and skill (Hyla 2016: 334).

Chunking (porcjowanie materiału uczenia się / atomizacja wiedzy) - division of learning material into parts corresponding to a specific learning goal (Hyla 2016: 334).

Knowledge management (zarządzanie wiedzą)– the process in which the knowledge and experience of course participants are gained, organized, stored and retrieved (Hyla 2016: 345).

LO – **Learning object (obiekt kursu)** – a fragment of learning material which enables achievement of a specific learning goal (Hyla 2016: 339).

Materials (materiały) –the resources used in education (learning and teaching) including commercial materials (global and local coursebooks, textbooks, teachers' books, tests, visual aids), reference materials (dictionaries, grammar books, readers) as well as teacher-prepared and learner-generated materials (Mc Grath 2013:2-5).

Multilingual project products (**wielojęzyczne produkty projektu**) teaching and learning resources (coursebooks, presentations, courses) prepared in various languages (Glosariusz terminów i pojęć, 2004:196).

Multimodality (multimodalność) – the use of several semiotic modes in the design of a product or an event. Modes, which can be combined in various manner, such as writing, image, sound, colour create messages. They can reinforce each other (say the same thing in different way), play a complementary role or be hierarchically ordered in action films (Kress & van Leeuwen, 2001:20; Kress, 2010:1).

Personalization (indywidualizacja) – the main e-learning principle – adjusting content, form, and way of providing information to individual preferences of the recipient (Hyla 2016: 341).

Portfolio (portfolio)

Russian definition - form of monitoring and evaluation of student achievement, and their characteristics, evidence of progress in learning, the materialized products on learning and cognitive activity, including self-estimation (Pedagogical terminology dictionary online).

Polish definition - the document used to plan, organize and document education, work samples and skills. It is to illustrate development of one's professional career and improvement of teacher's competences (Obidniak, 2002:76).

Spanish definition - collection of tasks that include individual achievement that promote auto-evaluation and gives an alternative to evaluation methods (Klenowski, V. (2005)

Three - layer content structure (trójwarstwowa struktura treści) – the concept of dividing of teaching content into three parts aimed at: recommending knowledge chunk, providing basic information; providing resources for construction of the whole knowledge picture in learner`s consciousness (Hyla 2016: 344).

3.1.4. Concepts related to distance learning

Asynchronous learning/teaching (uczenie się / nauczanie asynchroniczne) - teaching in which learners work on learning material in different time and places (Szabłowski 2011: 27). In asynchronous learning/teaching the basic instruments student uses are computer and Internet. Learning process organizer by means of special software and server creates educational environment called educational portal on which they place didactic materials. Student uses their own computer to retrieve these materials, process them, solve tasks and tests and takes advantage of electronic library to obtain additional materials to communicate with administration. Linking with the portal takes place in time suitable for the student. Therefore, asynchronous model can be evaluated as effective, cheap, available and open to multimedia (Galwas, 2012).

Digital educational resources (cyfrowe zasoby edukacyjne) - a set of software, information, technical and organizational support, that reflects a certain subject area and implements the technology for its study by different learning activities. Two groups of Digital Educational Resources are defined: information sources and information tools (Noskova, Yakovleva, 2015).

Distance learning technologies (technologie nauczania na odległość)

Russian definition -Technologies of indirect (distant) interaction of students and teaching staff with the use of information and telecommunication networks. (Federal Law "On Education in Russian Federation").

Polish definition - technologies which support distance learning. These technologies make possible to distribute and process teaching/learning materials (Hyla, 2016: 24).

Spanish definition - All the technologies used to develop distance education

E-learning (kształcenie na odległość)

Russian definition: Organization of educational activities and interaction of students and teaching staff with the use of information technologies, hardware and databases. (Federal Law "On Education in Russian Federation")

Polish definition: a method of conducting didactic process in conditions in which both learner and students work in different places and sometimes at different time. Participants of didactic process use not only conventional means but also mainly new informational technologies to communicate. These technologies allow them to transfer voice, video materials, electronic text, documents etc. They also enable for direct contact in real time between teacher and students by means of audio or video conferences despite real physical distance between them (Kubiak, 2000: 11).

Spanish definition: System that allows to teach in the distance with ICTs support (Technology, communication networks, videoconference, digital tv, multimedia resources, etc.) that combines pedagogical perspectives: classical instruction, practice, synchronous and asynchronous contacts

E-learning course (kurs nauczania na odległość)- structuralized resource of e-content used to develop individual competences (Hyla 2016, s. 334) E-learning course includes teaching content, various forms of activities for learners and procedures for learning outcomes evaluation (Szabłowski 2011: 13).

E-learning platform (platforma e-learningowa) lub VLE Virtual Learning Environment (Wirtualne środowisko nauczania) – software which intermediates between a teacher and a learner. It is an application which contains data base, teaching content, discussion forum, repository of tests and a system of logging in for learners. (Szabłowski 2011: 14-15; Słownik e-learningu).

E-learning system (system nauczania na odległość)– a solution based on informational technology supporting teaching process and made available for a wide group of users via computer network (Hyla 2016: 343). In e-learning system informational technologies are used either as means or tools for teaching –learning process. Computers or Internet resources are used. (Szabłowski 2011: 13) The rules of e-learning assume that at least minimum of knowledge needed to complete the course is provided, the process of learning is individualized and learners are allowed to use course resources in time which is suitable for them and needed to solve their problems and tasks (Hyla 2016: 338, SKILLTOM).

Internet conference (**konferencja internetowa**) – the form of distance knowledge transmission in which an individual communicates with numerous persons (Hyla 2016: 338)

Repository (repozytorium) - a site in the web allowing for retrieving content which is structured and verified by the content curators (Hyla 2016: 342)

Self-learning materials (materiały do samodzielnego uczenia się) materials designed to help distance learners to study in their own time and pace. The materials may be created in various forms: text, audio, film, multimedia. Such materials contain learning objectives directly stated, are written in a personal style using I and you pronouns, are self-motivating and allow student`s self-assessment (WikiEdukator)

Synchronous teaching (nauczanie synchroniczne) - teaching which uses immediate contact between learner or learners and a teacher (Szabłowski 2011: 16).

3.2. Comparison of basic terms definitions

Ten terms were selected as basic. The terms connected with information were information **education environment, information resources and informatization.** The following notions connected with competences were chosen: **competence, informational competences, key competences and teacher professional adequacy**. From terms connected with education the notion of **portfolio** was selected. The terms regarded as most important to e-learning were **e-learning and distance learning technologies**.

As far as the definition **information education environment** is concerned, Russian sources stress the function of this kind of environment, which is enabling educational processes through the Internet. Polish definition focuses on the software`s role of intermediating between teacher and their students. In Spain, the notion is not generally in use.

In Russia and Spain, the same definition of **information resources** is honoured, regarding them as data sets organized in a way which enables obtaining reliable information. Polish definition is a general one and comes from the field of economics. The definition stresses that data which comprise information resources are essential for organization to function.

Russian and Spanish definitions of **informatization** emphasize using informatics and processes connected with its implementation to the benefit of various dimensions of social functioning. Polish definition stresses making data availability for other information processing systems.

All three definitions of **competence** stress that it is the ability to act. Russian definitions stress willingness of an individual to act and act in a way that respects norms and has the aim to achieve certain standards. Polish and Spanish definition emphasizes individual ability to adjust. Spanish definition states that competence is characterized by adequacy to context in which action takes place. Polish definition mentions creativity as a component of competence contains aim of successful action as an element of competence.

Russian and Polish definitions understand **informational competences** primarily as an ability to use modern information technologies. Russian and Spanish definition stress the purpose for which the ability is used which is information processing. Russian definition mentions searching, analysing, organizing, storing and transmitting information. Spanish definition enumerates obtaining, evaluating, storing, producing, presenting and exchanging, information via Internet.

Russian and Spanish definitions of **key competences** emphasize that such competences are essential for professional development and functioning in modern society. Polish definition mentions basic skills such as reading, writing and counting. All three definitions list such key competences as ability to use information technologies, and communication skills, including mastery of foreign language as well as cooperating with others.

Polish definition emphasizes that **teacher professional adequacy** is formally described by educational authorities. When definition addresses teacher`s competences, professional development and self-reflection is stressed. Russian definition specifically mentions five groups of activities in which teacher`s competence is manifested. These activities seem to concern didactic process which is focused on learning-teaching goals is student–cantered and aims at creating environment most favourable for learning.

All three definitions: Russian, Polish and Spanish agree that **portfolio** is a set of material evidence of individual`s performance and a form of evaluation of learner’s achievement. Russian and Spanish definition stress that portfolio may serve as a tool of student`s self-assessment.

All three definitions agree that **distance learning technologies** are technologies which make distance learning possible. Polish definition states that the purpose of these technologies is to support, Spanish definition stresses the role of technology in development. Russian definition emphasizes that technology enables student-teacher interaction in teaching-learning process.

Definitions of **e-learning** which were gathered focus on different aspects of the process. Russian definition stresses the role of information technologies, hardware and databases in organizing educational activities and facilitating teacher-learner interaction. Polish and Spanish definitions emphasize the fact, that due to new informational technologies teacher and students may work in different places and sometimes at different time.

4. CONCLUSIONS

The aim of the article was to select notions connected with e-learning, group them and present their definitions in the form of a glossary. Three research questions were formulated:

- How can the terms selected be grouped?
- Are there differences in Russian, Polish and Spanish explanations of basic terms?
- How do the terms differ in Russian, Polish and Spanish explanation?

Twenty-nine notions were selected from handbooks dictionaries and specialized resources devoted to e-learning. They were divided into four groups. Definitions of ten notions regarded as basic were gathered from Russia, Poland and Spain and compared. The following concepts were regarded as basic: information educational environment, information resources, informatization, competence, informational competences, key competences, teacher professional adequacy, portfolio, distance learning technologies and e-learning.

Glossary of terms was presented. The analysis of the definitions gathered allowed for formulation of the following conclusions:

- Selected notions can be divided into concepts related to information, competences, education and e-learning.
- The comparison of basic terms definitions taken from Russian, Polish and Spanish resources has shown similarity in the basic means they are understood. Differences can be observed in focus on functions of technologies, mentioning software and role or purpose of actions or technologies. The definitions also differ in the degree of specificity and the number of concept`s aspects mentioned. No pattern of similarity between definitions from Russia, Poland and Spain was recognized.

It is hoped that the work will serve as a reference both for designers of e-learning courses and students.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Balakireva E.V., 2008: *The professional approach to teacher education*. SPb: Herzen University publishing house.

Competencias clave para el aprendizaje permanente. Un marco de referencia europeo, 2007: Ministry of Education, Spain [online] at http://www.mecd.gob.es/dctm/ministerio/educacion/mecu/movilidad-europa/competenciasclave.pdf?documentId=0901e72b80685fb1 (accessed 27.08.2017).

Concept of creation and development of information educational environment of open education system of Russian Federation [online] at https://minobr.gov-murman.ru/files/eios_conception.pdf (accessed 27.08.2017) [In Russian]

Federal Education Standards of Russian Federation [online] at http://xn--80abucjiibhv9a.xn--p1ai/%D0%B4%D0%BE%D0%BA%D1%83%D0%BC%D0%B5%D0%BD%D1%82%D1%8B/336 (accessed 27.08.2017) [In Russian]

Federal Law "On Education in Russian Federation" [online] at 2012 http://www.consultant.ru/document/cons_doc_LAW_140174/ (accessed 27.08.2017) [In Russian]

Federal Law "On information, informatization and information protection", 25 January 1995 [online] at http://www.consultant.ru/document/cons_doc_LAW_61798/ (assessed 27.08.2017) [In Russian]

Galwas B., red., 2012: *Materiały XII Konferencji „Uniwersytet – Wirtualny Model, Narzędzia, Praktyka*", 2012. Warszawa: Ośrodek Kształcenia na Odległość OKNO Politechnika Warszawska

Glosariusz terminów i pojęć używanych w europejskich programach współpracy w dziedzinie edukacji. 2004. Warszawa: Narodowa Agencja Programu Sokrates Fundacja Rozwoju Systemu Edukacji

GOST 7.0-99 [online] at http://www.internet-law.ru/gosts/gost/8548/ (accessed 27.08.2017) [In Russian]

Guri-Rosenblit, S., Gros, B., 2011: *E-learning, confusing terminology, research gaps and inherent challenges.* International Journal of E-Learning and Distance Education 25(1) [online] at http://www.ijede.ca/ index.php/jde/article/view/729/1206?goback=.gde_ 4157305_member_144302026 (accessed 27.08.2017)

Hall, J. K. 2012. *Teaching and Researching Language and Culture*. London: Routledge.

Hyla, M., 2016: *Przewodnik po e-learningu*. Warszawa: Wolters-Kluwer

iMod Education https://www.imodeducation.com/popularity-online-courses-e-learning-2016-based-trends-statistics/ (accessed 20.08.2016)

Juszczyk S., 2002a: *Edukacja na odległość: kodyfikacja pojęć, reguł i* procesów. Toruń: Wyd. Adam Marszałek. 241 s.

Klenowski, V., 2005: Desarrollo del portafolios para el aprendizaje y la evaluación. Madrid: Narcea, S.A.

Komorowska, H. 2002. *Dobry nauczyciel – jego cechy i zachowania w świetle badań.* In: H. Komorowska, D. Obidniak (eds.) *Stopień po stopniu*. Warszawa: Wydawnictwo Naukowe PWN. 11-14.

Kozyrev, V., Radionova, N. F., eds., 2004: Education in modern world. SPB, Collective monograph / Ed. Herzen State Pedagogical University. ISBN 5-8064-0849-3 [In Russian].

Kress, G. 2010. *Multimodality. A social semiotic approach to contemporary communication*. London and New York: Routledge.

Kress, G., van Leeuwen, T. 2001. *Multimodal Discourse. The modes and media of contemporary*. London: Arnold.

Kubiak M.J., 2000: *Wirtualna edukacja*. Warszawa: Wydawnictwo Mikom

Mc Grath, I. 2013. *Teaching Materials and the Roles of EFL/ESL Teachers*. London: Bloomsbury.

Męczkowska A., 2003: *Kompetencja*, [w:] Encyklopedia pedagogiczna XXI wieku, red. T. Pilch, t. 2, Warszawa 2003, s. 693-696.

Noskova T., Yakovleva O. 2015: *Educational Interactions Quality in E-Learning Environment*. In Mkrttchian, V., Bershadsky, A., Bozhday, A., Kataev, M., & Kataev, S. Handbook of Research on Estimation and Control Techniques in E-Learning Systems. Hershey, PA: IGI Global. doi:10.4018/978-1-4666-9489-7. 216-232.

Obidniak, D. 2002. *Dokumentacja dorobku zawodowego*. In: H. Komorowska, D. Obidniak (eds.) *Stopień po stopniu*. Warszawa: Wydawnictwo Naukowe PWN. 11-14.

Pedagogical terminology dictionary [online] at http://pedagogical_ dictionary.academic.ru/ (accessed 27.08.2017) [In Russian]

Royal Spanish Academy [online] at http://www.rae.es/ (accessed 21.11.2017).

Schlosser, L. A., Simonson, M., Hudgins, T., 2010: *Distance education.* Definition and glossary of terms. Charlotte: Information Age Publishing

SKILLTOM słownik pojęć e-learning [online] at http://skilltom.pl/slownik-pojec-e-learning/ (accessed 07.07.2017)

Słownik e-learningu [online] at http://eduway.pl/slownik-pojec-elearningu/ (accessed 07.07.2017)

Słownik języka polskiego PWN [online] at https://sjp.pwn.pl/szukaj/ informatyzacja.html

Szabłowski S. (2011). *E-learning dla nauczycieli.* Rzeszów: Wydawnictwo Oświatowe FOSZE

Trishina S.V., Khutorskoy A.V. (2004). *Information competence of a specialist in the system of additional professional education.* Internet-magazine "Eidos". June 22nd [online] at http://www.eidos.ru/journal/ 2004/0622-09.htm (accessed 27.08.2017) [In Russian]

UNESCO, 2011. *UNESCO ICT Competency Framework for Teachers*. Paris: UNESCO and Microsoft 2011.

WikiEdukator Self-learning materials [online] at http://wikieducator.org/Session_3 (accessed 07.07.2017)

Zalecenie Parlamentu Europejskiego i Rady 2006/962/WE z dnia 18 grudnia 2006 r. w sprawie kompetencji kluczowych w procesie uczenia się przez całe życie (Dz.U. L 394 z 30.12.2006, s. 10–18).

Zimnaya I.A., 2003: *Key competences - a new paradigm of the result of education.* Higher education today. No. 5. P. 34-42. [In Russian]

DEVELOPMENT OF KEY COMPETENCES IN CRM FIELD AND E-LEARNING

Milena Janakova
Silesian University in Opava, School of Business Administration in Karvina, Univerzitni nam. 1934/3, 733 40 Karvina, Czech Republic, mija@opf.slu.cz

Abstract: *This paper is focused on support for optimal key competences in the CRM (Customer Relation Management) field. In order to carry out complex work with these applications, IT (Information Technology) users need optimal key competences. Default CRM course is limited, however, by the time and scope of the selected topics. The presented solution for this reality is based on the monitoring of frequently required competences and searching out optimal CRM applications to adopt the needed skills in education. For a comparison, NetSuite CRM, Salesbox CRM, Salesforce CRM are selected. Salesforce CRM provides the most integrated activities. Unfortunately, there is not a CRM application offering all the specified activities and teachers have to select other CRM applications for students to understand the CRM field better.*

Keywords: CRM, E-learning, information technology, key competences.

INTRODUCTION

Caring for customers is one the most important tasks for companies and organizations. The market is overloaded in Europe and a wide range of goods and services are available. Customers select goods based on interest, quality, availability or price. Their interest is also focused on blogs and discussion on the Internet. The reason is to share experience with using certain goods or services. Customer relation management (CRM) plays an important role in sales within this situation. (Chen & Popovich, 2003)

Customer relation management is based on processes which are focused on creating positive relationships with customers (clients). The key is to know about the preferences of customers and offer optimal goods and services at the right place, time and quality. These processes are often linked to marketing and are concerned about customers in various situations. (Kumar & Reinartz, 2012) Unfortunately, not all negotiations come to an end with a final order of payment. Sellers often have to take long preparatory actions before the deal can be closed.

Information technology provides support in this area as well. There are many applications and information systems available which are focused on customer relation management. Their control is intuitive, via a menu but responsible activation needs optimal key competences. (Helgeson, 2017) There is a place for education and cooperation between schools, universities and the private sector.

1. CRM PRODUCTS

All CRM applications argue that they are user-friendly. This is natural because design application is important for intuitive navigation in this application. IT (Information Technology) users require an instant solution with good navigation, automation of frequent tasks and accessibility to the best examples from practice, which are verified in the given environment of the company and organization. The selection of the CRM application (CRM Software Selection Quick Start Guide, 2015) is simple because there is a large volume of available applications, information systems or easy tools that the IT user may use immediately, without difficult implementation and education.

There are analyses, surveys and top product ladders on the Internet which help in navigation between the available applications. Criteria are different for sorting such as:

- CRM with the Best ROI.
- CRM with the Smoothest Implementation.
- The Most Usable CRM.
- Top CRM for Small Businesses.
- Top CRM for Midsize Businesses.
- Top CRM for Company Businesses. (Compare CRM Software, 2017)

A selection of the CRM application by the position on the market and user satisfaction also brings solid results. (Gartner Inc., 2014) By such an evaluation, there are applications on position leaders, high performers, contenders, and niche:

- Leaders have a very good position on the market and are also evaluated highly by their users.
- Contenders have a good position on the market, but their users speak of lower level satisfaction with such a product.
- High performers do not have a position on the market as leaders, but are highly evaluated by their users.
- Finally, niche solutions do not as yet have an optimal position on the market and they do not have enough users to evaluate these applications.

Out of the large numbers of CRM applications, mention is only made of a fragment: Salesforce CRM, SugarCRM, Zoho CRM, Pipedrive, and HubSpot CRM (as leaders), Base CRM, Maximizer CRM, Nimble, Vtiger CRM, Nutshell, Workbooks.com, PipelineDeals, Salesnet, Insightly, bpm'online, Membrain, OnePageCRM, Pipeliner CRM, Really Simple Systems, Prophet CRM, Less Annoying CRM, amoCRM, InfoFlo Software, Close.io, Cosential, Contactually, iSEEit, Relenta CRM, ProsperWorks CRM, Bullhorn CRM, Salesbox, Freshsales, Redtail CRM, and Salesflare (as high performers), Microsoft Dynamics 365 for Sales (formerly Dynamics CRM), NetSuite CRM, Oracle CRM On Demand, Oracle Sales Cloud, Oracle Siebel, Sage CRM, Infor CRM, and SAP CRM (as contenders), and Highrise, Act!, GoldMine, ConnectWise Manage, Apptivo Project Management, Capsule, Commence CRM, Odoo CRM, and SalesforceIQ CRM (as niche solutions).

Without regard to the adopted solution, IT users must have a good orientation on the public level in the available CRM applications. Key competences have a key role and IT user have to have it. Default knowledge is based on everyday work with customers, with the given application and education with good examples from practice.

2. KEY COMPETENCES

It is simple to say that IT users must have key competences from CRM. Key competences have their own development based on changes in preferences of costumers, availability of information technology and also changes in society. Great press is created by competition. Everyone looks at other applications, available support of CRM processes and the experiences of other customers. IT users highly evaluate competences which focused on:

- Account Management.
- Contact Management.
- Dashboards.
- Data Import and Export.
- Forecasting.
- Integration with other software.
- Lead Management.
- Opportunity Management.
- Pipeline Management.
- Social Network Integration. (MacLeod, 2017)

Management of contacts and accounts is a natural request based on traditional records of information about customers. Dashboards affect the speed of understanding the information presented. IT users see the current trends of monitored value to adopt the needed decision. Data is stored in many databases and other sources. This reality needs very good tools for import and export data in order to realize work in implemented applications. Forecasting has close links to key performance indicators and business intelligence. The reason for this is to search for an available gap on the market and business opportunities. Integration with other software helps with communication between various applications and information systems in companies and organizations. Lead management is focused on processes for leads. These processes are useful for generation, inquiry, filter, grade, distribution and qualification. A request for opportunity management has its source in reality and the way to order is complicated, with monitoring being very important. Pipeline management has links to the need to set various prices by destination, volume of orders, or other individual conditions for very important customers. Finally, social network integration works with questions, answers and other customer requests on social networks such as Twitter, Facebook, LinkedIn, or Pinterest.

From this point of view, education must demonstrate how to work with many CRM applications in different ways. The default CRM course only has default for 13 weeks to explain the given topic. This kind of course is divided into lectures and seminars with a range of 1-2 education hours per week. In this situation, it is impossible to work with all CRM applications and teach about the differences between them. The solution is to select 1-3 CRM applications as representatives with variability. This learning is focus on needed (selected) key competences, based on verified examples of good practice.

3. VARIABILITY OF EDUCATION TO SUPPORT KEY COMPETENCES

For positive acceptance of teaching by students, a high level of variability is needed and a number of examples from practice. Students understand the explained topic better based on visual support and practice examples. No one wants to read books or PDF files, although these learning sources are available in learning as well. Video and simulation, which show how to work with a CRM application, have a better influence. As concerns learning, there is not enough space to show all CRM applications, and the teacher has to select the optimal applications. This work is divided into three steps.

The first step is focused on selection of needed key competences which IT users often need for active work with CRM applications. Realized analyses and surveys that evaluate available CRM applications are recommended. For purpose learning in a CRM course, the key competences that allow for good orientation in activities focused on contact management, dashboards, forecasting, lead management, opportunity management and social network integration are important.

The second step is focused on selection of tested applications. One may think that the selection of the CRM application is unimportant and that the teacher may select the application by preferences, or there is the idea that the best way is to select the top CRM application. As concerns testing, three applications were selected: NetSuite CRM (application I.), Salesbox (application II.) and Salesforce CRM (the top CRM application). See Table 1.

In this table, specified activities of CRM were tested in selected applications. If the CRM application allows this activity, there is the symbol “X”. In other cases, there is the symbol “-“. Finally, the third step is focused on a comparison of the detected options of selected applications with a recommendation for learning, which actively reflects the actual demand of IT users and provides an easier way to adopt new skills for a student.

Table 1.

Evaluation of selected CRM applications and top CRM application for learning needed key competences by selected activities

Selected activities for active work with CRM	Application I. NetSuite CRM	Application II. Salesbox CRM	Top CRM application Salesforce CRM
Contact management	-	X	X
Dashboards	X	-	X
Forecasting	X	-	-
Lead management	X	-	X
Opportunity management	X	X	X
Social network integration	-	X	X
Total number of activities	4	3	5

Source: Own work

It is apparent that Salesbox CRM provides the smallest number of monitored activities. These three activities are contact management, opportunity management and items for social network integration. On a public level, this application displays the main menu for work with tasks, delegations, opportunities, accounts, contacts, appointments, call lists, campaigns and insights. In the middle, NetSuite CRM provides four activities such as dashboards, forecasting, lead management and opportunity management. On the public level, this application displays the main menu for work with activities, leads, opportunities, customers, forecast, reports, documents, setup and support. Most of the activities are integrated into Salesforce CRM. This application provides five activities for contact management, dashboards, lead and opportunity management, and items for social network integration. On the public level, this application displays a menu for work with contacts, accounts, leads, opportunities, reports and dashboards.

For an objective description of the selected CRM application, one must mentioned that all the applications provide a particular support for all the monitored activities, but not in an optimal implementation. Orientation has to be more user-friendly in dashboards, forecasting the need for more links on business intelligence which may make use of the potential of the stored data. For contact and leads management, CRM applications also use lists of accounts, customers, or another setup is needed. Social network integration is not ideal in all tested CRM applications, but there are inspiring chatters, links on Google Search and Google maps (Salesforce CRM), or Facebook and LinkedIn for contacts (leads), MailChimps emails (Salesbox CRM). In these cases, there are barriers in easy use CRM applications. This reality is therefore evaluated by the symbol “-“ in the above-mentioned table.

From the perspective of the teacher, a good solution is to select at least two CRM applications. The reason is to demonstrate a benefits and advantages in the CRM field. For easy enter into topic, it is better to start with more user-friendly and simply CRM application. Second CRM application has to be more complex to show other options in detail via available settings and templates. The list of available CRM applications is large and an optimal interest is provided if students select a CRM application for study purposes through their own preferences as well (for example, for the preparation of a school paper).

CONCLUSION

Key competences are also of interest for customer relationship management (CRM). CRM holds an important place in many companies and organizations. Information technology support is needed in a dynamic and global society. Without regard to the adopted solution, IT users have to have a solid orientation on the public level in the available CRM applications and a relevant education is needed. From the view of students, learning has better value when they may select by their own preferences and skills. From the perspective of teachers and IT users in companies, there is a need to show the main activities in the CRM field such as contact management, dashboards, forecasting, lead management, opportunity management and social network integration.

The selection of the needed CRM application is important for learning as not all activities are offered (or easily implemented) in all CRM applications. Three applications were tested for this purpose, such as NetSuite CRM, Salesbox CRM and Salesforce CRM in the specified (main) activities. Unfortunately, there is not a CRM application that offers all the specified activities. To provide an optimal overview about the CRM field with benefits and advantages, teachers have to select at least two applications. Good advice is to select one more user-friendly application that students understand easier and other CRM application that is more complex to show adopted solution in detail. Additional CRM application is selected by students for the preparation of school papers. This way provides variability in education and an explanation of the key competences in the CRM field.

REFERENCES

Compare CRM Software, 2017: [online] at https://www.g2crowd.com/categories/crm, (accessed 2017)

Chen, I. J., Popovich, K., 2003: Understanding customer relationship management (CRM): People, process and technology, *Business Process Management Journal,* Vol. 9 Issue: 5, pp. 672-688. ISSN 1463-7154.

CRM Software Selection Quick Start Guide, 2015: [online] at https://selecthub.com/customer-relationship-management/crm-software-selection-quick-start-guide/, (accessed 2015)

Gartner Inc., 2014: *Gartner's CRM Application Selection Criteria*. [online] at https://www.gartner.com/doc/2664819/gartners-crm-application-selection-criteria, (accessed 2014)

Helgeson, L., 2017: *CRM for Dummies,* For Dummies. ISBN-10 1119368979.

Kumar, V., Reinartz, W., 2012: *Customer Relationship Management: Concept, Strategy, and Tools*. Springer. ISBN 978-3-642-20109-7.

MacLeod, N., 2017: *Building Safe Systems in Aviation: A CRM Developer's Handbook*, Routledge. ASIN B06XD92M7P.

DIGITAL COMPETENCIES OF THE LEADERSHIP OF MODERN NETWORK SCHOOL

Victoriia Stoikova
Nikolaev Region In-Service Teacher Training Institute
54001, Ukraine, Mykolaiv, Admiralska St, 4-A
viktoriya.stoykova@moippo.mk.ua

Abstract: *The article deals with the structure of digital professional competence of the head of a network educational organization, which includes educational districts, support schools, and their affiliates. Implementation of educational and managerial processes in a comprehensive educational institution, the resources of which are distributed in time and space, becomes possible subject to the executive possession of necessary competencies in the field of information and communication technologies.*

Keywords: educational districts, digital professional competencies, network management, Internet technologies.

INTRODUCTION

The modern organizations react to a new informational reality in which they have to function.

In this reality, due to the intensive development of information and communication technologies and their penetration into all production, educational and social sectors of life, vertical corporate communications are transformed into horizontal, local communication is replaced by global, the new channels of exchange of corporate knowledge are appearing, "viral" technologies of information dissemination and the formation of a brand organization are used, etc. Realizing the strength and potential of information and communication technologies for corporate life, the executives change their professional views on enterprise strategy formation 2.0.

Also, in the global economy, there is a mass emergence of network organizations that came to replace by the bureaucratic. Accordingly by B. Milner's theories, such organizations are multidisciplinary and use the following in their activity: the intellectual job and creative potential of each employee, innovation and interaction, collective activity, self-directed working project groups, institutions of freedom and collectivity, project activity, horizontal management systems, authority Consumer (customer) (Millnerб 1999). To such organizations, the scientist gives the generalized name "virtual corporations", the existence of which become possible due to modern information technologies and a new type of managerial thinking.

It is clear that these evolutionary processes also penetrate the educational branch. On the one hand, educational organizations move to the level of network's consolidated collaboration and the combination into the network organizations - educational districts, on the other hand, educational and managerial processes are moving more and more into virtual (network) levels and require managers to mastering the digital competencies (Stoikova, 2016).

1. PROBLEM STATEMENT

The scientists determine the distinctive features of network organizations: the unstable nature of the elements' functioning and the formation of interim alliances; qualitative changes in the information exchange on the basis of information and communication technologies; implementation of communications and management actions on the basis of integrated and local information systems; interaction with all partners on the basis of a series of contracts, agreements; the opportunity for each participant to have equal direct relations with other participants; independence from spatial and temporal restrictions; high degree of organization and coordination of information flows and innovative processes; strengthening the role of the formation of key competencies of participants; rational use of shared resources (tangible and intangible); redistribution of risks and reduction of time and financial costs for the introduction of innovations (Millner, 1999; Sichkarenko, 2015).

The main administrative resource in the network organization is information (Sichkarenko K.O., 2015), therefore, the competencies in the ability to choose and formulate goals, setting tasks, constructing and analyzing information models of the studied processes and phenomena, interpreting the results, predicting the consequences of the decisions and making the corresponding conclusions, ability to organize, systematize, structure a certain amount of knowledge (Kozyr M.V., 2014) become one of the main structural components of the professional competence of the head of the educational district. And the distribution of structural units of the network organization in time and space requires from the head of skills to ensure effective communication at a distance through telecommunication technologies and the Internet.

M. Kozyr emphasizes the necessity of mastering the basics of information management as the basis of a qualitative educational process due to the increase of information volumes, the growth of the impact of information technology on the effectiveness of the subjects of the educational process, the necessity to optimize the process of making managerial decisions in the context of the development of the information society (Kozyr M.V., 2016). In his research, the scientist considers the information management, on the one hand, as a process of information control, and on the other hand, as a management process with the help of information. In both cases, for the effective performance of certain functions, the head of the educational institution has to have the competence to build a quality information environment and the application of information technology for data processing, automation of management function, decision support, expert examination, e-office management, etc.

The digital competence of the head of a network educational institution acquires the status of not just a progressive skill but a vital function, without which the head can't perform the quality management of the educational district.

The notion of "managerial competence" or the competence of the head of the school has been reflected in the works of many contemporary domestic and foreign scientists (G. Bosman, L. Vasilchenko, L. Vashchenko, R. Vdovichenko, I. Grishina, L. Danilenko, R. Dahft, G. Yelnikov, L. Kalinina, L. Karamushka, P. Karstenier, C. Kwiatkowski, Y. Konarzhevsky, C. Koroliuk, V. Maslov, V. Oliynyk, T. Sorochan, E. Chernyshova, and others).

For our research, the works that are devoted to the justification of the managerial aspects of education informatization, by T. Davydenko, P. Guriy, G. Elnikova, O. Yelnikova, N. Morse, L. Kalinina, O. Naznachilo, M. Pleskach, as well as study of the development of information and communication competence by A. Gurzhii, M. Zhaldak, O. Zakhar, O. Ilkiv, G. Kozlakov, N. Morze, T. Cheprasova, A. Khutorsky, are interesting.

However, in spite of the increasing attention of scientists to the issue of forming information and communication competence of pedagogical workers and managers, in particular, remains out of sight are studies of the structure and formation of digital competence of managers of modern network educational organizations.

The purpose of the article is to substantiate the structure of digital competence of the head of a modern network educational organization.

2. STRUCTURE OF DIGITAL MANAGERIAL COMPETENCIES OF NETWORKING EDUCATIONAL ORGANIZATIONS

2.1. Professional competencies

Among the scientists, there are no unambiguous views on the structure of the professional competence of the head of the educational institution. In particular, in the studies there is the justification of professional competence as: a combination of knowledge, skills, attainments, abilities, professional personal qualities, professional norms and behaviour patterns (R. Vdovichenko); the synthesis of key, basic and special competencies, including: a deep understanding of the essence of the tasks and problems being solved, knowledge and experience, the ability to choose the means and ways of action, the sense of responsibility, the ability to learn from mistakes and make adjustments in the process of achieving the goals (A

Vasilchenko, I. Grishina); a combination of conceptual, human and technical skills and abilities (Richard L. Daut); a system of combined key (over professional), general professional and special-professional competencies (G. Yelnikova); a combination of more than professional; general-professional, qualification, special-professional competencies (S. Kwiatkowski).

The latter structure includes specific competencies inherent in a specialist with a certain narrow specialization. In our opinion, it is the most successful; however, it still needs some refinement.

The structure of the professional competence of the head of a network educational organization, we propose to consider as a set of key professional, general-professional and expert professional competencies. The specialty and specialization competencies we attribute to the composition of the expert professional competencies.

Thus, this structure can be used as a matrix (template) to study of any professional managerial competence. In particular, the digital competence of the leaders of modern network educational organizations we will also consider through the prism of its four-component structure of hierarchically combined components (Figure 1).

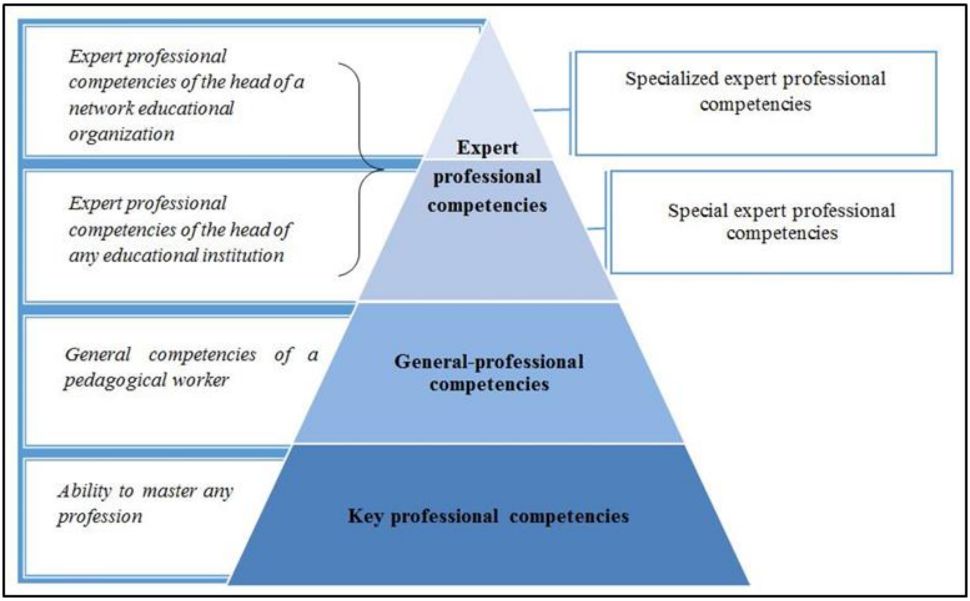

Figure 1. The structure of professional competence of the head of a network educational organization
Source: *Own Work*

2.2. Key digital competencies

In Digital Agenda of Europe and Digital Agenda of Ukraine-2020, it is determined that updating all spheres of life of countries and organizations with the help of the latest digital technologies and innovations will contribute to the enrichment and well-being of all employees of the organization and the entire population of the country (Digital Agenda for Europe, 2010; Digital Ajdzha Ukraine 2020, 2016). Therefore, among the priority directions of modernization of the European and domestic economic and social sectors, the renewal of managerial competence was determined.

The development of managerial competence in the field of digital management is determined by the leading "digital" trends, the use of each one will provide the network organization by the progressive development:

– Collection, description, storage, and processing of data, which allows obtaining valuable information for using in business processes, public life, work of the state. The ability to work with and analyze data will give the leader of a network organization the opportunity, by the first one, to get valuable market "insights", that is, to ensure the organization has high competitiveness.

– Providing communications of physical objects or devices at the level of simple communication or process control through built-in sensors, software products that allow the interaction of physical things with computer systems and networks, including the Internet. This trend includes "Internet things".

– Creating a new level of provision and receipt of service. Digital technologies have become the basis for creating new products, values, properties and, accordingly, the basis for obtaining competitive advantages in most markets.

– The introduction of the "shared economy" ideology and the transition to service models through the virtualization of physical infrastructure IT systems. Such technologies include "cloud" technologies.

– Reducing the amount of initial capital expenses for deploying the necessary digital infrastructure through the using of "cloud" technologies and software-defined architecture.

According to these trends, the educational system must be directed and able to ensure the development of the necessary digital competencies. These are the following five groups:

– information literacy and literacy in relation to data (ability to search, filter, evaluate, use and manage data, information and digital content);

– communication and interaction (communication skills, information sharing, interaction, contact with the public, use of public and private services through the use of digital technologies, knowledge of the digital "etiquette" of identity digital management, that is, the ability to create and manage accounts);

– digital content (creation, ability to change, improve, use digital content; awareness of copyright and licensing policies with respect to data, information and digital content; programming, that is, the ability to write code);

– safety (ability to protect devices and content, knowledge of security measures, understanding of risks and threats; protection of personal data and privacy; knowledge and skills to preserve their health and others from the point of view of the environment as digital technology; understanding of the impact of digital technologies on the environment environment);

– solving problems (ability to solve technical problems which arise with the computer technics, software, networks; ability to create knowledge, processes, and products through the digital technologies, individually or collectively, in order to solve every day and professional problems; the ability to independently determine the necessity of obtaining additional new digital skills).

It is indisputable that these groups of competencies are necessary for any profession, so we associate them with the key professional competencies of the head of a network educational organization (Figure 2).

2.3. General-professional digital competencies

General professional competencies - are formed by acquiring basic skills of practical actions inherent in a whole group of pedagogical professions. For their determination we apply the international standard "ICT-Teachers Competency Structure" (ICT-CFT) (UNESCO) proposed in 2012 by the United Nations Educational, Scientific and Cultural Organization, which defines the competencies of teachers necessary for effective ICT education. According to the standard, it is not sufficient to be the technologically competent and able to form the appropriate technological skills and abilities of his students for a modern teacher, and hence, for the head of an educational institution, a modern teacher should help students use ICT for successful cooperation, solving emerging tasks, forming a learning ability for further adaptation and Socialization in society. The proposed standard covers all aspects of the teacher's activity: understanding the role of ICT in education, educational plans, and evaluation, pedagogy, information and communication technologies, organization and management, teacher training.

The structure of information and communication competence of teachers is based on three approaches to learning (three successive stages of teacher development) - "Technological literacy" (the teacher helps students use ICT for effective learning activities), "Deepening of knowledge" (the teacher helps students learn the contents of the subjects on More profound level and use the knowledge gained to solve life's problems) and "Creating knowledge" (the teacher helps students acquire the skills to create new knowledge for the harmony social development of future citizens and employee) (Figure 2).

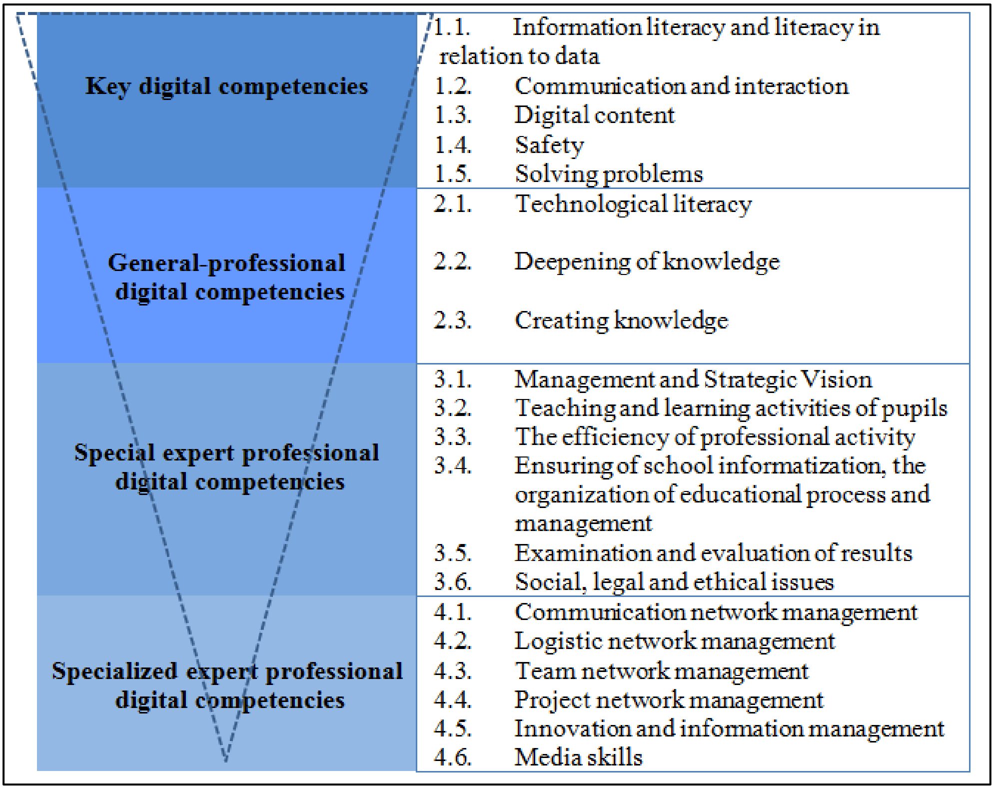

Figure 2. The structure of digital competence of the head of a network educational organization

Source: *Own Work*

2.4. Special expert professional digital competencies

N. Morze and O. Kuzminska, analyzing the Standards in the branch of information technology for the heads of educational institutions, developed by the World Association for the support of the introduction of information technologies in education, distinguish 6 areas of activity of the heads of educational institutions (Morze, Kuzminska, 2012) (Figure 2):

– Management and Strategic Vision. The heads of educational institutions promote and promote the ideas of informatization, develop ICT competencies, and ensure the formation of an educational environment that promotes the implementation of these ideas.

– Teaching and learning activities of pupils. Heads of educational institutions strive to ensure that the ICTs that are implemented in the learning process, teaching methods and the educational environment, maximally contributed to the effectiveness of teaching and learning activities of students.

– The efficiency of professional activity. Managers of educational institutions use ICT to increase the efficiency of teaching and management activities of both the manager and all employees.

– Ensuring of school informatization, the organization of educational process and management. Heads of educational institutions provide the implementation of ICTs to support the effective organization of educational process and management activities.

– Examination and evaluation of results. Heads of educational institutions use ICT to plan and implement effective methods of examination and evaluation.

– Social, legal and ethical issues. Heads of educational institutions understand the importance of the social, legal and ethical components of the use of ICT and develop relevant provisions and local acts.

However, such a list is not complete and may be supplemented. Modern trends in the managerial field are oriented towards ever-increasing openness in managerial processes, decentralization, institutional autonomy, and the involvement of all those who are interested in a consolidated management solution. From this point of view, the development of managerial competencies in the branch of digital management and the launch of digital education management, have the particular relevance. For managers of educational districts, such competence can become one of the basic ones, since the educational districts that are the centers of public state management of education, the initiation of democratic traditions, and the development of public factors in the management of general secondary education (Vatkovska, 2013).

M. Vatkovska notes that the benefits of e-governance in the field of education include: greater openness and transparency of management activity at all levels, the possibility of involving the public in the formation and implementation of state policy in the field of education, as well as management of individual educational institutions, increasing the personal orientation of educational services, raising public awareness about the services of public authorities in the field of education (Vatkovska, 2013).

The determined directions of activity may be the basis for special professional competences of the head of the educational institution. They include 7 groups of competencies: strategic management in the field of digital technologies, organization of educational process on the basis of digital technologies, optimization of professional activities through the introduction of digital resources and technologies, digitalization of expert and monitoring activities, legal and regulatory activities of the head in the use of digital Technology and content, e-government.

2.5. Specialized expert professional digital competencies

A significant problem in the educational network may be the establishment of logistical chains for the provision of educational services in the primary school, branch, and other subjects of the district. Optimization of the process of giving the teachers and students to lift to the educational institutes, the organization of distance learning, etc. is a prerequisite for the functioning of the educational district and provided with skills in the field of logistics of educational services.

The modern approach to solving these problems lies with the plane of possession of the head of the educational institution by modern digital technologies, in particular, the technologies of providing distance educational services, collaboration and communication in "clouds", network management, etc.

Widespread use of Internet technologies for the implementation of information, communication and logistics management leads to the emergence of new approaches in the organization of work with personnel and the formation of effective management teams in the network educational organization (Shmorgun L.G., 2010).

It is obvious that the educational process in network organizations is mostly distributed among individual network members. The basic unit of this process is the "project". The project form of activity is the basis of the management structure of all types of districts. The projects are implemented by the project teams that have double or even triple subordination: to the head of the organization (department) and the project(s) manager. Such a management system is implemented within the framework of project management.

Network organizations are innovative socio-economic formations that implement innovative educational processes (organization of profile education, pre-professional training, the provision in parallel with general secondary vocational education, etc.) and carry out research experimentation, therefore, the leadership has to master by the basics of innovation management and management skills by innovation regarding to organization of the educational process in all subjects of the network. Taking into account the peculiarities of a network educational organization, it becomes obvious that effective project and innovation management becomes possible in a digital format. Equally important is the media dimension of presentation of a network education organization, providing PR, brand creation: managers have to develop the new, technologically related with the social infrastructure of the organization, which, in design, will promote the constant interaction between physical and geographical subjects, and will provide self-organized discourse and the exchange of information between actors and service users (Deiser, Newton, 2013). In this direction, Roland Deizer and Sylvain Newton have researched a six-dimensional set of skills and organizational capabilities that executives need to shape in order to ensure the media presentation of the organization as an important source of its competitive edge.

For those skills, the researchers attributed: production skills for creating high-quality content, distribution skills for using the dynamics of information dissemination in controlled linear chains, the skills of receiving the information and elimination of non-important information for the allocation of valuable elements in the information space, skills for advising, supporting and coordinating the use of social tools in the organization in particular Through the system of "reverse mentoring", the skills of designing a social architecture that will provide a significant amount of space for excuse and external interactions, analytical skills.

Thus, specialized digital competencies are represented by six groups of network management: communication, logistic, team, project, innovation and information management as well as media skills (Figure 2).

CONCLUSION

Thus, the digital competence of the head of a modern network educational organization is a difficult complex formation and the main component of the professional competence of the head of a network educational organization. It consists of five key, three general-professional, as well as six special expert professional and specialized expert professional digital competencies of the heads of the educational districts. It provides the steadfast ability of the head to carry out systematic management of the educational network organization on the basis of leadership and create a harmonious educational and development environment of the educational institution.

It should also be noted that digital competence, like any other, is a dynamic entity and is modified in accordingly with the development of the economy, society, the emergence of new technologies, etc.

REFERENCES

Deiser, R., Newton, S., 2013: *Six social-media skills every leader needs.* McKinsey Quarterly, 1, 62-67.

Digital Agenda for Europe: Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (unofficial translation) (2010). European Commission, Brussels; "European Media Platform". - Project "Democratization, Human Rights and Civil Society Development in Ukraine", UNDP, 2010, 49 p.

Digital Ajdzha Ukraine 2020 ("Digital Agenda" - 2020) - a project (2016). Conceptual foundations (version 1.0). Priority areas, initiatives, projects of digitalization of Ukraine by 2020. Haytech Office Ukraine, 2016, 90 p., [online] at https://ucci.org.ua/uploads/files/58e78ee3c3922.pdf [In Ukraine]

Kozyr, M.V., 2014: *Intelligent possibilities in the informational competence of subjects of pedagogical interaction*. Pedagogical process: theory and practice, 2014, # 3, P. 93-97, [online] at http://nbuv.gov.ua/UJRN/pptp_2014_3_21 [In Ukraine]

Kozyr, M.V., 2016: *Information management - the basis of the quality of the educational process of universities*. Pedagogical education: theory and practice. Psychology. Pedagogy, 2016, # 25, P. 65-69, [online] at http://nbuv.gov.ua/UJRN/Potip_2016_25_13 [In Ukraine]

Mil'ner, B., 1999: *Lessons of the bureaucratic management system*. Voprosy ekonomiki, 1999, # 1, P. 77-87. [In Russian]

Morse, N., Kuzminskaya, O., 2012: *Does the head of the school have an ICT competence?* Informatics and Information Technologies in Educational Institutions, 2012, # 4, P. 65-74.

Shmorgun, L.G., 2010: *Management of Organizations: Teach. Manual*, Kyiv: Knowledge, 2010, 452 p. [In Ukraine]

Sichkarenko, K.O., 2015: *Networking organization of innovation activity: scientific report.* NAS of Ukraine, State Enterprise "Institute of Economics and Forecasting of NAS of Ukraine", Kiev, 2015, 48 p. [In Ukraine]

Structure of ICT competence of teachers. Recommendations of UNESCO. [Version 2.0. Russian translation]. The site of the UNESCO Institute for Information Technologies in Education. [online] at http://iite.unesco.org/pics/publications/en/Files /3214694.pdf (291).

Stoikova, V. V., 2016: *Educational districts: types, functions, structural models*. New pedagogical thought, 2016. # 3, P. 24-32.

Vatkovskaya, M., 2013: *Implementation of e-government as a direction of modernization of public administration in Ukraine*. Public Administration: Theory and Practice, 2013, Issue 2, [online] at http://nbuv.gov.ua/UJRN/Patp_2013_2_8. [In Ukraine]

II. THEORETICAL AND METHODOLOGICAL ASPECTS OF DISTANCE LEARNING

SOME METHODOLOGICAL ASPECTS OF MOOCS DEVELOPING

Eugenia Smyrnova – Trybulska
University of Silesia in Katowice, Poland
esmyrnova@us.edu.pl

Nataliia Morze
Borys Grinchenko Kiyv University, Kiyv, Ukraine
n.morze@kubg.edu.ua

Olga Yakovleva
HSPU, SPb, Russia, zest-xp@yandex.ru

Tomayess Issa, Theodora Issa
Curtin University, Australia
Tomayess.Issa@cbs.curtin.edu.au, Theodora.Issa@cbs.curtin.edu.au

Abstract: *The authors of this article conducted analyses of some methodological aspects of MOOCs developing, such as microlearning, subscription learning, peer assessment as well as presenting and analysing the research outcomes, research results of a survey conducted among students of several countries within the framework of the European Union project IRNet (www.irnet.us.edu.pl), limitations and future research.*

Keywords: MOOCs, microlearning, subscription learning, peer assessment, IRNet

INTRODUCTION

Because the design of educational interventions is typically carried out in an iterative cycle, this method is also recommended for the development of a MOOC. A design methodology can support this. An example is the ADDIE model, an educational development programme consisting of five phases: analysis, design, development, implementation and evaluation (Bates, 2015).

Quality remains a major concern for all concerned stakeholders: HEIs, government agencies, students and MOOC providers. The successful uptake of online courses, including MOOCs, in developing countries largely depends on the development of effective quality assurance processes that are informed by explicit indicators and clear methodology to ensure the course quality and thus provide a meaningful learning experience to each and every learner. (Patru, Balaji, 2016).

The article presents the conception of the MOOC entitled: "ICT-tools for e-learning", developed within the framework of the European IRNet project. Chapter I includes some methodological aspects of MOOCs developing, based in particular on such methods as *microlearning, subscription learning*, *peer assessment.* Besides, the study includes a comparison of the structure of DLC and MOOC. Chapter II and III contains the case study – authors project of MOOC and some research results..

I. SOME METHODOLOGICAL ASPECTS OF MOOCS DEVELOPING

The researchers, having analysed background research and their own experience, stressed: "The development of a MOOC can occur iteratively between different runs of the MOOC, but one can also choose either a slower pace (improvement after a few MOOC runs) or a faster pace (improvement as part of the MOOC run itself). It is essential to start with analysing the context, conceptualising the design, and setting goals — determining why the MOOC is being developed and for whom (from a user's point of view and from the institutional and societal points of view). Then, the iteration cycle should be designed right from the start (including instruments for continuous analysis and evaluation)". (Patru, Balaji, 2016: 53)

This and other development cycles can be applied at different levels of granularity (e.g., learning activity, module, course or programme). For the learning design cycle as a whole, and at each level of granularity, there are common concepts for which services can be delivered to enhance and support the different development phases of MOOCs. The Larnaca Declaration on Learning Design (Dalziel et al., 2013) provides an excellent overview of these common concepts (Patru, Balaji, 2016).

Methodology of a MOOC's design

As stressed by Spanish researchers: „The development of a MOOC involves the implementation of a complex process of planning, design and development. This process requires the participation of different professionals and work areas. The efficiency of the production system needs to establish specific methodologies. These should address the specific characteristics of the context of development, and they must combine strategies and techniques from different areas: instructional design, audiovisual production and multimedia development." (Barrio, Fernandez, Garcia, 2017: p. 183). In own study Olazabalaga, Garrido, Ruiz (2016) analysed the Trends and Methodologies in area research on MOOCs. K.Gurba (2015) described the MOOC history and future. In A.M.F.Yousef et al. (2014) presented an empirical examination of criteria to assure design quality of MOOCs, 29 criteria were identified to measure the instructional design and assessment categories which represented the pedagogical dimension. T. Daradoumis, R. Bassi, F. Xhafa, S. Caballe (2013) focuses on th review on massive e-learning (mooc) design, delivery and assessment. In the article prepared by international team of authors (Smyrnova-Trybulska et al, 2016) was described some *Theoretical and Practical Aspects: Comparison of Selected Research Results: Poland, Russia, Ukraine, and Australia on MOOCs.*

Microlearning

We could stress that Microlearning can be regarded as a one of the more effective methods in MOOCs. According to Hug (2005: 4) “The following dimensions can be used to describe or design microlearning activities:

- Time: relatively short effort, operating expense, degree of time consumption, measurable time, subjective time, etc.
- Content: small or very small units, narrow topics, rather simple issues, etc.
- Curriculum: small part of curricular setting, parts of modules, elements of informal learning, etc.
- Form: fragments, facets, episodes, "knowledge nuggets", skill elements, etc.
- Process: separate, concomitant or actual, situated or integrated activities, iterative method, attention management, awareness (getting into or being in a process), etc.
- Mediality: print media, electronic media, mono-media vs. multi-media, (inter-)mediated forms, etc.
- Learning type: repetitive, activist, reflective, pragmatist, conceptualist, constructivist, connectivist, behaviourist; also: action learning, classroom learning, corporate learning, etc”. (Hug 2005: 4)

John Eades (2015) in particular notes that “Now that we agree Microlearning is where training is headed, the next most important thing to consider is the medium you choose to deliver your content” and described 3 Reasons Why Video Is The Best Medium For Microlearning:

1. **“Alignment.** 75% of Millennials visit YouTube monthly. Millennials coincidentally are going to make up 75% of the workforce by 2025. But they aren’t alone. Regardless of age, people simply prefer video over other mediums. According to Neilson, video is the most popular content consumed globally. Think about it; if given a choice between watching an instructional video and reading a 3 page document, which would you choose?
2. **Retention and Transfer of Knowledge.** Video is the most effective medium for communicating information in a short period of time. Most people are visual learners, so combining visual examples with audio creates a higher likelihood

of knowledge transfer. Studies show that humans only retain 10% of heard information after 3 days Vs 65% when visuals are added.

3. **Easily Produced.** Because of the advances in cameras and software, video is the easiest and cheapest to produce than it's ever been. Check out this one minute video we built using an iPhone and the Splice App to show how we make Microlearning. It no longer takes an expert in video production to produce high-quality video that people want to consume." (John Eades (2015)

Subscription learning characteristics:

- "Learners subscribe or are subscribed to a series ("threads") of short informational interactions ("nuggets").
- Interactions usually last less than five or ten minutes.
- Learners usually receive these nuggets through some form of push technology.
- Subscription-learning threads are usually—and preferably—designed using the scientific find known as the spacing effect." (Thalheimer, 2013).

Besides, "the experience of those countries using complementary methodologies such as *peer assessment*, portfolios, individual learning and/or school assessment plans, and project-based assessment should be further examined and built upon." (Official Journal of the European Union 2010)

The importance of this category was stressed by a lot of researchers from different countries: Hoi K. Suen (2014), who noted that: "The teach-learn-assess cycle in education is broken in a typical massive open online course (MOOC). Without formative assessment and feedback, MOOCs amount to an information dump or broadcasting shows, not educational experiences. A number of remedies have been attempted to bring formative assessment back into MOOCs, each with its own limits and problems. The most widely applicable approach for all MOOCs to date is to use *peer assessment* to provide the necessary feedback."

The pedagogical strategies and technologies for peer assessment in Massive Open Online Courses (MOOCs) analysed in his own study Robert O'Toole (2013)

This and other contemporary methods were used in elaborating a MOOC entitled: "ICT-tools for e-learning", developed within the framework of the European IRNet project.

Figure 1 below shows the structure of one of the MOOC's Modules and Table 1 presents „The Comparison of the structure of a DLC and a MOOC".

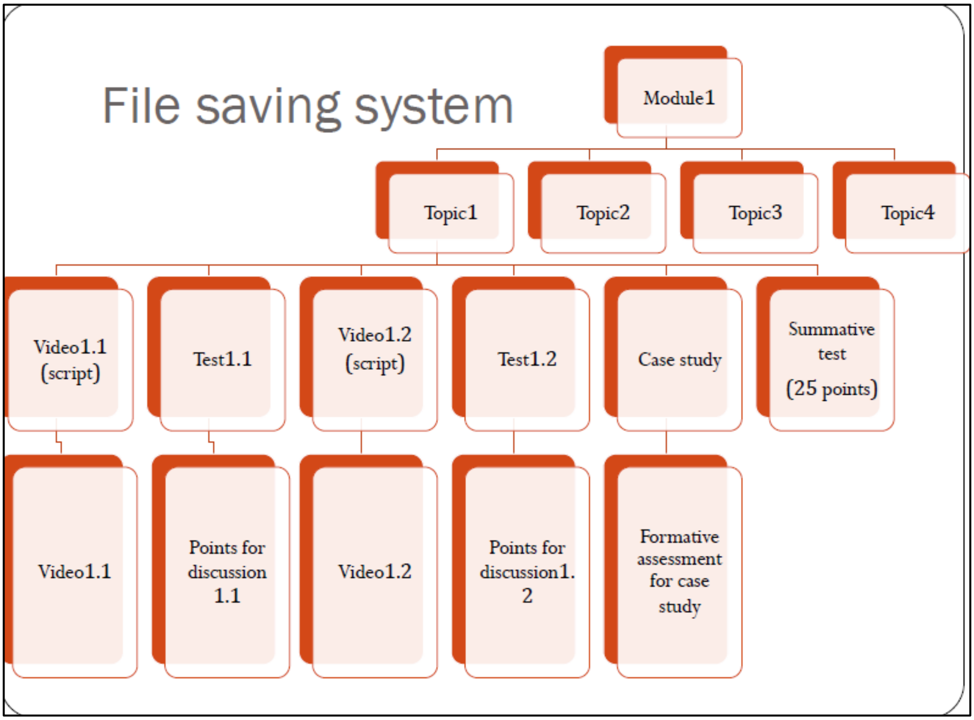

Figure 1. Methodology of MOOCs design
Source: *Own research*

Table 1.

Comparison of the structure of a DLC and a MOOC

Detailed structure of an Internet-based distance course	**MOOC: Module study scheme**
Introduction	Module study scheme
• Course description: goals, objectives, registration procedures, course structure, skills and knowledge (both in terms of IT and course subject matter) required prior to taking the course and upon its completion, information on documents, assignments required to obtain credit for the course (text or html documents).	•Video, Points for discussion+ Individual tasks (Interactive tasks) +Self-assessment test – no points •video Points for discussion+ Individual tasks (Interactive tasks) +Self-assessment test – no points •Presentation on the topic •Lecture notes
• Reading list: core reading, additional reading, Internet resources (a listing of recommended core and additional sources with which participants need to	•Selected bibliography •Additional bibliography

familiarize themselves during the course – a text, PDF or html document).

- Glossary of terms containing basic concepts and key terms related to the course topics (types of dictionary: Encyclopaedias', ordinary Glossaries, FAQ’s, etc.).
- Forum, a course feature facilitating discussion on a given course (News Forum, Discussion Forum).
- Participant registration survey designed to collect information on the profile of potential students, contains questions relating to various issues (Survey, Questionnaire).

Thematic Modules N (1<N<10):

- ***Pre-test (a diagnostic test)*** (*a package of quizzes (tests) designed to gauge participant knowledge of the course material*)***).***
- ***Core didactic materials*** for a given course subject area (*Lessons (didactic materials and self-testing quiz*), *Glossaries, Encyclopaedias, links , files (text files, PDF, audio files, video files, multimedia presentations, others.*
- ***Package of tasks*** designed to help participants assimilate material, to help the instructor check student understanding of the material, to consolidate and apply the knowledge.
- ***Checking students’ knowledge*** (*Lessons, Glossaries, Encyclopaedias, reference links to Internet resources, files stored in folders (text files, PDF, audio files, video files, multimedia presentations, other material)*

• Graded test

Topic 1

•video Points for discussion+ Individual tasks (Interactive tasks) +Self-assessment test – no points

•video Points for discussion+ Individual tasks (Interactive tasks) +Self-assessment test – no points

•Presentation on the topic

•Lecture notes

•Selected bibliography

•Additional bibliography

•Graded test

Topic 2

....

Summative test

- ***Creative tasks block*** designed to help the student to work independently to assimilate knowledge, skills and to develop ways to solve specific problems, to complete individual projects; practical tasks (individual and group ones) (*Assignments (various types: Advanced uploading of files, Online text, Upload a single file, Offline activity), Journals, Workshops, Forums, AudioRecorder, WIKI*, etc.*)*
- ***Interactive communication feature,*** *enabling students to communicate with one another and with instructors synchronously (Chat, instant messaging software (Skype, NetMeeting, Gadu-Gadu, Yahoo Messenger, ICQ, etc.), and asynchronously (Forum, E-mail, Internal Messaging System, etc.)*
- ***Additional reference material for a given subject area*** (*Lessons, Glossaries, Encyclopaedias, reference links to Internet resources, files stored in folders (text files, PDF, audio files, video files, multimedia presentations, other material)*
- ***Checking students' knowledge*** (Test quiz) *(Quiz, Hot Potatoes Quiz)*

Conclusion module (Conclusion of the course)

- ***Examination designed to test*** (*Quiz*).
- ***Final evaluation survey*** (*Survey, Questionnaire*).
- ***Self-reflective survey*** (*Survey, Questionnaire*) (Smyrnova-Trybulska, 2009)

Source: *Own research*

II. CASE STUDY

The structure of the course “ICT-tools for e-learning”, elaborated within the framework of the IRNet Project includes:

Introduction.

1. **ICT-tools for presentation of multimedia content and tools for making didactic videos (Figure 2, 3)**
   - Preview of Analysing Tools for presentation of content.
   - Comparison and evaluating of Tools for presentation of content.
   - Developing of the practical skills of use Tools for presentation of content in education.
   - Preview of Analysing Tools for making didactic videos.
   - Comparison and evaluating of Tools for making didactic videos.
   - Developing of the practical skills of use Tools for making didactic videos.
2. **Tools for adaptive learning. Learning Styles**
   - Cognitive domain.
   - Psychomotor domain.
   - Affective domain.
3. **Tools for mind maps and infographics knowledge**
   - Preview of Analysing Tools for mind maps and infographics knowledge.
   - Comparison and evaluating of Tools for mind maps and infographics knowledge.
   - Developing of the practical skills of use Tools for mind maps and infographics knowledge.
4. **Gamification in education)**
   - Learn what game elements are used in gamification of learning process
   - Learn about types of gamification
   - Learn about motivation and techniques for improving knowledge
   - Learn about different types of games
5. **Tools for communication and collaboration (Figure 4)**

The topic applies to:

- University faculty and management, teachers, professionals, MSc students who want to use ICT tools for collaboration in education online and in blended learning, privately or as part of an educational institution or company;
- General public, keen on getting familiar with blended learning and to implement it in their educational institution;

6. Tools for formative assessment and control (Figure 5)

- Preview of analysis of ICT tools for formative assessment and control.
- Comparison and evaluation of ICT tools for formative assessment and control.
- Developing of the practical skills of use of ICT tools for formative assessment and control.

7. Digital Storytelling

- Preview of Analysing Tools for Storytelling.
- Comparison and evaluation of Tools for Storytelling.
- Developing of practical skills of using Storytelling Tools.
- Previous tasks for testing in real scenarios.

8. ICT-tools for developing Intercultural competences in e-learning

- Preview of Analysing ICT-tools for developing Intercultural competences in e-learning
- Comparison and evaluating of ICT-tools for developing Intercultural competences in e-learning
- Developing of the practical skills of use ICT-tools for developing Intercultural competences in e-learning.

9. Social Presence and online tutoring

- To define online tutoring and its methodology.
- To outline clusters of ICT tools applied for the purposes of online tutoring.
- To define the role and functions of social media in the context of online tutoring,
- To provide recommendations on enhancing interactivity and social presence in online tutoring,
- To outline competences required for online tutors.

10. ICT Tools for Teaching Students with Special Needs

- To outline the learning problems students with visual impairment/hearing loss experience in the classroom;
- To define ICT tools designed for the students with special needs, their availability, characteristics, specifics of implementation in the classroom, etc.;
- To analyse practices and ways how commonly available ICT tools can be adjusted to the needs of special learners;
- To provide recommendations to the teachers on special methods of teaching students with visual impairment / hearing loss placed in the classroom with the students with normalised abilities applying specially designed ICT tools;
- To discuss practices of experts in teaching students with special needs and ways of facilitating their teaching with ICT tools

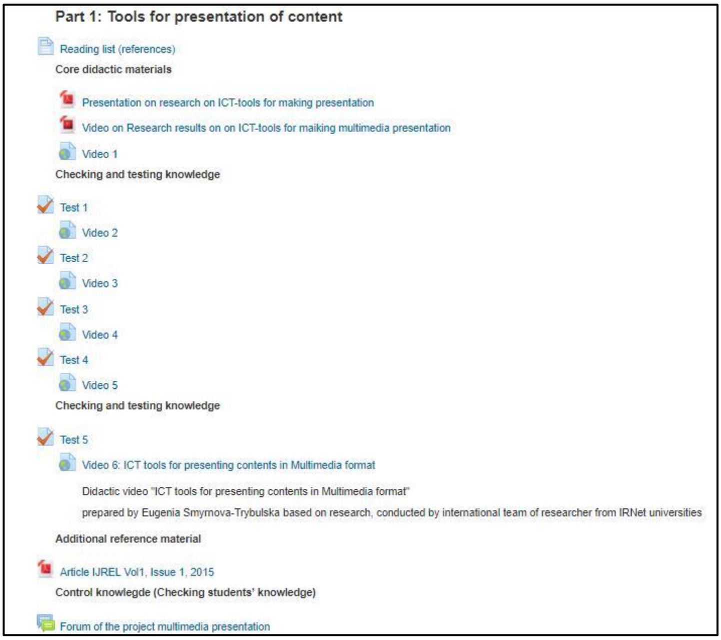

Figure 2. Copy screen of the part of Module ICT-tools for presentation of multimedia content

Source: *Own Work, http://el.us.edu.pl/irnet*

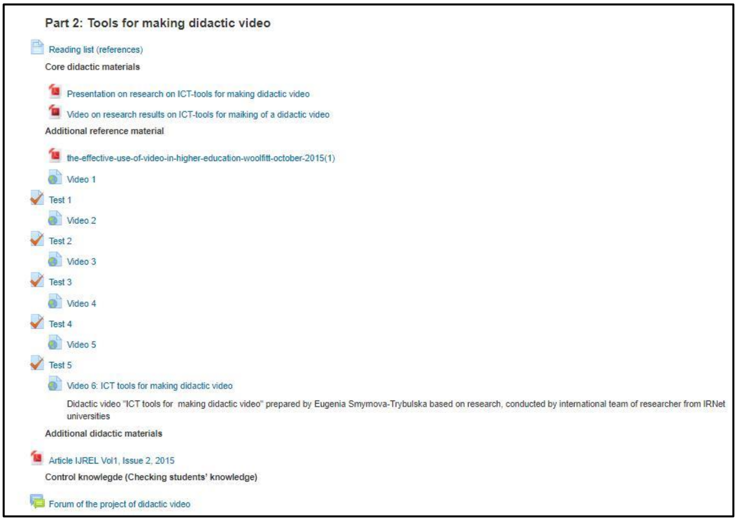

Figure 3. Copy screen of the part of Module ICT-tools for making didactic videos

Source: *Own Work, http://el.us.edu.pl/irnet*

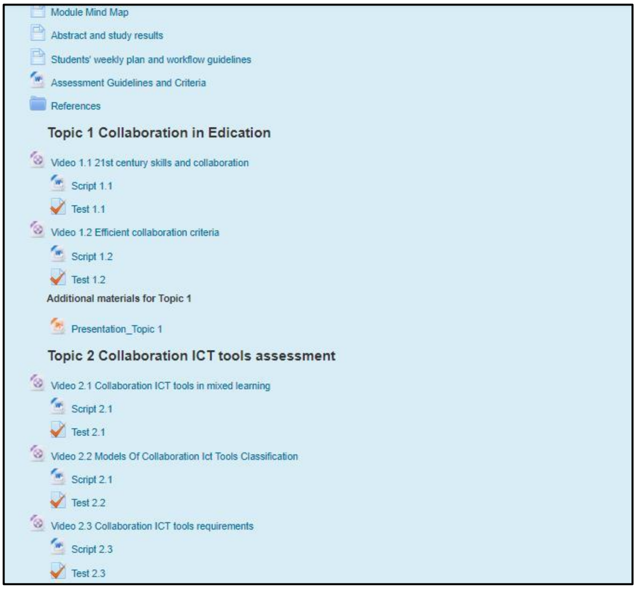

Figure 4. Copy screen of the part of Module Tools for communication and collaboration

Source*: Own Work, http://el.us.edu.pl/irnet*

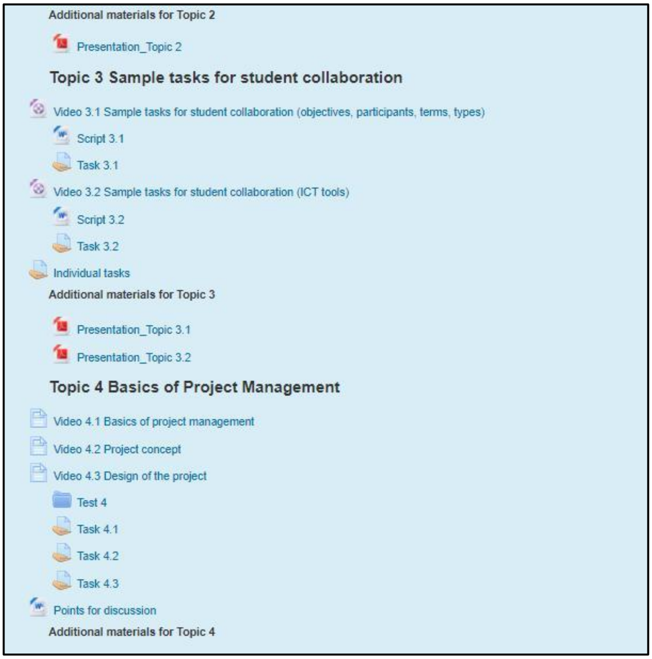

Figure 5. Copy screen of the part of Module Tools for communication and collaboration

Source*: Own Work, http://el.us.edu.pl/irnet*

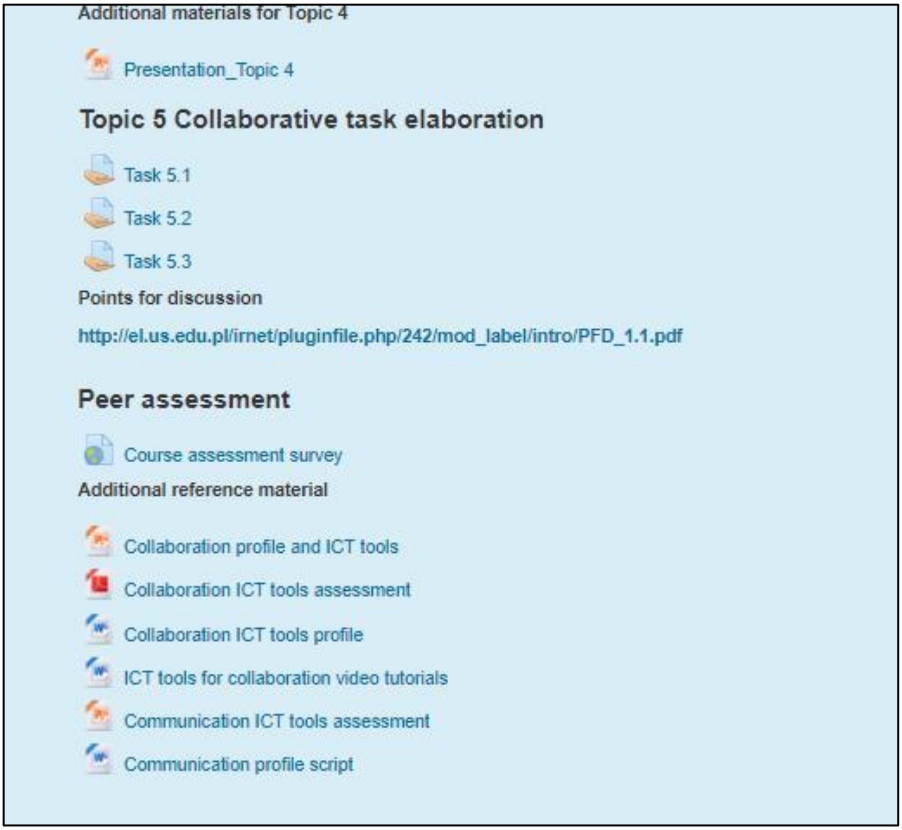

Figure 6. Copy screen of the part of Module Tools for communication and collaboration

Source: *Own Work, http://el.us.edu.pl/irnet*

III. SOME RESEARCH RESULTS

A survey has been conducted in several IRNet project partners universities: University of Silesia (US), Poland, Borys Grinchenko Kiev University (BGKU), Kiev, Herzen State Pedagogical University of Russia (HSPU), Saint Petersburg, Russia). The authors present below results of the survey carried out with participation of 99 respondents (US, PL), (BGKU, UA), (HSPU, RU). The questionnaire was elaborated in Google Drive (Google Form), it was supposed to be filled anonymously by students of different specialization. The University of Silesia conducted the survey at the Faculty of Ethnology and Sciences of Education among students of the humanistic specialization: Integrated Primary Education and Kindergarten Education, Kindergarten Education with Child's Development Early Support, Social-Cultural Animation with Cultural Tourism, Integrated Primary Education and Pedagogical Therapy; A total number of 99 students took part in it.

The purpose of this section is to describe the empirical results derived from the data-set of the MOOCs platform evaluation three research studies (Table 2 – Table 11)

Table 2.

Results of students' responses to the question: *Should the content of LMS Moodle and MOOC (Single choice question)*

	US	BGKU	HSPU
Be different	27,3%	62,3%	84,4%
Be the same	21,2%	37,7%	15,6%
Be partially the same	51,5%	-	0

Source*: Own Research*

Table 3.

Results of answers of students on question: *Should the content of LMS Moodle and MOOC for identical topics (Single choice question):*

	US	BGKU	HSPU
Be different	18,2%	53,6%	87,5%
Be the same	35,4%	46,4%	12,5%
Be partially the same	46,6%	-	0

Source*: Own Research*

Table 4.

Results of students' responses to the question: *What type of course is it better to use in teacher training? (Single choice question):*

	US	BGKU	HSPU
MOOC	16,2%	63,8%	46,9%
LMS Moodle	34,3%	36,2%	53,1%
Both types	49,5%	-	0

Source*: Own Research*

Table 5.

Results of students' responses to the question: *What type of course is it better to use to extend your basic knowledge? (Single choice question)*

	US	BGKU	HSPU
MOOC	21,2%	63,8%	43,8%

LMS Moodle	28,3%	36,2%	56,3%
Both types	50,5%	-	0

Source*: Own Research*

Table 6.

Results of students' responses to the question: *What type of course is it better to use to gain new knowledge?:*

	US	BGKU	HSPU
MOOC	15,2%	68,1%	90,6%
LMS Moodle	30,3%	31,9%	9,4%
Both types	54,5%	-	-

Source: Own Research

Table 7.

Results of students' responses to the question: *What elements of a MOOC are mandatory? (Multiple choice question)*

	US	BGKU	HSPU
video	45,5%	68,1 %	90,6%
presentations	70,7%	69,6%	78,1%
text	58,6%	52,2%	68,8%
joint-access wiki portal	13,1%	-	21,9%
mind maps	32,3%	-	21,9%
additional links to sources	27,3%	44,9%	50%
self-assessment tests	40,4%	53,6%	68,8%
control tests	31,3%	34,8%	71,9%
useful links	27,3%	-	50%
personal e-portfolio	13,1%	-	28,1%
blog	17,2%	-	21,9%
spreadsheets for formative assessment	20,2%	24,6%	34,4%
individual tasks for further assessment by a tutor	12,1%	-	37,5%
pair work	17,2%	29%	9,4%
group work	18,2%	-	34,4%

peer review	28,3%	-	28,1%
joint project	19,2%	43,5%	31,3%
discussion forum	27,3%	52,2%	71,9%

Source*: Own Research*

Table 8.

Results of students' responses to the question: *Can MOOC materials be used in groundwork courses of blended learning?*

	US	BGKU	HSPU
Yes	68,7%	85,5%	96,9%
No	31,3%	14,5%	3,1%

Source*: Own Research*

Table 9.

Results of students' responses to the question: *What do you find appealing in a MOOC? (Multiple choice question)*

	US	BGKU	HSPU
Interesting|topical thematic scope	44,4%	66,7%	18,8%
Self-improvement	44,4%	60,9%	65,6%
Certification	27,3%	53,6%	15,6%
Acquiring additional competitive skills	28,3%	52,2%	56,3%
Lack of scope/content of university curriculum	15,2%	14,5%	21,9%
Attractive lecturer	15,2%	11,6%	9,4%
Course popularity	20,2%	20,3%	15,6%
Other	2%	-	3,1%

Source*: Own Research*

One of the survey questions was: Reasons to unsubscribe from MOOC. Among the most important reasons to unsubscribe from the course given by the respondents who participated in the survey is too long duration of the course. In addition, as emphasized in the study (Gurba 2015), the authors of massive courses recognize more and more the need for more practical approach and implement their courses in a manner which allows for keeping their participants longer and preventing the still very high rate of the participants leaving the course too soon, long before its completion. Not only the design of the course - the design approach to a problem - is salvation, but also a good set of partners from outside the academic world, and so is the industry, services and areas of practical applications. The development of design types of massive courses is one of the important directions in the modification of the MOOC base. Some authors use an even longer new name MOOP, in which instead of the word course the last expression is a "project". We are therefore faced with a creation a massive open online projects, rather than the usual courses MOOCs (T. Toikkanen, MOOP: The Next Step Beyond MOOCs, "Tarmo.fi Blog" http://tarmo.fi/blog/20x5/04/moop-the-next-step-beyond-moocs) In: (Gurba 2015)).

Table 10.

Results of students' responses to the question: *What activities should be mandatory for a MOOC? (Multiple choice question):*

	US	BGKU	HSPU
Communication	50,5%	29%	46,9%
Collaboration	42,4%	18,8%	43,8%
Storytelling	8,1%	0%	9,4%
Assessment	38,4%	1,4%	59,4%
Feedback	16,2%	13%	81,3%
Problem solving	24,2%	8,7%	59,4%
Brainstorm	30,3%	5,8%	25%
Team work	24,2%	0%	28,1%
Discussion	33,3%	11,6%	53,1%
Tutoring	16,2%	4,3%	50%
Research	20,2%	7,2%	21,9%
Peering	24,2%	0%	28,1%

Source*: Own Research*

Table 11.

Results of students' responses to the question: *What elements of an LMS Moodle are mandatory? (Multiple choice question):?*

	US	BGKU	HSPU
Video	47,5%	17,4%	
presentations	52,5%	21,7%	
Text	55,6%	14,5%	
joint-access wiki portal	17,2%	-	

mind maps	34,3%	-
additional links to sources	25,3%	2,9%
self-assessment tests	44,4%	7,2%
control tests	46,5%	5,8%
useful links	31,3%	-
personal e-portfolio	10,1%	-
Blog	15,2%	-
spreadsheets for formative assessment	22,2%	1,4%
individual tasks for further assessment by a tutor	16,2%	5,8%
pair work	19,2%	4,3%
group work	17,2%	-
peer review	18,2%	-
joint project	11,1%	7,2%
discussion forum	31,3%	7,2%

Source*: Own Research*

Implications for higher education including policy

Widening participation in HE is a major component of the government education policy — to increase not only the number~~s~~ of young people entering HE but also the proportion from under-represented groups (e.g., those from lower-income families, people with disabilities and some ethnic minorities) (https://en.wikipedia.org/wiki/Widening_participation)

In their own publication M . Patru and V. Balaji (2016) stressed the promoting a culture of quality in higher education. Quality lies at the heart of higher education policies in all countries around the world. However, the demand for higher education is increasing well beyond the capacity of traditional institutions. Thanks to technology, teaching and learning are now less constrained by time and place. Online learning holds the potential of delivering quality education to anyone, anywhere. Many of the online self-paced courses offered outside of traditional higher education are of high quality, enabling learners' access to new knowledge, new skills and new professional opportunities. In a world of growing virtual mobility, and in an effort to address a more diverse range of learning options for working adults, more and more open and distance teaching universities have expressed their intention to promote the large-scale delivery of certified short learning programmes (SLP) and to incorporate MOOCs into these courses as flexible building blocks. Governments should develop or strengthen quality assurance frameworks for the recognition, validation and accreditation of flexible learning pathways as part of their broad development agenda. (Patru M., Balaji V. Eds., 2016: 13)

DISCUSSION

Education 2030: A new vision for education. Education 2030 must be seen within the broader context of development today. MOOCs can contribute to SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. The Education 2030 Framework for Action, adopted at Incheon (Republic of Korea) in May 2015, recognises lifelong learning for all as one of the underpinning principles of this new vision, stating that “all age groups, including adults, should have opportunities to learn and continue learning.” It also calls on countries to “develop policies and programmes for the provision of quality distance learning in tertiary education, with appropriate financing and use of technology, including the Internet, massive open online courses (MOOCs) and other modalities that meet accepted quality standards to improve access.”

CONCLUSION

MOOCs could be successfully designed and adapted to support the expansion of access to post-secondary education for all categories of learners and to maintain their motivation. They could also play a significant role in providing learning opportunities for those in fragile/emergency situations. (Patru, Balaji, 2016).

The MOOC entitled: “ICT-tools for e-learning”, developed within the framework of the European IRNet project based in particular on such methods as *microlearning*, *subscription learning*, *peer assessment*. In the near future this course will be opened to a focus group from the partners’ university and after some improvements to a wider audience.

ACKNOWLEDGEMENT

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536 and statutory research.

REFERENCES:

Barrio M.G., Fernandez M.R., Garcia S.A., 2017: *Production methodology for the development of audiovisual and multimedia content for MOOC RIED.* Revista Iberoamericana de Educación a Distancia (2017), 20(1), pp. 183-203.

Bates, A.W. (Tony), 2015: *Teaching and Learning in a Digital Age: Guidelines for designing teaching and learning for a digital age.* Bates: 2015, open textbook available [online] at http://opentextbc.ca/teachinginadigitalage/ (accessed 14 September 2017)

Daradoumis T., Bassi R., Xhafa F., Caballe S., 2013: A review on massive e-learning (MOOC) design, delivery and assessment. Conference P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC), 2013 Eighth International Conference 208-213 IEEE

Eades J., 2015: *Why Video Is The Best Medium For Microlearning Microlearning is where training is headed; but which is the best medium to deliver your content in order to improve knowledge transfer?* [online] at https://elearningindustry.com/video-best-medium-microlearning (Accessed 10 September 2017)

Gurba K., 2015: *MOOC Historia i przyszłość,* Kraków 2015 137 s. ISBN: 978-83-7438-470-4

Hoi K. Suen, 2014: *Peer Assessment for Massive Open Online Courses (MOOCs)* The International Review of research in Open and distributed learning Vol 15, No 3 (2014) [online] at http://www.irrodl.org/index.php/irrodl/article/view/1680/2904?utm_content=buffer8db3c&utm_medium=social&utm_source=plus.google.com&utm_campaign=buffer (accessed 14 September 2017)

Hug, T., 2005: *Micro Learning and Narration. Exploring possibilities of utilization of narrations and storytelling for the designing of "micro units" and didactical microlearning arrangements*. Paper presented at the fourth Media in Transition conference, May 6–8, 2005, MIT, Cambridge (MA), USA. [online] at https://www.researchgate.net/publication/237558117_Micro_Learning_and_Narration_Exploring_possibilities_of_utilization_of_narrations_and_storytelling_for_the_designing_of_micro_units_and_didactical_micro-learning_arrangements (accessed 10 September 2017)

IRNet Project Web-site www.irnet.us.edu.pl (accessed 14 September 2017)

Official Journal of the European Union 2010 joint progress report of the Council and the Commission on the implementation of the 'Education and Training 2010 work programme' (1) (2010/C 117/01)) [online] at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:117:0001:0007:EN:PDF (accessed 14 September 2017)

Olazabalaga I.M., Garrido C.C., Ruiz U.G., 2016: *Research on MOOCs: Trends and Methodologies.* Monograph, 87-98 [online] at http://www.ugr.es/~portalin/articulos/PL_monograph1_2016/art_7.pdf

O'Toole, R., 2013: *Pedagogical strategies and technologies for peer assessment in Massively Open Online Courses (MOOCs).* Discussion Paper. University of

Warwick, Coventry, UK: University of Warwick. (Unpublished) [online] at http://wrap.warwick.ac.uk/54602/7/WRAP_O%27toole_ROToole%20Peer%20Assessment%20in%20MOOCs%20%281%29.pdf (accessed 14 September 2017)

Patru M., Balaji V. Eds., 2016: *Making Sense of MOOCs*. A Guide for Policy-Makers in Developing Countries UNESCO and Commonwealth of Learning, 2016 ISBN 978-92-3-100157-4

Smyrnova-Trybulska E., 2009*: On principles of the Design and Assessment of Distance Courses* [In:] Distance Learning, Simulation and Communication, 2009, Proceedings, editor: Miroslav Hruby, Brno, Czech Republic, May 6, 2009, pp.159-165. ISBN 978-80-7231-638-0

Smyrnova-Trybulska E., Ogrodzka-Mazur E., Szafrańska-Gajdzica A., Morze N., Makhachashvili R., Noskova T., Pavlova T., Yakovleva O., Issa T., Issa T., 2016: *MOOCS – Theoretical and Practical Aspects: Comparison of Selected Research Results: Poland, Russia, Ukraine, and Australia* In: Proceedings of the International Conferences On Internet Technologies & Society (ITS 2016) Educational Technologies 2016 (ICEduTech 2016) And Sustainability, Technology And Education 2016 (STE 2016) Melbourne, Australia 6 – 8 December, 2016. Editors: Edited by Piet Kommers, Tomayess Issa, Theodora Issa, Elspeth McKay and Pedro Isaías, IADIS 2016, pp. 107–114.

Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M., 2014: *What Drives a Successful MOOC? An Empirical Examination of Criteria to Assure Design Quality of MOOCs*. In Advanced Learning Technologies (ICALT), 2014 IEEE 14th International Conference on (pp. 44-48). IEEE.

FORMATIVE AND PEER ASSESSMENT IN HIGHER EDUCATION

Nataliia Morze, Viktoriia Vember, Liliia Varchenko-Trotsenko
Boris Grinchenko Kyiv University
18/2 Bulvarno-Kudriavska Str, Kyiv, Ukraine
n.morze@kubg.edu.ua, v.vember@kubg.edu.ua, l.varchenko@kubg.edu.ua

Abstract: *This article shows specialities and tendencies of implementation peer assessment in educational process of higher educational institutions, the authors present a comparative analysis of traditional and formative evaluation as well as the advantages and disadvantages of the introduction of methods and tools of peer assessment in universities are presented. The study presents the results of the survey on the use of technology for assessment and use of ICT tools for evaluation attended by scientific and pedagogical staff of the Borys Grinchenko Kyiv University. The authors also propose ways of using ICT tools for introduction of peer assessment in high school as well as describe resources for implementing peer evaluation, which can be created in an electronic training course based on LMS Moodle, in particular its Workshop activity .*

Keywords: assessment, formative assessment, peer assessment, peer learning, ICT, higher education.

INTRODUCTION

Today's graduates of higher education institutions need to be able to cooperate, communicate and solve problems - these are the skills that are formed through social and emotional learning and which refer to the soft skills needed by a specialist in the modern labour market. Combined with traditional skills, this social and emotional skill will help students to succeed in the development of the digital economy. The modern educational system is in the stage of global world change and should prepare a person to live in an open information space, to provide lifelong learning. The situation of the inconsistency of the contents and results of training future specialists with the current requirements of the labour market, characterized as a global crisis of higher education: the system prepares people for the "outdated" economy. The field of education requires new approaches and innovative pedagogical and information and communication technologies for 21st Century Skills (Figure 1).

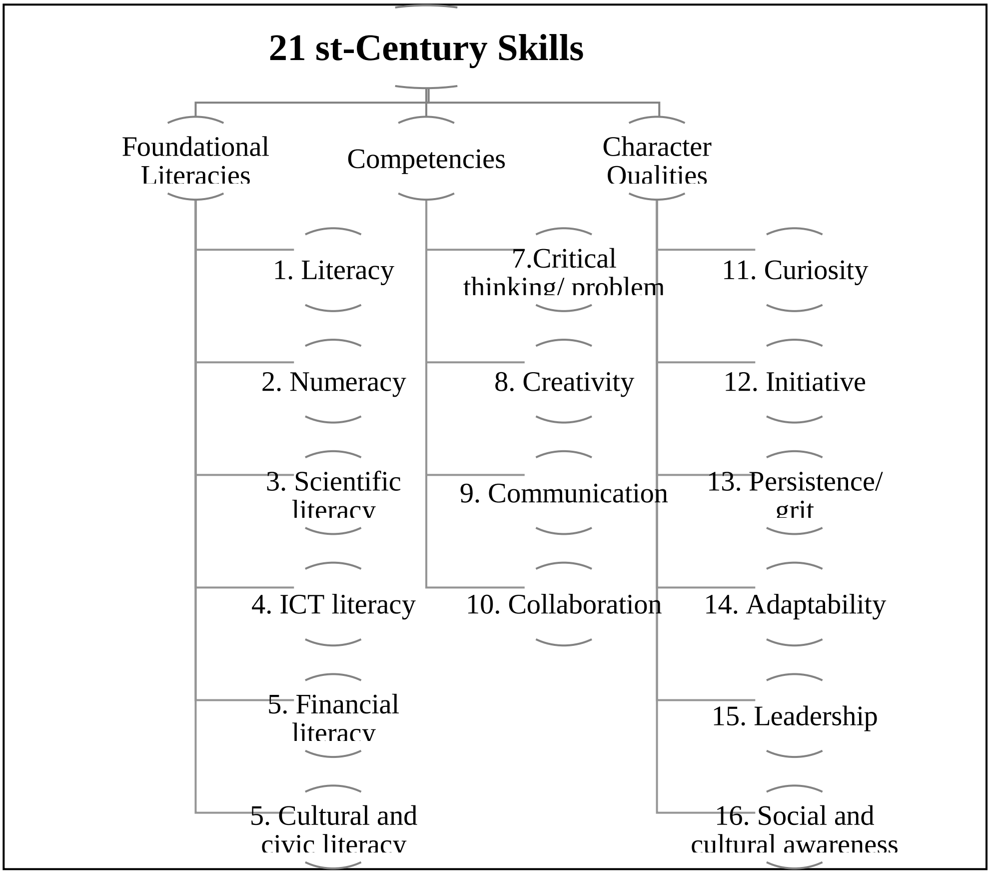

Figure 1. 21st-Century Skills

Source: World Economic Forum report New Vision for Education: Fostering Social and Emotional Learning Through Technology

At the same time, diagnostics of education is a compulsory component of the educational process, which is aimed at determining the level of achievement of the goals set and includes the control, verification, accounting, evaluation, accumulation of statistical data and their analysis, reflection, revealing the dynamics of educational changes and personal progress of the student, Redefining goals, refining educational programs, adjusting the learning process, forecasting further changes and developing the educational process. One of the components of the diagnosis of student achievements is assessment. Classical world practice is the definition of New Zealand scientist Clarence Edward Beeby, who treats evaluation as "systematic gathering and interpretation of facts, followed by the next stage - judgment of their value and appropriate planning of further actions" (Husen, 2000). In general, the assessment carries out a number of functions in the educational process: controlling, teaching, diagnostic-correcting, stimulating-motivational, developing, educational and management functions of the learning process. An analysis of the current views of EU scientists on the assessment of students' academic achievements suggests changes in the theory and practice of this field of pedagogy in the context of emphasizing personality-oriented learning, namely the recognition of the so-called formative evaluation function, which in the scientific-pedagogical literature is interpreted as formative assessment.

With the implementation of mixed, distance learning, the appearance of a large number of massive open online courses (MOOCs), peer learning technology, which is part of peer assessment, is increasingly gaining ground. In this culture students become active participants in the learning and evaluation process by sharing responsibility in this process (Current Perspectives on Assessment). Students are not involved in sharing and developing criteria in self and peer-evaluation, reflecting on their own learning and keeping track of their performance, and utilizing feedback to refine their knowledge, Skills and behaviours. In this culture, teachers do not relinquish their obligations to students in the learning and assessment process, but work with students to help them develop strategies for learning and assessing. Teachers need to scaffold student learning by supporting them to close gap between the desired goal and their current achievement level.

The purpose of the article is to identify the features, advantages and disadvantages, methods and ICT tools for the implementation of peer evaluation in the educational process of higher education institutions.

The hypothesis is that understanding the advantages and disadvantages of traditional and peer assessment will help higher education instructors effectively combine peer evaluation, the implementation of modern ICT tools for peer evaluation support will help dismiss the teacher from routine work and organize peer-to-peer group work more qualitatively and form peer assessment and self-assessment skills.

Methods

To achieve the goal, a number of methods were applied, in particular theoretical ones: methods of systematic and comparative analysis of scientific sources, methodological literature, and special literature to find out the elaboration of the problem of implementing peer evaluation in the educational process of higher educational institutions; Synthesis and generalization for the formulation of the main provisions of the study; Empirical - expert survey, conversations with scientific and pedagogical staff. In particular, at the Borys Grinchenko Kyiv University, a survey was conducted among scientific and pedagogical staff, in which 84 participants responded. The survey, which was conducted online (https://docs.google.com/a/kubg.edu.ua/Forms/d/15wZ7IcLjQgYVZlwYD-p7Rs2kQhPAWlojDXM9z5ccojQ/edit?Ts=595bc9fe#responses), raised questions about the studied issues. The results of the survey showed that today peer assessment is used extensively in the educational process by 15.6% of the respondents, 62.3% use it in part, 22.1% do not use it. At the same time, 51.9% of respondents are ready to use peer evaluation in the educational process after a closer look at this method.

Other survey results are presented later in the article. Therefore, it is important to consider theoretical peculiarities of peer-to-peer evaluation and recommendations for its implementation in the educational process of universities.

1. THEORETICAL PECULIARITIES OF PEER-TO-PEER EVALUATION

1.1. Main purposes for assessment

The ability to conduct self-esteem, reflection, evaluate others, and work in a team refers to the skills of the 21st century, as a modern person in the knowledge economy society should learn to independently evaluate their activities, make relevant conclusions and change, and not wait for the reactions of others to control and evaluate.

The three main purposes of assessment are described as follows:

- **Assessment *for* learning** occurs when teachers use inferences about student progress to inform their teaching. (*formative*)
- **Assessment *as* learning** occurs when students reflect on and monitor their progress to inform their future learning goals. (*formative*)
- **Assessment *of* learning** occurs when teachers use evidence of student learning to make judgements on student achievement against goals and standards. (*summative*)

Assessment *for* learning integrates assessment into the learning and teaching process and establishes the teacher's role in assessment. Through assessment *for* learning teachers ascertain students' knowledge, perceptions and misconceptions and use this evidence to inform curriculum planning and teaching practice in order to support students to operate at the edge of their competence. Teachers use a range of assessment tools and teaching approaches integrating assessment in the learning and teaching process. Assessment goals are explicit and students are assisted to understand clearly what they are trying to learn and what is expected of them. Assessment is seen positively as supportive of student learning and assisting students to close the gap between their current achievement and the expected goal. Assessment *for* learning recognizes the influence that assessment has on the motivation and self- esteem of students and provides them with constructive feedback. Assessment *for* learning encourages the active involvement of students in their learning and it depends on teachers' diagnostic skills to make it work (Earl 2003).

Assessment *as* learning establishes students' roles and responsibilities in relation to their learning and assessment. It engages students in self- and peer-assessment and promotes students' confidence and self-esteem through an understanding of how they learn. Its focus on student reflection on their learning is powerful in building metacognition and an ability to plan for their own future learning goals. In assessment *as* learning students monitor their learning and use feedback from this monitoring to make adaptations and adjustments to what they understand (Earl 2003). Earl also expresses the view that "effective assessment empowers students to ask reflective questions and consider a range of strategies for learning and acting. Over time, students move forward in their learning when they can use personal knowledge to construct meaning, have skills of self-monitoring to realize that they don't understand something, and have ways of deciding what to do next" (Earl 2003: 25). Assessment *as* learning emphasises the process of learning as it is experienced by the student.

Assessment *of* learning describes the extent to which a student has achieved the learning goals, including the *Standards* and demonstrates what the student knows and can do. Its purpose is summative and gives an "overview of previous learning" (Black 1998, p28). This is the assessment that is used to certify learning for reporting to students, the parents and the system. It takes place usually at the end of a unit, a program, a semester or a year of study. It is based on teacher moderation to ensure consistent judgment of student achievement and is supported by examples or evidence of student learning. Assessment *of* learning can be used to plan for future learning goals.

1.2. The concept of formative evaluation

The concept of formative evaluation by different scholars is interpreted differently. In our survey, we suggested that colleagues choose the most relevant definition of molding evaluation and get the following results:

- an interactive assessment of students' progress, which enables the teacher to identify the needs of the students and adapt the learning process accordingly (Lokshina, 2009) - 57.7%;
- activity of teacher and students, which provides information that can be used as feedback for the correlation of the learning process (Black, 2000) - 38%;
- a two-way process between a teacher and a student in order to optimize the learning process (Cowie, Bell, 1999) - 28.2%;
- Assessment, which forms the knowledge of students and teachers - 23, 9%;
- Any assessment that helps the student to learn and develop (Perrenoud, 1991) - 19.7%.

Among the peculiarities of the molding evaluation according to the results of the survey, the following was preferred:

- Not only products of educational activity are evaluated but also the training process -60,6%
- Development of evaluation criteria based on the set training goals -54.9%
- Participation of the students in the assessment - 47,9%
- The process of evaluation is -35.2%
- Use of electronic tools for evaluation -26.8%
- Absence of an open comparison of results of different students -21,1%

The following methods are used for formative evaluation (Figure 2):

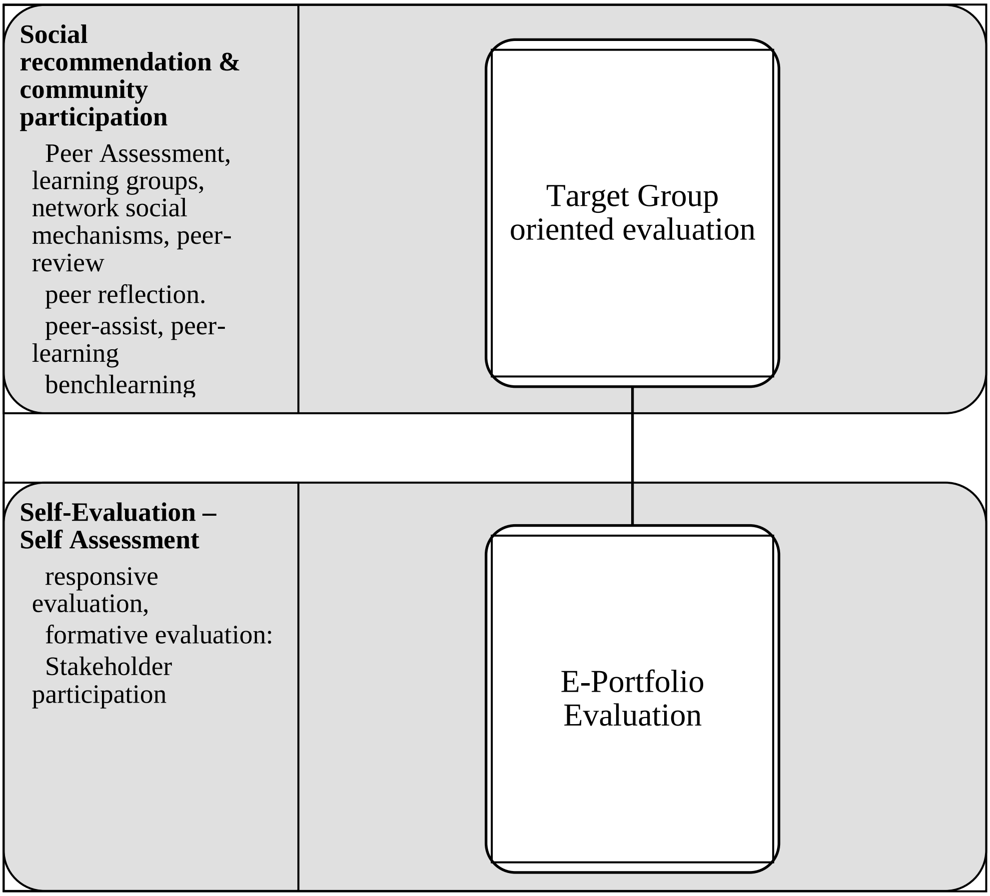

Figure 2. Methods of formative evaluation

Source: Own work based on Intel

Research supports the powerful role that self-assessment can play in learning (Kitsantas, Reisner, & Doster, 2004). Providing students with opportunities to assess their thinking and that of their peers gives them practice in the skills they need to become independent and self-directed learners.

Self-assessment helps students internalize the standards by which their products and performances will be judged (Wiggins, 1990). Assessments, such as rubrics, which are often used for final products, can be used by students as they work on a project to determine how their work measures up to expectations. When students participate in the development of rubrics, they also must think about what excellence looks like in the field in which the product is created. They then learn to identify the discrepancies between their thinking and the thinking of experts in the field. This practice helps students develop the skills necessary to assess their own progress.

When students assess their own thinking processes and the products they create, they are doing more than just looking for errors. They are “making explicit what is normally implicit" (Noonan & Duncan, 2005). This is especially important when assessing mental processes, such as higher-order thinking and other 21st century skills that cannot be observed directly without careful planning.

Making self-assessment part of a daily classroom routine is critical for producing confident, independent learners, but it requires careful planning and consistency in instruction. Black and his colleagues (2003) suggest the following guidelines for successful implementation of student self-assessment:

1. The criteria for evaluating any learning achievements must be made transparent to students to enable them to have a clear overview both of the aims of their work and of what it means to complete it successfully. Such criteria may well be abstract—concrete examples should be used in modeling exercises to develop understandings.

2. Students should be taught the habits and skills of collaboration in peer feedback, both because these are of intrinsic value and because peer assessment can help develop the objectivity required for effective self-assessment.

3. Students should be encouraged to bear in mind the aims of their work and to assess their own progress to meet these aims as they proceed (pp. 52-53).

In student-centered classrooms, teachers assess students, students assess each other, and ultimately, students assess themselves. Considerable research shows that asking students to think metacognitively about their thinking and their learning results in greater achievement. Marzano (1998) found that interventions that asked students to reflect on their learning had a greater impact on student achievement than any other method. When students assess themselves honestly, they can no longer see themselves as passive recipients of knowledge and skills instruction. They are, in very important ways, responsible for their own learning, response to instruction, and engagement in meaningful learning tasks.

For students who have become accustomed to being "taught" instead of "learning," the change in classroom culture to one where students are in control of their learning can be uncomfortable. The teachers in Black's (2003) project in southern England found that their older students sometimes did not respond positively to the role they were expected to play in classrooms where formative assessment was frequent and ongoing. While following their own progress in learning can be motivating for some, for others, it can require an uncomfortable level of commitment. Teachers need to be aware of this when they begin implementing formative self-assessment. As Black and his colleagues explain, "To overcome this pattern of passive reception requires hard and sustained work."

The value of self-assessment cannot be overstated. When this kind of thinking becomes an integral part of daily classroom activities, students learn more, are more intrinsically motivated, persist in challenging tasks, and attain higher levels of confidence in their ability to learn (Kitsantas, Reiser, & Doster, 2004)

Different tools can be used for formative evaluation. Among the tools used by the study participants, the priority is given by the question of guidance (64.4%) and reflection (63%) (Figure 3):

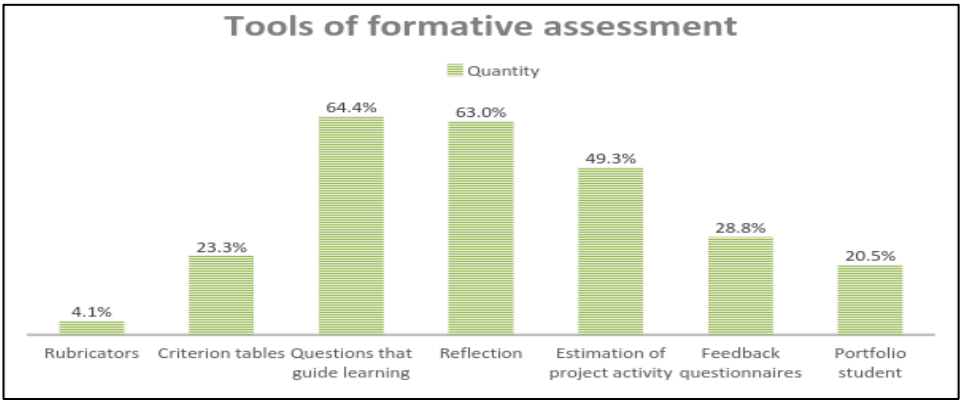

Figure 3. Tools of formative assessment.

Source: Own work

The level of learning by students of knowledge depends on the form of educational work (Figure 4). Therefore, in order to ensure the effectiveness of learning, it is envisaged to apply different forms, methods and technologies, in particular practice through action and training in cooperation.

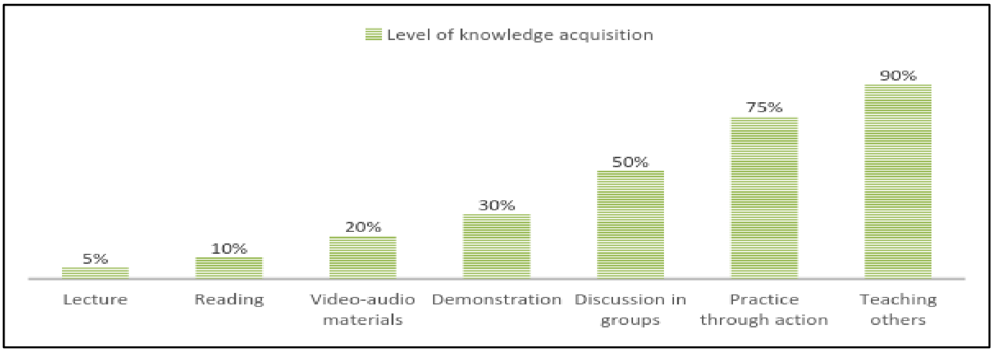

Figure 4. Dependence of the level of students' acquisition of knowledge from the form of educational work.

Source: Morze, 2003.

1.3. The features of peer training

Peer training is aimed at actively involving all its participants in the educational process. The basis of peering education is the equality of all, the pronounced subject-subject character of communication, aimed at achieving certain pedagogical goals, the solution of tasks by using the interaction, the use of the influence of each on the network community and, on the contrary, the influence of the community on each of its members.

As additional advantages of peer training, are the following (Makoveeva, 2003):

- adaptability of educational organizations, specialists to changing conditions, rapid reaction to changes in market conditions, new market requirements, increase of compliance with socio-economic, socio-cultural, educational needs of society;
- concentration of activities of participants of network interaction on their key professional, academic competences, unique processes that take place in the field of education;
- eliminating duplication of a number of functions by participants in network interaction;
- involvement in the joint academic, professional activity of competent participants possessing the necessary resource potential;
- increase the efficiency of mechanisms for information exchange between participants of informal network interaction, replication of best practices, innovative practices;
- realization of partnership relations in the process of achievement of certain results;
- absence of spatial, temporal restrictions;
- raising the level of competitiveness of participants in peer education;
- increase of speed, generation and transmission of specialized knowledge;
- high level of innovation activity, readiness and desire for change in accordance with the requirements of the changing world, increasing requirements to the level of professionalism of the teacher.

The peculiarity of peer education is that it was born precisely from those opportunities that had never been before. It is based on the Internet, technologies Web 3.0, massive digitization of various materials and a large number of open educational resources (open educational resources, OER).

An example of a successful peer education system can be Peer 2 Peer University (https://www.p2pu.org/en/) (P2PU), which operates with the support of the Chicago Public Library and aims to optimize interaction in the professional pedagogical field.

The peculiarities of peer education include: the participation of a large number of students, a minimum of interaction with the teacher, a customized communication between students, the use of peer evaluation, etc.

The components of peer training are reflected in (Figure 5):

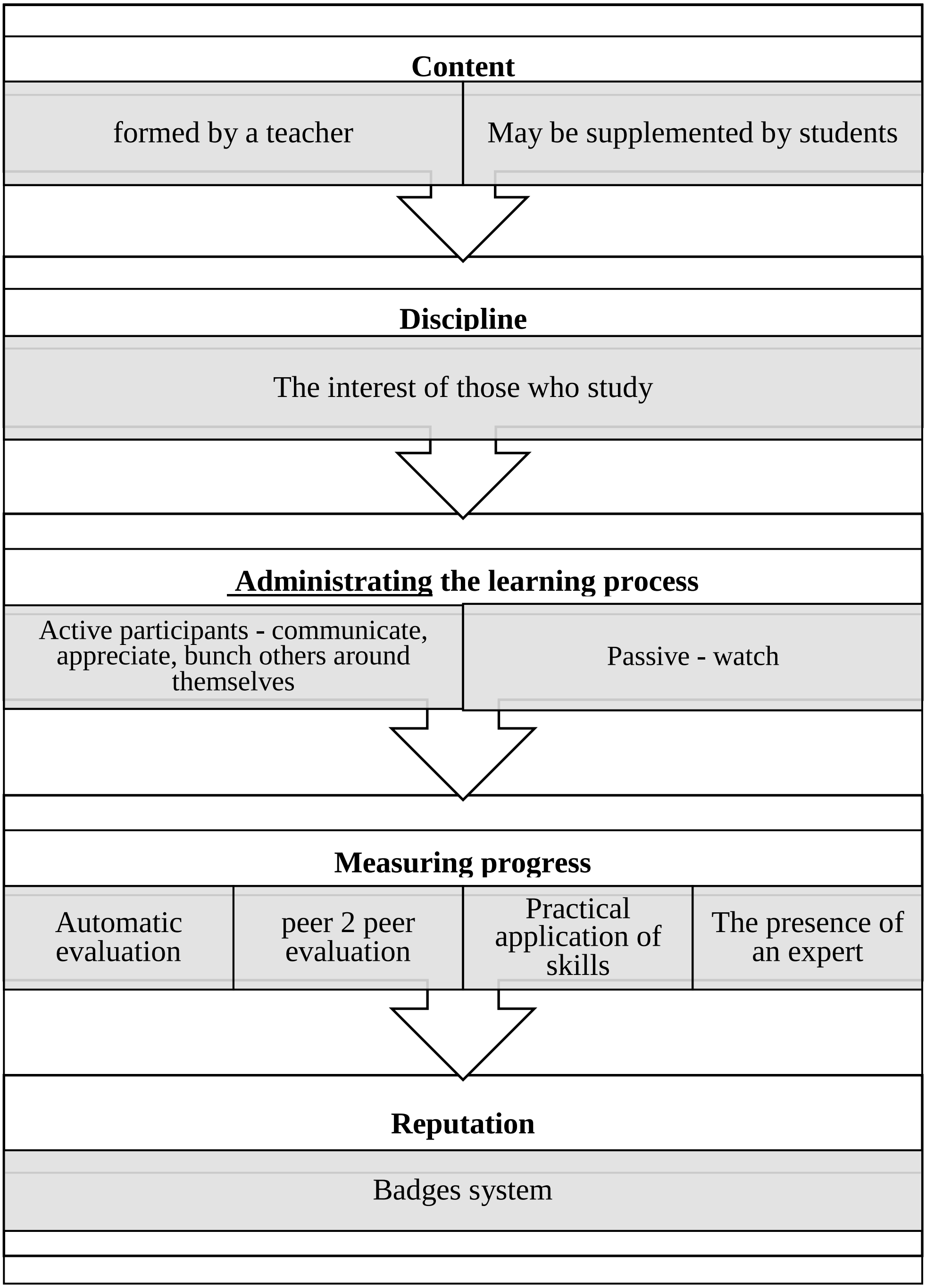

Figure 5. Ingredients of peer education

Source: https://www.p2pu.org/en/

The peculiarity of peer evaluation can be attributed to: the availability of clear language criteria, the organization of students' work in pairs or groups to evaluate each other, the application of the principle of double anonymity: students do not know who they are evaluating; Students do not know who rated them.

When developing the evaluation criteria, consider that:

- the criteria are aimed at assessing the student's work (at the intermediate or final stage);
- the work of the student is evaluated according to the criteria or compared with the model proposed by the teacher, but not with the work of other students;
- criteria must be known to students in advance;
- a clear algorithm for evaluating the outcome of which a student can independently determine his level of achievement and evaluation is to be used;
- evaluation criterion is a concrete expression of educational objectives. You can only evaluate what they are taught.

1.4. The advantages and disadvantages of traditional and peer assessment

We have highlighted the advantages and disadvantages of Table 1 and Table 2 ratings, which we ranked as a percentage of our peer support as a result of a survey (https://docs.google.com/a/kubg.edu.ua/ Forms / d / 15wZ7IcLjQgYVZlwYD-p7Rs2kQhPAWlojDXM9z5ccojQ / edit? Ts = 595bc9fe # responses).

Table 1.

Advantages and disadvantages of traditional assessment

Advantages		**Disadvantages**	
Evaluation of work by a specialist in this subject area	68%	Possibility of biased evaluation by a teacher	69%
Verification of the level of student learning	58%	The need for a teacher to spend a significant amount of time testing and providing evaluation of work	61%
Detected and specified errors allow students to learn from their own mistakes	57%	Evaluation covers only the final result	33%
Assessment of the student's final result	53%	Students learn only from their mistakes, do not take into account the experience of others	25%

Source: Own work

Table 2.

Advantages and disadvantages of peer evaluation

Advantages		**disadvantages**	
Analyzing the work of others, students can identify typical errors that should be avoided	71%	May be missed and not taken into consideration the errors available in the work	78 %
Increasing the transparency of the evaluation	60%	Estimation of work by a specialist can lead to an incorrect assessment	60 %
The work of others can provide students with ideas on how to improve the quality of their own work	60%	Ability not to meet students' deadlines for implementation of stages of peer evaluation	46 %
Motivation for collaborative work of students	58%	The organization of students' work and description of evaluation criteria requires a significant amount of teacher time of	22 %
Assessing the work of other students according to the criteria provided gives the opportunity to better understand the educational material	44%		
When one work is analyzed and evaluated by several students, the final score will be unbiased	43%		
Formation of high-level thinking skills among students	36%		
The teacher spends less time checking and rating jobs	36%		

Source: Own work

Thus, the disadvantages of traditional assessment can be eliminated by using peer assessment.

2. USE OF ICT FOR IMPROVING PERSONAL EVALUATION IN THE EDUCATIONAL PROCESS OF HIGHER EDUCATIONAL INSTITUTIONS

The results of the survey showed that e-mail, automated computer tests, and work with shared documents or presentations are the most popular among the ICT tools that teachers use in the learning process (table 3).

Table 3.

Use of ICT tools in the educational process

E-mail	68.8%
Computer tests that are checked and evaluated automatically	58.4%
Working with shared documents, presentations	51.9%
Resource Task in LMS Moodle	28.6%
Online tests	22.1%
Knowledge maps	19.5%
Wiki resources	16.9%
Social Networking	16.9%
Resource Seminar in LMS Moodle	15.6%
Forums (including Forum in LMS Moodle)	14.3%
Crossword puzzles (for example, Hot Potatoes, LearningApps)	13%
Smart Notebook	9.1%
Resource Glossary in LMS Moodle	9.1%
Chats (including Chat in LMS Moodle)	5.2%

Source: Own work

However, a survey analysis showed that some resources that can be used for peer assessment are used by less than one-third of the teachers and when using them, they do not always take into account all the possibilities of such tools. In this case, the use of ICT should take into account the peculiarities of peer evaluation, one of which is the organization of pair or group work.

The means of ICT that allow students to work together include:

- **video (and audio) conferences** – video and audio exchange with computer networks, presentation and evaluation of performances;
- **online meetings** (for example, the resource http://www.anymeeting.com) for the joint discussion of projects;

- **forums** – an internet resource, a popular type of communication on the Internet. The forum creates themes for communication, which makes it the best for a chat. Anyone interested in certain information can conveniently and quickly view them on the forum and add their own materials. In the educational process, forums created within the framework of electronic training courses (in particular, in LMS MOODLE) can be used;

- **instant messaging** – a telecommunication service for exchanging text messages between computers or other device users through computer networks. In the educational process, messages can be used in LMS MOODLE or in the corporate Google account ;

- **chats** – a network tool for fast text messaging between users of the Internet in real time, such chats can be created as a separate resource in the electronic training course;

- **Blogs are a website** whose main content is regularly added to the recordings, images or multimedia. For blogs characterized by short records of temporary significance. The aggregate of all blogs on the Internet creates the blogosphere. Students can use blogs for reflection or project presentation, evaluation can be implemented through commentary;

- **wiki-resources** is a powerful tool for quickly creating and editing collective materials. Students can create collaborative articles, evaluate the work of others using templates, the teacher can track the history of edits and contribute to the work of each participant;

- **electronic mailing lists** – Internet service, which enables you to combine a certain number of people into a single closed distribution group;

- **"white boards"** – a tool for placing shared files on the screen "shared notebook" or "whiteboard". Software for video conferencing and data conferences often includes tools that allow the user to make a mark on the electronic board about the way he would do it on a normal wall board. The main property of this type of application is to allow more than one person to simultaneously work on the image, with the synchronization of two versions with each other almost in real time;

- **mental maps** – services or software for creating diagrams that display words, ideas, tasks, or other elements that are radially around the main word or idea;

- **social networks**– a social structure formed by individuals or organizations. It reflects the various connections between them due to various social relationships, ranging from random acquaintances to close family universities;

- **shared documents** ¬ documents that create and store in the cloud, which can be shared by several users (with different permissions - viewing, commenting, editing). All changes are fixed and can be rejected by the owner. Documents, tables, presentations, etc. can be used to work together. These materials are used on online disks (Google Drive, Sky Drive).

Separately pay attention to the resources for implementing peer evaluation, which can be created in an electronic training course based on LMS Moodle.

Resource Workshop involves collecting and analyzing students' work with a collective assessment.

Students can submit works in the form of any digital content (files) such as a document, a spreadsheet, a presentation, and can add text directly to the field on the site with the help of a built-in text editor (link to blog, document, wiki-resource etc).

The materials are evaluated using several rating criteria determined by the teacher. The process of collective evaluation and understanding of the form of this assessment can be done in advance using examples of work presented by the teacher, with reference to the example of the assessment. Students are given the opportunity to evaluate one or several works presented by group members. Materials and reviewers may be anonymous if required.

Students receive two grades at the workshop - an assessment of their material and an assessment of the evaluation of their colleagues' materials. Both grades are entered in the evaluation journal.

The seminar involves several "phases" that determine the various actions of the teacher and students. The teacher can independently "switch" the seminar in different phases, or set up automatic switching:

Setup phase ¬ In this phase, users can not take work or place jobs. Teachers can use this phase to modify the workshop settings, modify the evaluation strategy, and editing the assessment form.

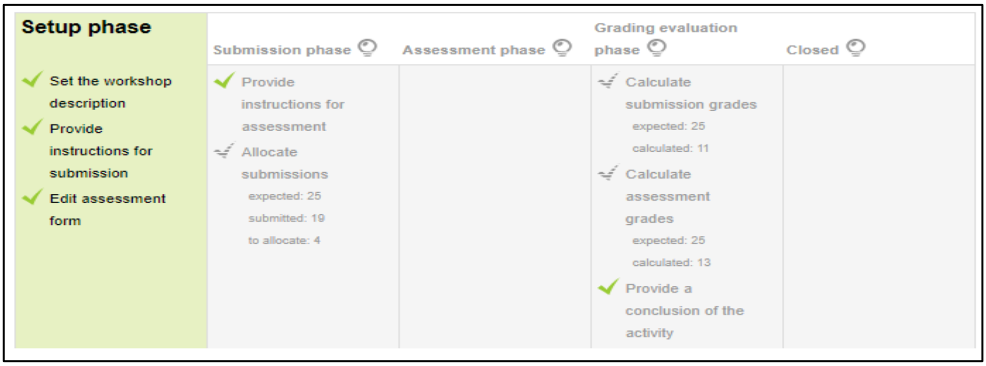

Figure 6. Setup phase

Source: LMS Moodle

During this phase, the teacher determines the criteria for evaluating the works, which will further evaluate the submitted work (Figure 7).

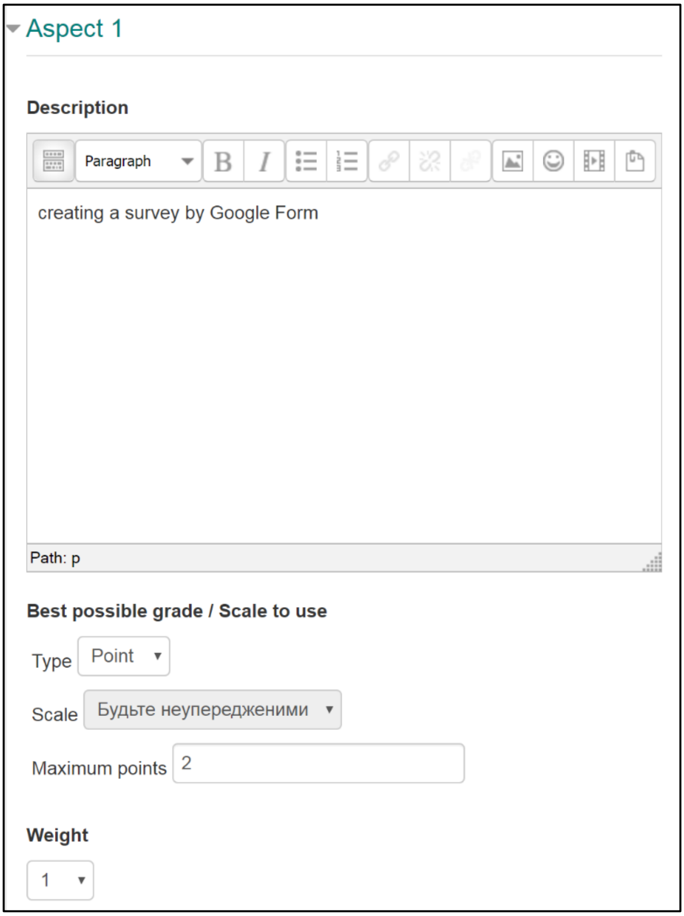

Figure 7. Setting up of evaluation criteria

Source: LMS Moodle

Submission phase – In this phase, students can submit their work (within the deadline for submission, if any). Teachers can distribute works for review by fellow students.

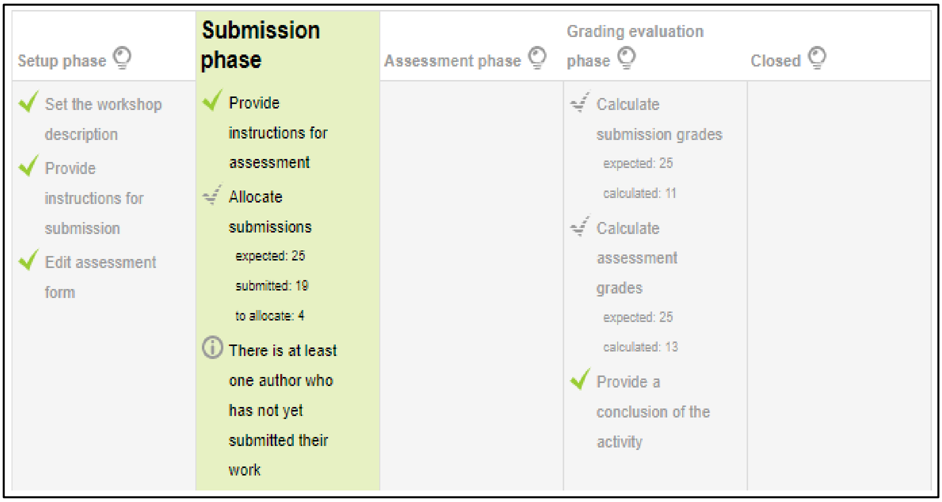

Figure 8. Submission phase

Source: LMS Moodle

Assessment phase - in this phase, reviewers can evaluate the submitted work (within the time period for evaluation, if any).

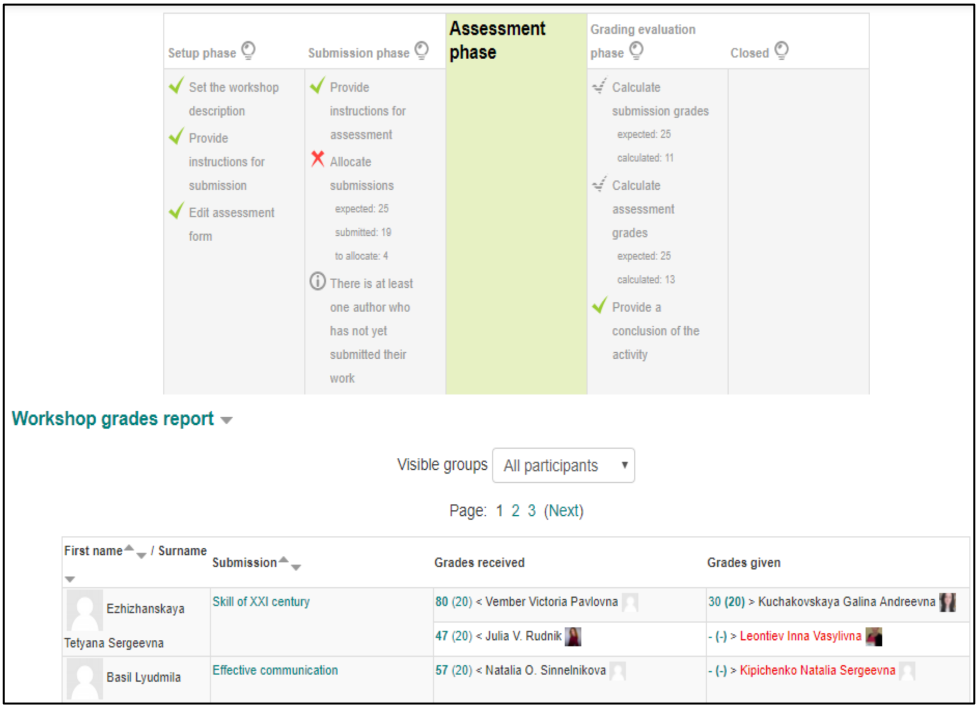

Figure 9. Assessment phase

Source: LMS Moodle

Grading evaluation phase – In this phase, users can not change their work and evaluation of the work. Teachers can use assessment tools to evaluate final evaluations and provide feedback to reviewers.

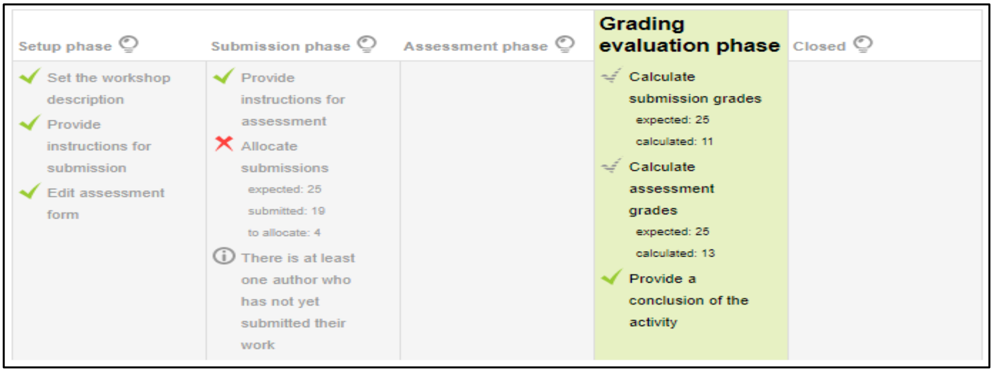

Figure 10. Grading evaluation phase

Source: LMS Moodle

The completion phase of the workshop is to save the marks received in the e-learning course log. Students will be able to view their work and assessments.

Another option is the use of peer evaluation using spreadsheets. The teacher in advance creates a joint spreadsheet, which provides a place for the presentation of the work, the name of the student, the work to be evaluated and the criteria for evaluation. An example of this method is a common table for assessment within the discipline "Innovative methods, technologies and monitoring of e-learning quality" for students in correspondence form (Figure 11).

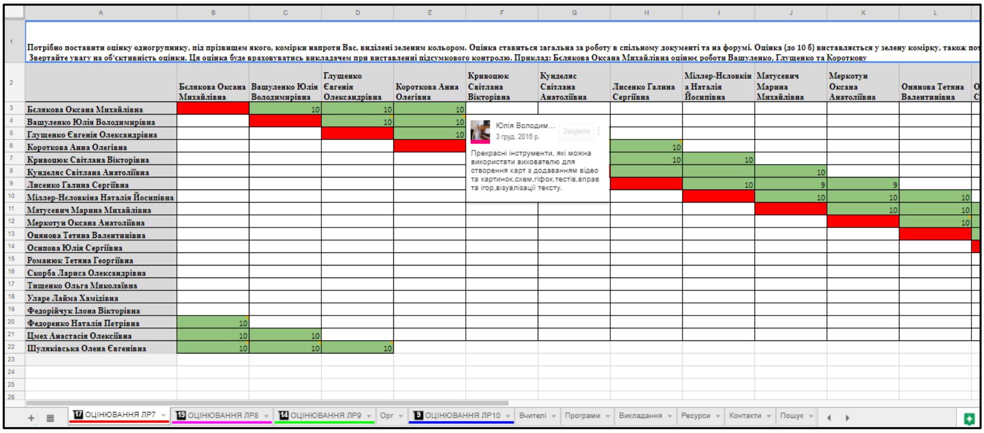

Figure 11. Joint Assessment Table

Source: Own Work

CONCLUSION

For the last decades, formative and peer assessment is actively being implemented in the world, especially in the EU, and is gaining momentum in Ukraine. Its peculiarities are assistance in the formation and development of the student's personality, which is achieved by providing effective feedback to the student, his active participation in the learning process, the constant adjustment of the educational process, student's motivation, and awareness of the responsibility for his / her own training.

The identified advantages and disadvantages of traditional and peer-to-peer evaluation suggest that the combination of traditional and peer evaluation will help to avoid the disadvantages of traditional assessment. In particular, the possibility of a teacher providing biased evaluation seen as a weak point of the traditional assessment can be solved when we use peer evaluation, which increases the transparency of the evaluation; such minuses of the traditional assessment as the evaluation of the final result, and students learn only from their mistakes, do not take into account the experience of others, are removed during peering evaluation and we have such advantages as analyzing the typical errors that should be avoided and the work of others can provide students with ideas on how to improve the quality of their own work. At the same time, it is not necessary to give up entirely the traditional assessment, because the disadvantages of peer assessment can be offset by the use of traditional assessment.

The implementation of ICT tools to support peer assessment can free the teacher from routine work, allow better organization of student and group work, and form peer assessment and self-assessment skills. The results of the conducted survey showed that 51.9% of scientific and pedagogical co-workers are ready to use peer evaluation in the educational process after more detailed acquaintance with its features. Among the wishes of the participants were the proposals on holding scientific and methodological seminars and workshops on the use of ICT tools to support peer assessment.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Bikov V.Y., 2010: *Fundamentals of Standardization of Information and Communication Competences in the Ukrainian Education System: Method. Pike* / [B. Y. Bikov, O. V. Belous, Y. M. Bogachkov and others.]; Per community Ed. V. Yu. Bykova, O. M. Spirin, O. V. Ovcharuk. Kyiv: Atika, 2010. 88 p.

Black P., 2000: *Formative Assessment and Curriculum Consequences*. Curriculum and Assessment. Scott David (Editor). Westport: Greenwood Publishing Group, Incorporated, 2000. Pp.7–24.

Black, P., 1998: *Testing: friend or foe? Theory and practice of assessment and testing*. Falmer Press, London.

Black, P., Harrison, C., Lee, C., Marshall, B., Wiliam, D. 2003: *Assessment for learning: Putting it into practice*. Berkshire, England: Open University Press.

Cowie B., B. Bell, 1999: *A Mode of Formative Assessment in Science Education*. / Bronwen Cowie, Beverly Bell - Assessment in Education: Principles, Policy and Practice. 1999. Vol. 6, n. 1 (1 March). Pp. 101–116.

Current Perspectives on Assessment [online] at https://www.eduweb.vic.gov.au/edulibrary/public/teachlearn/student/assessment_current_per.pdf (accessed 20 May 2017)

Earl, L., 2003: *Assessment As Learning: Using classroom assessment to maximize student learning*. Experts in Assessment series. Corwin Press, inc., Thousand Oaks, California.

Husen T., 2000: *Conversations in Comparative Education / Torsten Husen, Tjeldvoll Arild, Lingens Hans G. - Bloomington, IN: Phi Delta Kappa Educational Foundation*, 2000. - 181 p.

Intel® Teach Elements Collaboration in the Digital Classroom [online] at https://educate.intel.com/download/K12/elements/Collaborate_html/index.htm (accessed 20 May 2017)

June Ahn, Cindy Weng, Brian S. Butler: *The Dynamics of Open, Peer-to-Peer Learning: What Factors Influence Participation in the P2P University?* [online] at http://ahnjune.com/wp-content/uploads/2012/09/HICSS-final-draft.pdf (accessed 20 May 2017)

Kitsantis, A., Reisner, R. A., & Doster, J., 2004: *Developing self-regulated learners: Goal setting, self-evaluation, and organizational signals during acquisition of procedural skills*. The Journal of Experimental Education, 72(4), 269-288.

Lokshina O., 2009: *Innovations in assessing academic achievement of students in school education in the European Union*. Comparative-pedagogical studios. - 2009. - No. 2. - P. 107-113.

Makoveeva V, 2013: *Network Interaction as a Mechanism for the Integration of Education, Science, Production And Evaluation of Its Effectiveness*: Diss. Cand. Economics Sciences. Tomsk. 2013. 237 pp.

Marzano, R. J. 1998: *A theory-based meta-analysis of research on instruction.* Aurora, CO: McREL. [on-line] at www.mcrel.org/PDF/Instruction/5982RR_InstructionMeta_Analysis.pdf (PDF; 172).

Morze N, 2003: *System of methodical preparation of future teachers of informatics in pedagogical high schools*: Diss. PhD hab. Ped. Sciences 13.00.02 / Nataliia Morze. Kyiv, 2003. 531 p.

Morze N., Barna O.V., Vember V., 2013: *Forming Evaluation*: From Theory to Practice // Informatics and Information Technologies in Educational Institutions. - 2013. - № 6. - P. 45-57.

Morze, N, Buynitskaya, O.P., Varchenko-Trotsenko, L.O. 2016: *Creating a modern e-learning course in the MOODLE system*.

Morze, N, Varchenko-Trotsenko, L., 2014:. *Formation of cooperation skills among students using Web 2.0 services*. Educational Technologies and Society: International Journal / East European Subgroup, Russia (17-1), 637-649.

Morze, N., Varchenko, L., Smyrnova–Trybulska, E. 2015: *Ways of formation of effective students' collaboration skills based upon the usage of WBT*. International Journal of Web Based Communities, 11(1), 25-41.

Noonan, B., & Duncan, R. 2005:. *Peer and Self-Assessment in High Schools*. Practical Assessment, Research and Evaluation, 10(17), 18. Retrieved from http://pareonline.net/pdf/v10n17.pdf (PDF; 8).

Peer 2 Peer University, https://www.p2pu.org/en/ (accessed 20 May 2017)

Perrenoud P. , 1991: *Pour un approche pragmatique de l'evaluation formative*. Mesure et evaluation en education. 1991. Vol. 13, No. 4. Pp. 49–81.

Schunk, D. H., & Zimmerman, B. J., 1997: *Developing self-efficacious readers and writers: The role of social and self-regulatory processes*. In J. T. Guthrie & A. Wigfield (Eds.), Reading engagement (pp. 34-50). Newark, DE: International Reading Association.

Wiggins, G. 1990:. *The case for authentic assessment. Washington*, DC: American Institute for Research.

PROS AND CONS OF DISTANCE EDUCATION AT THE UNIVERSITY OF HUMANITIES AND ECONOMICS IN LODZ AS PERCEIVED BY THE STUDENTS - A CASE STUDY

Lucie Zormanová
UJAK, Praha
l.zormanova@centrum.cz

Abstract: *The article deals with advantages and disadvantages of distance study in higher education. The article presents the results of research focused on examining the advantages and disadvantages of distance study at the University of Humanities and Economics in Lodz as perceived by its adult students.*

The aim of the research was to determine the subjective satisfaction of students with their distance studies. To gather the data we decided to use qualitative research with semi-standardized interviews.

The research sample consisted of students of Master´s degree program, who had previous experience with a combined form of studies. They had studied in a combined form of study in a Bachelor's degree program. All students are older than 30.

Keywords: AHE, distance study, e-learning, adult students

INTRODUCTION

Although employees are required to develop their competences, frequently employers are not willing to let their workers undergo education activities during working hours, even though they realize the importance of their employees further education. One of the possibilities to solve this problem is through e-learning education, which is steadily becoming more popular. Distance learning is also suitable for people with disabilities, mothers on maternity leave, and it is also suitable for people living in regions with insufficient transport infrastructure, etc. (Zormanová, 2016)

1.THEORETICAL BACKGROUND

Distance education is a new form of education which takes place when a teacher and students are physically separated and they use technology for making connection between them (Heinrich, Molenda, Rusell, Smaldino, 2002). Distance education is a formalised teaching and learning system which provides opportunity to study without the use of classroom or face-to face interaction with teachers.

Distance education has a lot of advantages, including its own pedagogical merit, leading to different ways of conceiving knowledge generation (UNESCO, 20002).

Distance education increase opportunities for learning and training, improves cost effectiveness of educational resources. There are also some other advantages of distance education as flexibility, balancing inequalities between age group, limitation of geographical aspects or physical disabilities. One of the most important advantages of distance learning is its convenience because students can easily study at home, which has a good influence on the combination of education with work and family life. Distance learning can also increase interactions with students, mainly in the case of introverted students (Franklin, Yoakam, Warren, 1996). In daily life, students more and more often prefer studying internet sources to traditional handbooks (Morze, Spiwak, Smyrnova-Trybulska, 2015). Interactive online courses have a positive influence on performance in terms of knowledge acquisition than using traditional education forms (Leszczyński, Gotlib, Kopański, Wejnarski, Świeżewski, Galązkowski, 2015). It seems that it would be good to provide online courses which replace conventional lectures (Roszak, Kołodziejczak, Kowalewski, Ren-Kurce, 2016).

2. A CASE STUDY - AHE (THE UNIVERSITY OF HUMANITIES AND ECONOMICS IN LODZ)

There are distance education forms of bachelor and master study programs and courses of lifelong learning and complementary studies taught at AHE (The University of Humanities and Economics in Łodz) thanks to the Polish Virtual.

The following bachelor study programmes were offered at AHE in the academic year 2016/2017 in the distance learning form: Administration, Journalism, Economy, Philology, Finances and Accounting, Graphics, Informatics, Economy, Culturology, Pedagogy, Political Science, Psychology, Sociology, Nursing, International Relationships, Recreology, Logistics.

The following master study programmes were offered at AHE in the academic year 2016/2017 in the distance learning form: English Philology, German Philology, Polish Philology, Graphics, Material Engineering, Pedagogy, Political Science, Sociology.

As part of the complementary studies the following study programmes were offered at AHE in the academic year 2016/2017: Tax Consultancy; English Language

Didactics for Kindergarten and First Grades of Primary School; Physics for Primary and Grammar Schools; History for Primary and Grammar Schools; Informatics with E-Learning Elements; Teaching for Kindergarten and First Grades of Primary School; Mathematics for Primary and Grammar Schools, Ethics Teaching; Safety Education, International Trade, Financial Audit; Logistics; Pedagogy for People with Limited Legal Capacity; Neurologopaedics, Pedagogy, Resocialization, Work with Pupils with Specific Education Needs, Therapy and Education of Children and Youth with Autism and Asperger Syndrome; Psychology of Sport; Psychology in Business (Akademia Humanistyczno-Ekonomiczna w Łodzi, http://www.ahe.lodz.pl/akademia/uczelnia)

2.1 Organization of Distance Studies at AHE

Teaching is organized into 2–3 attended lectures at the university during the semester and the remaining study is done through an online environment. The attended lectures are planned face-to-face meetings between students and teachers. This usually consists of the introductory meeting before the start of the course, where students are informed what is to be expected from them and get acquainted with distance learning methodology. Further on, later in the semester, there is another meeting in order to reactivate and motivate students and help solve their study problems. Finally there is an evaluation meeting at the end of the course (Akademia Humanistyczno-Ekonomiczna w Łodzi, http://www.ahe.lodz.pl/academia /uczelnia).

The e-learning environment under (in Polish: Platforma zdalnego nauczania PUW) is one of the largest in Poland and operates 24 hours a day, seven days a week (Akademia Humanistyczno-Ekonomiczna w Łodzi, http://www.ahe.lodz.pl /akademia/uczelnia).

The course of the distance study is overseen by the association called Polish Virtual University (PUW), which is comprised of methodologists, information scientists, graphic artists and editors. The association helps academia teachers in creating distance learning materials.

Distance learning is carried out online. The online environment features didactic materials used for studying: distance study aids in textual and audiovisual form, textbooks written specifically for distance studies, discussion boards and chat rooms. Students also keep receiving tasks from their teachers in this online environment; they complete the tasks inside the environment and also receive feedback there. Another feature of the online environment is the creation of tests and evaluation of students. The tests are immediately evaluated by a computer program, which also assigns a mark for the test. Teachers may keep testing the knowledge of students throughout the course with tests whose results may or may not be counted in the final evaluation of the class. There is also a messaging system inside the online environment, where students and teachers can message each other.

3. THE RESEARCH METHODOLOGY

The aim of the research was to determine the subjective satisfaction of students with their distance studies. We focused on their motivation to study in the distance form, map the positives and negatives of this form of study as subjectively perceived by the respondents themselves.

The aim brought about the following research questions:

- What are the causes for students selecting the distance form of studies?
- What are respondents' motivational factors to study?
- What advantages and disadvantages do respondents see in distance studies?

3.1 Research Methodology

To gather the data – information answering the specified questions – we decided to use qualitative research with semi-standardized interviews.

Open coding technique was used to analyse the data. Analysed interviews were divided into units, which in this case mean words, sentences or paragraphs based on their meaning; the units are therefore semantic wholes. Units were assigned their codes.

Once a list of codes has been created, their categorization could begin.

Categorization created the following categories:

- Reason to choose distance form of education
- Motivation to study
- Support from family, friends and others
- The positives of distance form of study
- The negatives of distance form of study

The technique of laying cards was used to evaluate individual categories; the categories are organized into an image, which serves as the basis for text compilation in a way that retells the content of individual categories.

3.2 Characteristic of the Research Sample

The interviews were carried out with Pedagogy students of the first year of master study program studied in distance form. There were ten respondents. All respondents were middle-aged, between 35 to 48 years old. Nine respondents were employed full-time; one female respondent was on a maternity leave. Nine respondents have children. All respondents had previous experience with a combined form of study, therefore being able to compare both forms of studies

4. RESEARCH RESULTS

4.1 Reason for choosing the distance form of study

Respondents stated choosing this form of study due to time constrains, because combining study, family and work responsibilities is difficult and the distance form of study enables them to study at times when it is most suitable for them.

"This form of study seemed the least time consuming, which I appreciate as a full-time employee. I do not waste time by unnecessary travels." (Respondent A)

One female respondent choose this form of study due to health issues.

"I choose this study also because of health reasons, since my health caused problems during regular studies." (Respondent B)

4.2 Support from Family, Friends and Others

Respondents frequently mention that they are able to manage the difficulties of studies due to the help from their friends and family, who motivate them to study and provide support during hard times of study set-backs. The family also represents a significant help in harmonizing study, work and family duties, sometimes even providing financial help.

"I am also motivated by the responsibility to my whole family, who greatly participates and actually allows me to study (especially my husband and parents helping with babysitting, and my parents helping financially, because as I am currently on a maternity leave, my studies are demanding on my relatives...). My sister, who obtained a PhD degree, is also a big motivation for me as I would like to be at least a little like her, plus she encourages me, supports me and gives me energy, because I often don't believe in myself and am afraid that I will fail..."(Respondent D)

Frequently, the respondents state that family or friends supported them to begin studying. They boosted their self-confidence, and provided them with the sense that they could succeed when in doubt. Their scepticism about their study abilities was caused by previous study failures.

"I studied at university right after the grammar school, sadly unsuccessfully, which I never truly came to terms with. The idea of going to study again was ever-present, but I was afraid of another failure... But I wanted to prove it to myself. So when I discovered a field that was interesting for me, it was by chance that my always optimistic sister (unlike me) pushed me in the right direction at the right moment... And to be continuing at the master level I would have not thought possible a couple of years ago, since my original goal was 'only' the bachelor degree..." (Respondent E)

4.3 Positives of Distance Studies

Since the respondents of this research already had previous experience with other forms of studies (full-time and combined), they could compare the time demand of all forms of studies. The respondents knew how time-consuming it is to study, therefore they perceived the saved time during distance studies in comparison to the combined or full-time studies. All respondents agree that the most prominent positive aspect of distance education is the saved time and costs connected with it, which is caused by not having to commute to school as often as during combined studies.

”The main positive aspect is the time saved by not having to commute to school. This reflects on saved costs as well.” (Respondent G)

Since most of the respondents are employed full-time, with the exception of one female respondent, who is on a maternity leave, they found the distance form of study highly suitable. Respondents appreciate the possibility of studying whenever it is suitable for them, a specific advantage of distance studies. The significant time-saving is perceived to be caused by the fact that studying can be done at home, during suitable times, without having to spend more time during ~~at~~ lectures

“Less time spent at school, more time for other matters. More time for self-studying…” (Respondent H)

Since most of the respondents also have children, they also have to harmonize their family, work and study responsibilities. They appreciate the fact that it is possible with the distance form of studies. All respondents agree they have better conditions to harmonize all three types of responsibilities owing to the distance form of study; due to being able to plan the time of studying according to their own schedule and by saving time that would otherwise be spent commuting to school. Respondents perceive this advantage of distance study more strongly, because they had the experience of harmonizing family, work and study responsibilities in a combined form of studies, which they all went through in their bachelor study programmes.

“The advantage for me is that I don’t have to commute to school, which was very demanding to do when I worked and studied bachelor programme in the combined form. School was in the afternoons on weekdays, I had complications finishing early at work, had to make up for the missed hours by working on weekends, and I also had to find someone to pick my daughter up from kindergarten…” (Respondent D)

Respondents also stated that the positives of the distance form of study is quality and effective distance study materials and precisely defined requirements to successfully complete a subject.

“Well and clearly prepared study aids and materials. Clearly and precisely defined requirements. The chance of individual consultations with lecturers. That’s concerning my current studies at AHE.” Respondent I)

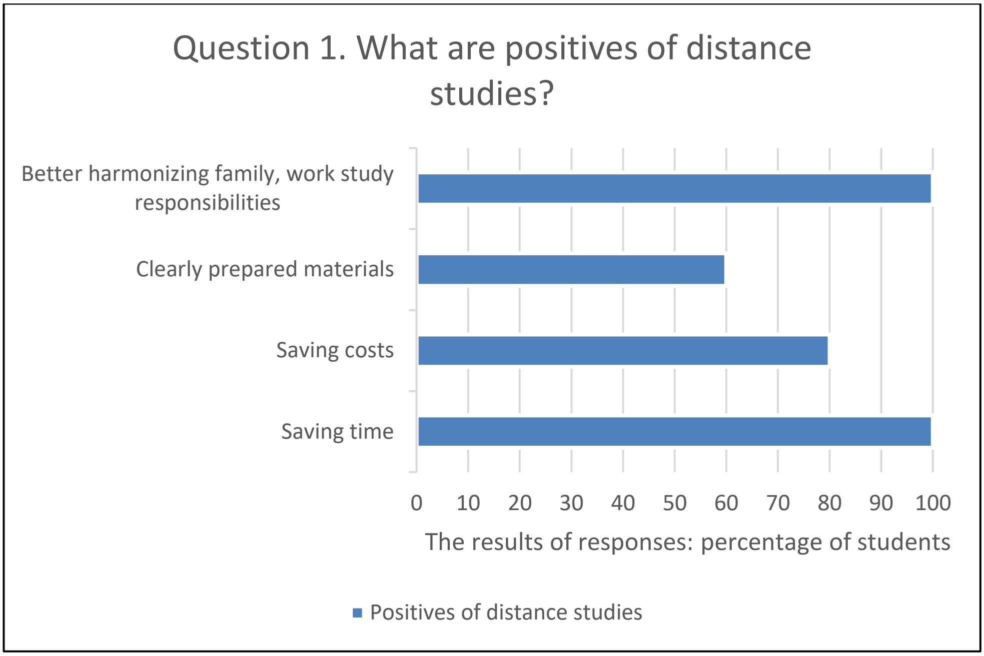

Figure 1. Positives of distance studies (in percentage)

Source*: Own Research*

4.4 Negatives of Distance Studies

The negative aspect mentioned by most respondents was the feeling of social isolation during studying. Most students see the absence of personal contact with classmates and teachers, and absence of direct conversation with teachers, as the negative aspect of distance form of studies.

"I see negatives in the fact that I'm in less contact with my classmates – a personal contact that is" (Respondent J)

"Though I don't have to commute to school, I miss the personal contact with my classmates and teachers. I miss the personal touch and the fact we can't discuss tasks, requirements of individual subjects, give and get help, support each other… Also limited contact with teachers is a disadvantage for me. I learn better when hearing about a topic, making notes and clarifying things with questions. I realize I can contact anyone via e-mail and ask for help, but I prefer personal contact, even with the price of having to visit school more often…" (Respondent D)

This absence of contact with other students and teachers is frequently connected with motivation to study – students can motivate each other during meetings, teachers motivate students during lectures and seminars; these are not as frequent in the distance form of studies as they are during combined or full-time studies.

"I perceive few negatives. Maybe the limited contact with the university environment, which can also motivate, and with other colleagues, as well as direct feedback." (Respondent I)

Students frequently realize, and perceive this as a negative aspect, the hardships of self-organizing their studies. They face issues with determination to self-study, fight procrastination.

"More time to self-study obviously leads to procrastination." (Respondent E)

Other respondents do not perceive any negatives of the distance form of study; they find it fully satisfying.

"None for me." (Respondent A)

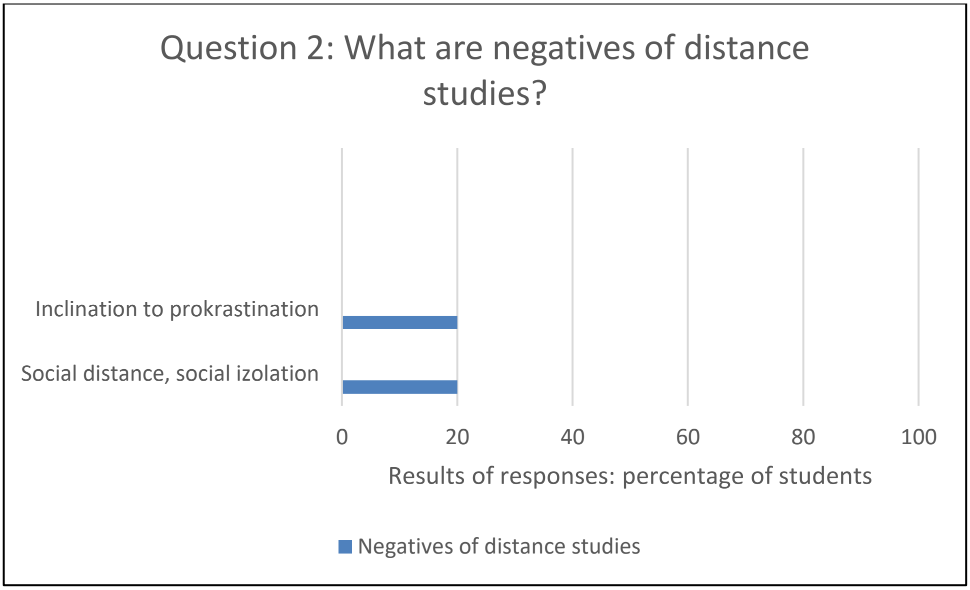

Figure 2. Negatives of distance studies (in percentage)

Source*: Own Research*

5. RESEARCH RESULT SUMMARY

Research results show that the motivation of all respondents to study, to begin and continue studying, was their current or possible future career or change of job. Although jobs and job positions were frequently mentioned, they were not the only driving force behind studying. Respondents also strived to increase their professional competences, cared for self-development. Respondents felt the need to educate themselves and gain new knowledge that they could utilise in practise.

Certain motivation for students is also the support of their family and closed-ones, who encourage them, and help them overcome obstacles and study problems, and also help them to harmonize family, work and study responsibilities.

Since the respondents had previous experience with the classic combined form of studies, they could compare that to the current distance form, and agree that the distance form of studies is less time consuming and can be better harmonized with family and work responsibilities. Students also valued the effectiveness of study materials and clarity of requirements to successfully finish individual subjects in their current distance studies.

Some respondents perceive the social isolation as a negative aspect that lessens their motivation. Social distance causing the feeling of social isolation implies students have to deal with limited feeling of solidarity, with loneliness, both of which negatively influences their success chances and may lead to quitting the distance studies. Another negative aspect mentioned by students was a higher inclination to procrastinate, since study activities were not organised.

CONCLUSIONS

The article described the subjective satisfaction of students with their distance studies. We dealt with students´ motivation to study in the distance form and the causes for students selecting the distance form of studies, we mapped the positives and negatives of this form of study as subjectively perceived by the respondents themselves.

Research results showed that students' motivation to study was their current or possible future career or change of job and also we found that students selected the distance form of studies because of health reasons and also because this form of study seemed the least time consuming.

Research results showed that students valued the fact that the distance form of studies could be better harmonized with family and work responsibilities. Students also valued the effectiveness of study materials.

Research results showed that distance education has some disadvantages. Some respondents perceived the social distance and social isolation. Some students were more inclined to procrastinate when studying in this form.

Based on the research results we created some recommendations.

The following recommendations to improve distance studies can be provided based on the research results:

1. Students evaluate the distance form of study mostly positively. Adult students perceive this form of study as less demanding in terms of harmonizing family, work and study responsibilities in comparison to the combined form of study. We therefore recommend using the distance form for adult students more prominently. We recommend to provide the distance form of study over the combined one. Distance form of study, as demonstrated in the research, is a highly suitable form of studies for adult

students, who frequently have to harmonize family, work and study obligations. The distance form of study feels adequate for them because they are able to fulfil their study obligations at times that suit them. Furthermore, they save their time that would be otherwise spent commuting to school.

2. As a negative aspect, students mentioned little contact with the teacher and they regretted not being able to discuss individual tasks and study requirements personally with the teacher. We recommend eliminating this problem by organizing two meetings. The first, introductory one, to present students and teachers, study plans of individual subjects and requirements for their successful completion. The second, final one, to evaluate the course.

   Besides meetings we recommend frequent e-mail contact between students and teachers, and allowing students to get in touch with teachers over the phone.

3. Since a number of respondents experienced social isolation and problems stemming from social distance, this problem needs to be eliminated. A number of respondents felt a low amount of communication with other students and with teachers as a negative aspect and connected it with decreased motivation to study. The problem can be remedied by frequent contacts between students and teachers and between students themselves; here we recommend using an online forum, on which once a week or biweekly, teachers can post a topic for discussion, ideally based on a topical article or event, together with questions that students can answer.

4. Inclination to procrastination can be eliminated by assigning study tasks or shorter seminar papers to students once per week or once per two weeks. The study tasks or seminar papers are always connected with one of the covered topics or individual topics. Students must complete these tasks and send their solutions to the teacher for evaluation and feedback. Students are evaluated based on these tasks. Similarly to study tasks, students send their assigned seminar papers to the teacher and get feedback on them.

   Tasks or seminar papers assigned to students in this way provide feedback to the students on the partial results of their study work and motivate them to learning. Effectively refined feedback is the basic prerequisite to secure a transfer. It is important to not have a long pause between sending the task solution or seminar paper and receiving the feedback from the teacher as that would demotivate students.

REFERENCES

Akademia Humanistyczno-Ekonomiczna w Łodzi, http://www.ahe.lodz.pl/akademia/uczelnia, (accessed 14 June 2017)

Franklin N., Yoakam M., Warren R., 1996. *Distance learning: a guide book for system plannning and implementation.* Indianapolis: Indiana University.

Heinrich R., Molenda M., Russel J., Smaldino S., 2002: *Instructional Media and Technologies for Learning*. Englewood Cliffs: Prentice Hall, Inc. ISBN 13: 978-0130305367

Leszczyński P., Gotlib J., Kopański Z., Wejnarski A., Świeżewski S., Galązkowski R., 2015: *Analysis of Web-Based Learning methods in emergency medicine: randomized controlled trial*. Arch Med Sci, pp 1-8. doi: 10.5114/aoms.2015.56422

Morze N., Spiwak S., Smyrnowa-Trybulska E., 2015: *Designing a Modern Cloud-Oriented Virtual Personalized Educational Environment.* New Educational Review, Vol. 40. No. 2, pp. 140-154, ISSN: 1732-6729.

Roszak M., Kołodziejczak M., Kowalewski W., Ren-Kurc A., 2016: *Implementation of e-learning portal for academic education and lifelong learning*, Int. J. Continuing Engineering Education and Life-Long Learning, Vol. 26, No. 2, pp. 135-152. ISSN 1560-4624.

UNESCO, 2002: *Open and distance learning – Trends, policy and strategy considerations.* Paris, France, UNESCO.

Zormanová L., 2016: *Distance education in European countries* In: E-learning. E-learning Methodology – Implementation and Evaluation edited by Smyrnova-Trybuslka E., vol. 8., Katowice-Cieszyn: Studio Noa for Universities Silesia in Katowice. 19-28 p. ISSN 2451-3644.

Note: I hereby confirm that the manuscript to be published in the Monograph is my own original work, and it has not been printed before in any other sources.

DIDACTICAL ASPECTS OF TEST CREATION: THEORETICAL COMPONENT

Zoya Voronova, Irina Holter, Maryna Romaniukha
Dniprovsk State Technical University (Kamianske, Ukraine)
Kamianske, Dniprobudivska st.2,
zoya.voronova2@gmail.com, rinulia@ukr.net, romanuks@ukr.net

Abstract: *The article deals with the pressing problem of test evaluation of students. The paper analyzes advantages and disadvantages of students' knowledge test evaluation. Test evaluation of knowledge allows to create effective models of student assessment, using current approaches and facing challenges of studying foreign languages. Test control is used to set the level of achievement of academic groups and individual students, to analyze various forms and methods of teaching and hold final evaluation.*

Keywords: control of knowledge, supervisory and reference computer training programs, test, classification of tests, test signs, test criteria, types of test questions.

INTRODUCTION

The introduction of a new system of managing higher educational institutions and stricter requirements for the quality of student training demand to search for more effective means of evaluation. Besides, optimal organization and monitoring of the quality of educational process is of great importance too. Tests, ratings, modern means of pedagogical control and evaluation can improve both the quality of student's training and the teaching, methodological, educational activities of teachers and management activities of the administration of higher educational institutions.

In the conditions of a significant reduction of class hours it is necessary to introduce new methods for managing educational and cognitive activities of students. The most characteristic type of teaching process control is feedback management. In order to manage feedback professors need efficient evaluation methods, which permit to see if all the planned activities were successfully fulfilled. For the implementation of effective feedback, it is vital to hold regular check and evaluation. Realization of these requirements in practice can be achieved only with the help of tests that are not very time-consuming both for the students and for the teachers.

Relevance of the problem. The method of testing with the use of ICT as one of the methods of pedagogical control is one of the most scientifically grounded among means of knowledge evaluation of students. It is widely used all over the world. Currently, standardized testing technologies are distributed in the educational system of Ukraine. The theory of educational evaluation and pedagogical testing technology are being widely introduced into higher education practices.

Previous research. As the analysis of scientific works on the research problem shows, the question of evaluating students' progress in terms of implementing test control of knowledge is one of the most controversial. To date there are many different approaches, both general and subject-oriented, which take into account the specifics of individual disciplines.

Many scientists, such as E. Baker, R. Henig, V.Reddy, B. Bitinas, V. Bespalko, A. Kokchetov, V. Maksimov studied the methodology of knowledge assessment and argued its efficiency. Of particular interest are papers devoted to knowledge assessment by D. Steiner, M. Kolen, R. Brennan, G. Fulcher., F. Davidson, V. Avanesov, N. Volkova, K. Korsak, I. Pidlasiy, N. Talizina, H. Tsehmistrova, M. Chelishkova, whose contribution has shaped the methodological foundations of our study.

The purpose of this article is to argue the approaches to organizing test assessment of students' achievement in the conditions of credit-modular study of philological disciplines that are in accordance with the provisions of the current legal documents and are oriented to take into account the nature of the educational and cognitive activity of future teachers and interpreters.

Uniqueness of the issue. The goal of present research is to investigate various types of test formats and ways of testing, in order to see how the theory could be applied in practice. The newness of the research is that it generated and summarized recent practice in the branch of testing. This article attempts to look at the importance of classroom assessment and evaluation advantages. The methodology of this paper is a descriptive approach, using classroom experience and relying on other research carried out in this regard. Classroom assessment and evaluation are highly concerned with qualitative judgments that are used to improve students' knowledge and learning. Assessment and evaluation also give teachers useful information about how to improve their teaching methods. Evaluation goes beyond students' achievements and language assessment to consider all aspects of teaching and learning.

1. THE ROLE OF COMPUTER TESTING IN EDUCATIONAL INSTITUTIONS: THEORETICAL REVIEW

Much work is being done in many countries to expand the scope of computer testing in educational institutions. For example, several states in the United States have introduced or are planning to develop and implement computer testing in response to federal government testing requirements to assess the performance of educational institutions and teachers (Fetisov 2011; Bateshov 2011).

Based on this, testing in pedagogical science is considered as a method of pedagogical diagnostics, besides, the academic community study the differences of the test from other forms of assessment, different approaches to the classification of tests are determined. The most common is the classification proposed by Norman E. Gronlund, who distinguishes the incoming testing; formative and diagnostic testing; thematic, final, cross testing and evaluation of residual knowledge. This classification is also respected by Russian researchers V. Zvonnikov, M. Cheleshkova, A. Mayorov, and others.

There has been a lot of researchin the field of testing all over the world over the last 10 years. M. Kolen and R. Brennan (Kolen, Brennan 2014) consider the role of tests very useful and important, especially in language learning. It is a means to show both the students and the teacher how much the learners have learnt during a course. Moreover, according to them, tests could be used to display the strong points and weaknesses of the teaching process and help the teacher improve it. They can demonstrate what should be paid more attention to, worked out ~~on~~ and practised. Furthermore, the tests results will display the students their weak points, and if carefully guided by the teacher, the students will be even able to take some remedial actions.

R. Henig (Henig 2013) believes that students learn more when they have tests. According to his works, tests decrease the practice and instruction time. What he means is that the students are as if limited; they are exposed to practice of a new material, however, very often the time implied for it is strictly recommended and observed by a syllabus. That denotes that there will be certain requirements when to use a test. Thus, the students find themselves in definite frames that the teacher will employ. Nevertheless, there could be advantages that tests can offer: they increase learning, for the students are supposed to study harder during the preparation time before a test. He emphasises the idea that the learners study harder for the classes where they are tested thoroughly and claims that the students want and expect to be tested.

L. Shepard (Shepard 2013) thinks that too much testing could be disastrous. It can entirely change the students' attitude towards learning the language, especially if the results are usually dissatisfying and decrease their motivation towards learning and the subject in general.

D. Steiner (Steiner 2013) assumes we should not forget that the tests when administered receive less support from the teacher as it is usually during the exercises in a usual language classroom. The students have to cope themselves; they cannot rely on teacher's help if they are in doubt. During a usual procedure when doing various activities the students know they can encounter the teacher's help if they require it. They know the teacher is always around and ready to assist, therefore, no one is afraid to make a mistake and try to take a chance to do the exercises. However, when writing a test and being left alone to deal with the test activities, the students panic and forget everything they knew before.

G. Fulcher and F. Davidson (Fulcher, Davidson 2007) think that students' encouragement is a vital element in language learning. Another question that may emerge here is how to reach the goal described above, how to encourage the students.

So, we can speak about the tests as a tool to increase motivation. However, having failed for considerable number of times, the student would definitely oppose the previous statement. Hence, we can speak about assessment and evaluation as means for increasing the students' motivation

Besides, there are works that touch upon computer tests and their role in teaching foreign languages: J. D. Brown (Brown 2008), T. L. Chiu, H.C. Liou, and Y. Yeh (ChIu, Liou, Yeh 2007), T.F. McNamara and C. Roever (McNamara, Roever 2006), M. Takimoto (Takimoto 2009), K. Zechner, D. Higgins, X. Xi, D.M. Williamson (Zechner, Higgins, Xi, Williamson 2009)

The main characteristics of tests as defined by modern testing science are the following: validity (conformity of the used materials to the objectives of assessment); reliability (continuity of results of test control with repeated use); comprehensiveness (the scope of study material presented in the test); standardization (setting the single procedure for conducting and summing up the results of testing) (Shymkova 2007; Baker 2013; Kane 2013).

The separate kind of tests are multimedia tests – they are computer testing programs created using a whole arsenal of multimedia, with a combination of text material, audio and video information, photographs, painting reproductions, animations, and the like.

The analysis of scientific and pedagogical literature (V. Avanesov, V. Kuznetsov, A. Mayorov, Z.Slepkan, etc.) showed that the basic conditions necessary to hold test evaluation are:

- taking into account the classical and modern test theory: on the basis of test theory and modern methods of test design it is possible to provide reliability, validity and efficiency of assessment; it is also important that test control is not limited to evaluating student knowledge; tests help assess the entire students' educational activity, in particular the dynamics of their overall development, the formation of special skills and abilities, activity, cognitive interests and creative abilities;

- professional interest and creative attitude of the teacher to the organization and management of educational process. According to V. Avanesov, "tests can be effective only in such an educational process where the teacher ... becomes a developer of new software and methodical tools, the organizer of the process of self-education of students. Training should begin with the entrance test evaluation, be accompanied by self-assessment and end with a final test" (Avanesov 1998);

- active participation of students in the organization and implementation of their own educational and cognitive activities within the learning process by self-assessing the results of their learning.

In comparison to traditional forms of assessment, computer testing has several advantages:

- prompt receipt of test results and freeing the teacher from the labour-intensive work on the processing of test results;

- objectivity of assessment;

- computer testing is more captivating compared to traditional forms of polling which creates positive motivation for students;

- improving the efficiency of the teaching staff (Avanesov 1998; Henig 2013; Fetisov 2011; Kuznetsov 1999; Shepard 2013; Shymkova 2007).

However, despite some achievements, the problem of diagnosing the academic achievements of future philologists through testing has not yet received a thorough study and scientific synthesis.

We see a pedagogical test as a system of tasks of a specific form, interrelated by the course material with increasing complexity, promoting to evaluate the structure and measure the scope of knowledge and other characteristics of the individual.

Typically, a test is a standardized method for determining the level and structure of students' knowledge. In this kind of test, all participants receive the same tasks, under the same conditions and with the same rules of assessment of responses. This method allows us to range participants according to the level of their knowledge and on this basis, to objectively determine the place in the group (or rating) of each student.

Unification and standardization of the structural representation of test tasks is especially needed to let the students understand the instructions fully, to objectively evaluate the test results, to use ICTs to hold the assessment and analyze the test tasks.

The form, type and kind of test tasks affect their structure, the principles of content design, determine the level of skills and professional training of students. Therefore, it is necessary to rely on some general principles for constructing test tasks, regardless of the type of specific discipline they will be created for (Mereshchuk, Barkhayev, Stadnik 2006; Steiner 2013).

The test task is an integral part of the pedagogical test, which meets the requirements of technological capacity, form and, moreover, statistical requirements: the specified complexity.

Test tasks can be divided into two groups: closed - tasks with a variety of options; tasks with alternative options; the tasks with multiple choice; tasks for matching correspondences; tasks for establishing the correct sequence and open ones - the open tasks; add-on tasks.

It should be noted that not all types of tests allow you to use a computerized version of programmable assessment. Let us define them. An open task type, or, simply speaking, keyboard input - is a very powerful tool when checking various kinds of terms, constants, dates. However, its implementation, as a rule, is mathematically complex and therefore most of the developers skip them. The problem is, first of all, that the phrase entered must be subjected to a syntactic, and ideally, semantic analysis that simulates the variants of the possible text responses of the person who answers the test. In addition, the student can make an automatic mistake and in most areas of knowledge, such machine errors can't be considered an error, which requires a very flexible implementation of computer logic (Avanesov 1998; Koh, Reddy, Chatterji 2014; Kordon 2012; Kuznetsov 1999). Besides, we need to mention that a language learner can enter various synonyms that may not be provided by the database developer and at the same time can be absolutely or partially correct.

It is implied that there may be several possible answers in an open question. There are also a number of variations to open questions.

1. Enter multiple responses in a certain sequence. It can be used in questions demanding the narration of strict sequence of any operation. The type of question is as difficult to program an open one, it is complex in designing and causes certain difficulties for students, since it requires not only error-free input of answers, but also an error-free reciprocal arrangement. However, despite its rather rare application, this type is indispensable and is a powerful means of determining the level of knowledge of students in matters such as the sequence of the transformation of matter in chemistry, the sequence of actions of various types of repairs, etc.

*2. The selective type of question.*This is a classic variant, which most developers consider necessary and sufficient for computer testing. In this type of question, one or more correct answers from the proposed ones can be taken into consideration. Some theorists draw a dividing line between these two varieties of questions, but from the point of view of formal logic, these varieties are absolutely equivalent. Computer implementation of this type is incredibly simple. Perhaps it is precisely what makes it a popular choice in various existing testing programs. For the implementation of this type, it is sufficient to have basic knowledge in any programming language or in programmable office systems such as Excel or Quattro.

In the selective type of question, there are also varieties.

1. An alternative type is the simplest form and assumes a ready-made answer already in the text of the question. It is only possible to specify whether the answer is correct or not (answer "Yes or No"). In spite of its simplicity, this type can be successfully used in a few areas of knowledge.

2. Consecutive type of question. It is the most difficult for students, although quite simple in implementation, it gives the teacher a powerful tool for evaluating not only specific knowledge but also logic.

The open or closed form of test tasks also determines the level of development of students' mental activity. This requires constructing tests that use educational elements that develop three levels of cognitive-mental activity - the level of analysis and synthesis, algorithmic and intellectual-search levels. A variety of test tasks provides a depth of perception of the content of discipline provided that we wisely select the elements of the discipline to diagnose the level of knowledge through testing. Undoubtedly, it is necessary to compile several test-tasks of various types for each study topic in order to form a bank of test tasks of the corresponding course.

The development of test-tasks and tests as means of diagnosing the level of educational-professional training begins with the division of skills and knowledge, identified by the educational-qualification standards of philological degree. The required scope of foreign language skills can be represented by the modules of the disciplines, which are given in the curriculum of training. In turn, these modules are formed with the help of learning blocks. It is the mastery of these learning blocks which is evaluated by the testing of appropriate skills – those of structuring new ideas, conceptual-analytical and productive-synthetic ones. Therefore, the learning blocks must be clear-cut components of the curriculum, structured in a modular way (Baker 2013; Kane 2013; On conducting a pedagogical experiment 2003; Steiner 2013).

Systematic objective assessment, especially its ICT-based version is also an effective means of differentiating and individualizing the learning process based on the analysis of test results and increasing the motivation of students to systematically study independently during the school year. Students are actively involved in the organization and implementation of their own educational and cognitive activity through self-control and self-examination by testing the results of their independent work (Henig 2013; Kuznetsov 1999).

2. TECHNIQUE AND METHODOLOGY OF TEST DESIGN.

2.1. Division of the tests and their ones

According to the goal and importance in the educational process assessment tests are divided into the ones for formative and summative assessment.

Formative assessment is applied at all stages of learning and are designed to track the level of mastery of study material, fix it and recapitulate it. Their main goal is to identify gaps in students' knowledge.

Tests for summative assessment are carried out as some kind of summary of the work on the studied topics.

It is advisable to carry out tasks for formative assessment at different stages of the lesson (during brainstorming, when detecting the scope of students' perception of the study topics and during its consolidation), but not more than for 10-15 minutes.

As long as these tasks are formative, they should not be made too complicated. At this stage of assessment, it is necessary to use predominantly such test tasks as selective, sequential, or ordinal, constructive, schematic tests.

The data from thematic assessment informs the teacher about the level of students' learning material and indicates how wise the test design algorithms were. In order to ensure maximum reliability of the evaluation results and to check comprehensively how fully the topics were studied, the instructor must prepare a test with a large number of tasks. It should fully reflect the content of the topic, should give a balanced presentation of both the main theoretical material and practical problems. When preparing materials for modular control, the teacher must make them well-balanced in terms of complexity. To do this, developers should include tasks in approximately this proportion: 25% are easy tasks, 50% - average complexity, 25% - complex. This distribution will reflect the ratio of strong, average and weak students in the group.

When designing a test, one must take into account that the proposed tasks must be diverse in terms of content and form, they will not be monotonous, but will provide a permanent and steady motivation of students to work. It is not worth to limit the tasks by closed form, it is wise to offer to students open tasks too, where they have to write a complete answer to the question themselves.

The number of test tasks combined in one pedagogical test is determined by the term "Test Length" or "Test Volume". To assess students' knowledge in the process of express control (15-20 minutes) you can use a test with a maximum length of 15-20 test tasks; at modular control of knowledge and skills of students, designed for a whole lesson, it is required to include the maximum of 40-50 test tasks.

Specialists, for example, emphasize that the reliability and objectivity of the test check of knowledge and skills increases with the increase in the length (volume) of the test. In order for the tests to fulfill the above-mentioned functions, it is necessary to develop a test designed wisely from the didactic and substantive side, as well as to evaluate their compliance with the educational standard.

For the effectiveness of the thematic control of knowledge and skills of students through testing the teacher needs:

- to have at least four variants of test kits;

- to assign the number of points for correct answer to the given question for every task of the test and for the whole set of tests (the number of points in each variant must coincide);

- to have a key with variants of correct answers of test tasks in all types of tests,

2.2. Methodology of students' knowledge evaluation from test results.

Teachers can transfer the points received to 5-point assessment scale by assigning value to each task. For example, for each correctly performed task that verifies the knowledge of the theoretical material or task with the choice of one correct answer students can get 1 point, the task with the choice of several answers or finding correspondence - 3-4 points. Having obtained the total number of points, the teacher determines the intervals that correspond to the international standards of ECTS. The following distribution of points is accepted: from 100 to 90% of the points corresponds to high level; from 89 to 60% - sufficient; from 59 to 30% - average; from 29% and below - the initial one.

So, students can be evaluated with the highest score if all tasks are correctly performed, but also if their test results are very close to the best score. Thus, the student is given some opportunity to make a mistake, which he does not have during the traditional evaluation.

If the number of points obtained for the test by more than 50% of students is below the maximum, one should pay attention to the correctness of the test task, the relevance of its content to the test material.

For proper introduction of testing as a methodical form of educational process it is mandatory to make it systematic, to ascribe a roleto it in the general structure of studying and to develop methods of its use throughout the school year, not only during the course of thematic certification, but also at the lessons of studying and consolidating new material, which will be a good training for students, will help them get used to performing similar tasks. It is crucial for the students to successfully master the algorithms of performing test tasks of various types, levels of complexity and structure, to discuss test results, to identify typical mistakes and determine the ways to eliminate them. Only this approach to the implementation of test technologies will contribute to the qualitative development of their modern educational institution.

3. COMPUTER PROGRAMS FOR CREATING TESTS.

There is now quite a big market for computer testing programs. Let us discuss the most widely used and the most user-friendly ones.

"Test Designer 3.3" is a versatile knowledge test program that allows you to use an unlimited number of topics, questions and answers. The program supports five types of questions and suggests any types of tests. It is possible to support the tests with music, sounds, images and videos. Any data can be printed on the printer, exported to files of different formats (Word, Excel, Access, HTML, XML, Text file, Paradox, DBase, etc.). It also gives the opportunity to set the value of questions and answers, to limit the answers in time, assign a score after end of testing (the scale of assessments can be configured from 2 to 100-point system), check spelling. On a single computer testing can be conducted by several students independently of each other by entering the program under their own names.

"Tests designer" consists of three parts: "Editor" (designed to fill and edit the database); "Simulator" (created for testing procedure based on the database

"Editor"); "Results Administrator" (designed to analyze the test results). The program has many features in terms of combining multimedia: questions can include music, sounds, images, videos, formatted text of unlimited length. In addition, "Tests designer" supports the main types of test tasks of the closed and open type.

MyTestX is another well-known system of programs for creating and conducting computer testing, collecting and analyzing the results, evaluating test results on the scale indicated in the test (program can be downloaded for free from the address http://mytest.klyaksa.net).

The UniTest System Universal Test is another program to create tests, to hold testing (locally, on CDs, in conjunction with electronic tutorials, on a local network of educational institutions, etc.), as well as for a detailed analysis of test results.

The UniTest System program, as well as its predecessors, allows you to use all forms of test tasks: to choose one correct answer, select several correct answers from the proposed variants, set the match, set the sequence, enter a response from the keyboard or enter a free answer with keyword search. You can use formatting, graphics, audio and video files in the question texts. There is a system for automatic importing of already prepared test tasks from any Microsoft Word documents or plain text documents.

The UniTest System consists of 5 main modules: Editor, Test, Report, Settings and Monitor (Server and Monitor for testing in the network). In addition, the package includes UniTest Starter (Quick Launch) and UniTest Direct (Internet Recovery).

PowerPoint, which is part of the Microsoft Office Word suite, also offers a wealth of opportunities for creating multimedia tests and allows you to combine different kinds of information representation, apply hyperlinks and links.

4. OUTCOMES

It is very important to use theoretical recommendations in practice. Building up on elements of the above mentioned test platforms we developed our own program based on HTML-5. It is the latest version of Hypertext Markup Language, the code that describes web pages. It's actually three kinds of code: HTML, which provides the structure; Cascading Style Sheets (CSS), which take care of presentation; and JavaScript, which makes the things happen. The set of tests is for offline use, it allows for the use of multimedia, for instance, images, audio and video files to let the assessment reach audial and visual language learners.

Below are the types of questions with textual material that can be presented with our html-based testing program:

MULTIPLE CHOICE

Text comprehension:

THE LAWS OF HEALTH

There are certain laws of health which deserve particular attention and they are so simple that even a child can learn them. A constant supply of pure fresh air is indispensable to good health. To secure this, nothing impure should remain either within or near our homes, and every room in the house especially the bedrooms, should be properly ventilated every day. (4, c.400-401).

1. Who can learn laws of health?

a) adults b) children c) adults and children

2. What is indispensable to good health?

a) pure fresh air b) pure fresh water c) pure fresh carbon monoxide

3. What room in the house should be properly ventilated first of all?

a) kitchen b) bedroom c) living room

Grammar test:

1. This is the …… task I've ever done.

A. ease B. easiest C. easer

2. There aren't …….. slices of pie left.

A. more B. much C. a lot of

3. It was the book ……… you had left on the bench.

A. which B. whose C. what

4. They can ……… everything at the moment.

A. see and hear B. are seeing and hearing C. saw and heard D. were seeing and hearing

MATCHING

Establish correspondence between the parts:

1. They were about to leave a) and luckily I was at home.

2. He called on me last Saturday b) he will soon come around.

3. Brian began on his third painting c) when you rang.

4. Don't worry about the chairman d) for the exhibition.

Match proper text to image (Figure 1):

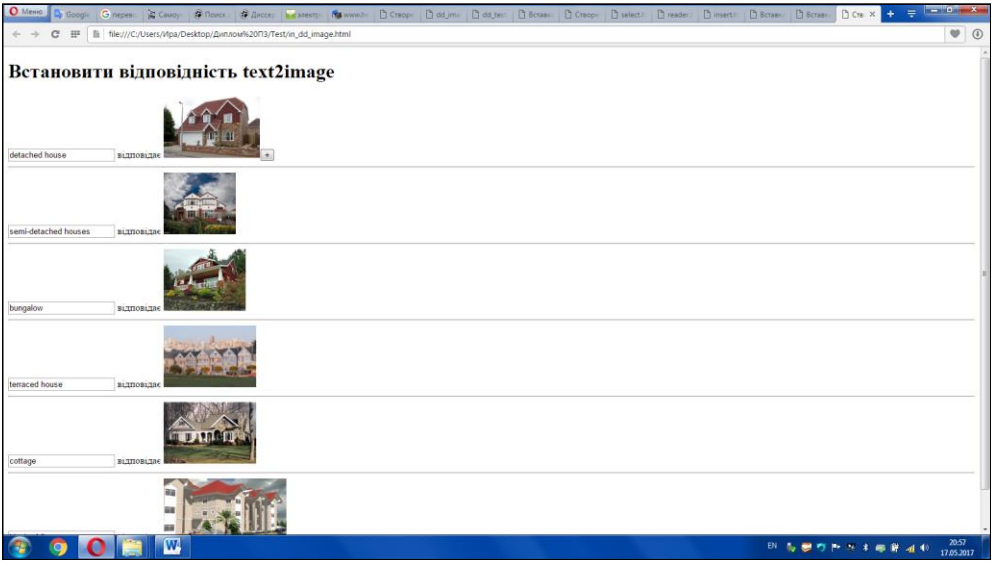

Figure 1. Results of taking the matching text-to-image test

Source*: Own Work*

GAP FILLING:

Closed-end questions:

Is losing, lost, loss, consumes, consumers, division, divide, independent, independence, independently, to depend on, faint, faintly

1. Mankind ……..a lot of natural resources harmful for our planet.
2. Kate is so oblivious. She always……….. her books and purses.
3. My cat is a very ………. animal. She always does what she wants.
4. After that horrible ………. he still cannot recover.
5. This large hypermarket always makes nice presents for their ……… .
6. Amanda was looking ……. at her son and couldn't say a word.

Open-end questions. Insert proper article:

1. Come to ... blackboard and write. 2. You have ... spelling mistake in ... word "nursery". 3. He is ... old friend of mine. 4. There came ... tap at ... door and in another moment we saw ... small girl enter ... room. 5. He is ... young artist and, I should say,

rather talented. 6. He gave her ... cigarette and lighted it. 7. I don't feel ... sympathy towards this man.

TRUE/ FALSE

6. Choose the sentence which is closer in meaning

1. They were about to leave when you rang.

A. They left something.

B. They were going to leave.

2. He called on me last Saturday and luckily I was at home.

A. He came to visit me.

B. He phoned me.

CONCLUSIONS

The value of tests as a tool for evaluating the effectiveness of student learning and cognitive activity in comparison with other forms of control lies in the fact that, firstly, the tests are a much more qualitative and objective method of evaluation and, secondly, test indices are focused to measure the scope of assimilation of key concepts, topics and sections of the curriculum, skills and abilities, but not just to confirm that the student has some formally acquired knowledge (Henig 2013).

The use of test evaluation in training philologists allows teachers to develop effective models for assessing students' achievement with maximum use of modern approaches, specifics, goals and objectives of learning a foreign language, and, taking into account existing trends, opens ways to computerize test evaluation.

Among the main advantages of test evaluation of students in linguistics we can distinguish:

- taking into account the individual characteristics of students; the possibility of analyzing in detail the scope of student’s knowledge in each content module of the course;

- implementation of efficient diagnostics and feedback with each student; gaining the learning time in the course by ongoing knowledge evaluation and the objectivity of evaluation of learning outcomes;

- a large selection of forms and means of evaluation;

- saving teachers’ time and efforts by automating knowledge assessment.

At the same time, along with the positive ones we should mention the negative features of tests. In particular, test control does not allow the teacher to check the student's oral presentation.

Here we gave a short theoretical overview of such testing platforms as Test Designer 3.3, MyTestX, The UniTest System Universal Test and Microsoft PowerPoint.

Having launched an offline testing system for the language learners we are trying to automate the process of their knowledge assessment, looking for ways to evaluate writing skills and increasing motivation to study languages.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Avanesov, V.S., 1998: *Composition of test tasks: A training book for teachers of universities, teachers of schools, post-graduate students and students of teacher training Universities,* 2nd ed-n., corrected and elaborated, M.: Adept, 1998, 294 p. [In Russian]

Baker, E.L., 2013: The chimera of validity, Teachers College Record, Vol. 115 No. 9, [on-line] at www.tcrecord.org (accessed 15 June 2017).

Bateshov E.A. Fundamentals of computerization technology development: A training book, Astana: Poligraf-Mir, 2011, 241p. [In Russian]

Brown, J. D., 2008: *Raters, functions, item types and the dependability of L2 pragmatics tests.* In E. AlcónSoler, & A. Martínez-Flor (Eds.), Investigating pragmatics in foreign language learning, teaching and testing, pp. 224-248.

Chiu, T. L., Liou, H.C., Yeh, Y., 2007: *A study of web-based oral activities enhanced by automatic speech recognition for EFL college learning.* Computer Assisted Language Learning, 20, 3, pp. 209-233.

Fetisov, V.S., 2011: *Computer technologies in testing: teaching aid*, Nizhyn, Publisher PE Lysenko M.M., 2011, 140 p. [In Ukrainian]

Fulcher G., Davidson F., 2007: Language Testing and Assessment, New-York: Routledger, 396 p.

Henig, R.J., 2013: *The politics of testing when measures 'go public'*, Teachers College Record, Vol. 115 No. 9, [on-line] at www.tcrecord.org.

Kane, M., 2013: *Validity and fairness in the testing of individuals*, In: Chatterji, M. (Ed.), Validity and Test Use: An International Dialogue on Educational Assessment, Accountability and Equity, Emerald Group Publishing, Bingley, pp. 17-53.

Koh N., Reddy V., Chatterji M., 2014: *Understanding validity issues surrounding test-based accountability measures in the US*, Quality Assurance in Education, Vol. 22 Issue: 1, pp. 42-52, available at https://doi.org/10.1108/QAE-12-2013-0051 (accessed 1 June 2017).

Kolen, M. J., Brennan, R. L., 2014: *Test Equating, Scaling, and Linking*: Methods and Practices. USA: Springer, 172 p.

Kordon, Yu. V., 2012: *Test control as one of the methods of checking the knowledge, skills of students in higher medical educational institutions*. In: Modern information technologies and innovative methods of training of specialists': methodology, theory, experience, problems: a collection of scientific works. Iss. 30, Kyiv-Vinnitsa, 2012, P. 255-259. [In Ukrainian]

Kuznetsov, V.G., 1999: *The concept of development of test technology to control the level of student learning in the system of vocational education in Russia*. Testsineducation. Scientific-methodical newsletter with electronic attachment, 1999, Iss.1, P. 30-45. (In Russian)

Mcnamara, T.F., Roever, C., 2006: *Language Testing: The social dimension*. Oxford: Basil Blackwell, 292 p.

Mereshchuk, M. Ya., Barkhayev, Yu.P., Stadnik, G.V., 2006: *Test assessment and rating in education: teaching aid*, Kharkiv: KHNAMG, 2006, 106 p. [In Ukrainian]

On conducting a pedagogical experiment as to the introduction of credit-module system of organization of educational process in higher educational institutions of III-IV levels of accreditation. The decision of the Collegium of the Ministry of Education and Science of Ukraine from April 24, 2003, № 5/5–4. [In Ukrainian]

Shepard, L.A., 2013: *Validity for what purpose?* An afterword, Teachers College Record, Vol. 115 No. 9, pp. 1-12.

Shymkova, I.V., 2007: *Use of automated test control knowledge for organization of independent educational and cognitive activity of students* / Collection of scientific works. Pedagogical sciences. Iss. 46, Kherson: Publisher KhSU, 2007, P. 407-410. [In Ukrainian]

Steiner, D.M., 2013: *Trusting our judgment: measurement and accountability for educational outcome*s, Teachers College Record, Vol. 115 No. 9, [on-line] at www.tcrecord.org.

Takimoto, M., 2009: *Exploring the effects of input-based treatment and test on the development of learners' pragmatic proficiency*. Journal of Pragmatics 41, pp. 1029-1046.

Zechner, K., Higgins, D., Xi, X., Williamson, D.M., 2009: *Automatic scoring of non-native spontaneous speech in tests of spoken English*. Speech Communication, 51, pp.883-895.

GENERAL DATA PROTECTION REGULATION (GDPR) AND DISTANCE LEARNING

Miroslav Hrubý
University of Defence
Kounicova 65, 66210 Brno, Czech Republic
miroslav.hruby@unob.cz

Abstract: *The main goal of the paper is to give the basic information about the General Data Protection Regulation (GDPR) and its possible influence on distance learning and e-learning. The first part of the text is focused on the GDPR content and importance. Next, the author's point of view on the GDPR consequences for ~~into~~ the distance learning and e-learning is formulated. There can be found a few complicated problems which could be solved by using different approaches which are based on specific culture context. The text could serve as a starting point for the discussion of the conference participants and future readers.*

Keywords: data protection, distance learning, e-learning, GDPR, study environment.

INTRODUCTION

The Czech Republic and other European Union (EU) countries have to prepare their data protection due to the new requirements arising from the General Data Protection Regulation (GDPR). The GDPR is an EU regulation designed to strengthen and unify data protection within the EU. The GDPR will come into effect on 25 May 2018 and will affect every organisation that processes EU residents' personally identifiable information. GDPR has been designed not only to harmonize data protection practices, but specifically to strengthen the rights of data subjects.

The GDPR eases the flow of data between all the EU member states. Anyone who processes information about EU nationals will need to prepare for compliance. It is expected that the GDPR will supersede the Data Protection Act (DPA) 1998 in the U.K.

For example: organisations need to be able to demonstrate compliance with the Regulation in a way not previously required, the standards required for gaining consent to process personal data are much higher, organisations will be required to report significant data breaches to the Information Commissioner's Office within 72 hours, and the potential penalties for non-compliance are significantly higher than they are currently (potentially amounting to a 20 million Euro fine).

Later in the text the author tries to specify a few aspects which could be interesting for the contemporary education institutions.

1. GDPR – BASIC TERMS AND PRINCIPLES

The Article 4 of the GDPR (http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf) contains 26 definitions, such as personal data, processing, restriction of processing, profiling, pseudonymisation, filing system, controller, processor, recipient, third party, consent, personal data breach, genetic data, biometric data, data concerning health, main establishment, representative, enterprise, group of undertaking, binding corporate rules, supervisory authority, supervisory authority concerned, cross-border processing, relevant and reasoned objection, information society service, and international organisation.

Personal data means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.

Processing means any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction.

Controller means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law.

Processor means a natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller.

Consent of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her;

The Article 5 specifies the principles relating to processing of personal data. These are:

- lawfulness, fairness and transparency;
- purpose limitation;
- data minimisation;
- accuracy;
- storage limitation;
- integrity and confidentiality;
- accountability.

These principles mean that personal data shall be:

- processed lawfully, fairly and in a transparent manner in relation to the data subject;
- collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes; further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes shall not be considered to be incompatible with the initial purposes;
- adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed;
- accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased or rectified without delay;
- kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed; personal data may be stored for longer periods insofar as the personal data will be processed solely for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes subject to implementation of the appropriate technical and organisational measures required by the GDPR in order to safeguard the rights and freedoms of the data subject;
- processed in a manner that ensures appropriate security of the personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organisational measures.

The controller shall be responsible for, and be able to demonstrate, compliance with the principles.

2. GDPR FROM THE EDUCATION POINT OF VIEW

The GDPR can significantly affect especially the distance learning which uses modern technologies where collecting and using personal data have become a common practise. Firstly, the students of all age groups should be aware of possible abuse of data collections which are connected with their distance learning. Secondly, GDPR implementation into study and learning processes should be evident and clear for all participants. Thirdly, the permanent discussion on suitable practises in the field should be the basis for the building a study environment where the power is functionally distributed and the valid law regulation is respected. The controller, the processor should be strictly defined and students' consent should be always made in a suitable written form.

2.1 Permanent discussion of the topic

Firstly, seminars and conferences tailored towards education professionals should be required. Right there is a place to explore the subject in detail. Experts from education, law and technology should clearly explain how educational institutions need to change their data policy, provide best practice examples (lessons learned from GDPR projects) in understandable form for the participants, and moderate discussions on key problems. An important topic for the universities is the impact of GDPR in research. Outcomes description should immediately be available in electronic form for the education community.

2.2 Data Subjects and their Rights

The GDPR covers more detailed rights for data subjects – the students of all age groups. These can be sorted as follows.

2.2.1 Data Subject Access and Rectification Rights, Right to Object

The data subject shall have the right to obtain from the controller confirmation as to whether or not personal data concerning him or her are being processed, and, where that is the case, access to the personal data and the following information:

- the purposes of processing;
- categories of recipients;
- retention periods;
- rectification right;
- the right to lodge a complaint with a supervisory authority;
- data source;

- the existence of automated decision-making including profiling;
- third country transfers.

The controller shall provide a copy of the personal data undergoing processing.

2.2.2 Right to Obtain Restriction of Processing

The data subject shall have the right to obtain from the controller restriction of processing in some specific cases.

2.2.3 Right to Erasure (Right to Be Forgotten)

The data subject shall have the right to obtain from the controller the erasure of personal data concerning him or her without undue delay and the controller shall have the obligation to erase personal data without undue delay where e.g. the personal data are no longer necessary in relation to the purposes for which they were collected or otherwise processed, the data subject withdraws consent on which the processing is based, the personal data have been unlawfully processed, the personal data have to be erased for compliance with a legal obligation.

2.2.4 Data Portability Rights

It means a right to receive the personal data, which the data subject has provided (via online forms, data generated by and collected from the activities of users) to controller, and to transmit those data to another controller if processing is based on consent or execution of a contract with data subject.

2.2.5 Rights Pertaining to Automated Decision-Making and Profiling

It means a right not to be subject to a decision based solely on automated processing, including profiling, if that decision produces legal effects concerning that data subject or similarly significantly affects him. Profiling stands for the recording and analysis of a person's psychological and behavioural characteristics, so as to assess or predict their capabilities in a certain sphere or to assist in identifying a particular subgroup of people.

2.3 Study Data and Transparency

The principle of transparency requires that any information addressed to the public or to the data subject have to be concise, easily accessible and easy to understand. If suitable, visualisation should be used. Such information could be provided in electronic form, for example, when addressed to the public, through a website. This is of particular relevance in situations where the proliferation of actors and the technological complexity of practice make it difficult for the data subject to know and understand whether, by whom and for what purpose personal data relating to him or her are being collected.

2.4 Introduction to GDPR Implementation

The key questions which should be answered at the starting point of the GDPR implementation at an educational institution are:

- What data is collected?
- Who is receiving it?
- What processing will be done?
- How long will it be stored?
- Who will it be shared with?

The educational institutions should keep in mind that no processing without prior data subject consent is possible. Data subject consent should always be expressed in explicit action and documented provable format. All activities should be governed by work contracts, student policies, and research policies.

3. THE MAIN CURRENT TASKS FOR EDUCATIONAL INSTITUTIONS

The following list of data protection aspect can serve as a useful starting point for the necessary activities inside the educational institutions which is based on Harrisons Clark Rickerby's approach. (https://www.hcrlaw.com/preparing-general-data-protection-regulation-gdpr-10-steps-schools/)

3.1 Raise Awareness

Make people in your educational institution aware that legislation (e.g. the Data Protection Act (DPA) in the U.K.), is changing to the GDPR and how it will affect educational institutions. This task should be solved at the national level and educational institutions should be supported by the Ministry of Education according to their individual needs.

3.2 Information You Hold

Audit the information you currently hold and what data processing policies are currently in place. Nowadays, a great deal of unnecessary information is held in many cases and not all current data processing is done in compliance with the GDPR.

3.3 Privacy, Data Subjects' Rights and Consent

Review your current privacy agreement and put a plan in place for any changes that are necessary. Remember that privacy is an important aspect of education. Check your current privacy policies to ensure your procedures cover all the rights data subjects have. Pay attention to how you delete personal data.

Review how you are seeking, obtaining and recording consent for data processing and whether any changes are needed. Pay attention to Learning Management Systems which often store sensitive information without data subjects' consent. Remember that keeping a permanent (electronic) communication with data subjects can give a useful significant feedback due to their feelings connected with the GDPR implementation in an educational institution.

3.4 Students and Personal Data Breaches

Think about what systems you're going to put in place to verify the age of individuals and to gather consent from parents or guardians in regards to data processing.

Make sure you have the correct procedures in place to investigate and report a personal data breach. Sensitive information about a personal data breach is connected with a necessary trust of data subjects.

3.5 Data Protection Officers, Data Processors and e-Safety Policy

Designate a Data Protection Officer (DPO) to take responsibility for data protection compliance and assess. The educational institutions must have an appropriate responsible person who is publicly known and respected.

Choose an accredited Data Processor who is also compliant with GDPR obligations and IT asset disposal. Data Processors should be well known for all participants of educational activities.

Having an e-safety policy in place is vital to ensure all key stakeholders know what needs to be done to remain compliant. Underestimation of an e-safety policy can destroy a reputation of an educational institution.

CONCLUSION

The GDPR introduces a framework of new data protection rights for EU citizens. It will have a huge impact on education. Especially providers of distance education should be carefully prepared. Non-compliant educational institutions could be fined as much as €20 million or 4 % of global annual turnover. Educational institutions need to act now to ensure they are compliant by the time the regulation is introduced.

Educational institutions should especially focus their attention at these problem areas:

- Competent staff, sufficient security mechanisms, informed data subjects;
- Minimize data collection;
- Contract with data management;
- Data subject consent management;
- Transparency.

If any assistance with preparing for the GDPR is required, responsible authorities should act in time. Educational institutions could ask staff data protection training, school data protection officer specific training, data protection legal advice, etc.

The main methods of the proper GDPR implementation should be a cooperation of competent and responsible people, communication inside the educational institutions, their communication with data subjects and a permanent respect to the GDPR. The educational institutions should collect a useful feedback from data subjects, inform them in time and update the GDPR implementation if necessary.

ACKNOWLEDGEMENTS:

The paper was supported by the partial development plan for the organization Faculty of Military Technology, University of Defence, Brno, Czech Republic.

REFERENCES

REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation), [online] at http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf, (accessed 10 July 2017)

GDPR, https://www.gdpr.cz/, (accessed 10 July 2017)

EU GDPR Portal, http://www.eugdpr.org/, (accessed 10 July 2017)

Overview of the General Data Protection Regulation (GDPR), https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/, (accessed 10 July 2017)

Conference: the impact of GDPR in higher education, [online] at http://blog.fullfabric.com/conference-impact-gdpr-higher-education-event-london-university-data, (accessed 10 July 2017)

Highlights from our conference The Impact of GDPR in Higher Education, [online] at http://blog.fullfabric.com/highlights-gdpr-conference-higher-education-university-data-protection, (accessed 10 July 2017)

How Will GDPR Affect Your School? [online] at http://www.e4education.co.uk/how-gdpr-affects-schools, (accessed 10 July 2017)

How will GDPR affect schools?, [online] at https://www.stonegroup.co.uk/how-will-gdpr-affect-schools/, (accessed 10 July 2017)

GDPR: How schools should prepare for compliance, [online] at http://edexec.co.uk/gdpr-how-education-organisations-should-prepare-for-compliance/, (accessed 10 July 2017)

General Data Protection Regulations (GDPR), [online] at https://www.isc.co.uk/campaigns/school-regulation-and-inspection/general-data-protection-regulations-gdpr/, (accessed 10 July 2017)

Preparing for the General Data Protection Regulation (GDPR) – 10 Steps for Schools, [online] at https://www.hcrlaw.com/preparing-general-data-protection-regulation-gdpr-10-steps-schools/, (accessed 10 July 2017)

GDPR: prepared for change?, [online] at http://edtechnology.co.uk/Article/gdpr-prepared-for-change, (accessed 10 July 2017)

Preparing for the GDPR, [online] at http://universitybusiness.co.uk/Article/preparing-for-the-gdpr, (accessed 10 July 2017)

Implementing the new GDPR: what does it mean for Universities?, [online] at https://www.surf.nl/binaries/content/assets/surf/nl/kennisbank/security-en-privacy-conferentie/tweedaagse---gdpr-and-your-alumni-clouddatabase---cosimo-monda.pdf, (accessed 10 July 2017)

University of Leicester, Information Assurance Services, http://www2.le.ac.uk/offices/ias, (accessed 10 July 2017)

Collibra University, GDPR Requirements, [online] at https://university.collibra.com/lessons/gdpr-requirements/, (accessed 10 July 2017)

University of Bath, Data Protection, http://www.bath.ac.uk/data-protection/index.html, (accessed 10 July 2017)

University of Exeter, Data Protection under the new GDPR, http://www.exeter.ac.uk/ig/dataprotectionunderthenewgdpr/, (accessed 10 July 2017)

Desatero omylů o obecném nařízení (GDPR), https://www.uoou.cz/vismo/dokumenty2.asp?id_org=200144&id=23799, (accessed 10 July 2017)

The Office for Personal Data Protection, GDPR Misinterpretations Rectified, https://www.uoou.cz/en/vismo/dokumenty2.asp?id_org=200156&id=1541, (accessed 10 July 2017)

MEDIA IN 21ST CENTURY EDUCATION – IN THE TEACHER'S PRACTICAL THOUGHT

Natalia Maria Ruman
Department of Humanistic Education and Auxiliary Sciences of Pedagogy
Faculty of Ethnology and Sciences of Education,
Bielska 62, 43-400 Cieszyn
University of Silesia in Katowice
nruman@interia.pl

Abstract: *Cyberspace is the environment where contemporary society, and in particular its younger generation, lives and functions. It is an area which offers a spectrum of new opportunities with regard to education, communication, one's professional career as well as leisure time. In addition to its unquestionable advantages, cyberspace provides ample ground for numerous hazards that have to be confronted by social scientists, humanities scholars and those pursuing engineering disciplines. This paper is designed to provide and discuss examples of areas, rules and methods relating to the use of multimedia in the contemporary instructional and educational environment, and to outline opportunities and problems connected with the status and role of electronic media in society. There are various views and positions regarding the role and status of computerisation of Polish education. On one hand there are those who are of the opinion that it is necessary for schools to teach new cultural techniques, and on the other hand, many people subscribe to the view that IT education should be abolished if the computer disturbs personal contact between the teacher and the student. That is why media education should be aimed at inculcating students with a cautious attitude towards media.*

Keywords: Media education, computerisation, educational environment

INTRODUCTION – MEDIA IN EDUCATION

The enormous progress of civilisation and the communication techniques closely associated therewith cannot help impacting human beings and their intellectual as well spiritual development. With globalisation in full swing, there are strong trends towards homogeneity of popular media culture. Mass media are a determinant for a new dynamic type of culture, the so-called mass culture (Luhan, 1995: 67-69).

Mass culture is a product of contemporary technological civilisation and represents specific values that have been studied, and been a subject of controversial opinions, for many years now. Literature on the subject presents a wide spectrum of opinions – ranging from opinions holding that mass media have an enormous effect on the development of norms, standards, values, through moderate views to downright criticism.

Mass media influence our conscious and subconscious minds, breaking down all social barriers, and ignoring age limits, they are available for everyone and at any time. Content offered to us by the media is becoming an integral part of our thoughts, it is becoming that, which seems to be obvious. Images, above all, invoke emotions and create a semblance of reality. Such media do not develop an individual, they only make individuals more and more passive. Therefore media are increasingly determining how we perceive, understand and experience the world.

Contemporary media are marked by the dominance of images and almost automatic marginalization of words (human beings are regarded as *homo videns*, who are reading less and less and live in a world of imitation), imposing a particular manner of constructing and perceiving messages. “Emotionalisation” of messages weakens the ability to critically evaluate content. This dependence on the media makes us reflect on the extent to which the media have an impact on human presence, on the development of the world of values. In this era of traditional authority figures being undermined, young people give themselves over to propaganda, advertisements and unsophisticated entertainment. The mass media are becoming both a model, and deformation of, social behaviours. Strong emotions accompanying information in audio-visual messages are encoded in the RECIPIENT'S consciousness. Such emotions can be of both positive and negative nature (Jankowska, 1985: 37-40).

A negative attitude is characterised by addiction to media that leads to the formation of a specific mentality, in other words, as it were, to a distorted world view (in a broader perspective). On the other hand, positive attitudes require some effort on the part of the one “receiving” a media message. Such attitudes are based on the recipient's critical thinking, retaining it and allowing the recipient to have their own opinion in particular creative actions. Positive attitudes are categorised as follows: critical ones – sound, objective approach; selective reception; creative activity – media messages being insufficient to satisfy one's creativity needs and to allow one to personally engage in intellectual pursuits; broad horizons – built upon an appropriate hierarchy of values, dialogue – when an opportunity to engage in participative or interactive communication is taken up; tolerance – being open to the phenomenon of diversity (Nowakowska-Buryła, 2003: 32-33).

1.1 Media in education – an outline

In the 1980s in Western Europe, stakeholders in education started considering the use of media in teaching. At the beginning, computer literacy programs were proposed that would be delivered in various types of schools and at various education levels.

We can distinguish four types of education forms:

- introduction to computer science and computers;
- extended curriculum to include computer science;
- a computer science course correlated with a particular occupation or trade;
- an offering of applied computer science courses.

What was important was the formal integration of new media with educational processes on a technological plane as well as a new school subject – computer science. That is demonstrated by the following aims and objectives of computer literacy courses:

- to familiarise students with basic concepts and structures in computer science;
- introduction to computer and peripherals use;
- to impart knowledge on possibilities of use and control of IT techniques;
- introduction to the presentation of problem solutions in an algorithmic form;
- to provide information on individual programming languages (Kron; Sofos, 2003: 2-27).

New opportunities afforded by the use of media were presented:

a) ability to access, at any place and time, large amounts of data to be processed;

b) establishing an interactive relationship between computer systems regardless of the distance between them;

c) a variety of uses both in local and external networks;

d) creating virtual realities interrelated with real presentations in such a way that one cannot tell the difference (Gajda, 2004: 33-37).

By providing information from various spheres of life, media can stimulate one's interest, satisfy cognitive curiosity, develop moral stances, in other words, they serve the purpose of disinterested education. A significant role of the media is to provide the latest information, stimulate cultural interests, satisfy the need for relaxation and entertainment. The pedagogical aspect of media reception boils down to learning the latest education technology, selective and active reception of content provided by the media and co-development of educational programs. What is of particular urgency is embracing the latest educational technology and developing students' selective and critical media reception (Gajda, 2004: 33-37).

1.2 Media education vs culture

Computer programs available in the market allow users to independently create presentations that combine images, graphics, text, sound and video sequences – (multimedia) and address multiple senses simultaneously, which increases education effectiveness. Progress is also made in software – multimedia software is entering widespread use. Software development companies offer a range of educational programs. A multimedia program addresses almost all of the information acquisition channels – sight, hearing, and the verbal channel. Teaching effectiveness is increasing, students' comprehension of subject matter is enhanced, learning pace is increasing, and the scope of acquired knowledge is also extending. Computer programs can be used both in the classroom and at home for independent study. EduROM multimedia course-books are used too. These educational materials conform to the core curriculum approved by the Ministry of National Education. HOWEVER, multimedia should be used as a supplement and an addition to a lesson prepared by a teacher, as it is the teacher who highlights the information the students should pay attention to and is responsible for all the aspects of the lesson being taught.

Modern education enthusiasts assume that the classroom and lesson-based system will sink into oblivion, thematic blocks will be created, electronic books will become available, education will be offered through the so-called e-learning. On a pan-European scale distance education is co-ordinated by the European Distance Education Network (EDEN) established in 1990 in order to promote distance education through the provision of a platform for collaboration. EDEN is an association open to all types of schools at all education levels as well as networks of academics; we will witness an intensive development of programs offering simulations to solve problems, and proper use of such programs can increase the effectiveness of educational activities and enhance learners' creative thinking; the teacher's role as an expert will change into that of an animator.

Unfortunately, creating virtual worlds solidifies the barriers, and extend distance, between people, and contributes to gradual disappearance of imagination in learners, as well as building communication barriers between the student and the teacher (Hatalska, 2002: 53-54). DESPITE THE ABOVE, it appears necessary to include media education in the education process. Media are conducive to human development accompanied by respect for knowledge, wisdom and beauty. The human being needs to learn to live again and the role the mass media play in this process is significant (Gordon, 1982: 25). All media are a tool to explore the world and to make life more pleasant, but a tool is useful only to those who have learned when and how to use it. The same tool in the hands of those who do not know when and how to use it may turn out to be dangerous. Media have an effect on our daily lives and behaviour as well as the development of values.

Media are a powerful instrument for shaping human character, their instructional and educational value is very significant, but we must remember that if media are not subject to any control, they can do more harm than good from an educational perspective.

In discussing the effect of media on recipients, we can distinguish three attitudes: immunity, acquiescence and activity.

A distinction is to be drawn between two essential types of occupational competencies: those associated with media pedagogics and with the use of media in education. Both these types are based on media competencies which we acquire throughout our lives by interacting with new media on a daily basis.

Media-pedagogical competencies are those competencies that allow instructors, on the basis of their own life experience, on one hand, to transfer their communication and functional competencies to their own practice as well as education, skills improvements and further education, and, on the other hand, to make a contribution of their general professional competency, entitling them to work as teachers, which forms the basis of their pedagogical competencies as well as competencies in educational use of media.

According to Stefan Aufenanger, there are four dimensions of media-pedagogical competencies:

- Familiarity with pedagogical / didactic concepts: from the perspective of media pedagogics professionalization, it appears important that the teacher should know and be able to properly use established concepts.

- Knowledge about children's and teenagers' media worlds: educators and teachers should have access to the media world of their pupils and students. It is only with this knowledge that they will be able to put themselves in young people's shoes and adopt their perspective.

- Raising awareness of the subject of the media and experiences associated with media: being aware and sensitive means being open to intentions that can be expressed by means of media, stories and characters shown in media.

- Activities related to media pedagogics: media-pedagogical competence should be imparted specifically with reference to practical activities, carried out as supervised teaching practicums or lesson observations. Media pedagogics casuistry should be given consideration as a significant supplementary concept - a form of education whereby real life cases are analysed and discussed in order to identify options of action aimed at properly resolving a given case (Baacke, 1997: 31-35).

According to Sigrid Blömeke, there are five areas of media-pedagogical competencies:

- Media didactical competency: ability to reflectively use media and information technologies in appropriate forms of education or teaching and further development thereof.

- Media educational competency: ability to discuss topics in class that are related to media, with reference being made to the most important pedagogical ideas.

- Socialisation-related competency in the media context: ability to constructively take into account learners' requirements in media-pedagogical activities.

- School development competency in the media context: ability to shape and develop framework conditions for media-pedagogical activities.

- Teacher’s own media competency: ability to pursue content-focused, independently defined, and creative activities in a socially responsible manner (using media and information technologies) (Strykowski, Kąkolewicz, Ubermanowicz, 2008: 59-68).

The afore-mentioned multiplicity of aspects (multiple dimensions of competencies) cannot, in practice, be implemented in a hierarchical order. It would be more accurate to say that they are linked by mutual interrelations and functional connections and their implementation depends on a particular, current action context in which particular competencies are required. It should be remembered, though, that media-pedagogical competencies already comprise certain dimensions of media-didactical competencies, and the transition area between these two competency planes is not clearly defined.

Operating and using media (e.g. a photographic camera, a microscope, a movie camera, a computer); ability to create web pages using editors as well as developing, combining, collecting teaching materials; essential knowledge on technical equipment (on computers, modems etc.) - these are but a few difficulties faced by teachers in connection with the introduction of media courses to school curricula. It is important to stress that we are not talking here about specialist knowledge that only specific professional groups have (e.g. programmers); still, teachers who want to work using latest technologies should have essential knowledge so that they are less dependent on specialists. Competencies related to the functioning of media are closely connected with the ability to coordinate work. Teachers perform the role of an expert, i.e. they carry out activities that previously were carried out exclusively by specialists. They not only use pre-prepared materials but also, increasingly on an unassisted basis, look through sources and prepare content specific for a given audience.

It is proposed that media education should take into account the following aspects:

- children's and teenagers' life circumstances as well as communication environment;

- needs and emotions;

- level of knowledge and experience specific to this development stage;

- level of the ability to make judgments and degree of axiological awareness.

Proper media education should therefore create such conditions for learning that learners can actively familiarize themselves with media in terms of their pedagogical aspect.

CONCLUSION

Information education is education preparing for life in information society. By drawing an analogy between events that happened several centuries ago and the most recent history, one can develop in young people certain intellectual predispositions that they will find useful in their lives, such as: the ability to evaluate critically, logical thinking, the ability to analyse political and social events, the ability to select and assess information provided by the mass-media, sober assessment of situations, also in terms of ethics (Jadczak, 1998: 65).

Active teacher participation in computer courses will help to broaden your knowledge and skills in the area of computer technology in teaching.
Knowledge of computer technology allows for the self-help of scientific research.
Media education provides teachers with more freedom in teaching methods.
Every effort should be made to ensure that media should properly fulfil their mission and should not constitute an obstacle to recipients' emotional and moral development. As John Paul II said: "(…) Ladies and gentlemen: as communicators of the human word, you are the stewards and administrators of an immense spiritual power that belongs to the patrimony of mankind and is meant to enrich the whole of the human community" (Pope's address to the people of the communications industry, Los Angeles, 15 September 1987, n.8) (John Paul II, 2004: 345-348; John Paul II, 2004: 12-14).

Parents as the first educators of their children are also the first source of information about media. They have a duty to instil the ability to "use the media in a moderate, critical, watchful and prudent way" in the family home (*Familiaris consortio*, 76). Young people should acquire basic knowledge of audio-visual culture not only in their family home but also at school. It is necessary to teach how to navigate the world of illusion and fiction created by the media in a safe and conscious manner. Out of the sheer multitude of items on offer one should choose those that *do* broaden one's knowledge, widen one's interests, as well as contributing to the development of one's personality and spiritual sphere (Żurakowski, 1984: 41-43).

In our times – in the media society, it is necessary to equip the school community with competencies in using media education tools, and in particular, with the skill to use computers and the global IT network. It is important not only to have technical skills but also to be able to practically use individual tools that support the process of accomplishing the objectives of the didactic process (Goban-Klas, 2004: 307). Hence the importance of equipping every educational establishment with the latest media tools and devices that will improve the effectiveness and quality of teaching and learning. Universal access to an enormous amount of information on the Internet and in other mass media will certainly have an effect upon the individual, while assigning an entirely new role to the teacher. The teacher's role in media education is of inestimable importance as it is the teacher who, to a great extent, is responsible for teaching quality and it is her/his competencies that determine the effectiveness of media education activities.

Media is a powerful instrument for shaping a person, their educational and educational values are valuable, but we must be aware of the fact that uncontrolled care can harm the child in the sense of education.

REFERENCES

Baacke, D., 1997: *Medienpädagogik. Grundlagen der Medienkommunikation*, Tűbingen.

Buckingham, D., 2003: *Media education: Literacy, learning and contemporary culture*. Cambridge: Polity Press.

Gajda, J., 2004: *Media w edukacji.* Kraków: Oficyna Wydawnicza Impuls.

Goban-Klas, T., 2004: *Media i komunikowanie masowe. Teorie i analizy prasy, radia, telewizji i Internetu,* Warszawa-Kraków: Wydawnictwo Naukowe PWN.

Gordon, G., 1982: *Communication and Media. Hosting Hours*. In J. Gajda (Eds.), *Telewizja a upowszechnianie kultury*. Warszawa: Wyd. Instytut Wydawniczy Związków Zawodowych, s. 19-46.

Jadczak, M., 1998: *Treści etyczne w podręcznikach historii dla liceów ogólnokształcących.* Kultura i Edukacja, 3, s. 52-73.

Jan Paweł II, 1999: *Środki społecznego przekazu pomostem pomiędzy wiarą i kulturą.* Orędzie na Światowy Dzień Środków Społecznego Przekazu 1984. In *Orędzia Ojca Świętego Jana Pawła II*. Kraków: Wyd. M, t. 1, s. 212-237.

Jan Paweł II, 2004: *Media w rodzinie: ryzyko i bogactwo*. Orędzie na XXXVIII Światowy Dzień Środków Społecznego Przekazu 2004. *Społeczeństwo, 2,* s. 340-359.

Jan Paweł II, 2004: *Media w rodzinie: ryzyko i bogactwo*. Orędzie na XXXVIII Światowy Dzień Środków Społecznego Przekazu 2004. *L'Osservatore Romano, wydanie polskie, 4,* s. 11-16.

Jankowska, H., 1985: *Rozwój czynności poznawczych u dzieci*. Warszawa: Wyd. Państwowe Zakłady Wydawnictw Szkolnych.

Komendziński, T., 2001: *Cognitive science, metaphor and conceptual blending*. Toruń: Adam Marszałek.

Kron, W. F., & Sofos A., 2003: *Dydaktyka mediów*. Gdańsk: Gdańskie Wydawnictwo Psychologiczne.

Luhan, Mc M., 1995: *Przekaźniki, czyli przedłużenie człowieka.* In: M. Mc Luhan, *Wybór pism* (53-74). Warszawa: Wyd. Artystyczne i Filmowe.

Nowakowska-Buryła, I., 2003: *Postawy dzieci wobec mediów.* Edukacja medialna, 1, s. 24-42.

Strykowski, W., & Kąkolewicz, M., & Ubermanowicz S., 2008: *Kompetencje nauczycieli edukacji medialnej*. Neodidagmata, 29/30, s. 52-81.

Żurakowski, B., 1984: *Wartości w świecie dziecka*. Warszawa: PWN.

III. ICT TOOLS – USE IN EDUCATION

SOME TRENDS OF ICT TOOLS APPLICATION BY TEACHERS: A COMPARATIVE STUDY OF RUSSIAN AND SPANISH EXPERIENCE

Tatiana Noskova, Tatiana Pavlova, Olga Yakovleva
Herzen State Pedagogical University of Russia
icsto@herzen.spb.ru

Prudencia Gutiérrez-Esteban, Rafael Martín-Espada, Sixto Cubo-Delgado, Juan Arias-Masa, Gemma Delicado-Puerto, Laura Alonso-Díaz, Rocío Yuste-Tosina
University of Extremadura
pruden@unex.es

Abstract: *The paper studies the specificity of the use of ICT tools by Spanish and Russian teachers. The research was carried out within the framework of the IRNet project with the participation of two universities - Herzen State Pedagogical University of Russia and University of Extremadura, Spain. The results of the survey described give a general idea of various ICT tools use intensity in two countries.*

Key words: ICT tools, competences, teaching activities, IRNet.

INTRODUCTION

From the pedagogical activity standpoint, the achievement of a new quality of the educational process and the orientation towards innovative results in the electronic environment, require setting new goals and using special tools of professional activity (Smyrnova-Trybulska, Noskova, Pavlova, Yakovleva, Morze, 2016). What new tools does a teacher need to master in order to make an entire use of the high potential of the electronic environment?

In Russian pedagogical studies, quite widespread is the approach, according to which five groups of pedagogical tools that are used in the creation of electronic educational resources are identified: interactive, multimedia, modelling, communication and productivity (Osin, 2007). Despite the name "tools", in fact this idea represents the quality of the electronic educational resources content, which determines new opportunities for the resource use in the educational process.

In European pedagogical studies, for Area, Gutiérrez and Vidal (2012), in the case of teaching materials based on technologies, the main characteristics of these digital materials are: Hypertextuality, Multimedia and Interactivity. At the same time, there are authors who classify the digital educational resources according to the following criteria (Grañas's proposal):

1. News: This category includes reference books and documents containing structured information, but not for an educational purpose a priori.

2. Instructional: Materials designed according to training needs.

3. Evaluative: They constitute a variation of instructional materials, and have a purely evaluative purpose.

4. Instrumental: Interactive services or applications that cover many aspects of learning support, including tools for the search, processing and visualization of information.

5. Experiences: Interactive training scenarios that are based on games or simulations.

6. Conversational: Conversational materials and services consist of synchronous or asynchronous communication dialogues in which there are (conversations) between participants in a training activity.

7. Collaboration: This type of material includes a wide range of work proposals for this purpose: databases, encyclopaedias, reports, articles, notes, manuals and guides, networked lectures, from activities fully open to highly formalized.

When choosing the most appropriate educational ICT tools for a particular educational situation, a number of factors may influence, but ideally, a reasonable variety of methods and resources should be used to enable students to participate, illustrate their ideas, investigate and find solutions to problems, in order to favour the acquisition of learning (Jiménez-Cortés, Vico-Bosch, Rebollo-Catalán, 2017).

Regarding the use of technological means in education, traditionally some mistakes have been made as "transferring" the didactic situation into cyberspace, and taking the teaching methods and learning strategies of in live classroom to the virtual formative environments. However, these strategies and methods were tailor-made and thought for face-to-face teaching. Therefore, its implementation without adaptation, it has not been a successful measure, since we have brought into virtual teaching the way of thinking in face-to-face teaching. The pursuit of the new teaching strategies has come to the fore, bringing, for example, the concepts of "flipped classroom" (Lucke, Dunn, Christie, 2017).

ICT tools "in hands" of a teacher have evolved from a merely learning tool into a multifunctional tool for creating various educational opportunities for learners' self-guided work, and for designing and shaping an electronic educational environment (Gutiérrez-Esteban, Camacho, 2017). The main purpose of pedagogical ICT tools is to organize and support the activities of students in the electronic educational environment (both in the classroom and outside). Pedagogical ICT tools in the organization of out-of-class independent work play a special and a very important role (Noskova, Pavlova, Yakovleva, 2017).

We suggest the classification of "pedagogical" ICT tools, based on the focus of different types of students' activities organized and facilitated in the electronic environment:

- ICT tools for presenting and organizing learning information acquisition in the electronic environment;
- ICT tools for organizing educational communication in the electronic environment;
- ICT tools for managing educational and cognitive activities in the electronic environment.

1. EXPERIMENTAL STUDY OF THE OF ICT TOOLS APPLICATION BY TEACHERS

1.1 Research Methods

An experimental study of the ICT tools use by teachers was carried out within the IRNet project (http://www.irnet.us.edu.pl). In this paper, we focus on the results obtained by Russian and Spanish research teams. For the purpose of study, a questionnaire was elaborated.

The main objective was identifying the specific application of the three main groups of ICT tools in the electronic educational environment by teachers:

- ICT tools for presenting and organizing learning information acquisition in the electronic environment (for example, the intensity of various electronic and interactive equipment application, a variety of electronic content, etc.),
- ICT tools for organizing educational communication in the electronic environment (for example, a variety of communication ICT tools and students' involvement in networking and communication, etc.),
- ICT tools for managing educational and cognitive activities in the electronic environment (for example, the intensity of various ICT tools application).

In addition, within each group, two questions were proposed that allowed determining the correlation between actually used ICT tools by teachers and the opinion of teachers about the relevance of these types of ICT tools for students.

In each of the questions, respondents were asked to assess the degree of application or preference of ICT tools on a 5-point scale (1 point - never or almost never, 2 points - very rarely, 3 - rarely, 4 - quite often, 5 - very often or constantly). The questionnaire was designed for teachers and specialists in the field of education (school teachers, academic teachers, methodologists, etc.) who actively use ICT in their professional activities, understand the essence and specificity of e-learning, and have a sufficient experience in using distance education technologies to facilitate students' activities. All questions were presented in Russian and English with the aim of disseminating this experience, as well as attracting the necessary number of respondents from Spanish universities and schools. In addition, the questionnaire passed the initial validation: it was analysed, and each issue was evaluated and commented on by Russian and Spanish experts.

Finally, quantitative and qualitative analysis of the results was carried out using Google Form tools and Statistical software (statsoft.com). In general, the analysis was performed on 122 variables. The research sample included 65 respondents in total, 19 from Spain and 46 from Russia. Of all the results obtained, we selected only those that have statistically significant differences. The quantitative and qualitative analysis of the obtained results shows general trends in the use of ICT tools by Russian and Spanish teachers. In addition, the distinctive differences were determined in the preference of ICT tools. Moreover, we see the prevailing directions of ICT tools use.

1.2 General Overview of the Participants

General overview of the participants is presented in Table 1. The larger part of the respondents appeared to be academic teachers with a certain teaching experience, together with the sufficient practice in implementing ICT in their professional activities. Consequently, the respondents can be considered the representatives of the advanced part of the pedagogical community.

Table 1.

General overview of the participants

Teaching experience			ICT experience			Professional occupation	
<3 years	*>5 years*	*3-5 years*	*<3 years*	*>5 years*	*3-5 years*	*School teacher*	*Academic teacher*
5%	92%	3%	5%	89%	6%	11%	89%

Source: Own work

2. COMMON TRENDS IN THE APPLICATION OF ICT TOOLS BY RUSSIAN AND SPANISH TEACHERS

In order to see the general trend, it is enough to analyse the number of respondents who chose the lowest rank (1), as well as the highest rank (4 and 5). The results of the survey (see Table 2) show that both Russian and Spanish teachers are very active in using multimedia equipment in their professional activities. They also benefit from thematic websites. Mobile devices are less popular. Teachers almost never use virtual and augmented reality interfaces. Respondents note the importance of the e-content choice (variability and diversity) and they actively provide students with the opportunities for automated self-control. The use of e-mail is equally in demand by all teachers. Cloud documents are also quite in demand.

Table 2.

Common trends in presenting and organizing learning information acquisition in the electronic environment

1.	***What ICT tools do you use for presenting educational information*** *(relate the degree of use on a 5-point scale):*									
	Russia (%)					*Spain (%)*				
(1-5)	*1*	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*
computer + multimedia projector, document camera	2	2	4	15	77	0	0	0	20	80
websites	7	9	18	20	46	15	0	30	20	35
mobile devices	28	24	17	6	25	35	15	10	15	20
virtual and augmented reality interfaces	63	11	11	11	4	60	10	10	10	10
2.	***What opportunities do you provide students to learn the content*** *(relate the degree of use on a 5-point scale):*									
	Russia (%)					*Spain (%)*				
(1-5)	*1*	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*
selection of necessary content (content diversity, hypertext navigation)	9	17	13	35	26	0	10	20	10	60

selection of the preferred educational content formats (text, audio, video)	6	13	22	28	34	0	10	15	35	40
support of educational motivation (motivating resources, e.g. video, etc.)	6	20	20	26	28	5	10	30	20	35
automated self-control	15	15	20	22	28	10	20	30	10	30

Source: Own work

3. DIFFERENCES IN THE ICT TOOLS APPLICATION

For each variable, an average rate of the application intensity was calculated. In this paper, we present only statistically significant differences between the answers of Russian and Spanish teachers. The Figures 1-3 below present the most interesting results for each of the three groups of questions.

3.1 ICT Tools for Presenting and Organizing Learning Information Acquisition in the Electronic Environment

In relation to ICT tools employed for presenting and organizing learning information acquisition, it should be noted that LMS presents the highest rate, due to it is a widespread tool in the university educational level area. Similar punctuation it shows “own lecturers recordings” and “foreign language e-resources” for teachers from both countries. Undoubtedly, LMS is the most used tool due to its adaptability to the user demands (teachers), the reports offered to teachers regarding students’ learning progress, their improvements and involvements, and mainly their practices within this digital scenario. Due to the fact that Spanish teachers are more actively using LMS, it can be assumed that they also apply own lectures recordings on the basis of LMS. It is obvious that the realities of close interaction within the European Union also encourage Spanish teachers to use foreign language e-resources more actively.

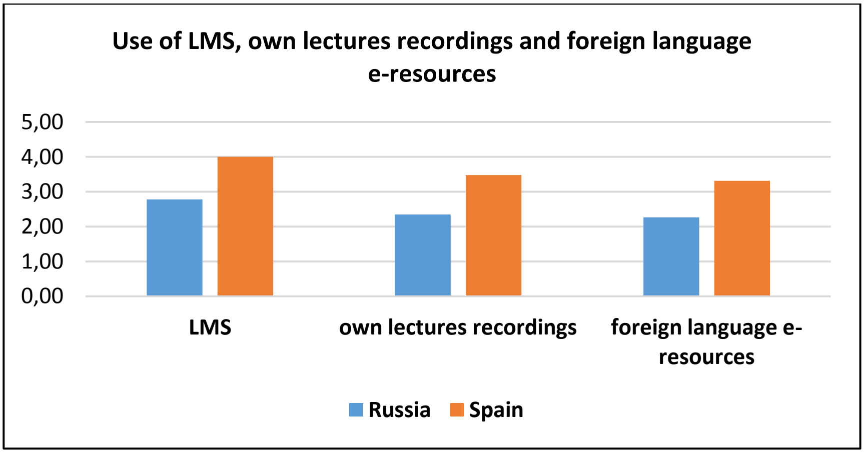

Figure 1. Use of LMS, own lectures recordings and foreign language e-resources (average rate)

Source: Own work

3.2 ICT Tools for Organizing Educational Communication in the Electronic Environment

We presume that the activity in the application of LMS is related to preferences in the ICT tools for organizing educational communication. LMS provide rich opportunities for facilitating communication and interactions. This tendency is again founded in relation to the organization of the educational communication in the electronic environment; teachers mainly make use of forums, especially Spanish teachers, followed by “rules, regulations, terms of network interactions” and finally, online lecturers. The proportion between both countries is similar.

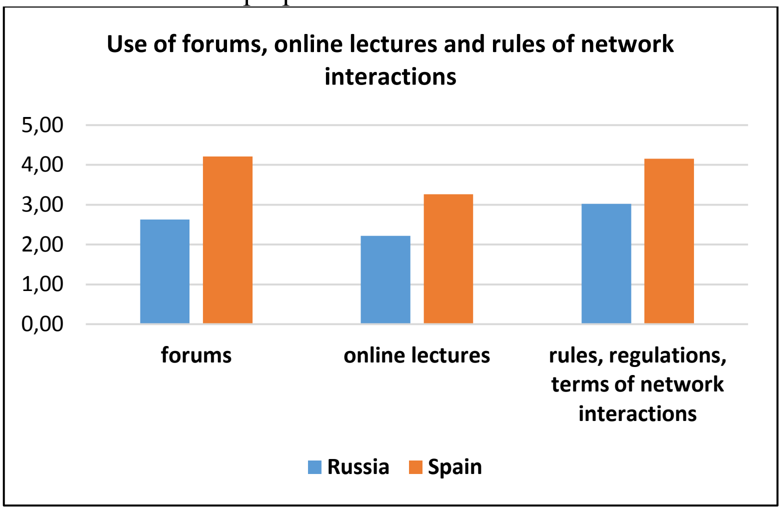

Figure 2. Use of forums, online lectures and rules of network interactions (average rate)

Source: Own work

3.3 ICT Tools for Managing Educational and Cognitive Activities in the Electronic Environment

In both countries, teachers trend to use ICT tools for organizing learning information acquisition in order to know students' academic achievements by using online polls. However, there are some differences when choose criterial rubrics and electronic organizers, with different frequency for both tools. In general terms, it seems to be that Spanish teachers repeatedly use this kind of tools versus their Russian counterparts.

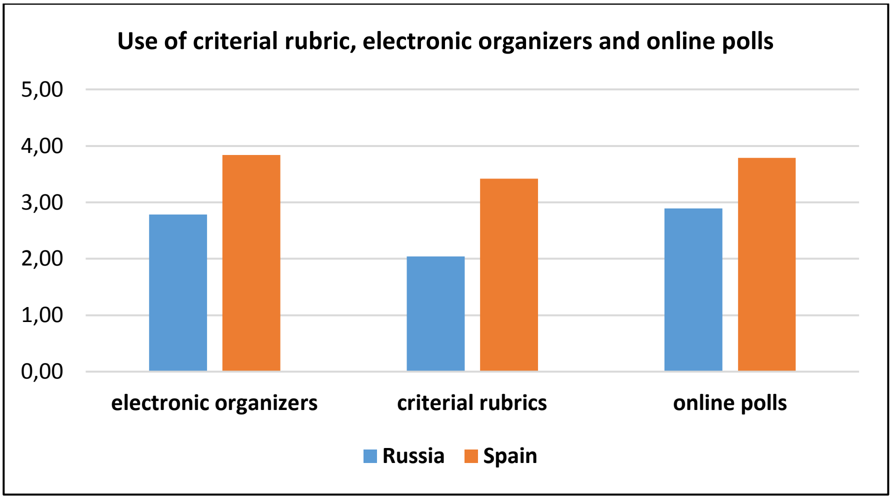

Figure 3. Use of criterial rubric, electronic organizers and online polls (average rate)
Source: Own work

CONCLUSIONS

The results show the current tendency in ICT tools use by teachers from Russia and Spain. Mostly they take advantage of the electronic content capabilities, for example, multimedia and interactivity for fostering motivation. In addition, the benefit from ICT tools efficiency and performance, for instance while actively implementing automated tests and learning analytics. Moreover, they use cloud technologies for supporting networking and collaboration. Teachers consider themselves to be aware of students' demands and aspirations of ICT tools offered.

Spanish teachers in general are more active users of ICT tools. We can note that the e-resources that teachers use largely cause their communication preferences and ways to manage teaching and learners' cognitive activities. As in the case of active use of LMS, the electronic system induces the application of available communication means (e.g. forums, online lectures, etc. together with the appropriate management capabilities (e.g., electronic organizers, criterial rubrics, online polls, etc.).

Without a doubt, the main advantage of modern ICT tools is an opportunity for a teacher to go beyond in-class interactions, to provide learners with a certain freedom in educational and cognitive activities, taking into account the opportunities and specificity of information and communication behaviour of young people. ICT tools and new activities allow teachers to create electronic educational environments where learners not only master the necessary competencies, but also get the opportunity for self-realization, personal development, and professional development (Dabbagh, Kitsantas, Al-Freih, Fake, 2015).

The prospective of the study consists in scaling the survey, engaging respondents from other European and Russian universities. In addition, the data obtained can be applied while designing e-courses in universities. This is especially important, because the data on the most promising directions in the application of ICT tools by teachers have been obtained, and several directions have been identified that require special attention and development, taking into account the educational request, and information behaviour of the 21st century students (Gibert, Tozer, Westoby, 2017).

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Area, M., Gutiérrez, A. y Vidal., F., 2012: *Alfabetización digital y Competencias informacionales*. Madrid: Ariel-Fundación Encuentro-Fundación Telefónica.

Dabbagh, N., Kitsantas, A., Al-Freih, M., & Fake, H., 2015: *Using social media to develop personal learning environments and self-regulated learning skills: a case study*. International Journal of Social Media and Interactive Learning Environments, 3(3), p. 163-183. ISSN: 2050-3962.

Gibert, A., Tozer, W. C., & Westoby, M., 2017: *Teamwork, Soft Skills, and Research Training*. Trends in ecology & evolution, 32 (2), p. 81-84. ISSN: 0169-5347.

Graña, J., 2011: Categorizacion dos Recursos TIC. [online] at: https://sfticaldan.wordpress.com/2011/10/31/categorizacion-dos-recursos-tic/, accessed 20 May 2017.

Gutiérrez-Esteban, P. & Camacho, M., 2017: *You Hold the World: harnessing the power of Mobile Personal Learning Environments (mPLEs) in Next-Generation Teacher Education*. In Alegre de la Rosa, O. (ed.). Research on University Teaching and Faculty Development. International perspectives (pp. 357-372). New York: Nova Science Publishers. ISBN: 978-1-53610-884-2.

Jiménez-Cortés, R., Vico-Bosch, A., Rebollo-Catalán, A., 2017: *Female university student's ICT learning strategies and their influence on digital competence*. International Journal of Educational Technology in Higher Education, 14 (1), 10. ISSN 1698-580X.

Lucke T., Dunn P.K., Christie M., 2017: *Activating learning in engineering education using ICT and the concept of 'Flipping the classroom'*. European Journal of Engineering Education, 42 (1), p. 45-57. ISSN: 0304-3797.

Noskova T., Pavlova T., Yakovleva O., 2017: *Electronic communication in education: a study of new opportunities.* In Simulation and Communication 'DLSC 2017': Brno, University of Defence, 2017, p. 214-223. ISBN 978-80-7231-416-4.

Osin A.V., 2007: *Electronic educational resources of new generation in questions and answers*. M.: Agency "Social Project". 32 p. [In Russian] ISBN 978-5-98433-017-6.

Smyrnova-Trybulska E., Noskova T., Pavlova T., Yakovleva O., Morze N., 2016: *New educational strategies in contemporary digital environment.* International Journal of Continuing Engineering Education and Life-Long Learning, 26 (1), p. 6-24. ISSN 1560-4624.

USE OF BOT-TECHNOLOGIES FOR EDUCATIONAL COMMUNICATION AT THE UNIVERSITY

Nataliia Morze
Borys Grinchenko Kyiv University
18/2 Bulvarno-Kudriavska Str, Kyiv, Ukraine, 04053
n.morze@kubg.edu.ua

Oksana Buinytska, Liliia Varchenko-Trotsenko
Borys Grinchenko Kyiv University
13b Marshala Tymoshenka Str, Kyiv, Ukraine, 04212
o.buinytska@kubg.edu.ua, l.varchenko@kubg.edu.ua

Abstract: *In the article the authors analysed the conditions and benefits of using chat bots in the messengers to provide effective educational communication. They defined the most popular instant messengers used by modern student, analyzed the tools provided in the messengers, in particular the possibility of creating special programs simulating human activities - chat bots. Special attention is given to determining the ways of using bots in the educational process. The article also describes the technology of implementation of the Smarsy chat bot for communication between participants of the educational process at the Borys Grinchenko Kyiv.*

Keywords: messenger; chat bot; communication; collaboration; Smarsy

INTRODUCTION

In modern society, information and communication technologies are actively used in all spheres of human life, including education. They are catalyst for change that affects the educational system, from content to its forms and methods. It is their development that allowed us to return to the development of new educational technologies based on efficient electronic communications in real time and integrated data exchange systems. Electronic communications combines people through the Internet with the help of such services as e-mail, social networks, blogs, wikis, etc. It allows users to communicate and solve common tasks at any time from any place, it allows to study, to receive relevant information, to make common, well-considered decisions in real time. That is why the modern educational environment of the modern university should include a component that will provide electronic communication among all participants in the educational process.

The purpose of the article: is to investigate the state and benefits of using Chat Bots in the media for effective education communication. To achieve the goal, the following tasks were solved: to identify the most popular media among students through a survey; to analyze the toolkit provided in the chatters to create chat bots, in particular Telegram; to determine how to use bots in the educational process (based on Telegram messenger); to describe implementation of Smarsy technology for communication among participants in the BGKU educational process.

1. FORMS OF ELECTRONIC COMMUNICATION

The most common forms of electronic communication in real time include: videoconferencing; online meetings; web forums; instant messages; chats; wiki social networks. Their number and variety are constantly changing.

As e-communication is gaining in importance and is becoming one of the main types of communication in the modern world, special attention is paid to messengers with support for chat-bots - programs simulating human activities.

The rapid development of technology has overpowered the market for software products and mobile applications used for communication. Experience has shown that users are reluctant to receive news about the installation or use of new special applications and mobile applications. According to ComScore, 80% of their time users spend making use of only the main applications. Against this background, the messenger segment for e-communications continues to grow strongly ("Bots: what it is, how they work and why we need to understand them", 2016). In 2016, the cumulative audience of the most popular messengers overtook the most popular social networks. As a result of the research it became obvious that it is easier to get to the user with the help of the program that he has installed and opens every day than to convince him of the need to work with a new application.

This means that it is advisable for application developers to create custom applications for well-known programs that will enable them to expand their functionality. So in such a way new technologies appear, one of which is the bots.

2. CHAT-BOT – THE PART OF MODERN COMMUNICATION TECHNOLOGIES

Among all the latest developments and inventions such as the Internet of things, big data, electric cars, cloud technologies, 3D printing, etc., the most trendy and popular are chat bots.

Robot, or bot (English - bot, abbreviated in Czech - robot) is a special program that performs automatically and / or in a given schedule of any action through interfaces intended for people ("Robot (program)", 2017).

Usually, bots are used for monotonous and repetitive work, with the highest possible speed (obviously, much higher than human capabilities).

Over 170 million Facebook accounts and 48 million Twitter accounts are bots. Such data is reported by researchers from the University of Southern California and the University of Indiana, as well as The Huffington Post ("Modern IT technologies for business: why companies need bots and clouds", 2017). Bots become an important and noticeable part of everyday life. However, their use is at an early stage. In fact, the bot is an interlocutor in a messenger that automatically responds on request. It interacts with external services and applications and, if necessary, can do it on a specific schedule. Instead of searching for a long time on Google or installing dozens of apps on your smartphone, you can do the same with several commands in the messenger.

Bots are also used in situations where the best response is required in comparison with human capabilities (for example, bots for games, bots for online auctions, etc.) Sometimes they are used for simulating human actions (for example, bots for chats, etc.).

Chat-bots can give quite adequate answers to questions formulated in the correct Ukrainian language. Such bots are often used to report weather forecasts, results of sports events, exchange rates, etc.
The term "ChatBot" was introduced by Michael Moldin (creator of Verbot, Julia) in 1994 to describe the spoken-word program ("Hello, Bot! Are Chat Bots – The Next Generation of Applications?", 2016).

The main advantages of using chat bots are:

1. It is much easier to install bots than mobile apps. To install the bot, you just have to find it in the messenger and start the correspondence. Bots are a set of automatic messages.

2. Ease distribution. Bots can be distributed through links and through other bots. In the case of Slack messenger, any member of the working group can add the bot so that become available to the all team.

3. High-quality mobile applications are expensive in development and support. Creating the program suppose the presence of qualified developers (or even teams) for Android and iOS, requires tests, debugging, applications in app stores. In the case of bots, they are easily created and added to ready-made messengers.

4. There is a huge number of situations in which the mobile application is unjustified. Almost instant start of the bot opens many new usage scenarios. Bots are used in cases where you do not need to create extra applications.

5. Bots can manage searching requests, data stored in the cloud. Transferring computations to the cloud reduces the load on the user.

6. Bots are adapted. Chats are a "natural environment" for bots, so they can easily live and work in a live conversation, as is done by personal assistants (Siri, Google Now), in auto-navigators, smart watches, emails, push messages, and more. .

7. The use of chat bots creates an image of a structure that follows modern technologies.

8. The use of chat bots does not require a complex programming knowledge. If you want to learn how to program a chat bot - quite simply, you do not need to know the programming languages. It is enough to determine in which messenger you need to create a bot and what it should do.

9. Chat bots are not artificial intelligence. This is another step towards the use of artificial intelligence technologies.

3. USE OF CHAT-BOTS IN MESSENGERS

By exploring the current state of the use of chat bots in the messengers it can be concluded that chat bots are very universal means capable of solving various tasks from communication to counselling, from information services to voting, from instant surveys to ordering educational content that will allow participants in the educational process to make decisions in time.

To determine the ways of using chat bots in the educational process at the beginning of the study, a target audience was identified - users aged from 17 to 21 years. To determine the types of messengers most used by students, a survey was conducted. Based on the student survey results (the number of students who answered more than 1000 questions), they determined that they are users of such messengers: Viber, Facebook Messenger, Telegram and WhatsApp (Figure 1).

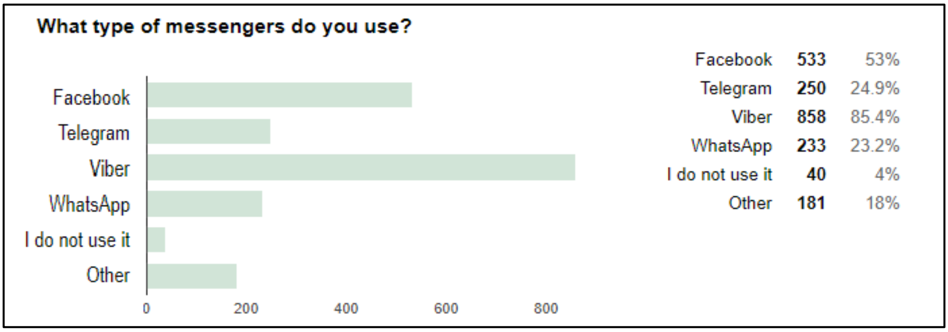

Figure 1. Student Survey Results

Source: Own work

In order to identify the tool provided by popular messengers to create chat bots, a detailed analysis of not only the functionality of messengers was conducted, but also considered examples of existing chat bots and the current state of the tools for their development.

Messenger Viber does not have open tools for developing chat bots. Viber Ari is only available to users who sign up for Public Accounts, which are only government agencies, brands or businesses, public organizations, or public entities.

The Facebook Bot Engine also looks attractive for Messenger's chat bots developers, because it provides wide range of user interfaces for bots and has detailed documentation.

Telegram is a messenger that allows you to exchange text and multimedia files and has bots - special accounts that can automatically process and send messages. Boots can virtually do any tasks that an average user of the Telegram account with online services does. Bots can teach, entertain, search, broadcast, remind, connect and connect to the Internet of things. In essence, bots are a user-friendly interface for working with a variety of web services. To use bots, you only need an account in Telegram. For users, interacting with them looks like chatting in chat, the only difference is that the other end is not a person, but a program with elements of artificial intelligence.

“Telegram Bot can be programmed for a specific purpose, as to search for videos, pictures, to read RSS feeds, and even to interact with other Telegram Bots. The Telegram Bot API is a functions set to support the creation of the Telegram Bot dynamic through programming languages, such as Phyton, Java, C/C++. The Telegram Bot dynamic specifies the interaction rules with person users and other Telegram Bots, which are machine users” (Juan Carlos de Oliveira; Danilo Henrique Santos; Mário Popolin Neto (2016). Chatting with Arduino platform through Telegram Bot. 2016 IEEE International Symposium on Consumer Electronics (ISCE), 2016, P. 131 – 132.)

That is why the Telegram messenger was chosen during the research for the implementation Bot Technologies at the University.

The advantages of the Telegram Messenger include:

- Cloud storage of files;
- File transfer (rar, pdf, mp3, jpeg) up to 1.5 GB;
- Ability to synchronize with different devices;
- Maximum number of interlocutors in chat - 5000;
- Maximum speed of message arrival;
- The highest level of security among messengers;
- Self-destruct messages (deleted after receiving by the recipient);
- The presence of bots;
- Presence of thematic channels.

4. CHAT BOTS IN EDUCATIONAL INSTITUTIONS

The survey conducted indicates the following reasons for low student activity when using ICT:

- The absence of a living teacher in the face of whom you feel responsible.
- The lack of teammates, along with which you feel the spirit of competition.
- Lack of hard schedule, praise, reproach - nothing but your own motivation to reach the end.

As can be seen from the statistics, for 90% of the respondents, a teacher is needed to help them grasp the knowledge gained. It can be artificial intelligence.

Prototypes of chat-bot applications are in demand on the market of educational services, in particular

Artificial intelligence will allow you to introduce an individual approach to each student. Educational programs will not just be textbooks and tests, with a new interface - they will become real teachers and the more students will participate in a similar educational system, the more "smarter" it will be. Receiving feedback from students in terms of the number of solved tasks and their progress, the system will be able to adjust the previously applied approach, and over time, it will become a "perfect teacher", which can be given beginner at the entrance, and at the exit to get a professional.

For solving the urgent tasks of the educational branch: providing assistance to students who learn remotely automated surveys when attaching the studied material, receiving feedback from users about the quality of educational services, etc.

The most useful bots for solving educational tasks are:

1. @AndyRobot is a chat bot which will unobtrusively help you learn English from scratch or pull it to the required level. AndyRobot can conduct serious conversations "in life", support small talk, pick up tests and games for users.
2. @ucheba_bot - A bot which can answer questions to participate in the quiz to pick up an IQ test to give general knowledge on various sciences. It is actually a teacher with a lot of different functions. According to the feedback, it is highly appreciated by students who are studying IT-technologies: the bot helps to save on textbooks, provides the necessary information and sets up really important questions.
3. @Wikipedia_voice_bot - Wikipedia's voice search box bot. You can request the necessary information without distracting from your daily activities.
4. @YTranslateBot is a Yandex-based bot translator. "Understands" phrases and translates them entirely, unlike many other bots-dictionaries.

5. @pronunciationbot - the bot that converts the received text into an audio message or sends transcription of words on the international phonetic alphabet in order to teach the correct pronunciation.
6. @stepicbot is a bot that helps you find open online courses and educational materials on the stepik.org platform: from lessons on rational thinking to advanced C / C ++.

In addition, there are chat bots for the formation of the curriculum. Today, the educational process actively applies a personalized approach that educates a holistic person and a highly skilled specialist in a particular industry. Therefore, creating a curriculum should take into account the interests of students and the solution of educational tasks without the exchange of contact data (telephone numbers, addresses of mailboxes or accounts in social networks), as well as without creating groups in messengers or networks. In addition, Smarsy's personal assistant will help you quickly automate a poll or vote without human intervention, so fake results, double voting and other tricks in this case are not possible. Smarsy's personal assistant also provides quick and easy access to any e-learning or administrative information (schedules, news, announcements, etc.) directly in your favorite messenger, without the need to download websites and remember the logins and passwords.

Borys Grinchenko Kyiv University began using these innovative technologies for the good of its students, faculty and administration.

To this end, a plan has been developed for the experimental introduction of bot technology, their features. The content of the course is adapted to the individual pace of learning so that each student learns in a comfortable rhythm. Chatting and AI-algorithms help with collecting and analyzing data for each student.

The University of Dickinson in Australia, Victoria is developing an Intelligent Chat Boat that will respond to students' questions about campus quality. IBM's Virtual Assistant for Artificial Intelligence will help you find a lecture hall, apply for training, find a parking space and much more.

The personal assistant in education, which operates on the basis of modern bot technology known messengers (Telegram, Viber, Facebook Messenger) is a Smarsy chat-bot. Its main goal is to provide students, faculty and administration of the University with the opportunity to quickly communicate with each other for the purpose (Figure 2).

Organizational and technical training
↓
Information and technical stage
↓
Transfer databases of employees and students to the executor
↓
Installing the system on mobile devices of the experiment participants
↓
Setting quantity of participants involved in the experiment
↓
Providing access of e-resources to the executor
↓
Access to e-resources of Borys Grinchenko Kyiv University
↓
Monitoring and improving the system Smarsy University
↓
Evaluation the effectiveness of the experiment

Figure 2. Plan for the experimental introduction of bot-technology
Source: Own work

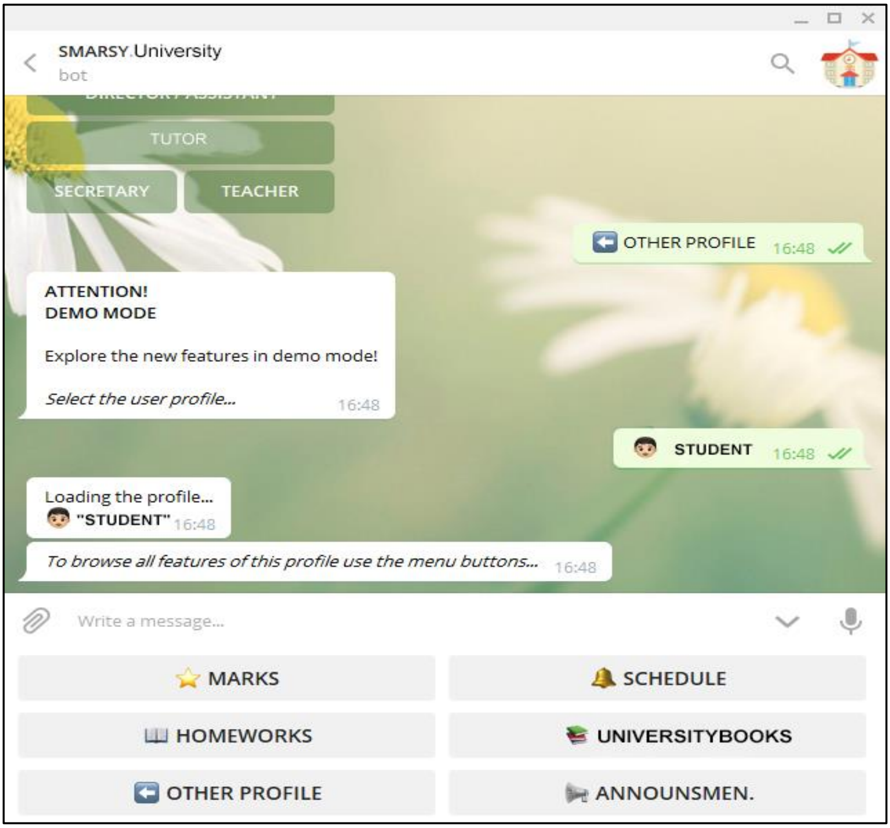

Figure 3. The role of the student
Source: Own work

Each participant can choose the appropriate role student, parents or school staff (director assistant, class teacher, secretary teacher). For each of the specified roles, the chat bot has functions and features defined by the administration. So for the student, the appearance of the chat bot is presented in Figure 3, for the manager – Figure 4.

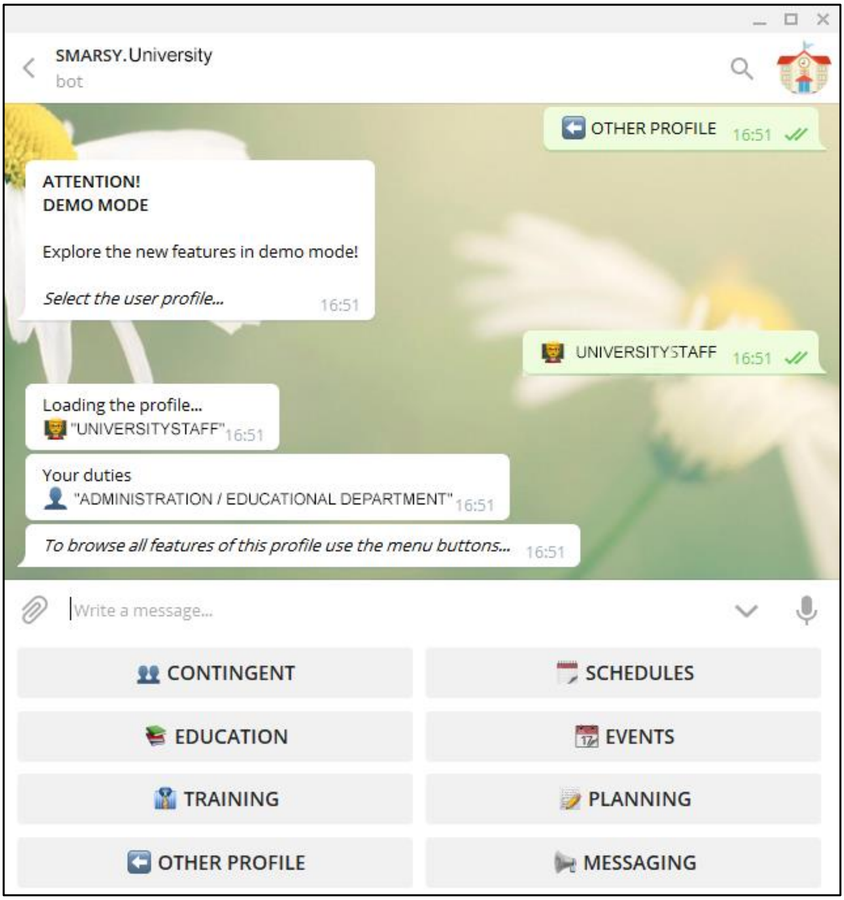

Figure 4. The role of the director

Source: Own work

At the initial stage, it is planned only to create a chat bot for organizational and informational tasks, which will allow students not only to review the schedule of studies, tasks, assessments, and in the future, taking into account the individual needs to build their own trajectory of training. For the administration, we expect to help chat-bot not only in alerts and questionnaires, but also in planning, contingent formation, scheduling of classes, and, accordingly, in making up-to-date correct decisions.

CONCLUSION

An integral part of the informational educational environment of the modern university is the electronic communication between all participants of the educational process in real-time and integrated data exchange systems. There aren't a lot of willing staff who want to install new software on their own mobile devices, then you need to use those applications that are already installed. After analyzing what messengers students use and after studying their possibilities, our decision was to use Telegram and to create a personal learning assistant - the Smarsy chat bot, which aims to provide students, faculty and administration of the University with the ability to ensure fast communication with each other, for solving educational problems, without contact information exchange, without creating groups in messengers or networks. The Smarsy feature is to help solve information and organizational tasks – is the ability to automatic survey or voting without human intervention, access to any educational or administrative information without the need to download websites and remember the logins and passwords. One role - a student, a teacher, an administrator, is given to each participant and it is given the corresponding levels of access to the resources of the informational educational environment. Upgrading and developing Smarsy, we are waiting for the chat-bot in the construction of personal trajectories of student training, planning, contingent formation, scheduling of classes, and, accordingly, making the right decisions right.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

“Chat-bots will teach your children” – column by Michael Yang, [online] at https://rb.ru/opinion/bot-study, (accessed 4 September 2017)

Bots: what it is, how they work and why we need to understand them, [online] at https://te-st.ru/2016/06/08/chatbots/, (accessed 30 August 2017)

de Oliveira J. C., Santos D. H., Neto M. P., 2016: *Chatting with Arduino platform through Telegram Bot.* 2016 IEEE International Symposium on Consumer Electronics (ISCE), 2016, P. 131 – 132. Electronic ISSN: 2159-1423. DOI: 10.1109/ISCE.2016.7797406

Hello, Bot! Are Chat Bots – The Next Generation of Applications? [online] at https://habrahabr.ru/company/microsoft/blog/281459/, (accessed 3 September 2017)

Modern IT technologies for business: why companies need bots and clouds, [online] at https://www.epravda.com.ua/rus/publications/2017/03/20/622844/, (accessed 25 August 2017)

Robot (program), [online] at https://uk.wikipedia.org/wiki/Робот_(програма), (accessed 26 August 2017)

THE STYLOMETRIC ANALYSIS OF PAPERS PRESENTED AT THE DLCC CONFERENCE IN CIESZYN

Anna Ślósarz
Pedagogical University of Kraków, Podchorążych 2 / 565
aslosarz@up.krakow.pl

Abstract**:** *The purpose of this paper was to analyze expression styles of 253 conference papers published in the 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2016 DLCC Conference in Cieszyn proceedings. It was hypothesized that the representatives of similar disciplines expressed themselves in a similar fashion, with the country of origin not being a differentiator. A statistical analysis of the vocabulary of the papers was conducted using the "Stylo" program. The visualizations showed similarities in the expression among 216 authors. The expression styles of the papers were qualitatively analysed. It was found that the DLCC participants have developed common terminology, which is one of the conditions for recognizing Distance Learning Studies as an academic discipline, similar to Media Studies or Knowledge and Communication Studies.*

Keywords: *paper, word, stylometry, space map, cluster.*

PRESUPPOSITIONS

Approaching the stylometric study of the DLCC conference papers, it was hypothesized that language serves not only communication but it also reflects the perception of the world of the group, and it even expresses values and the national spirit of the group (Herder, 1772; Humboldt, 1822). The findings of the American anthropological linguistics representatives have also been referred to, who, according to their understanding of the American Indians languages, believed that every language user utilizes a language which is common in a given society, thus *society speaks through the individual* (Sapir, 1949: 533).

Additionally, two hypotheses of the Tartarus School representatives were applied while analyzing the papers. The first one formulated by Jurij Łotman who argued that the text forms sense and therefore its comprehension is not limited only to a given culture but is of a global significance (1984: 74). The second one formulated by Aleksander Piatigorski who stated that the text message has three characteristics: it is perpetuated, understandable and is a way of communicating (1975: 115-116).

On the basis of cultural linguistics (Anusiewicz, 1994: 10) as well as the linguistic concept of the world (Bartmiński, 2007), it was assumed that language contains the most important contents of culture. Cognitive linguists (Lakoff & Johnson, 1980) showed that the metaphors reflect the way the world is perceived by the speaker. Therefore, the concepts form the structures and organize the way of thinking and judging, which is passed on to other people (laterally) and onto next generations (longitudinally). Anna Wierzbicka argued that the linguistic analysis of acts of expression is a way of learning about culture (1986) and also that the key words characterize cultures (1997).

In order to identify the most important topics according to conference participants and their shared ways of thinking, the papers were searched for the most commonly used words, then grouped into spatial matrices, hierarchical clusters and the lists of the Most Frequent Words (MFW) was prepared. Finally conclusions were drawn about the way Distance Learning (DL) issues were presented at each conference in the following years respectively and on the whole during the period of time the conferences under study were held.

1. AIM, MATERIAL AND METHODS

The aim of the study was to find out which words and collocations appeared most frequently during the 2009-2016 DLCC conferences. It was hypothesized that the representatives of the same or similar scientific disciplines expressed themselves in a similar fashion on the same problem, with the country of origin not being a differentiator. The research material was a corpus of texts consisting of 253 papers published in successive conference proceedings. The papers were saved as separate text files in UTF-8 (aka Unicode) format. Each paper was tagged with the author(s) names(s) and the year of publication. These tags appeared then on matrices and in dendrograms.

A statistical analysis of the vocabulary and collocations of the papers were performed, using the "Stylo" program and the computational stylistics method (Eder, Rybicki, Kestemont 2014). With the use of the “Stylo” package (Eder et al. 2013), Classic Delta distance and taking into consideration 100 MFW stylometric analyses were conducted. Visualizations of stylistic similarities between input texts were obtained:

1. Principal Component Analysis (PCA) where covariance plot was presented as a space map[1].

[1] Principal component analysis (PCA) invented by Karl Pearson (1901) is an statistical procedure used for transformation a set of observations into a set of values of variables

2. Cluster Analysis (CA) with dendrograms showing hierarchical clustering of the analyzed papers.

Table 1.

Number of papers published in conference proceedings

Year	Liczba referatów
2009	26
2010	22
2011	29
2012	35
2013	46
2014	35
2015	30
2016	30
Total	**253**

Source: Own work

Therefore, each paper had its closest "neighbour", which was similar to another paper, and so a map of interrelations was created (Eder, 2014: 5). The smaller "branches" of the dendrograms linked papers similar in terms of vocabulary used, larger ones – signalled the existence of more significant similarities. Each graph was saved as a graphic file in *jpg* format. Graphs and wordlists were grouped into 9 working folders – one for each year and additional one for the all papers.

Texts were not cleaned out of synsemantic words: articles, particles, prepositions and conjunctions, for example: *a, and, in, of, the, to*. Therefore, an "unpurified" corpus of papers was created; next the lists of MFW were populated; one for each year and one for all the conferences combined. The MFW lists were formed and saved automatically, as well as dendrograms and matrices were, in the corresponding working folders. However, lists of the most frequent words (MFW) calculated by *Stylo* program and presented in this paper do not contain synsemantic parts of language; these were omitted for the sake of clarity. In the centre of the examined conference language, only the most distinctive structures, i.e. the MFW typically used by participants of the DLCC conference were listed. Due to limited space, words and expressions appearing less frequently, though related to the subject matter of the conference, were omitted. These words and expressions assisted with putting newly investigated phenomena in the context of the main ones which had already been described. Additionally, they allowed the DL studies to progress in different directions.

The combination of CA, PCA, and MFW was a way of triangulation of the study results. It allowed for inter-complementing three different ways of presenting data.

showed on two, three or more dimensional space. It is used to bringing out clear charts for a dataset what make data easy to exploration and visualization.

2. LIMITATIONS

The study of expression style of the papers prepared by the participants of the DLCC conference is characterized by partial objectivity only because:

1. The distance between texts was measured with the usage of words only (without taking into consideration quotes and inter-textual relations).
2. The method of analysis did not include metaphors, stylistic choices or rare vocabulary while those make the individual expression unique.
3. Many papers were written conjointly: 216 researchers prepared 253 papers, with some researchers participating in writing more than one paper. It was impossible to determine the stylistic contribution of every single author.
4. It was not possible to include videoconferencing, which each year played an important role at the conference, bringing together researchers from different parts of the globe thanks to the use of English language.
5. Only one researcher was an English native speaker, so the expression style of other participants was influenced by academics and researchers, and not by the primary groups like family, neighbours, peers or friends.
6. The analysis did not cover the cultural differences in the expression style on the DL, because exclusively the DLCC conference publications were the research material.

2. THE DLCC CONFERENCES

2.1. Topics

The DLCC conferences have been devoted to the widely understood DL. The speakers referred to courses offered on various platforms, Massive Open Online Courses, Open Educational Resources, Lifelong Learning, informatics competences for teachers and students, e-assessments, as well as e-books, web sites, education in the cloud, robots, social media and educational, technical, economic, ethical and other problems and challenges related to those.

2.2. Participants

For the past eight years the DLCC conference has been gathering professionals from various academic and scientific disciplines, especially those with scientific, humanistic and social background. The participants represented different countries and universities. Among them, there were many computer scientists, including administrators of education platforms. English philologists, teachers, psychologists, librarians, representatives of chemical science, militaries, as well as representatives of linguistics, Roman philology, Polish philology, religious studies, and theology attended the DLCC conferences. It can, therefore, be said that different academic fields and areas were represented by the participants.

3. ANALYSIS OF THE PAPERS

3.1. Year 2009

In 2009, the Principal Component Analysis (PC1) reached about 19pts (taking into consideration 48.9% of data), which represents the highest stylistic variation of the papers in the history of the conference. This seems to be understandable as in 2009 the first DLCC conference was held, and therefore a common style of expression has not yet been developed.

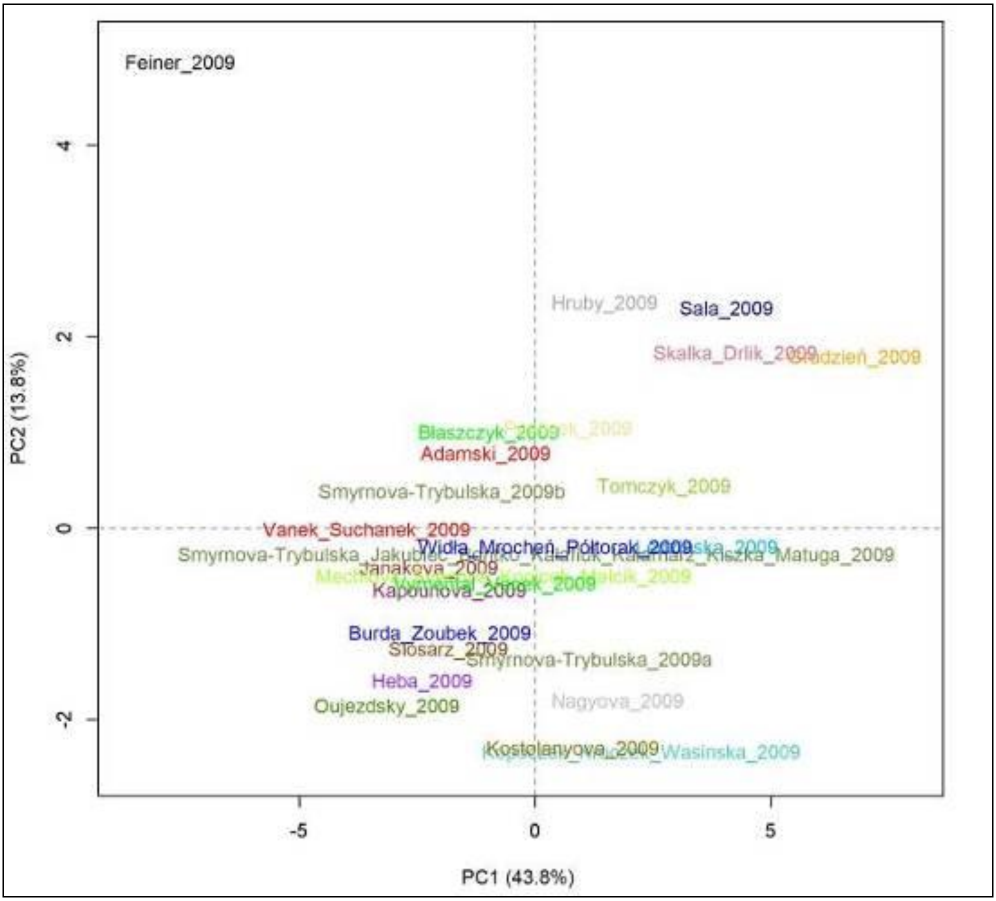

Figure 1. Principal Component Analysis[2] using a covariance matrix (2009)
Source: Own work

[2] On all charts Principal Component Analysis refers to correlation of 100 most frequent functional words and shows the position of papers in the space defined by principal components PC1 and PC2 according to K. Pearson and in this case the discriminative strength of words.

On the PCA plot (Figure 1), the names of researchers representing different countries appeared one nest to the other, e.g. Miroslav Hruby (Czech Republik) and Wojciech Sala (Poland) or Ales Oisezdsky (Czech Republic) and Agnieszka Heba (Poland). This means that the country was not a factor differentiating the style of expression.

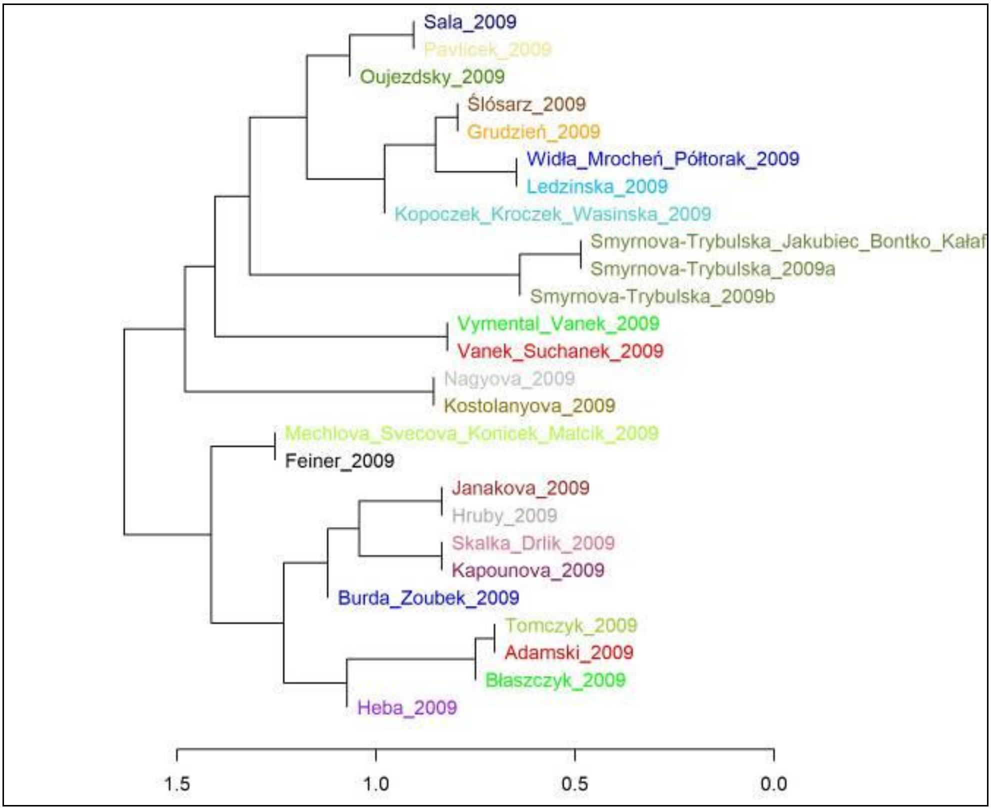

Figure 2. Cluster Analysis – dendrogram with hierarchical clustering of papers (2009)

Source: Own work

In the upper right corner, there are papers grouped based on the best fitting the stylistics of the conference. Those papers addressed technology: professional teaching at the Higher School of Information Technology (Jacek Grudzień), DL as supporting the education (Wojciech Sala), formal descriptions of electronic questions (Miroslav Hruby) and plagiarism prevention (Jan Skalka and Martin Drlik). The vocabulary of those papers was technology related. At the opposite end, there are papers by Ales Oujezdsky, Katerina Kostolanyova, Agnieszka Heba on multimedia devoted to the development of mathematical competences and by Remigiusz Kopoczek and Katarzyna Kroczek-Wasińska *Artistic Education Based on E-learning*. The positioning of Franz Feiner's paper in the upper left corner of the plot was a result of the fact that it was published in German language.

Cluster Analysis (Figure 2) also revealed some similarities, such as those of E. Smyrnova-Trybulska and dissimilarity of papers, either authored or co-authored by her, with other papers. On the most distant and opposite places, there are once again paper by F. Feiner and by: Erika Machlova et al. (about e-learning at secondary schools), Ingrid Nagyova (*Information iteracy of Pedagogy Students*) and Katerina Kostolanyova (IT applied in education). Therefore, it can be said that similarities and differences of the papers were illustrated more clearly on the dendrogram thanks to more detailed visualization and more thorough associations than on the PCA plot.

Twenty functional MFW specific for 2009 conference: *students, learning, education, course, distance, information, teaching, can, knowledge, educational, their, use, courses, e-learning, university, multimedia, computer, have, work, materials.*

The 2009 MWFs were mainly associated with the educational process and technological aspects of teaching. They appeared in the plural reflecting the scale of DL usage: *students, courses, materials, their*. The verb *can* reflected the researchers' optimism, similarly positioned statistically next to the verb *can* is the noun *knowledge*, e.g. *students* (...) *acquiring more knowledge* (Smyrnova-Trybulska, 2009: 9), *students who want to broaden their knowledge* (Widła, Mrochen & Półtorak, 2009: 50). Both words reflected the researchers' belief in the educational possibilities of DL.

Words *course, courses, learning, teaching, educational* show that the subject matter of the papers focused on the educational process, often personally prepared by the conference participants in the face of technical problems, hence the popularity of nouns such as *computer, materials.*

3.2. Year 2010

The space map for 2010 reveals stylistic differentiation of published papers. They are far from each other, do not form a nucleus as in 2009. Thematic diversity of the texts and addressing the problem from the point of view of different disciplines were also noted. For example, Radosław Jedynak connected supporting of students with remote control software, but Stefańska-Klar connected it with autism and Asperger Syndrome. As a result, these two papers contained different functional vocabulary, so on the plot they were placed relatively far apart.

The PC1 reached about 14pts, i.e. it decreased by 5pts as compared to year 2009. This means that a difficult process of developing a common stylistics of conference language has begun. The 15 authors of the 2009 papers prepared papers for 2010 conference and thus transferred their previous linguistic habits to the 2010 meeting room. To the unification of the expression in 2010 has also contributed publication of the conference proceedings in a timely manner, which allowed the participants to access it at the commencement day of the DLCC conference. Thanks to an excellent organization, the same happened also in 2009. Such a timely publication of conference proceedings was not an easy task for the conference organizers, but thanks to it the participants were willing to come to the conference counting on the quick acquisition of the points needed for professional stabilization and promotion. At that time, in Poland, English-language publications were scored higher than Polish-language ones.

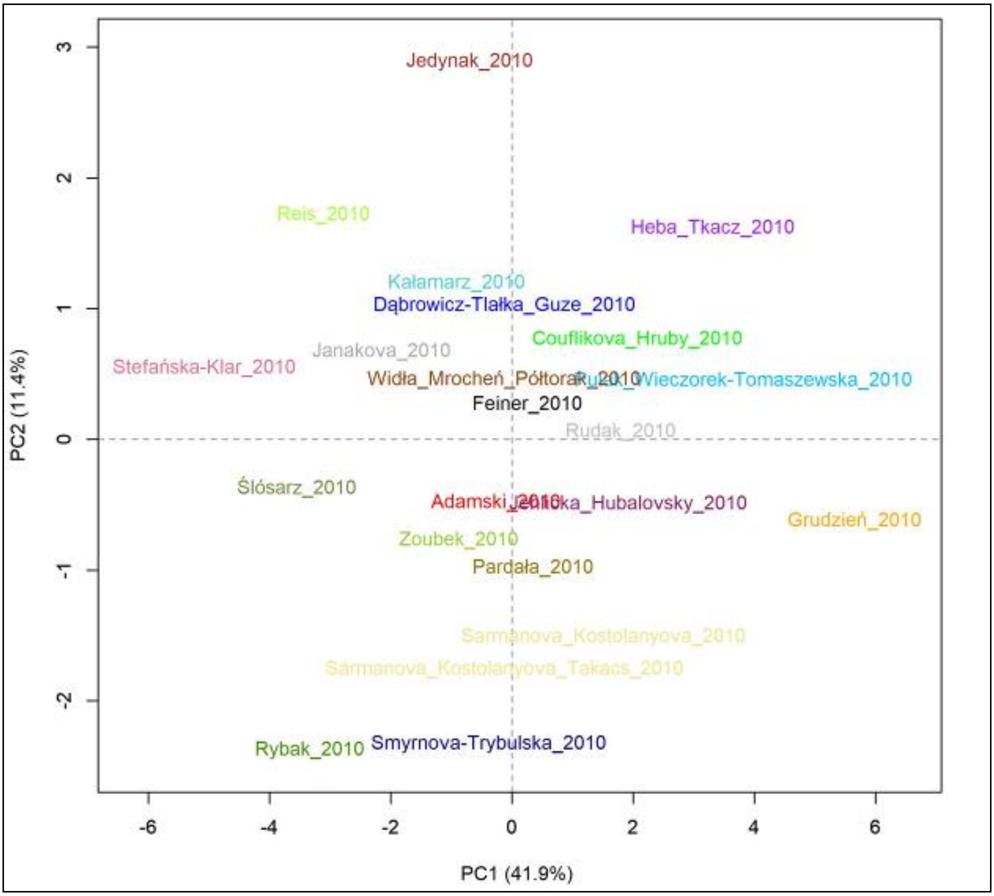

Figure 3. Principal Component Analysis using a covariance matrix (2010)
Source: Own work

Additionally, the papers were published on the Internet, which was a rare occurrence at that time. This was mandated by sponsoring of the first DLCC conference by the Visegrad Fund. That has contributed both to establishing international contacts as well as to the promotion of the DLCC conference and the academic achievements of its participants on the international arena.

The space map (Figure 3) shows that papers by Agnieszka Heba (who participated in the conference for the second time) and Piotr Tkacz were the closest to the general style of the conference. On the other hand, the paper by Anna Rybak, who participated in the debates of the conference only once and prepared her paper independently, was the most distant from style of the DLCC.

Cluster Analysis (Figure 4) revealed stylistic similarities of the papers on various topics. The keynote by Antonio dos Reis, who talked about technical evolution of e-learning, occurred to be stylistically similar to the paper by Renata Stefańska-Klar about *the use of the Internet in supporting and educating persons with autism and Asperger Syndrome* (2010: 249).

Papers by Eugenia Smyrnova-Trybulska and Franz Feiner were also similar. On the other hand, Adam Adamski's original paper *States of consciousness and learning* occurred to be stylistically similar to the paper by Aneta Couflikova and Miroslav Hruby *Protection of learning management systems*. Despite the thematic divergence of both papers, their titles alone reveal stylistic resemblance i.e. the use of the word *learning*.

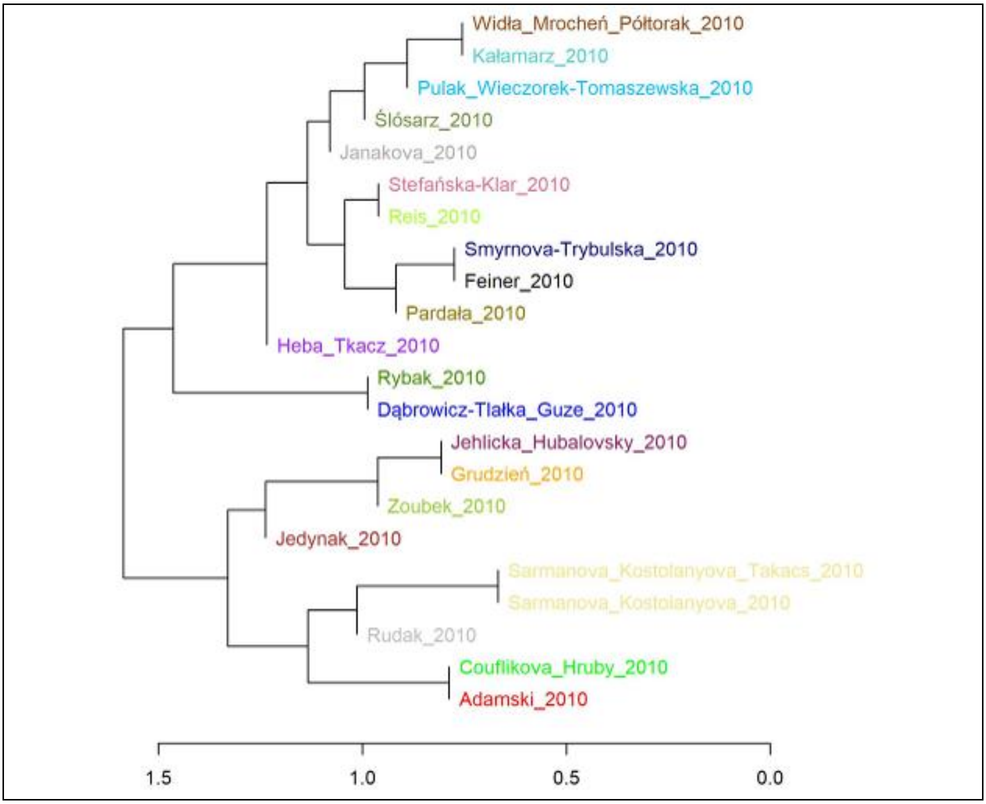

Figure 4. Cluster Analysis – dendrogram with hierarchical clustering of papers (2010)

Source: Own work

Twenty functional MFW specific for 2010 conference: *learning, education, students, teaching, can, course, distance, e-learning, information, their, teacher, educational, new, have, we, internet, student, university, computer, teachers.*

The 2010 MFW, like in the previous year, referred to the educational process. However, their order changed. In the first and the second position appeared the words *learning*, *education* (in 2009 they were respectively *students*, *learning*), which meant that the authors limited the debate to their own experiences and made conference discussions more abstract. The word *can* appeared in fifth position (in 2009 it was in eighth position), which, like the word *new*, may suggest more optimistic than a year before researchers' attitude to the capabilities of modern technology

3.3. Year 2011

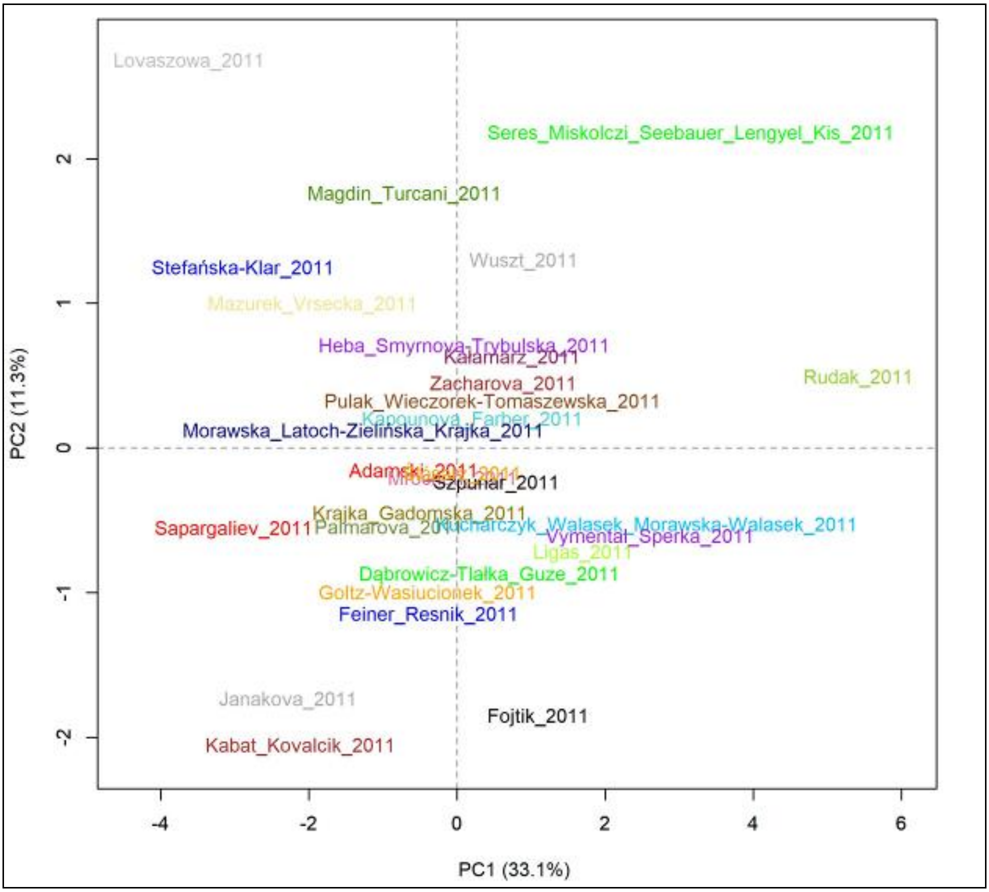

Figure 5. Principal Component Analysis using a covariance matrix (2011)
Source: Own work

The space map for year 2011 (Figure 5) shows further unifying of the styling of the DLCC conference expression. Many texts are close together. Scale C1 decreased to about 12pts. This can be seen as a manifestation of the linguistic integration of the DL research community, especially that in 2011 out of the 49 authors of the papers as many as 31 (63.3%) participated in the DLCC conference for the first time. Some authors represented countries which so far had not participated in the conference: Kazakhstan and Hungary. That is why the paper by Danyar Sapargaliyev from Kazakhstan differed from other papers by its individual style of expression. On the other hand, Hungarian researchers (György Seres, Ildiko Miskolczi and others), according to the PC1 co-efficient, adapted the style of their papers to the style of the DLCC conference second best after Leszek Rudak, who participated in the conference for the second time. The cultural conditioning and also diminished accessibility to the conference proceedings the most likely could be the reason for differences in the stylistic expressions between the researchers from Kazakhstan and Hungary and other researchers.

Michal Kabat and Juraj Kovalcik, whose style of expression was the most different from the one conceived at the DLCC conference, participated in the conference for the first time. However, in case of Milena Janakova, the difference, occurring every year, was due to her individual style and the subject matter of her paper.

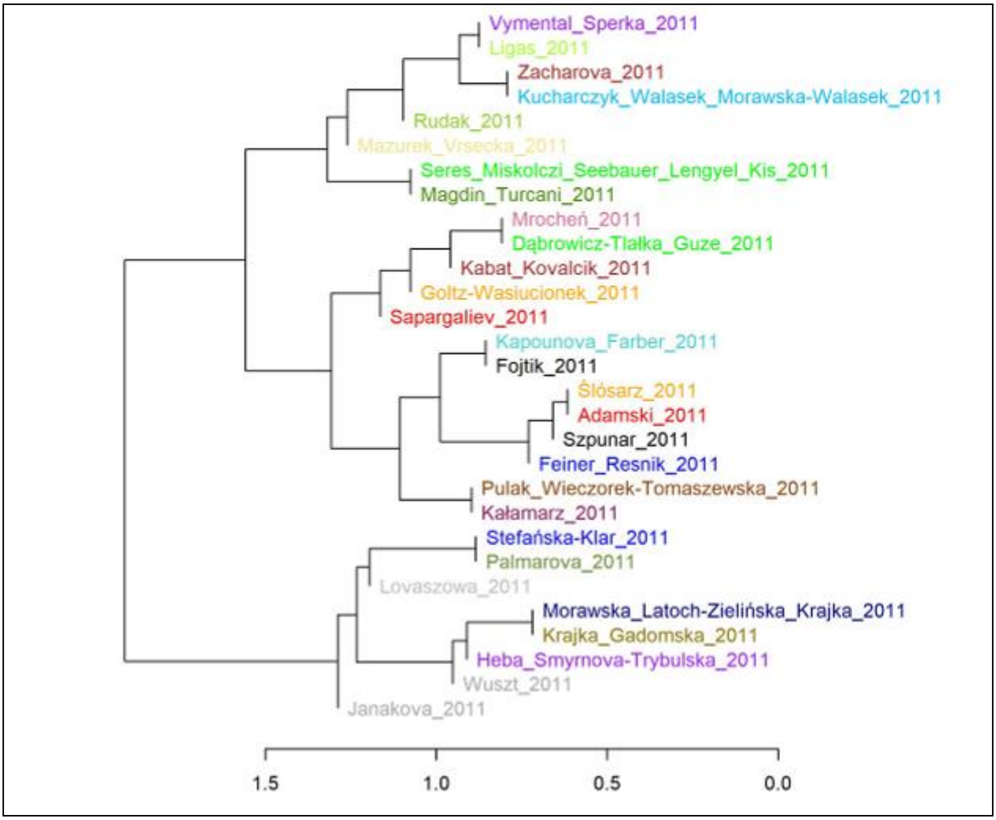

Figure 6. Cluster Analysis – dendrogram with hierarchical clustering of papers (2011)

Source: Own work

The Cluster Analysis (Figure 6) confirms the distinctiveness of M. Janakova's paper. It also unveils unexpected stylistic similarities to the papers on different topics, such as *Psychological Aspects of Distance Learning in Future Teachers Perceptions. The Role of Prior Experience and Computer Anxiety* by Renata Stefańska-Klar and *Blended Learning of Computer Programming* by Viera Palmarova (significant, that both titles contain words *learning* and *computer*).

Twenty functional MFW specific for 2011 conference: *learning, students, education, can, e-learning, use, their, computer, information, teaching, knowledge, teachers, course, new, have, process, teacher, educational, more, school.*

In 2011, the most popular word was *learning* – same as year before. *Can* appeared in the fourth position instead of the previous year's *teaching,* reflecting an optimistic attitude toward the DL and the tendency to move away from one-way teaching for the sake of establishing rapport – characteristic of connectivism. Replacing *university* by *school* expanded the research area. Other newly occurring words include *use* (6.), *knowledge* (11.), *process* (16), *more* (19.). The word *knowledge* became popular among the participants thanks to the title of the conference and the title of the conference proceedings from 2010: *Use of e-learning in the training of professionals in the knowledge society*. In the top twenty positions did not appear previous year's word *internet* because it has already been an ordinary and more and more easily accessible technology.

3.4. Year 2012

In 2012, researchers from Russia and Ukraine joined the conference. Among the 57 authors, 36 (63,2%) attended for the first time. Still, the space map shows further unifying of expression style. The PC1 decreased to about 9pts. There were several reasons for this:

1. The researchers attended the DLCC conference for the fourth time.
2. Some researchers were meeting during other parallel conferences (for example: *Virtual University* in Warsaw, *DLSC* in Brno).
3. The conference proceedings were published annually.
4. The papers were made available on the conference website.
5. The Silesian Digital Library (Śląska Biblioteka Cyfrowa) published conference proceedings free of charge.

It is worth noting that on the space map (Figure 7) the texts are mainly placed around positive values, which means that most of them were in line with the style of the conference. Marek Wrzosek, who attended the conference for the first time, did it the best. As a representative of a military academy, he was however familiar with such conferences and with the practical use of the DL.

On the other hand, the least characteristic features of the conference expression style were presented in papers by Sebastien Ducourtioux and by Barbara Dębska & Agnieszka Kubacka, who attended the conference for the first time. In addition, they came from distant research centres (Dunkirk, France; Krosno, Poland), which had not been previously represented at the conference.

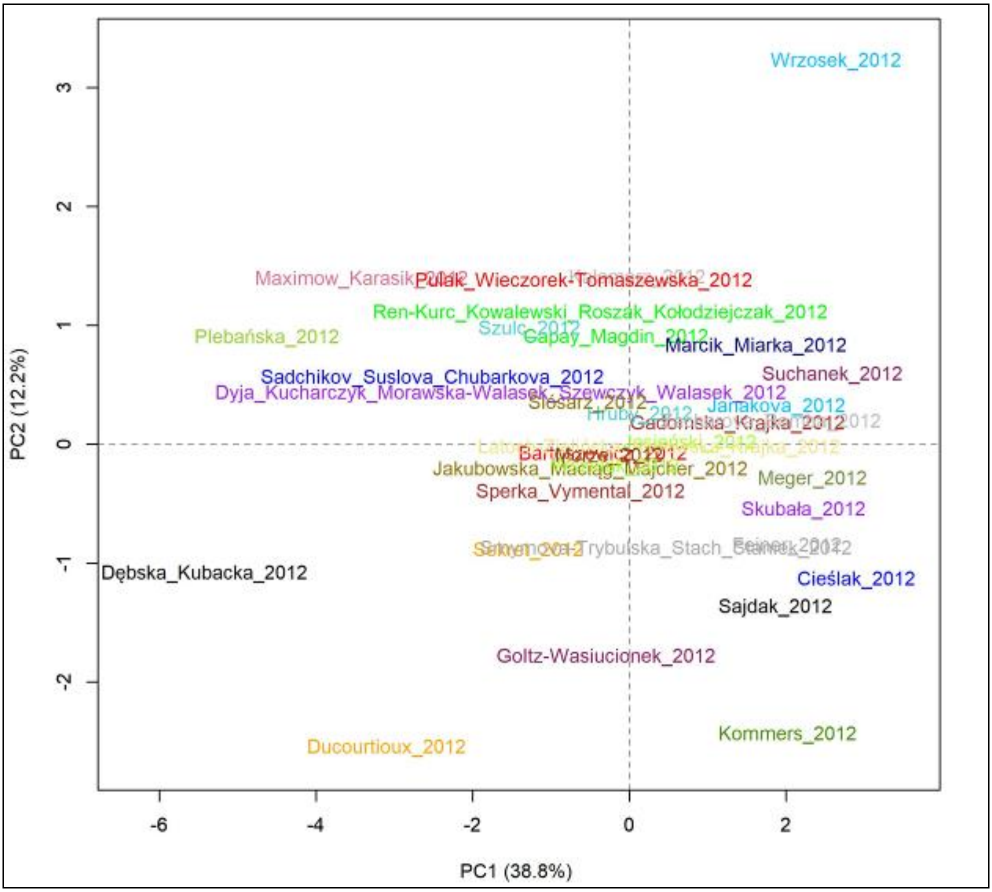

Figure 7. Principal Component Analysis using a covariance matrix (2012)
Source: Own work

The Cluster Analysis (Figure 8) shows that the seemingly extremely different stylistically papers by S. Ducourtioux and M. Wrzosek, had however a lot in common in terms of deeper meaning.

Twenty functional MFW specific for 2012 conference: *learning, education, students, e-learning, knowledge, information, can, their, educational, process, they, teaching, language, have, was, should, system, development, teacher, competences.*

The MFW for year 2012 found in the first three positions did not change since the beginning of the conference, and they were found in the same positions as in 2010. Newly appearing words were *development* and *competences* – they came up probably in connection with the title of the conference and the conference proceedings from 2011: *Use of e-learning in the development of the key* *competences*. On the other hand, the popularity of the word *language* resulted from English philologists (Wojciech Malec, Rüzena Dvorackova) and an Roman philologist (Sebastien Ducourtioux) joining the conference. The new, popular word also turned out to be *system*. The word *their* was replaced by *they*, reflecting moving away from case studies, rapports, didactic and technological issues for the sake of more abstract considerations.

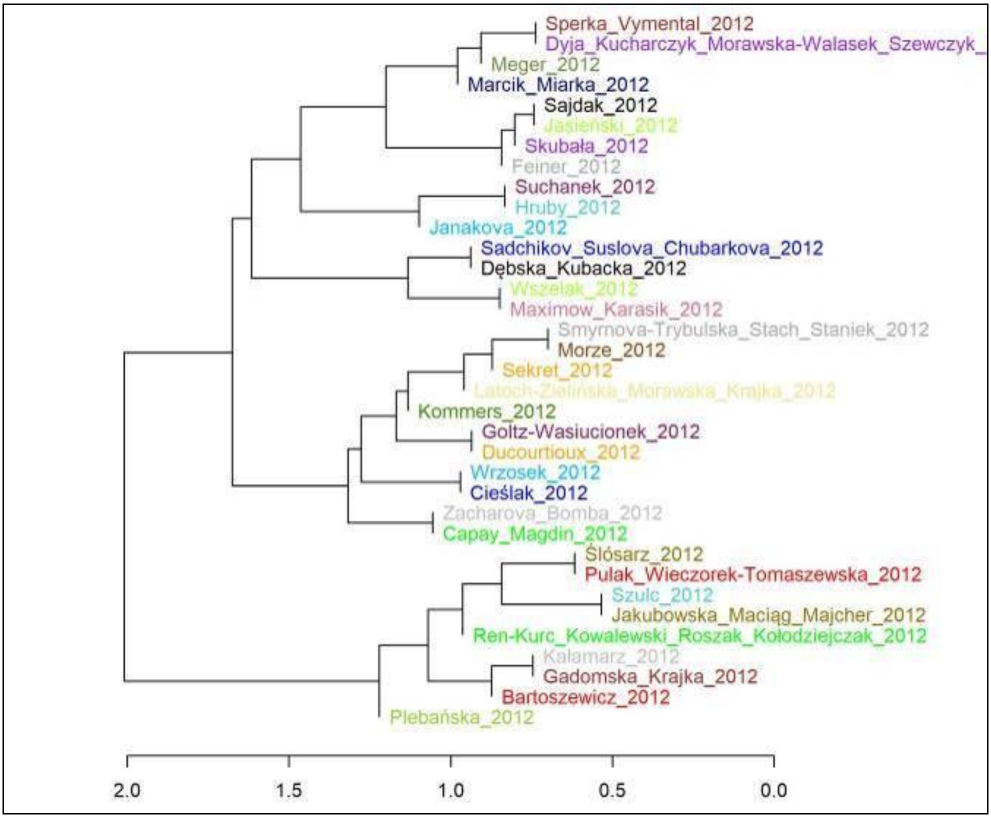

Figure 8. Cluster Analysis – dendrogram with hierarchical clustering of papers (2012)

Source: Own work

3.5. 2013

The space map shows that the stylistic expression was varied in 2013. The PC1 reached about 16pts, i.e. 7pts more than in the previous year, but was lower than for the first conference held in 2009, when it reached around 19pts.

Undoubtedly, the factor that differentiated the style of expression was 41 (64%) new participants joining the 2013 conference, from e.g. the Russian Federation, Ukraine, Spain, Great Britain, Bulgaria and Poland. Among them, there were experienced researchers (such as Hanna Gulińska, Tatyana Pavlova), because the

DL had been studied at many research centres. The newcomers brought in their papers their own style of expression to the conference.

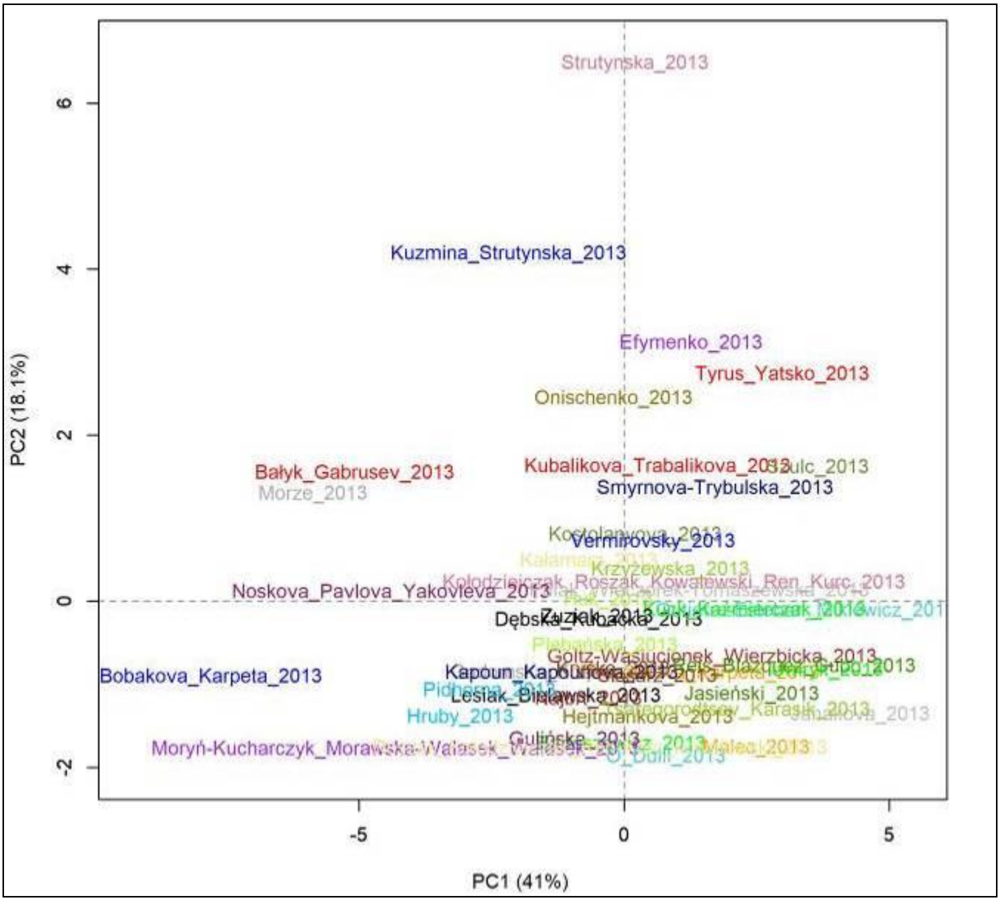

Figure 9. Principal Component Analysis using a covariance matrix (2013)
Source: Own work

The space map shows that many papers were written in the already established style of the DLCC conference. This is also not always true for papers prepared by researchers who joined the DLCC conference in 2013, such as Oksana Strutynska, Natalia Kuzmina, Vasyl Efymenko, Yuri Tyrus, Oksana Yatsko and Sergey Onishchenko from Ukraine.

Dendrogram (Figure 10) reflects stylistic and thematic similarity, e.g. presentations by Hanna Gulińska and Małgorzata Bartoszewicz, who used terminology developed by chemistry scientists. Stylistically similar also occurred to be reports on unrelated topics, e.g. a paper by Hanna Gulińska and by Wojciech Jan Zuziak *Designing and Programing Robots in Contemporary Didactics in Polish Schools*.

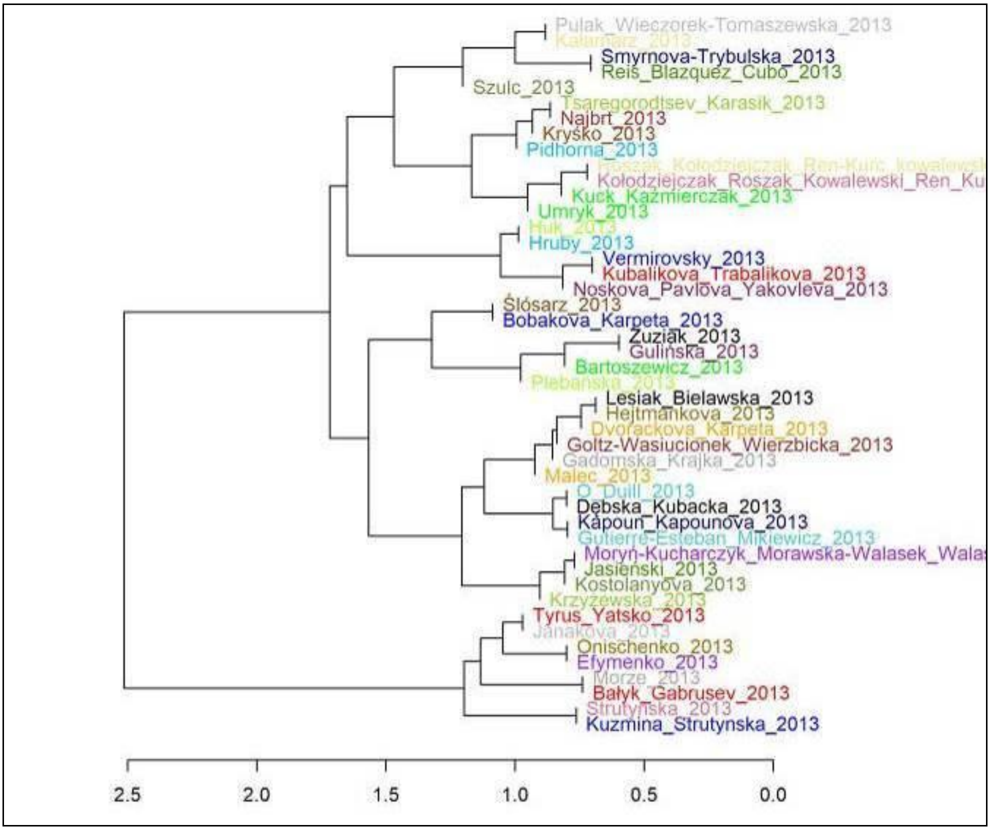

Figure 10. Cluster Analysis – dendrogram with hierarchical clustering of papers (2013)
Source: Own work

Twenty functional MFW specific for 2013 conference: *learning, students, information, education, educational, can, e-learning, their, course, teaching, use, process, teachers, distance, knowledge, new, technology, using, they, training.*

In the vocabulary of the 2013 conference, the importance of information and communication terminology increased: the word *information* emerged in third position, displacing *education*. *Technology* and *training* also emerged, as the latter one was included in the title of the conference and the title of the 2010 conference proceedings: *Use of e-learning in the training of professionals in the knowledge society*. The emergence of such vocabulary was also due to the large number of foreign researchers who joined the conference in 2013 and associated the DL not so much with *learning*, but with ICT and programming.

3.6. Year 2014

The space map for 2014 shows differentiation and further unifying of the expression style of the conference participants. Many of the texts are far from the others, loosely arranged. The PC1 reached about 10pts, which was down by 6pts when compared to the previous year and almost by half when compared with the first, 2009, conference, when it reached 19pts.

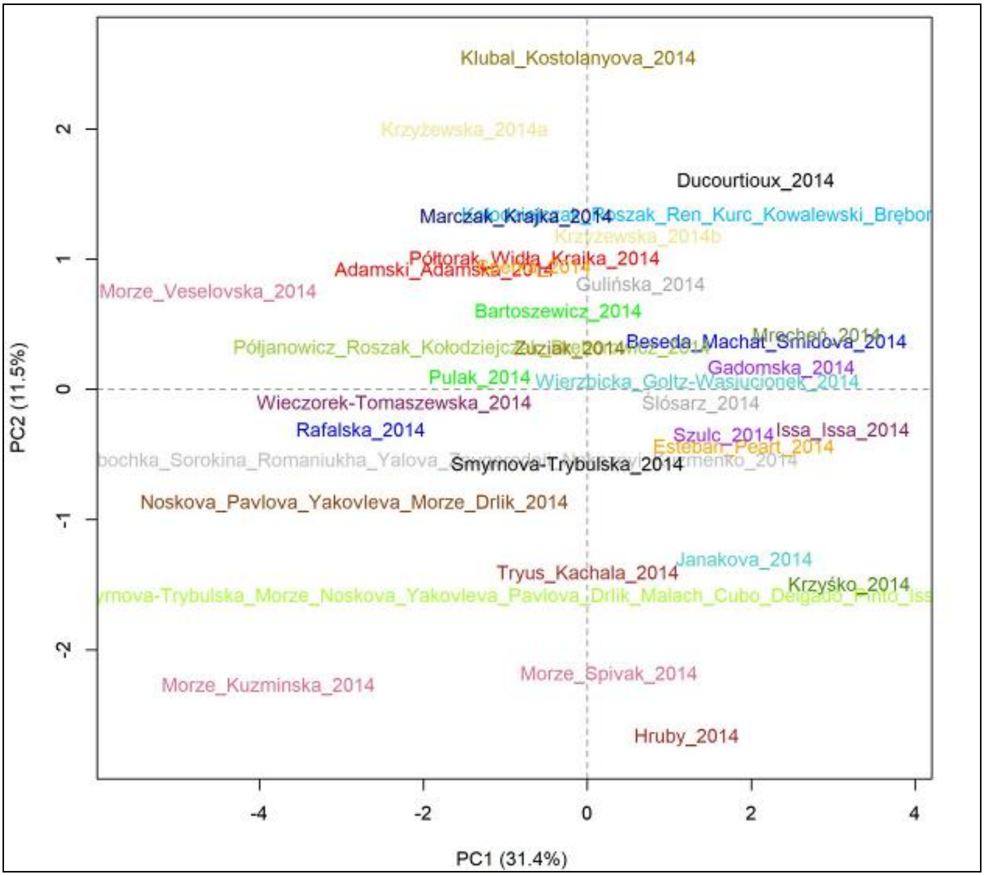

Figure 11. Principal Component Analysis using a covariance matrix (2014)
Source: Own work

The unification of the style of expression at the 2014 DLCC conference was possible for a several factors:

1. In 2014, the conference's tradition was already five-year old and the conference had an impact on 158 participants coming from various research centres; 158 authors and co-authors of papers had attended the conference by 2013, inclusive.
2. Conference materials were published in monographs and made available on the conference website, while scans of monographs were made available by Silesian Digital Library free of charge.
3. The majority of those who joined the conference in 2014 were co-authors of papers being presented.

4. In 2014, the international IRNET[3] project was launched, which allowed for longer lasting academic meetings.

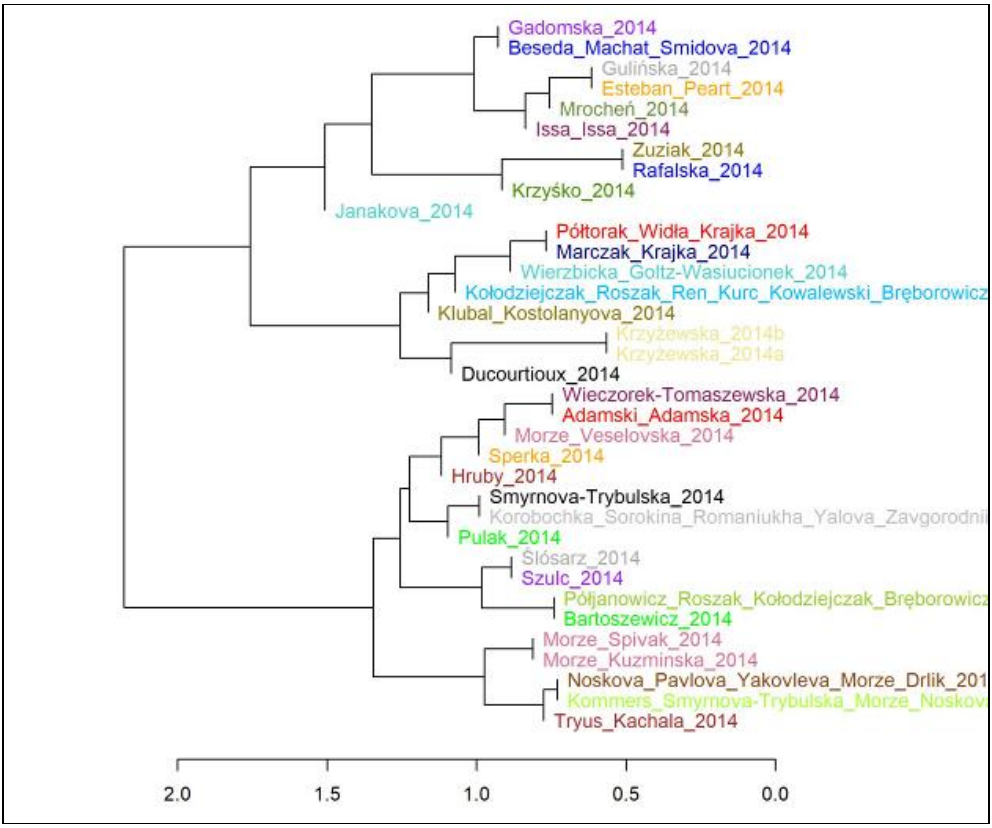

Figure 12 Cluster Analysis – dendrogram with hierarchical clustering of papers (2014)

Source: Own work

In 2014, there were 26 new participants. In the disseminated conference materials, they met with the expression style which had already been well established. Katerina Kostolanyova, who attended the DLCC conference since its very beginning, i.e. since 2009, and Libor Klubal with their papers entered very well in the conference expression style. Sebastian Ducourtioux fitted his paper in the

[3] IRNET - *International and Intercultural Research Network for Study and Development of New Tools and Methods for Advanced Pedagogical Science in the Field of ICT Instruments, e-learning Competences.* Duration of the project: 48 months, from 1st January 2014 till 31st December 2017. Project financed by the European Commission under the 7th Framework Programme, within the Marie Curie Actions International Research Staff Exchange Scheme. Grant Agreement No: PIRSES-GA-2013-612536.

conference expression style most accurately, although his paper published two years before was far from the conference expression style.

The papers co-authored by Natalia Morze and Eugenia Smyrnova-Trybulska significantly differed from other papers (exception: the paper by Yurii Tryus and Tamara Kachala) in terms of stylistic expression. Those authors proposed a new stylistic trend initiated by the launching of the IRNET project. That is why on the dendrogram (Figure 12) papers by those authors were placed next to each other, in the lower part of the graph.

Twenty functional MFW specific for 2014 conference include: *learning, students, information, education, their, university, educational, e-learning, use, can, research, course, online, they, knowledge, process, new, work, development, environment.*

The vocabulary of the 2014 conference papers was similar to the vocabulary of the previous year's conference, which also showed a tendency towards IT. The first four words did not change their positions when compared with the previous year. The word *university* returned and replaced the word *school*. The word *development* came back from 2012, when it was present in both the title of the conference and the title of the conference proceedings: *E-learning and intercultural competencies development in different countries*. The words *research* and *environment* were new to appear, illustrating the conference participants' desire to develop a synthetic academic reflection within the IRNET project, rather than just reporting their own experiences and accomplishments or preparing case studies.

3.7. Year 2015

On the space map for 2015 the texts are arranged in distant groups. PC1 reached about 11pts, which is 1pt more than in the previous year. The higher value of PC2 (9 vs. previous year's 6) showed the diversity of texts written by researchers representing an increasing number of countries and cultures. In 2015, researchers from Turkey joined the conference and with their first co-authored paper they entered well into the expression style and topics of the DLCC conference, discussing their own experience with implementing the DL at their university. Their second text was treating about National ICT Curriculum in Turkey and in this paper they applied an expression style different to the stylistics of the conference. Tatiana Prextova (Czech Republic) similarly to the Turkish researchers participated in the conference for the first time and prepared the paper independently, was the one who did the best with adopting the style of the conference.

Six papers poorly adapted to the conference's style. The most unconforming was the text prepared by Jerzy Kuck and Danuta Kazmierczak, because it addressed business management issues – a topic hardly ever addressed during academic conferences. Two years earlier, the same authors covered the issue of *E-learning as Distance Transfer of Skills and Knowledge*, therefore their paper adopted the

DLCC conference style relatively well (Figure 9, lower right corner of the space map).

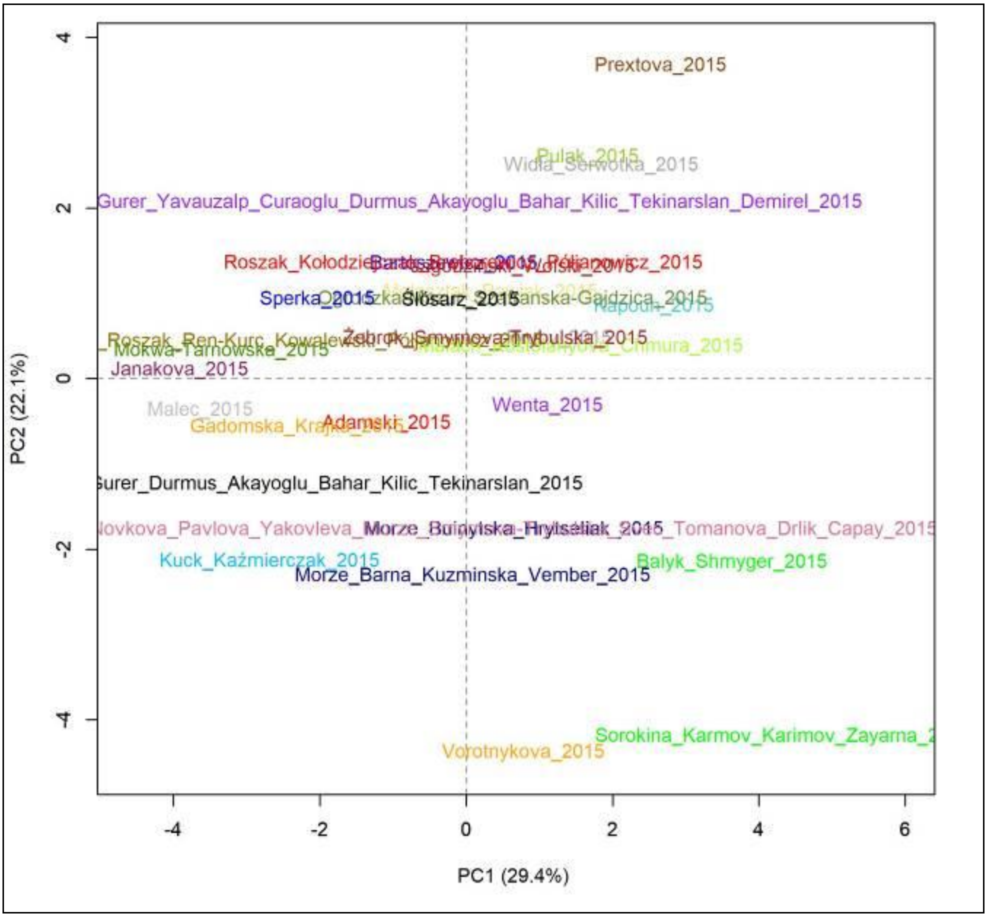

Figure 13. Principal Component Analysis using a covariance matrix (2015)
Source: Own work

The Cluster Analysis (Figure 14) showed that the paper discussing the Turkish curriculum, appearing to be written in a unique style and addressing a unique topic, occurred to be similar to the paper by Agnieszka Gadomska and Jarosław Krajka entitled *Pedagogical Solutions in the E-teacher Training – towards Effective Technology Adoption by Teachers*.

Twenty functional MFW specific for 2015 conference: *learning*, *students*, *education*, *information*, *educational*, *their*, *university*, *can*, *use*, *teachers*, *process*, *online*, *course*, *they*, *communication*, *teaching*, *work*, *technology*, *environment*, *research*.

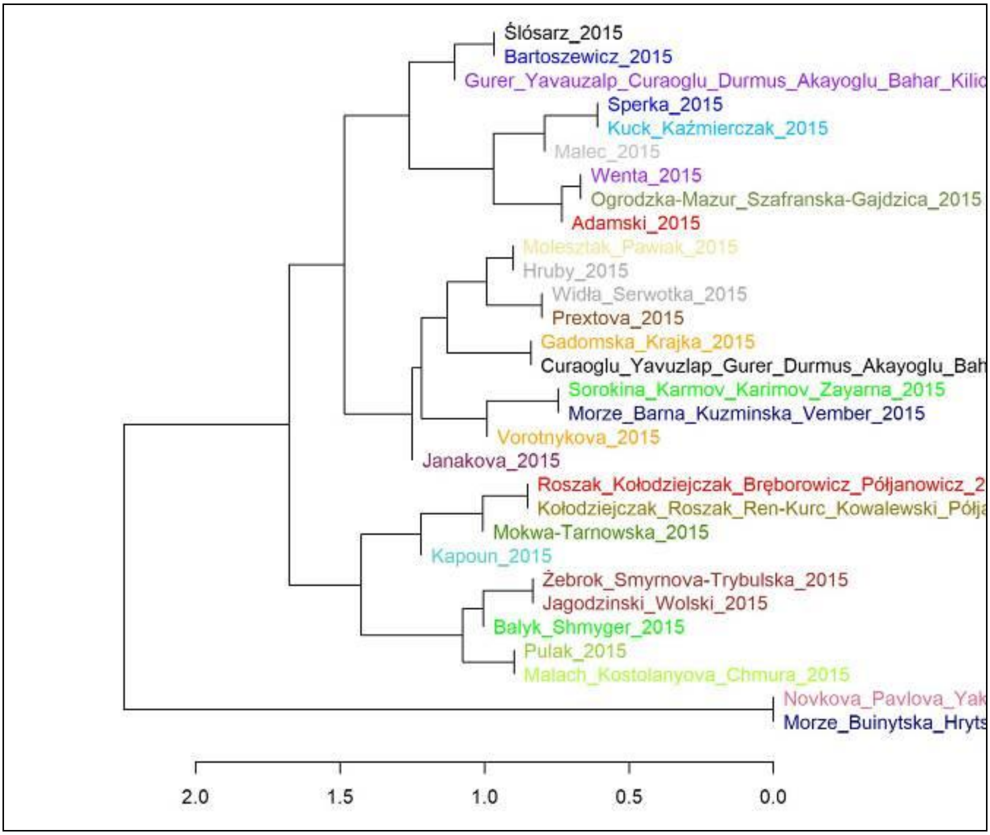

Figure 14. Cluster Analysis – dendrogram with hierarchical clustering of papers (2015)

Source: Own work

As compared with the year 2014, the new popular words in 2015 were: *teachers, teaching, technology, communication*. The first three words, however, appeared among the MFW in 2013. The only new word in the entire conference cycle turned out to be *communication*. This word refers to a wide spectrum of phenomena, so it turned out to be useful in a situation where researchers represented different countries and cultures, searching for common, therefore very general, terms.

3.8. Year 2016

In 2016, the PC1 reached around 17pts (32.9%), indicating stylistic differences in expression but remained within the limits of the first conference when PC1 reached 19pts (48.9%). This means that despite its global coverage, the expression style of the DLCC conference's participants has become significantly stabilized. Expression styles were distributed relatively evenly across the space map, which indicates their great diversity. Polish researchers were the ones who most precisely adjusted the style of their papers to the style of the conference. Nonetheless, the conference organizer Eugenia Smyrnova-Trybulska and its co-organizer Natalia

Morze initiated new ways of presenting issues by preparing papers that occurred to be most distant from both indicators of stylistic similarity.

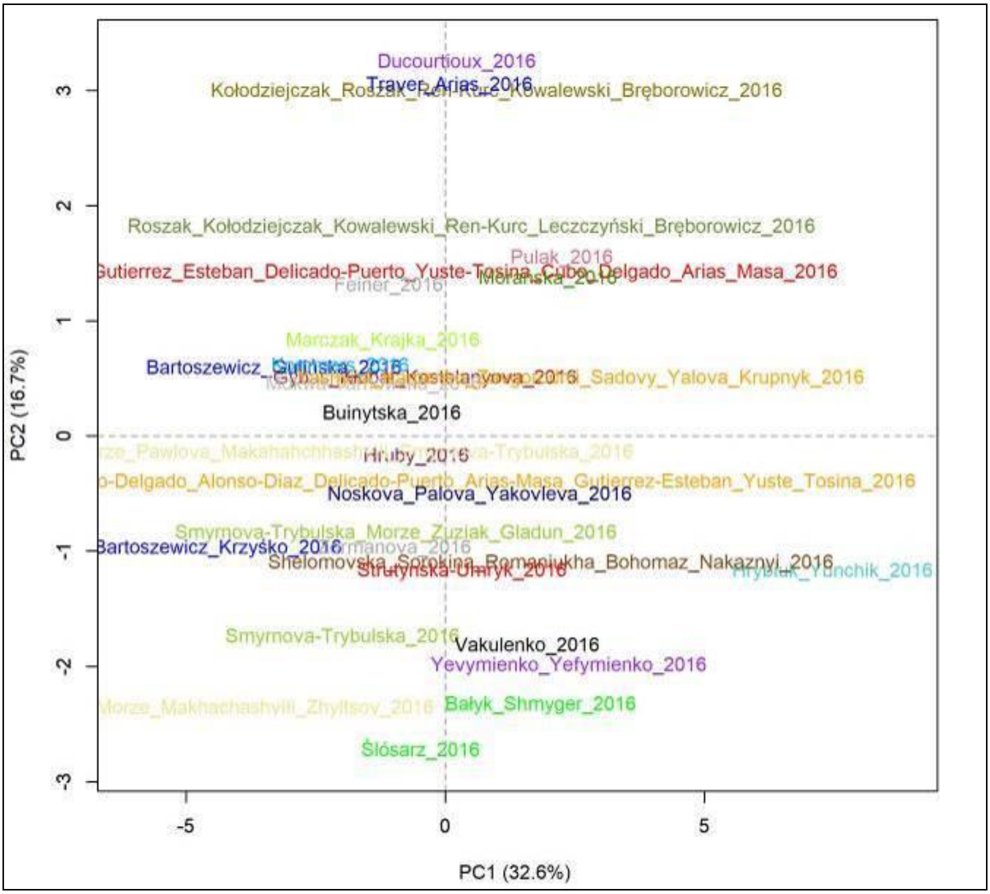

Figure 15. Principal Component Analysis using a covariance matrix (2016)
Source: Own work

The Cluster Analysis (Figure 16) shows that papers by E. Smyrnova-Trybulska and Natalia Morze (a co-author) are placed in the most distant positions, in the area of the upper cluster, which reflects their mutual stylistic similarity, and at the same time confirms distinctness of the topics and expression style when compared to other papers.

Twenty functional MFW specific for 2016 conference: *learning*, *education*, *students*, *research*, *educational*, *university*, *their*, *work*, *use*, *tools*, *online*, *information*, *process*, *distance*, *can*, *teaching*, *knowledge*, *teachers*, *course*, *figure*.

In the 2016, the order of the MFW was due to the topic of the conference (*E-learning Methodology - Implementation and Evaluation*) and signified increased interest of participants in the research process. The word *research*, which in 2014 appeared for the first time among the most popular words (11th position), in 2016 was found in 4th position. The new words were: *tools*, *figure*. The former appeared in the title of the conference as well as the title of the 2015 conference proceedings (*IT Tools - Good Practice of Effective Use in Education*). The latter was used for captioning figures and it appeared 254 times in captions; additionally, 13 times it was found in the body of the texts (statistically 8.9 times per one paper). It was observed that the authors illustrated their findings more frequently than in previous years: 2015 – 6.5 figure per paper, 2014 – 4.8, 2013 – 6, 2012 – 7.1, 2011 – 6.3, 2010 – 7.6, 2009 – 3.4. The greater number of visualizations in 2016 resulted from more abstract nature of the reflection, as compared with the previous years, since they referred to the methodology.

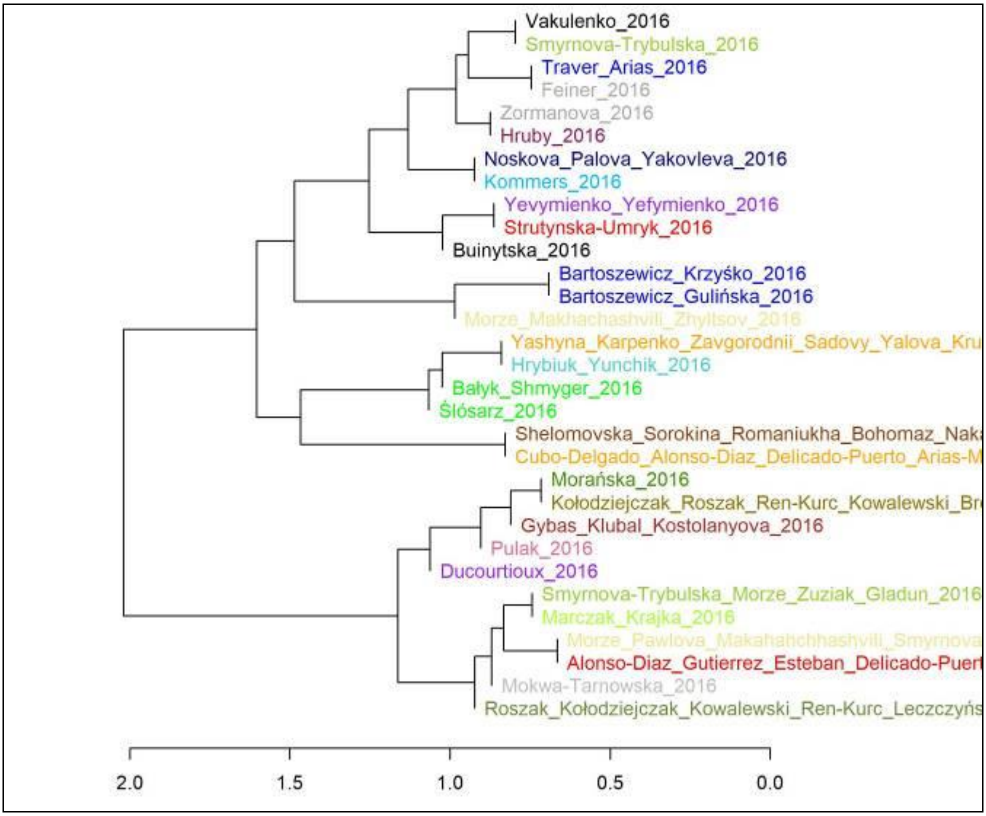

Figure 16. Cluster Analysis – dendrogram with hierarchical clustering of papers (2016)
Source: Own work

3.9. Years 2009-2016

The space map for the 2009-2016 conferences combined together revealed the highest value of the PC1 when probing for stylistic variations. Its value was about 24pts and 35.6%. The value was due to the thematic diversity of phenomena being discussed as well as to the geographical span of the conference. Over time, the conference was joined by researchers from a number of countries. Simultaneously, representatives of Europe, Asia, South America, Canada and Australia participated in videoconferences.

Most papers were written in line with the conference style. They are concentrated around the center of the chart. The most distant stylistically was the paper by F. Feiner published in German language. E. Smyrnowa-Trybulska's papers often did not meet the PC1 criterion, proposing new ways of expression. Likewise, the papers whose author or co-author was Hanna Bartoszewicz were characterized by the stylistic distinctiveness resulting from chemical topics they contained.

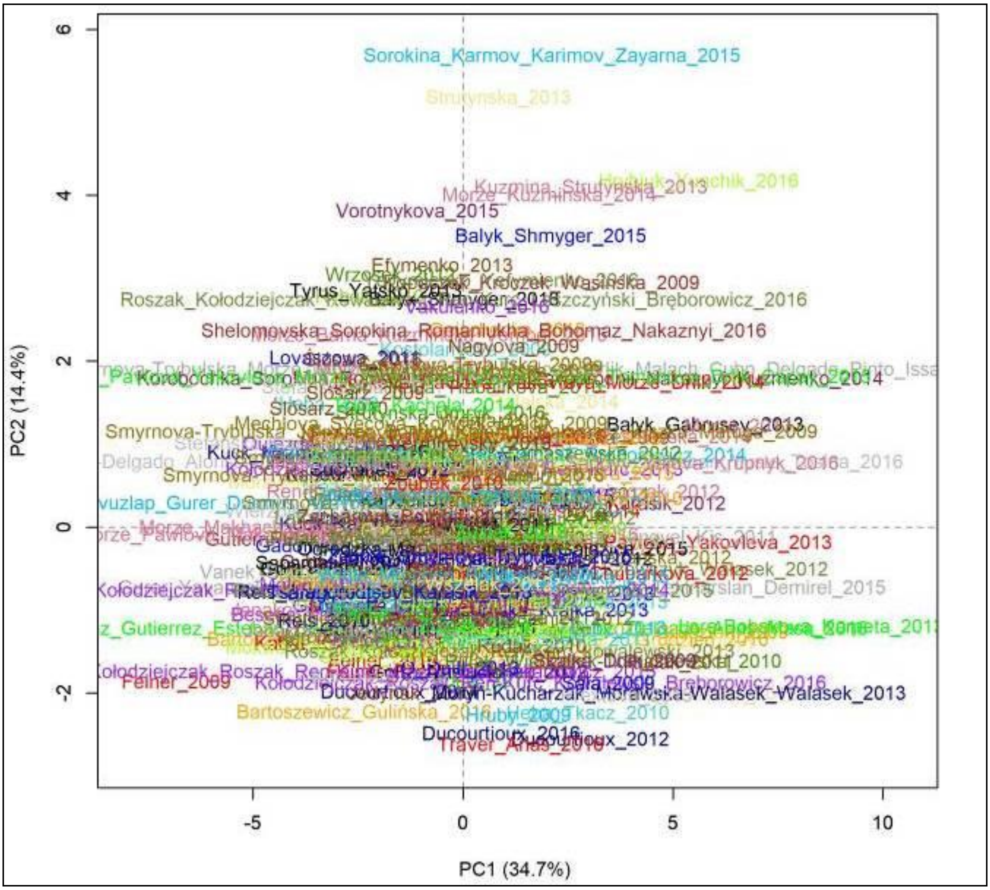

Figure 17. Principal Component Analysis using a covariance matrix (2009-2016). Due to the large number of participants, legible in this size chart are only the names of authors who have written in the most distinctive style.
Source: Own work

The Cluster Analysis for 2009-2016 conferences is based on a scale 0-7, which is several times greater than the scale for just one conference. It means that although the style of expression was unified during particular years (thanks to published texts and direct contacts between researchers i.e. by presenting their own papers, by participating in discussions and in meetings during the conference), nonetheless, the papers from the individual years showed differences due to the changing mix of the authors and variety of topics covered in particular years.

The presentation given by Milena Janakova, who discussed, rarely addressed on the DLCC conference, business issues and used a unique expression style, even clearly seen in the title of her 2011 paper *E- learning Applies Attractive Teacher Activities for the Development of Key Competencies in the Field of Information Technology* were found in the most distant, low places of dendrogram.

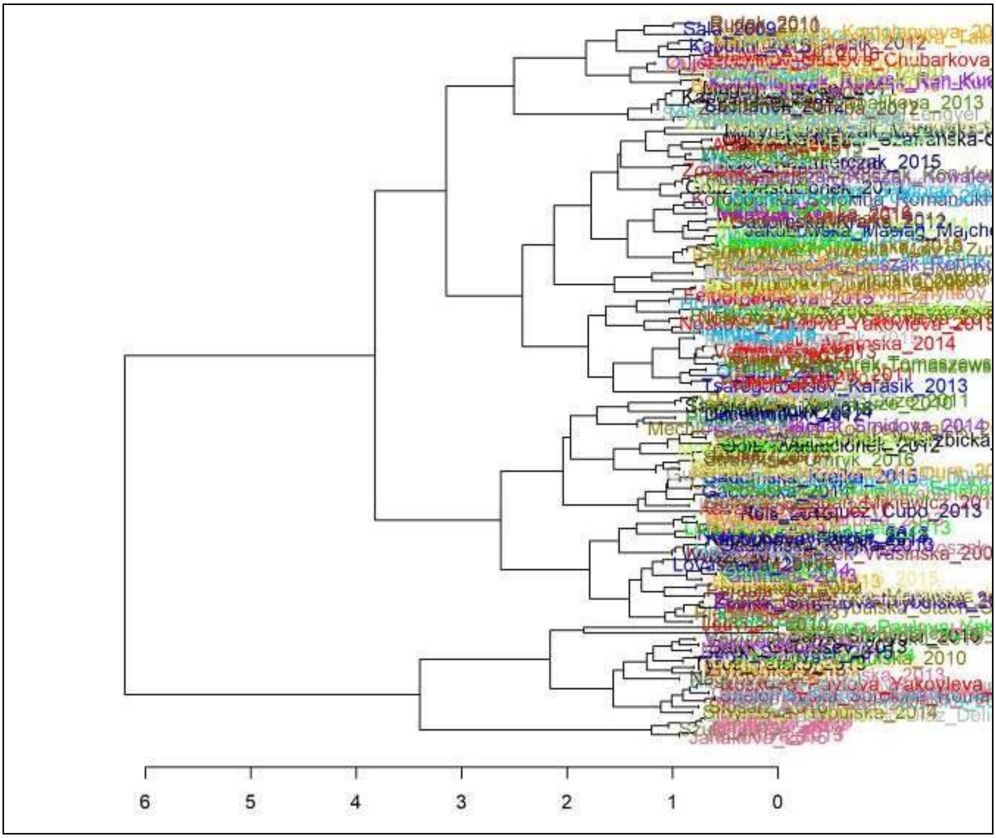

Figure 18. Cluster Analysis – dendrogram with hierarchical clustering of papers (2009-2016). Due to the large number of participants, in this size chart the names are unreadable. They can be read at a higher resolution.
Source: Own work

Twenty functional MFW specific for 2009-2016 conferences: *learning, students,education, information, their, can, educational, use, teaching, e-learning, course, knowledge, university, process, distance, teachers, they, new, work, research.*

The above listed words refer to the theme of the conference, characterizing it as being dedicated to the problem of DE. Its academic character is reinforced by the words *university, research.*

CONCLUSIONS AND RECOMMENDATIONS

Hypothesis *the representatives of the same disciplines wrote in a similar fashion, with the country of origin not being a differentiator* proved be true in relation to the researched material. Language of academics representing the same, similar and various disciplines, and coming from different cultural backgrounds, also occurred to be alike.

It can be stated that the participants of the DLCC conference, while discussing DL, use a common language regardless of their academic discipline, problem they address, their age, gender, country of origin or cultural background. This common language – being simultaneously developed during other conferences held in Poland, across Europe and worldwide – enables the transfer of experiences and research results, and integrates the DL research community.

Table 2 lists values of the co-efficient of similarity of the papers published between 2009 and 2016.

Table 2.

Values of the co-efficient of similarity of the papers published between 2009 and 2016

Year	PC1	PC2	PC1+PC2
2009	19	7	26
2010	14	6	20
2011	12	5.5	17.5
2012	9	6,5	15.5
2013	16	9	15
2014	10	6	16
2015	11	8.5	19.5
2016	17	6,5	23.5

Source: Own work

Table 2 shows that expressions style of participants of the DLCC conference were becoming more and more stylistically similar from year to year, although the trend fluctuated over the years. A common style was developed despite the increasing geographical span of the conference. New participants were often co-authors, collaborating with their superiors on the preparation of the papers. This means that the DLCCconference affects the development of an international language, allowing to describe the phenomena associated with DL, among the researchers coming from a number of countries.

Therefore, one can say after Edward Sapire that through the individual DL researcher the whole international and multidisciplinary community speaks, because they all use common vocabulary, terminology and expression style. The common language assists with perceiving and discussing the DL-related complex problems and with broadening horizons of the researcher because, according to Ludwig Wittgenstein, *the limits of my language mean the limits of my world* (Wittgenstein 2010: 74).

Developing a common terminology, with an international consensus, is one of the bases for distinguishing an academic discipline [*Rozporządzenie…* 2011 (*Regulation...* 2011)] which has a clearly identified object of research, research methods and social significance. The vocabulary used by researchers places the potential DL academic discipline in the area of social sciences (the Media Studies, Cognitive and Social Communication, Pedagogy, Psychology) as well as technical and mathematical disciplines (Information Technology). The problems addressed during the DLCC conference also show some connection with humanities (Ethnology, Cultural Studies, and Management Studies).

Nonetheless, the DL Studies has not yet been recognized as an academic discipline. The DL research does not secure academic progression; therefore the DL research is conducted gratuitously by passionate academics. Recognizing the DL Studies as an academic discipline would contribute to the development of the DL research, potential of which is expanding and is effectively used to equalizing educational opportunities, individualizing education and economic development in many countries.

REFERENCES

Anusiewicz, J., 1994: *Lingwistyka kulturowa*. Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław 1994, 180 p., ISBN 8322911203.

Bartmiński, J., 2007: *Językowe podstawy obrazu świata.* Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin, p. 328. ISBN 978-832-272-6853.

Eder, M., 2014: *Metody ścisłe w literaturoznawstwie i pułapki pozornego obiektywizmu – przykład stylometrii.* Teksty Drugie nr 2, 2014, p. 90-105, ISSN 0867-0633.

Eder, M., Kestemont, M. and Rybicki, J. 2013: *Stylometry with R: a suite of tools*. Digital Humanities 2013: Conference Abstracts. Lincoln: University of Nebraska-Lincoln, pp. 487-489.

Eder, M., Rybicki, J. and Kestemont, M. 2014: *'Stylo': a package for stylometric analyses*, https://sites.google.com/site/computationalstylistics/stylo/stylo_howto.pdf?attredirects=0&d=1, (accessed 4 August 2017).

Herder, J.G., 1770: *Abhandlung über den Ursprung der Sprache*. Christian Friedrich Voß, Berlin 1772, 232 p.

Humboldt, W. von, 1822: *Über das Entstehen der grammatischen Formen und ihren Einfluß auf die Ideenentwicklung*. Abhandlungen der historisch-philologischen Klasse der Königlichen Akademie der Wissenschaften zu Berlin, 1822/1823, Berlin 1825, s. 401-430.

Klar-Stefańska, R., 2010: *Use the Internet in Supporting and Educating Persons with Autism and Asperger Syndrome.* The Use of e-Learning in the Trainingof Proffessionals in the Knowledge Society, ed. E. Smyrnova-Trybulska. University of Silesia in Katowice, Cieszyn 2010, p. 249-260. 346 p. ISBN 978-83-60071-30-4.

Lakoff, G., Johnson, M.: *Metaphors We Live By*. University of Chicago Press, Chicago 1980, 256 p. ISBN 9780226468013.

Pearson, K., (1901): *On Lines and Planes of Closest Fit to Systems of Points in Space*. Philosophical Magazine nr 2 (11), 1901, p. 559-572, http://stat.smmu.edu.cn/history/pearson1901.pdf (accessed 21 August 2017).

Piatigorski, A., 1975: *O możliwościach analizy tekstu jako pewnego typu sygnału.* Semiotyka kultury, ed. E. Janus, M.R. Mayenowa. Państwowy Instytut Wydawniczy, Warszawa 1975, 499 p.

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 8 sierpnia 2011 r. w sprawie obszarów wiedzy, dziedzin nauki i sztuki oraz dyscyplin naukowych i artystycznych, (2011). Dziennik Ustaw, 30 August, nr 179, pos. 1065, p. 10427-10429, http://www.nauka.gov.pl/g2/oryginal/2013_05/748f846e0255320d2846109ed372a25d.pdf, (accessed 16 Juli 2017).

Sapir, E., 1949: *Speech as a Personality Trait.* Selected Writings of Edward Sapir in Language, Culture and Personality, ed. D.G. Mandelbaum. University of California Press, Berkeley 1963, p. 533-543, 617 p.

Smyrnova-Trybulska, E., 2009. *Introducton.* Theoretical and Practical Aspects of Distance Learning, ed. E. Smyrnova-Trybulska. University of Silesia in Katowice, Cieszyn 2013, p. 9-11. 307 p. ISBN 978-83-925281-4-2.

Widła, H., Mrocheń, I., Półtorak, E., 2009: *Gradual Development of Educatin with the Use of the Methods and Techniques of Distance Learning.* Theoretical and Practical Aspects of Distance Learning, ed. E. Smyrnova-Trybulska. University of Silesia in Katowice, Cieszyn 2013, p. 45-59. 307 p. ISBN 978-83-925281-4-2.

Wierzbicka, A., 1986. *Analiza lingwistyczna aktów mowy jako potencjalny klucz do kultury*. Problemy wiedzy o kulturze, ed. A. Brodzka, M. Hopfinger, J. Lalewicz. Polska Akademia Nauk. Instytut Badań Literackich: Warszawa 1986, 696 p. ISBN 83-04-01718-0.

Wierzbicka, A., 1997: *Understanding Cultures Through Their Key Words. English, Russian, Polish, German, and Japanese.* Oxford University Press: Oxford 1997, 317 p. ISBN 0-19-508835-2.

Wittgenstein, L., 2010: *Tractatus Logico-Philosophicus*, transl. C.K. Ogden. Project Gutenberg, http://www.gutenberg.org/ebooks/5740 (accessed 5 August 2017).

ACKNOWLEDGEMENT

The work presented in this paper has been supported by the funds for statutory research within *Social Communication in the 20th and 21st century: linguistic, socio-cultural, media, political and legal aspects* project (Research Project No. 8). I would like to thank Joanna Byszuk from Polish Language Institute in Kraków for helping me in instalation of the program and inspiring comments.

Note: I declare that this manuscript (to be published in the Monograph) is my own work and it has not been published yet.

COMPARISON OF SIMULATORS USED FOR EDUCATION AND PRACTICAL TRAINING OF THE CRITICAL INFRASTRUCTURE STAFF

Jiri Barta
Department of Emergency Management, University of Defence
Kounicova 65, 662 10 Brno, Czech Republic
jiri.barta@unob.cz

Abstract: *This article deals with the issue of practical training of the management staff during emergency events in the frame of critical infrastructure. The addressed event is frost that caused a large power outage with consequences overlapping other sectors. An extensive power outage is one of the most serious natural threats to current society. Practical training is an efficient tool for developing abilities and practical skills of crisis staff members. The goal of the exercise carried out was to test used simulation tools and their possible usage in practical training. During the exercise, deficiencies in the simulator processes have been identified.*

Keywords: constructive simulation; exercise; crisis scenario; critical infrastructure; preparedness.

INTRODUCTION

Simulation and practical training using simulation technologies have become increasingly widespread throughout the world. Expansion of simulations is even more significant with both development of technologies and growth of computing performance (Shelomovska et al., 2016; Delgado et al., 2016). Flood waves spread after heavy rainfall, the effect of laser use on air traffic safety in the vicinity of airports, spread of dangerous substances, efficiency of military ammunition and other processes are being simulated. Simulation is also used in practical training and skill acquisition of the employees. Crisis management members as well as crisis staff members at different levels of management are no exception (Hubáček & Vráb, 2012). Staff training is an important area where possibilities of simulation usage are not and will not be used enough in the near future (Delgado et al., 2016).

Computer simulation enters the area of staff practical training only at a slow pace. This is probably due to a lack of confidence in new technologies as well as the relatively high acquisition costs for building complex simulation centres. For this reason, complex simulators for staff practical training or crisis staff training are available, with exceptions, only in military facilities (Hubáček & Vráb, 2012; Hubáček & Řezáč, 2013).

1. CURRENT SITUATION ANALYSIS

This chapter deals with the issue of tactical and staff exercise and increase in the level of development of professional education and skills of crisis staff members. Attention is paid both to the possibilities of software support to the exercise as well as to evaluation of the already executed national staff exercise with involvement of all interested parties, including critical infrastructure entities (Urban et al., 2017).

1.1 Organised exercises

Emergency situation preparedness or crisis situation preparedness significantly contribute to providing efficient and rapid response and damage minimization. Acquiring practical skills and knowledge enables successful response to the emerged situation. In the Czech Republic (CR), the issue is dealt with by the Integrated Rescue System (IRS) Act (Act 2000a), which, however, addresses the compulsory exercise as well as practical training only of the IRS components. Neither the Critical Infrastructure Entities, nor the Crisis Staff members are subjects to the training obligation (Act 2000a). According to the Crisis Act (Act 2000b), the liaison security officer and the management of the company are responsible for the preparation and implementation of practical training.

Energy critical infrastructure entities that undertake education as well as practical training even if no regulations force them to do so represent an exception (Oulehlová et al., 2015). These companies are aware that their components are very important and that preparedness for addressing both emergency situation and crisis situation is necessary (Urbánek et al., 2015). Energy Critical Infrastructure Entities implement a broad scale of training without use of any simulation tools. Preparation of the training consists of theoretical staff instruction or practical exercises in situ, so-called live simulations which are financially and organizationally highly demanding (Hubáček & Vráb, 2012; Oulehlová et al., 2015; Delgado et al., 2016).

1.2 The effects of a power supply failure

In the case of a long-term power outage, consequences for the current technology based society would be enormous. Therefore, an important critical factor is the provision of protection, functionality and reliability of energy critical infrastructure.

Extensive long-term power outages are known both from abroad and the Czech Republic. The biggest European power outage was the blackout in Italy, which affected 57 million inhabitants in 2003. The cause of the outage were overloaded power lines from Switzerland, and due to incorrect interference after the failure, the domino effect followed as well as the interruption of all other lines. This power outage was one of the largest in the world (Sesame, 2011).

In the Czech Republic, the power supply was cut in 2007 due to the Kyrill tornado and in 2008 during the Emma windstorm. Outage was caused by strong wind and trees fallen on the power lines. This resulted in over one million households disconnected from the electricity supply. In December 2013, thirteen high-voltage masts fell due to the icing, and the electricity supply was cut off for almost ten thousand people.

The dependence of individual sectors on energy infrastructure is obvious. Power outage causes a cascade effect in other sectors (Luiijf et al., 2009). In the context of the research into the relations between critical infrastructure sectors, the energy sector has been considered a key one in ensuring the functionality of critical infrastructure. The interconnection of energy critical infrastructure with other infrastructure sectors was analysed in detail in the article Preparedness of Critical Infrastructure Subjects in the Energy Sector for Crisis Situations (Oulehlová et al., 2015).

1.3 Selected simulation tools

Various computer programs can help the instructors during preparation of training. They enable better graphic support of the solution, practice various ways of dealing with different situations and ways of command and last but not least they can be a prerequisite for various roles. The environment of these programs increases the effect of training which is then more realistic and students can remember the learned things better. Selected simulation tools which were suitable for realization of the exercise with the “Frost“ topic with the subsequent power outage were used within the preparation of the practical exercise.

1.3.1 SIMEX

It represents a system of constructive simulation for the computerised generation of forces and creation of synthetic environment. Originally it was designed for the use of army but the version for the components of the Integrated Rescue System called SIMEX has been developed as well. The simulator enables to practice management on the tactical, operational and strategic levels. Modelling of various emergency situations and dealing with them is possible in this environment (Figure 1).

Environment in the simulator is ensured by the combination of terrain database created from the detailed geographical data, model of weather and other dynamic environmental models. Terrain database contains all common objects in the countryside (bodies of water, roads, built-up areas, vegetation, relief, type of soil and other objects). Individual objects have predefined features influencing simulation of their own entities in relation to their purpose. Weather editor enables to set basic parameters (date and time, air temperature, velocity and direction of the wind, type and intensity of precipitations, humidity and pressure of air, type of cloud cover, light intensity etc.). Some of the parameters are mutually interlinked based on the actions happening in the atmosphere known from meteorology. Dynamic models of environment enable modification of the countryside with objects and phenomena which can change their form in the course of time (Figure 1). There are accidents simulated in great detail as well as a vast database of forces and means. Program puts more emphasis on the correct execution than on graphic output and it is aimed at the group of trainees as well as at an individual (Hubáček & Řezáč, 2013; Urbann at al., 2017).

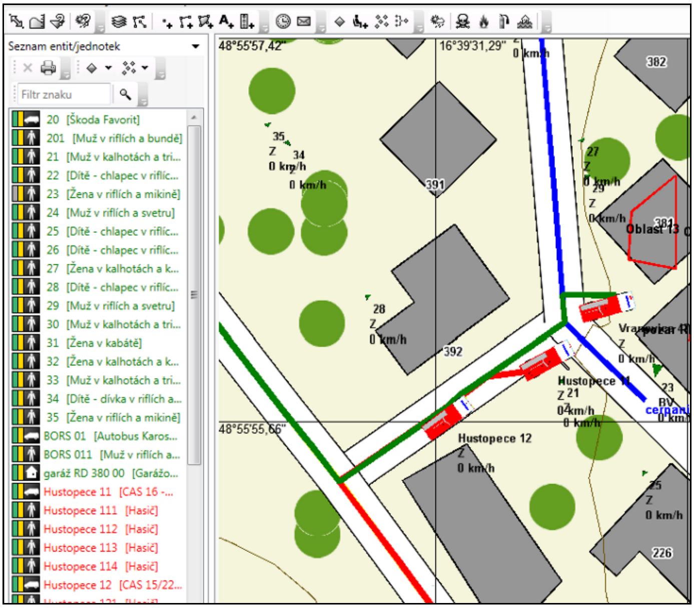

Figure 1. Environment of program SIMEX
Source: Own work based on program SIMEX

Concept of the program is suitable for the use in practical training of solving emergency events with the mutual cooperation of the intervening units.

1.3.2 Virtual Reality Training Software for Safety and Security

The creator of this environment is E-semble company which headquarters are in Netherlands. These programs serve to address emergency situations in preparation and practicing of practical abilities.

The environment of the Virtual Reality Training Software for Safety and Security (XVR) Crisis Media program serves for training correct and quick development of public awareness in emergency situations (Fig. 2).

Program XVR Resource Management aims at operational and strategic level of command. One of the components is a map with the survey of all already occurred situations and after the click on it, it is possible to determine the number of forces and means necessary for the intervention. Later transportation of the patient into the hospital follows, where it is possible to set the possibilities of treatment (E-semble, 2017).

Figure 2. Program XVR environment
Source: Own work based on program XVR

Module XVR On Scene serves the purpose of the individual components intervening in emergency situations and can show the progress on the predefined scenarios. Thanks to this program, it is possible to model a great number of emergency situations which can be dealt with subsequently as if the trainees were present at the place of accident. This program is also used by professional teams in several countries - Netherlands, Great Britain, New Zealand, Australia, Taiwan, China and Czech Republic. It is well suited for practical training of intervening units (E-semble, 2017).

1.3.4 3D Flood Simulation program

A computer program called 3D Flood Simulation is specialized software developed by the non-profit Centre for the Safe State organization and is focused on training tactical activities of the IRS components at emergency situation related to floods. Due to its variability, any emergency situation scenario can be created in the simulator. It is possible to model representative terrain including vegetation, static objects and water flow with the possibility of flood situation development in the application (Fig. 3). Simulator model allows for variable setting of simulation activities of crisis management staff, forces and resources dealing with extraordinary events dislocation, activities to carry out population evacuation, etc. (Kavan, 2015).

The simulator allowed creating a sequence of steps corresponding to the actual processes of the crisis management bodies in the case of dealing with emergency situation. Scenarios make use of intuitive application control, so most operations can be done using classic application control. The scenario is divided into chapters; each chapter contains a combination of cards representing one sequence of actions in the entire simulation.

Figure 3. 3D Flood Simulation environment
Source: Own work based on program 3D Flood Simulation

Creating Scenarios in the 3D Flood Simulation program can be divided into the following stages:

- Creating an abstract scenario model – forming a simplified description of the studied reality.
- Creating a simulation scenario model – recording an abstract scenario model in the form of a program.
- Verification and validation – verifying the scenario model correctness.
- Simulation – experimentation with the simulation scenario model.
- Analysis and interpretation of results.

These stages form a good basis for creating environment and emergency situation frost scenarios with large-scale power outage.

1.3.4 Virtual Battlespace

Virtual Battlespace 3 is an interactive virtual tactical simulator, which is based on the game engine "Real Virtuality 2" developed by Bohemia Interactive. The simulator uses computer games technology to teaching and training. It is a flexible solution for simulation training scenarios, missions and more. In addition, Virtual

Battlespace 3 Virtual Training Kit encompasses a full feature suite of products that enable rapid content creation, HLA/DIS (High Level Architecture, Distributed Interactive Simulation) integration, and training assessment. Virtual Battlespace 3 simulates any environment to help trainees learn techniques, procedures and develop communication and decision-making skills (Kozůbek, Čech & Flasar, 2010).

Virtual Battlespace 3 expands on its predecessor Virtual Battlespace 2 by improving the Virtual Battlespace open architecture, providing faster performance with our multicast system, and introducing a new, more modern-looking user interface. VBS3 in the version of Virtual Training Kit includes many modules and other plug-in applications. To carry out experimentation by modelling and simulation, it is possible to use the Virtual Battlespace 3 tools, such as Scenario Editor and Application Scripting Interface, which are two of the most significant ones.

Scenario Editor – a well-designed exercise is essential for effective training and realistic experimentation. The Scenario Editor sets the standard for scenario creation (Kozůbek, Čech & Flasar, 2010; Urbánek et al., 2013).

The use of simulation process in crisis management during practical training dealing with emergencies is very extensive. Simulator Virtual Battlespace 3 can be configured for civilian use and practice to training communication and teamwork. The only drawback is the lack of deployment of civilian entities, adding to the simulator Virtual Battlespace 3 would cost a lot of money. Therefore, it is currently better to buy a simulator specifically designed for civilian use, but Virtual Battlespace 3 inspired when creating scenarios.

2 APPROACHES AND METHODS

Modelling cannot capture the reality itself, but rather, with a simplified view, it looks at a certain part of the real process. Simulation is often used for the training of civil as well as military employees. It is used in the case when it is too expensive or too dangerous for the trainees to use the facilities in the real world. In such situations they spend time by learning valuable experience in the “safe“ virtual environment. The advantage is also represented by mistakes which the system during the training enables in safety-critical systems. The accuracy and veracity of the model depends on the modelling method used.

2.1 Computer simulation

A computer simulation method was used to prepare a series of practical exercises as well as for the actual implementation. This is an attempt to model the real world or hypothetical situations with the help of a computer to be able to study this system and trace how it works. The behaviour of this system can thus be predicted by changing the variables (Zehe et al., 2016). The behaviour of the model in the simulations varies depending on the settings of the original parameters taken from the real environment (Hubáček & Řezáč, 2013). There are many different types of computer simulations, the common feature of which is the attempt to create examples of representative model scenarios for which a complete list of all possible conditions cannot be made or is not available (Zehe et al., 2016).

The most appropriate form of computer simulation was considered for practical exercises preparation. It was selected from the following categories:

- "Live" simulation (where real people use simulated (or "false") facility in real world);
- "Virtual" simulation (where real people use simulated equipment in simulated world or virtual environment), or;
- "Constructive" simulation (simulation where people use simulated facilities in the simulated environment). Constructive simulation is often referred to as "war" one, because it is similar to strategic war games in which the players command armies of soldiers and war machines which can be usually moved on the playing area.

Constructive simulations where simulated entities are controlled by simulated operators were chosen as the most appropriate one. Constructive simulation is a kind of simulation where the model contains everything needed to replace the original during the simulation, including the one that involves humans (Ludík & Ráček, 2011). In constructive simulation, man is represented by a submodel. Decisions of these simulated individuals are applied in the actions of constructive simulations. Constructive simulations are used at different resolution levels for different types of operations in addressing emergency situation (Hubáček & Vráb, 2012).

2.2 Requirements on technical equipment

Simulation programs are extremely demanding on the hardware quality and technical maturity on which the simulation is run. They require appropriate technical equipment and specified work environment. All simulators use a modern 3D environment known from computer games, allowing participant to "enter" the environment and view the emergency situation from all sides and angles. The advantage of 3D environment is above all its great visuality. Only the SIMEX simulator uses classic 2D display and 3D display is used as an optional supplement. The drawback of 3D environment is its high demands put on computing power and the danger of slowing down and jamming of the simulation during controlling multiple entities. For smooth operation of simulations, it was necessary to provide workstations with the following requirements:

- Intel Core i5 3470 processor @ 3.2GHZ (4 CPUs) / AMD X8 FX-8350 @ 4GHZ (8 CPUs).
- RAM min. 8GB.

- NVIDIA GTX 660 2GB graphic card / AMD HD7870 2GB.
- 100% DirectX 10 compatible sound card.
- DVD drive.

2.3 Exercise scenario

From the tools for simulations, modelling and support of decision-making processes in crisis management, only those programs which met predefined criteria were analysed and included in the shortlist. These criteria were determined based on the experience of the research team from the area of information support and after consultations with experts in the area dealing with development of simulation tools. The basic criteria were: functionality, usability in solving emergency events, practical training of the teams and individuals, possibility of implementation of outputs from other tools and possibilities of editing scenarios. During the analysis of available simulation tools, some criteria were reconsidered and complemented with other characteristics which were required from the simulation tools.

The intention of the series of exercises was to verify and compare the usability of individual simulation tools in the practical training of crisis management staff. The priority objective of both the scenario and the exercise was not the preparedness of the IRS components, but the practical training and verification of the preparedness of the crisis management staff at the level of the region, the municipalities with extended powers, or the mayors of the municipalities and administrative authorities with extended territorial competence and other entities involved in emergency situation addressing. The aim was to verify activities, communication and cooperation of crisis staffs. A scenario that was implemented in selected simulation tools according to the possibilities was prepared (Oulehlová et al., 2016).

Figure 4. High-voltage masts collapsed due to icing
Source: GA Energo technik

The theme of the scenario was emergency situation, which took place in the Czech Republic in December 2013. Due to the weather conditions, a huge amount of icing occurred on the equipment in the outdoor environment. Thirteen high-voltage masts (Fig. 4) collapsed after overtaking the critical stability limit and the power supply to the nearby city was cut off. The local area where the icing caused tree falls on the roads and several villages cut off from the transport link was affected by these severe weather conditions.

The scenario was prepared and implemented with minor differences in the selected simulation programs. Workers of the Crisis Management Department who were expected to have the required knowledge in the field of crisis management were chosen as participants.

Trainers were assigned individual roles and provided with information about given roles in the scenario. They were given time to get familiar with the activities of the individual roles and for the studying of necessary documentation. Prior to the exercise, participants were made familiar with the basic functions of simulation tools and the communication system (Oulehlová et al., 2016). Since XVR, Virtual Battlespace and 3D Flood Simulation program simulation tools do not have their own communication systems, a communication system that is a part of the SIMEX simulator (Hubáček & Řezáč, 2013) was used in all exercises.

2.4 Evaluation of exercises

The analysis of the course of the exercise and overall assessment based on the record using support tools took place after the completion of the exercise. In the context of the simulator use, the major benefits were found in the field of call recording and recording the course of implementation of various activities of the participants. Moreover, various levels of the knowledge of crisis documentation and low level of its use have been found among the participants of the exercise. The exercises were evaluated from the point of view of the lecturers. The tutors answered the questions about user friendliness and complexity of individual simulators.

3 RESULTS AND DISCUSION

The exercise was going on for several days, with each day carried out on one selected simulation tool. The exercise took place during the month of April 2017. During exercise, attention was focused on communication. These are activities that are related to designing opening scenarios which lead to improving procedures and processes. Great emphasis was placed on the course of exercise preparation, because the exercise preparation, processing the schedule, including examination of contacts generally reveals significant deficiencies.

During practical exercises, the interaction between the intervening components was practiced. Depending on the emergency situation development in the simulator, other IRS units and components were gradually deployed (Fig. 5). In addition to the disposal of the fallen trees which number was gradually increasing and which threatened the nearby buildings, it was necessary to provide an access road for the company providing the repair of the fallen high voltage masts. It was important to ensure the movement of E.ON Distribution personnel who were performing a manual switchover of a replacement power line. Other assigned roles of the crisis staff, carriers, technical services, and other organizations performed activities within their competences.

Participants had to cope with unfavourable climatic conditions, poor road passability, technical problems and accident rates of vehicles that were simulated. Besides verifying the functionality of the environment depicting the real situation in 3D, other objectives of the exercise were to verify the setting of communication processes and links between the individual groups of participants, possibilities of their dynamic changes during the exercise depending on the development of the simulation, and last but not least, also the crisis management staff training itself (Hubáček & Řezáč, 2013; Zehe et al., 2016).

From the tools for simulations, modelling and support of decision-making processes in crisis management, only those programs which met predefined criteria were analysed and included in the shortlist. These criteria were determined based on the experience of the research team from the area of information support and after consultations with experts in the area dealing with development of simulation tools.

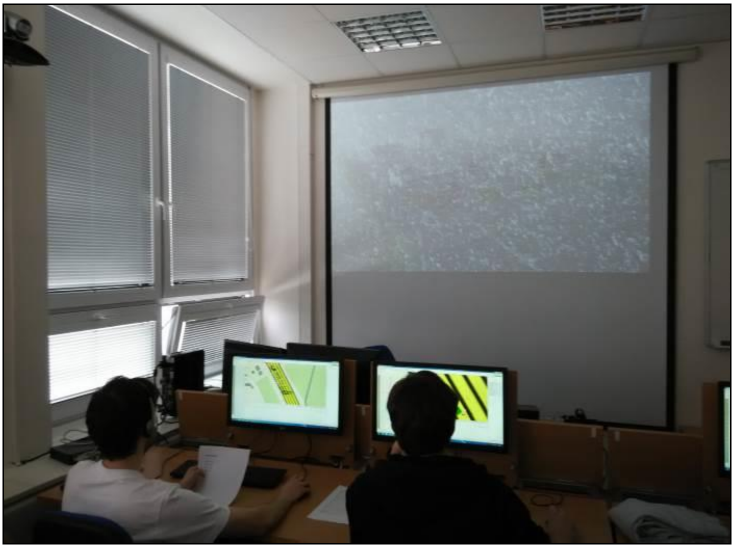

Figure 5. The emergency situation development in the simulator
Source: Own work

The basic criteria were: functionality, usability in solving emergency events, practical training of the teams and individuals, possibility of implementation of outputs from other tools and possibilities of editing scenarios. During the analysis of available simulation tools, some criteria were reconsidered and complemented with other characteristics which were required from the simulation tools. These added characteristics specified in more detail the choice of suitable simulators and made the original characteristics about what the simulator should meet, more accurate. Results of the evaluation can be seen in Table 1.

The XVR Simulation Tools and 3D Flood Simulation were a great benefit to the exercise. They showed the 3D scene of the emergency situation, and the intervention commander had an overview of what was going on at the scene. The disadvantage of these programs was the absence of integrated communication systems. During the exercise preparation, the possibilities of using freely available communication systems such as Skype were considered, but since this system does not allow recording, the idea was withdrawn. All simulations used the Astra communication system which creates part of the SIMEX simulation tool.

A great advantage of the SIMEX simulator was not only the above mentioned integrated Astra communication system, but also the possibility to control the process of moving of individual entities within the emergency situation addressing. These entities were moving according to current climatic conditions, and it was really efficient to modify the condition of the entities according to a defined scenario or the requirements of the exercise commander. On the one hand, emergency situation overall insight for the commander of the intervention was a benefit; on the other hand, this insight was counterproductive for other participants. They had the option of a complete overview of the emergency situation addressing ~~on~~ the monitors which they did not need and even though they were warned not to watch it, they violated the ban. This fact interfered with the exercise, because in a real environment the possibility of a complex insight in the emergency situation addressing would not be available.

Due to the observed positives and negatives, it is possible to conclude that all tested simulation programs have met the requirements put on them and are suitable for the practical training of the crisis staff members in the case of the disrupting of critical infrastructure elements. The most important benefit of the exercises carried out was the fact that the participants verified their theoretical knowledge and practiced practical skills in the processes of communication when addressing emergency situation.

Based on the results, a comparative table (Table 1) was compiled with the utility properties of the individual simulation tools where the most important properties and benefits of the simulation tools were listed.

Table 1.

Evaluation of Simulation Programs

Properties compared	**SIMEX**	**XVR**	**3D Flood Simulation**	**Virtual Battlespace**
Scenario editor	YES	YES	NO	YES
Communication Possibilities	YES	NO	NO	NO

Technological education for crisis management staff	YES	YES	YES	YES
Terrain database	YES	NO	NO	YES
Possibilities of the import of map background	YES	NO	NO	NO
Practical training of the teams	YES	YES	NO	YES
Recording exercises	YES	NO	NO	NO
Automated result evaluation	NO	NO	NO	NO
Usability for the crisis staff training	YES	YES	YES	WITH MODIFICATIONS
The order of the overall evaluation	**1.**	**2.**	**3.**	**4.**

Source: Own work

CONCLUSION

The causes of power outage cannot be completely eliminated. Whether natural or man-made emergency situation, it is necessary for crisis management staff to be ready to deal with these disasters. Institutions and crisis management authorities should use simulation tools to test skills and knowledge. The article presents the results of the education and exercises carried out as a part of the preparedness for emergency situation and crisis situation. The research has shown that the tested simulation tools are suitable for education and practical training provision, however, the SIMEX simulator, with its utility properties; best meets the requirements for a comprehensive tool.

In the real exercise of the critical infrastructure components, it is possible to allocate the exercising crisis staffs by members of various components. This enables all participants to co-ordinate the individual procedures of each component, the processes of passing information about activities and work standards, and last but not least, to meet and establish relationships before the real emergency situation and crisis situation intervention.

ACKNOWLEDGEMENTS

Results presented in this article were obtained as a part of the solution of the project by Technology Agency of the Czech Republic with the topic Research and Development of Simulation Instruments for Interoperability Training of Crisis

Management Participants and Subjects of Critical Infrastructure (research project No. TA04021582).

REFERENCES

Act. 2000a: *No. 239/2000, on Integrated Rescue System*, as amended. In: Collection of Laws, no. 73, pp. 3461 – 3474. ISSN 1211-1244.

Act. 2000b: *No. 240/2000, on Crisis Management, as amended*. In: Collection of Laws, no. 73, pp. 3475 – 3498. ISSN 1211-1244.

E-semble., 2017: *XVR: Virtual Reality training software for safety and security* [online]. Delft, Netherlands: [cit. 2017-04-21]. Dostupné z: http://www.xvrsim.com/?t=gb

Delgado, S. C.; Díaz, L. A.; Puerto, G. D.; Masa, J. A.; Esteban, P. G. & Tosina, R. Y., 2016: *Evaluation of the Implemantation of ICT in the Professional Teaching and Research Development of University Faculty*. In: E-learning Methodology - Implementation and Evaluation, Scientific Monograph edited by Eugenia Smyrnova-Trybulska, Vol. 8 University of Silesia, Studio Noa, Katowice-Cieszyn. ISSN 2451-3652 ISBN 978-83-60071-86-1

Hubáček, M. & Řezáč, D., 2013: *Simulation Technology and Training of Rescue Services*. In The Science for population protection, vol. 5, no. 3/2013, pp. 21-38. ISSN 1803-635X.

Hubáček, M. & Vráb, V., 2012: *The Use of Constructive Simulation for Policemen Training*. The Science for Population Protection, vol. 4, no. 3/2012, pp. 1-16. ISSN 1803-635X.

Luiijf, E.; Nieuwenhuijs, A.; Klaver, M.; Eeten, M. Van & Cruz, E., 2009: *Empirical findings on critical infrastructure de-pendencies in Europe*. In: R. Setola, S. Geretshuber (Eds.), Critical Information Infrastructure Security. Berlin, Heidelberg: Springer, 2009. pp. 302–310.

Kavan, S.; Rathauský, Z.; Cempírková, S. & Trčka, M., 2015: *New Trends of Education in the Shere of Safety Training*. The Science for Population Protection. vol. 7, no. 2, pp. 63-70. ISSN 1803-5682

Kozůbek J.; Čech P. & Flasar, Z., 2010: *Training of Military Professional on Fulfilling Tasks in Nowadays Asymmetric Operations with Use of Tactical Virtual Simulator*. In: Knowledge Based Organization International Conference. Sibiu: Nocolae Balcescu-Land Forces Aacademy, Sibiu, , p. 104-108. ISSN 1843-6722.

Oulehlová A.; Malachová, H.; Kincl, P. & Navrátil, J., 2016: *Simulated Exercise - "Gale" Crisis Scenario*. In: Vision 2020: Innovation Management, Development Sustainability and Competitive Economix Growth, 2016, VOLS

I - VII. Seville: International Business Information Management Association (IBIMA), p. 3867-3876. ISBN 978-0-9860419-8-3.

Oulehlová A.; Malachová, H.; Svoboda, O. & Urbanek, J., 2015: *Preparedness of Critical Infrastructure Subjects in Energy Sector for Crisis Situations*. In Safety and Reliability of Complex Engineered Systems - Proceedings of the 25th European Safety and Reliability Conference, ESREL 2015, Zurich, pp. 229-236. ISBN: 978-113802879-1.

Řehák, D.; Markuci, J.; Hromada, M. & Barcová, K. 2016: *Quantitative evaluation of the synergistic effects of failures in a critical infrastructure system*. International Journal of Critical Infrastructure Protection, vol. 14, pp. 3-17.

Sesame., 2014: *Securing the European Electricity Supply Against Malicious and accidental thrEats*. D9.2 Sesame Newsletter. Version: 2.0, pp. 35. Available at: https://www.sesame-project.eu/publications/deliverables/d9-2-sesame-newsletter/at_download/file

Shelomovska, O.; Sorokina, L.; Romaniukha, M.; Bohomaz, K. & Nakaznyi, M., 2016: *ICT-Competence of Univerzity Teachers in Profesiomal Development and Scientific Activity*. In: E-learning Methodology - Implementation and Evaluation, Scientific Monograph edited by Eugenia Smyrnova-Trybulska, Vol. 8 University of Silesia, Studio Noa, Katowice-Cieszyn. ISSN 2451-3652 ISBN 978-83-60071-86-1

Urban, R.; Oulehlová, A. & Malachová, H. 2017. Computer Simulation - Efficient Tool of Crisis Management. In: International Conference Knowledge-Based Organisation. Sibiu: "Nicolae Balcescu" Land Forces Academy, 2017, p. 135-141. ISSN 2451-3113.

Urbánek, J. F. et al., 2013: *Crisis Scenarios*. Brno: Univerzity of Defence. 240 pp. ISBN: 978-80-7231-934-3.

Urbánek, J. F.; Oulehlová, A.; Malachová, H.; Svoboda O. & Urbánek J. J., 2015: *Accident and incident investigation and modelling in critical infrastructure*. In Safety and Reliability of Complex Engineered Systems - Proceedings of the 25th European Safety and Reliability Conference, ESREL 2015, Zurich, pp. 43-47. ISBN: 978-113802879-1.

Zehe, D. et al., 2016: *Online Data Extraction for Large-Scale Agent-Based Simulations*. In: Proceedings of the 2016 annual ACM Conference on SIGSIM Principles of Advanced Discrete Simulation. ACM. p. 69-78.

EXPERIENCE AND THE PROSPECTS OF USING FREE SOFTWARE AT THE TEACHERS' TRAINING UNIVERSITY

Yuriy Horoshko, Hanna Tsybko
Chernihiv Taras Shevchenko National Teachers' Training University
Chernihiv, Ukraine
horoshko_y@ukr.net, a.tsb@ukr.net

***Abstract**: The article deals with the issue of the use of free software in the educational process of Chernihiv Teachers' Training University. The authors summarise the peculiarities of the selection and use of freely distributed software, correction of the content and methodical support of training courses in the field of computer science in the conditions of the transition to free software in the higher educational institution. They also describe the components of the computer-oriented methodical system of pre-service teachers' professional training based on the integrated application of free software.*

Keywords: educational process, teacher training, free software, teaching computer science.

INTRODUCTION

One of the main global trends in information society is the application of open standards in information technology.

In the market of desktop software in recent years, one can observe a slowdown in the development of professional paid software with a focus on the partial transfer of it to online services, which greatly complicates unauthorized use. At the same time there is an acceleration of the development of free software, which in its characteristics is not inferior to the paid software, and often exceeds it. Therefore, the perspective is to move away from paid to free software, from circulation of documents in closed formats to open formats of documents.

The use of free software in the educational process of higher education institutions provides a number of advantages, including the possibility of significant savings of budget funds, promotion of the formation of negative attitudes towards piracy among students; Giving the user the right to independently select the software in further work; The possibility of independent modification and adaptation of existing software.

Systemic, pedagogically substantiated introduction of free software in educational institutions will help society as a whole avoid the dominance of IT corporations by facilitating competition in software development: graduates trained in the use of free software will be able to use it in further professional activity without additional funds.

Currently, in a number of countries, the feasibility of using free software in the public sector and education sector has been recognized. In particular, in Argentina, Georgia, Russia, South Korea in the Philippines there exist state programs for using free software in educational institutions. Similar programs are being started in Italy, India, Germany and other countries.

The recognition by the world community of the feasibility of using free software, the increase of the number of software available for free use in educational institutions, encourage the development of various aspects of the use of free software in secondary schools and high institutions. In particular, such studies include works by Horoshko Yu.V., Semerikov S.O., Teplytsky I.O., Gabrusev V.Yu., Pokryzhen D.A., Kostyuchenko A.O., Shkardybarda M.I. and many other scholars and practitioners. However, the problem of the development of a computer-oriented methodical system of professional training for future teachers of physical and mathematical specialties, based on the integrated application of free software, remained unresolved.

Realizing the relevance and prospectivity of this direction of development of informational education, the staff of the Chair of Computer Science and Engineering during the last fourteen years is carrying out a purposeful transition to the use of free software in the educational process at the Faculty of Physics and Mathematics and other faculties of Chernihiv Taras Shevchenko National Teachers' Training University. In order to summarize the gained experience, the staff of the department in 2012 started work on the scientific research "Development of components of the free software-based teaching methods of computer science for students of teachers' training institutes of higher education”. The working hypothesis for this study is the assertion that only a teacher who has acquired his professional competences in higher education institution in the context of the integrated application of free software will be able to effectively implement free software in the process of his professional activity.

The purpose of the work: development of components of methodical system of training teachers of computer science that is based on the integrated application of free software and creates conditions for further use of this software by a specialist in professional activities.

The project was aimed at:

1. development of criteria for the selection of free software for its didactically substantiated application in the educational process of a pedagogical institution of higher education;
2. correction of content and methodical support of training courses of information orientation taking into account the integrated application of free software;
3. development of didactic materials on disciplines of computer science and checking their effectiveness in conditions of educational process.

The proposed research contributes to solving the actual problem of modern pedagogical higher education institutions - the training of a highly professional teacher and a specialist in the field of information and communication technologies, competitive in the modern labour market. The trained specialists will have experience in using free software, that will enable the school to meet the current requirements of the educational process.

RESEARCH METHODOLOGY

The methodological basis of the research is the systematic scientific and methodological analysis of the problem, which was conducted through the study and testing of software, the processing of scientific articles, publications in the pedagogical and computer press, regulatory documents and study of the experience of leading specialists in the field of information and communication technologies and teachers of computer science and methods of teaching computer science.

The means of the study are structurally-logical analysis of the state of the problem and potential opportunities for the development of the idea of implementation of free software into the educational process and computer hardware park, corresponding to the problem.

To solving the research problem, system-analytical and constructive approaches were used that allowed to optimize the course of research.

1. SELECTION AND USE OF FREE SOFTWARE IN THE PROCESS OF PROFESSIONAL TRAINING OF THE TEACHERS OF COMPUTER SCIENCE

In modern society, it is necessary to prepare a teacher who can effectively use in his professional activities a variety of software. It stimulates scientists and practitioners to reasonably select and apply software that meets the needs of a modern school. Solving the problem of implementing free software in educational institutions and state institutions in Ukraine requires a systematic approach and a certain set of activities.

Taking into account the experience of implementing free software in the educational process, the following problems can be distinguished:

- school curricula on computer science are mainly focused on the use of proprietary software;
- the amount of methodical literature is insufficient;
- the material base is obsolete, that limits the choice of current software;
- the management is not sufficiently interested in transition to the free software;
- some teachers have not an incentive to update teaching materials;
- the lack of motivation for students who are accustomed to use "the free" version of the most expensive software products;
- a large number of alternative software and at the same time an indefinite period of support (existence of a project).

Most of the above mentioned problems can be solved with a proper selection of free software for further use and study at the teachers' training university. In the course of the project implementation, the requirements were set for the selection of such software. In our opinion, selecting software involves solving the following tasks:

1. The software should provide the full range of services required by the users to perform their professional duties. Sometimes it is necessary to use a package of several free programs to replace the proprietary software.

   For example, when transiting from the popular proprietary office suite Microsoft Office to the free LibreOffice, one should offer Scribus software as an alternative to Microsoft Office Publisher, as the LibreOffice package does not have a computer layout program.

2. The software must have an interface and a set of services similar to the product that the user has become accustomed to working with.

   As practice shows, the transition to the use of anything new to the user is primarily related to overcoming the psychological barrier, which is a habit, even if this new set of services is much better than what they used to do. That is why, if the proposed new software product is close to that with which the user works, such barriers are much easier to overcome. Thus, the interface of the visual programming system Lazarus completely duplicates the Delphi interface. Therefore, the transition from Delphi to Lazarus does not cause a psychological barrier to its use.

3. The software must be cross-platform or such that allows easy use of emulation technology.

   If a user already has a certain set of proprietary software, it is difficult to make him move to free software, taking into account the money spent on the paid product. And vice versa: if a user needs a set of programs that do not have the appropriate free full-featured alternative (for example, "1C Enterprise"), he will need to use the appropriate platform. That is why it is necessary to use cross-platform products that allow to move freely from one platform to another. Also, there exist a lot of accumulated Windows-based applications that can be emulated using other operating systems (for example, Windows-based programs can be run on the GNU / Linux OS, Mac OS through the Wine emulation).

4. The software should be based on the use of open source code and document format.

Some closed-source software has been repeatedly seen in undocumented actions that violated the privacy of the user working with the computer. In particular, it is known that most Internet browsers transmit encrypted data packets to the developer, which includes information about the hardware component of the user, the sites that he visits, search engine queries, personal data, etc. Such software work is in fact uncontrollable by the user. The use of the open-source software product and the documents format enables, if desired, to control both the work of the software product and any operations with the document. In particular, in our opinion, after the adoption of the Open Document Format for Office Application (ODF) format as an international standard ISO / IEC 26300, it is promising to move away from circulation of documents in closed formats to open document formats.

5. The use of software should be pedagogically substantiated.

The developer of proprietary software for the purpose of selling should provide all possible tools that may be needed by a potential client. At the same time, the client himself cannot use 50% of this tool at all. On the other hand, the free software developer usually focuses on the main, most widely used tasks and tools that become the basis for learning.

6. The software should have a Ukrainian localization.

Practice shows that commercial software products are being localized only when the company-developer plans to get the appropriate return on sales. If one can do without a translation, the money for translation is usually not spent. This is largely due to the practical absence of software products with the Ukrainian-language interface: for most users there is enough already developed English-language or Russian-language interface. However, in the educational process, the use of such software products is pedagogically impractical. Free software in this case has significant advantages, since the majority of programs have the ability to use the Ukrainian-language interface.

Taking into account the above requirements, there was proposed a set of programs (Table 1) that allow, on the one hand, to perform a simple transition from proprietary to freely distributed software, and, on the other hand, do not reduce the set of functional capabilities for the educational and production activities of the user.

The software listed in Table 1 has been successfully used for a long time in the organizational and educational process at the Faculty of Physics and Mathematics of Chernihiv Taras Shevchenko National Teachers' Training University.

Table 1

Freely distributed software for use in the educational process

Software type	Name of open /free software	Advantages	Disadvantages	Crossplatform	Alternatives
Operating System	OSLinux (OpenSUSE, Debian)	Stability, reliability, convenient differentiation of rights	Somewhat higher hardware requirements for working with modern software		
Office suite	Libre Office	Better format support, more logical menu organization and document structure	Somewhat slower work, incomplete set of tools	*	KOffice, GNOME Office, Google Docs
Layout of documents	Scribus	More professional direction		*	
Archiver	7zip	Better compression ratio	Somewhat fewer additional features, a simpler interface	*	PeaZip, FreeArc
File manager	Konqueror, Nautilus, Far, Midnight Commander	No binding of the system to the file manager, better functionality			Dolphin, Thunar, Unreal Commander, Gnome commander
Pro-gramming system	Free Pascal, Lazarus	Full-time work in 32-bit mode, more libraries, work with Cyrillic		*	Geany, NetBeans, Eclipse

Declara-tive pro-gramming system	SWI Prolog			*	GNU Prolog
Email Client	Mozilla Thunderbird	Functionality, convenience		*	Sylpheed, Evolution
Raster graphic editor	Gimp	PhotoShop format support	Somewhat less functionality	*	Krita
Vector graphic editor	Inkscape	Wide features, ease of use	Somewhat less functionality	*	OO Draw, sK1
Audio editor	Audacity		Weaker functionality associated with licensing issues	*	
Video editor	KDEnlive, Avidemux, VirtualDubMod		Fewer "working" video formats		Kino, VideoSpin
Media player	VLC, Mplayer (and front-end), AIMP, Amarock	Great opportunities, significant support		*	Kaffeine, Audacious, cmus
Learning manageme nt systems	ITALC, LMS/LCMS: Moodle, Atutor, Efront	Simultaneous work with PC with different OS	Somewhat less functionality	*	VNC
Virtuali-zation tool	VirtualBox	Advanced console features, convenience	Somewhat fewer additional features	*	QEMU
Text recognition tools	Online Software Version				CuneiForm, ocropus

The list of free educational software can considerably vary depending on the operating system and the learning course.

Source: Own work

2. COMPONENTS OF THE FREE SOFTWARE-BASED METHODICAL SYSTEM OF COMPUTER SCIENCE TEACHERS TRAINING

The implementation of free software in the educational process requires some changes and corrections in all branches of informatics education and their methods. As a result of the work on the project, the components of the methodical system of training the teacher of computer science were developed in the conditions of application of free software. The obtained results are reflected in the content of the textbooks used in the educational process of Chernihiv Taras Shevchenko National Teachers' Training University in order to accompany the training of professional disciplines of the curriculum. The content of each of the manuals is based on the many years of experience in teaching students of faculty of physics and mathematics and other faculties of the university relevant sections of the computer science course.

2.1. Elements of the methods of teaching freely distributed utilities

The educational course "Information and Communication Technologies" deals with the issues related to the use of freely distributed program utilities, namely archivers on the example of the 7-Zip, file managers on the example of the Far Manager, browsers on the example of Mozilla FireFox, mail programs on the example of Mozilla Thunderbird, Virtual computers on the example of Oracle VM VirtualBox. The developed didactic materials can be used in the study of disciplines of computer a pedagogical educational institution, as well as in the independent mastering of the basics of work with such programs.

2.2. Elements of the methods of teaching office programs

Elements of the methodology of office program training are used in the course "Computer science" and are intended to support the training of widely used office applications: the word processor, the spreadsheets, the program for creation of presentations on the example of a freely distributed office suite LibreOffice that has gained popularity in Ukraine and in the world.

The content of the LibreOffice's training materials covers the main functions of these software tools. When studying the word processor Writer the practical work of the following content is offered: input and formatting of text; creation and application of templates; processing objects (including getting acquainted with the editor of formulas Math); processing tables. The topics of practical work on the spreadsheets Calc, are the following: creating and formatting tables, performing calculations and graphic constructions; solving problems of the course of higher mathematics (matrix method for solving systems of linear equations, plotting functions, approximate solving equations with the help of parameter selection); solving optimization problems (for example, the problem of resource allocation and transport task); processing databases in the spreadsheets (sorting, filtering, summarizing, constructing a pivot table). The practical work of studying the presentation design program Impress includes getting familiarized with the basic services of the program, and its contents relate to the review of the LibreOffice components, including the DBMS Base and the Draw graphics editor.

The task of each practical work is accompanied by basic theoretical information, as well as a detailed description of execution with indication of alternative methods. For control and self-control, a list of control questions is included that covers the content of all performed tasks. For each work there added ten variants of control practical tasks, divided on three levels of complexity that makes it possible to implement a differentiated approach to the formation of competencies to use the specific features of application software.

These teaching materials can be used during classroom classes, as well as for independent study of the features of freely distributed office packages, or as a collection of tasks for correspondence forms of study.

2.3. Elements of the methods of teaching databases

The tendency of extensive use of databases exists in fact in all spheres of human activity. Such spreading of databases based on various data models in a wide variety of information technologies is the basis for in-depth study of database-related issues, and above all questions about data models, in the course of computer science at the pedagogical university.

Mastering the effective methods of processing data on the basis of their formalization and structuring with the help of information modelling becomes absolutely necessary for specialists of the diverse industries, and especially for future teachers of computer science.

In the theoretical part of the proposed teaching materials, the notion of data modelling is emphasized, in particular the formation of competencies in constructing conceptual data models. The practical part is focused on using the LibreOffice Base DBMS. This choice is due to the fact that this DBMS is part of the LibreOffice suite of office applications that is cross-platform (there are implementations for all popular operating systems: the family of Microsoft Windows operating systems, the Linux family, Mac OS X), and also freely distributed. At the same time, it is a powerful database processing tool.

The LibreOffice Base database is a powerful relational DBMS, which allows user to create complex databases and use the SQL language to generate queries. In current version 5, query for data selection can be created using the QBE language. But for requests for updates, addition and deletion of data, one must necessarily apply the SQL language, that implemented in a way that minimizes the possibility of unwise recurrence of such queries. This way of implementing database modification queries is more successful than MS ACCESS, for example, where modification queries can be triggered by inexperienced students many times without any restrictions, and the practice of MS ACCESS shows that this often leads to data distortion.

For the further formation of students' competencies in the analysis of the subject field of the problem, the construction of an information model (in this case, firstly ER-model, and then on its basis SQL-model), and the research of the resulting model, students are offered a series of three laboratory works. In the first work, students must, on the basis of the terms of a certain subject field, develop an adequate data model, and then define the entities of the subject field, their properties and the relationships between them. Then, on the base on this data model, students create appropriate tables, identify the keys of these tables, establish links between tables, create forms for inputting and editing data with the constraints on the values in the fields, and finally fill in tables with data.

In the second laboratory work students must develop queries to the database created in the previous work. Conditions for the queries are formulated in terms of the subject field. Queries for data selection and data calculation are proposed to be performed using the QBE language (in terms of the LibreOffice Base - in the query designer), and data modification queries must be described in SQL.

In the third laboratory work, students must develop reports (using computational fields) to the database created in the first laboratory work.

The tasks in laboratory work contain 12 options, so each student’s subgroup performs its own version.

The considered materials are intended for students of physical and mathematical faculties of teachers’ training universities, but they can be used by students of other specialties of universities, who study computer science, as well as teachers of computer science.

2.4. Elements of the methods of teaching programming

Due to the planned transition to the use of free software at the Faculty of Physics and Mathematics for the study of the basics of algorithmization were selected the programming languages Object Pascal and C ++ and, correspondingly, the programming environments Lazarus and Code::Blocks. The choice of these languages and environments is based on a large number of methodological manuals, sets of laboratory works, etc. It is important that these languages are the main languages at Olympiads in computer science for schoolchildren in Ukraine and in the world.

Like Delphi, Lazarus is an RAD environment (rapid application development), which allows user to quickly create a user interface. Unlike Delphi, Lazarus is a cross-platform application that supports OS such as GNU / Linux, Microsoft Windows, Mac OS X, FreeBSD, WinCE. IDE Code::Blocks is freely distributed and cross-platform as well.

The Lazarus environment is quite suitable for learning object-oriented programming, and its free and open source code, the ability to use this environment in commercial development legally, the ability to port their own applications on the most popular platforms allows to use it for creation of rather complex cross-platform projects.

In the process of studying the basics of algorithmization and programming, students carry out a series of laboratory works, where the tasks are divided into three levels of complexity that makes possible the differentiated approach to the evaluation of learning results.

2.5. Elements of the methods of teaching modern operating systems

In the process of teacher training with the systematic use of free software, it is extremely important for students to acquire competencies in the use and administration of modern, freely distributed operating systems. The GNU / Linux operating system has all the prospects to become the main operating system in the learning environment.

GNU / Linux is considered to be the most significant achievement in the field of free software. Today, the Linux family is in the forefront of server and server applications. At the same time, Linux is increasingly spreading as a regular office, home and gaming OS, like a free and honest operating system - GNU / Linux is becoming an operating system for education and training. As a result of the project, educational and methodological materials were developed to provide a new course of teaching operating systems that includes the main current trends in this field. The corresponding manual describes the theoretical content of the basic structure and functionality of modern operating systems, their main modules and components, as well as the main concepts, approaches to the organization and principles of operation in Linux operating system. The manual is intended for students of pedagogical universities studying the course "Modern operating systems" or similar one.

2.6. Elements of the methods of teaching e-learning courses creating

One of the new learning technologies that is becoming widespread in an informative society is distance learning. In particular, Internet-based learning is most popular. Due to the development of the Internet and modern methods of communication and data exchange, it is possible to create and use new tools such as electronic notes, encyclopaedias, tests, glossaries, questionnaires, virtual laboratories, etc. One of the options for introducing such methods and technologies into the learning process is the use of learning management systems. The basics of using such systems are studied by students in the course "Creation and administration of distance educational resources". In order to accompany this course, educational and methodological materials are developed, which discuss the theoretical and practical issues of creating electronic training courses and manuals using free learning management systems. The presentation is based on LMS Moodle, eFront, Atutor, and EXE-Learning.

EFront is a new generation of e-learning systems that combines the functions of the Learning Management System (LMS) and the Learning Content Management System (LCMS).

The use of eFront helps to solve the tasks of organizing the educational process in educational institutions, as well as the tasks of professional development, certification and selection of employees in organizations of different sizes.

Moodle (Modular Object-Oriented Remote Learning Environment) is a free, open source distance learning system. The system implements the philosophy of "pedagogy of social constructivism" and focuses primarily on organizing the interaction between the teacher and the students, although it is also suitable for organizing traditional distance courses, as well as for continuing full-time learning.

Moodle is translated into dozens of languages, including a partial translation into Ukrainian. The system is used in 175 countries of the world.

The aim of the Moodle project is to provide teachers with the best tools for managing and accelerating learning.

LCMS ATutor makes it easy for teachers to organize various training courses. Students receive an adaptive and easy learning environment. Beside that ATutor is licensed under the GPL2 license, this program supports at the moment and in the future a number of standards that provide easy access to other software and easy third-party software development.

ATutor is a web-based system, easy to install, configure, and maintain for system administrators; Teachers (instructors) can easily create and transfer teaching materials and run their online courses. The system is modular, that is, it consists of separate functional units - modules, so it is open for modernization and expansion of functionality.

The developed teaching materials are used by students in the educational process. In addition, due to the modern requirements of the Ministry of Education of Ukraine, the teaching and methodical support of most curriculum disciplines should be submitted in the form of electronic learning resources. In this regard, at the Department of Computer Science and Engineering a workshop for teachers of all faculties for the development of electronic training courses and manuals has started. The participants of the workshop acquire the necessary competencies in using the developed methodical support.

2.7. Elements of the methods of teaching computer graphics and multimedia

In the analysis of available free software and its selection for use in the course "Computer graphics and multimedia technologies" it was found that existing open-source programs can cover the entire spectrum of study of the elements of computer graphics and multimedia technologies in secondary schools and high institutions.

For the formation of students' competencies in the processing of graphic, audio and video data in the educational process freely distributed analogues of popular proprietary programs are used. In particular, the raster graphics editor, GIMP (GNU Image Manipulation Program), is a serious alternative to the Photoshop for semi-professional raster graphics processing. For vector graphics processing one can use the Draw program from the LibreOffice package, which can replace software products such as Corel Draw, Xara Designer, or Adobe Illustrator for high school needs. The Inkscape program is a vector graphic editor designed to create artistic and graphic illustrations (including animated), and can also be used as a general-purpose automated design system.

It is suggested that one should study the audio on the base of the Audacity program. This audio editor allows to work with multiple audio tracks at the same time, apply standard methods of sound processing, make sound recordings. Formation of competencies for video data processing is carried out using Avidemux video editor, which supports a large number of video file types, has a simple and convenient data processing tool, multilingual interface and a rich set of various filters.

It's worth noting that GIMP, Inkscape, Audacity, Avidemux software are cross-platform, that is, operate under different operating systems, including Linux, Free BSD, MacOS. Such independence from a platform gives significant benefits to the user in his further professional activities, increases the flexibility of the learning process and simplifies the transition to the use of various operating systems.

CONCLUSION

The main results of the project "Development of components of the free software-based teaching methods of computer science for students of teachers' training institutes of higher education”, are:

1. The didactic potential of free analogues of commercial software that is widely used in educational institutions has been substantiated.
2. Selection of free software for application in the educational process of the schools and pedagogical institutions of higher education has been carried out.
3. Educational software products have been developed and improved: a test program Tester has been created, a teaching and methodical complex Gran, recommended by the Ministry of Education and Science of Ukraine for use in the educational process of schools and universities, has been improved.
4. Methodical support of training courses of information orientation, aimed at preparing students for the effective use of free software in their further professional activities, has been developed.

5. The methodical system of teaching information modelling on the basis of the use of free software has been developed and tested. This work has led to a successful dissertation by Y. V. Horoshko “System of information modeling in the training of future teachers of mathematics and computer science” for the scientific degree of the Doctor of Pedagogical Sciences in specialty 13.00.02 – Theory and Methods of Teaching (computer science).
6. The methodical system of teaching programming based on the application of free software has been developed and tested. This work has led to a successful dissertation by A. O. Kostyuchenko "Methodical system of training pre-service teachers of mathematics and computer science for the development of educational software tools" for the scientific degree of the Candidate of Pedagogical Sciences in specialty 13.00.02 – Theory and Methods of Teaching (computer science).

Experience and results of the research are presented in 24 publications in scientific editions of Ukraine and abroad.

The didactic materials developed during the work on the project were implemented into the educational process of Chernihiv Taras Shevchenko National Teachers' Training University, Chernihiv K.D. Ushinsky Regional Institute of Postgraduate Pedagogical Education, National Pedagogical Dragomanov University.

As a direction of further research the team of project implementers consider work on the problem of developing components of the methodical system of teaching computer science, that will form the pre-service teachers’ professional competence not only in the use of available free software, but also in the creation of author educational software for organizing an effective learning process in a modern school.

REFERENCES

Assemblée nationale, [on-line] at http://www.assemblee-nationale.fr/14/ta/ta0180.asp, (accessed 2 August 2017)

Goroshko, Yu.V., 2015: *Theory and methodology of working with databases.* Chernihiv, 2015. P. 78. [In Ukraine]

Goroshko, Yu.V., Kostyuchenko, A.O, 2011: *Theory and methodology of pedagogical software development.* Manufacturing Yermolenko O. M., Chernihiv, 2011. P. 144. [In Ukraine]

Goroshko, Yu.V., Tsybko, G.Yu., Vinnychenko, E.F., Shkardybarda M.I., Kostyuchenko, A.O., Penkov, A.V., 2013: *Selection of freely distributed software for use in pedagogical university,* The Bulletin of Chernihiv Taras Shevchenko National Teachers' Training University Series: Pedagogical Sciences, issue 113. P.125-129. [In Ukraine]

Goroshko, Yu.V., Tsybko, G.Yu., Vinnychenko, E.F., Shkardybarda M.I., Kostyuchenko, A.O., 2013: *Method of using freely distributed utilities*. Publisher Lozovy V.M., Chernihiv: 2013. P.50. [In Ukraine]

Kostyuchenko, A.O., Shkardybarda M.I., 2013: *Theory and method of creation of electronic tutorials*. Publisher Lozovy V.M., Chernihiv: 2013. P.104. [In Ukraine]

Shkardybarda, M.I., 2013: *Modern operating systems. Linux: Tutorial for Students* Publisher Lozovy V.M., Chernihiv: 2013. P. 133. [In Ukraine]

Tsybko, G.Yu. 2013: *Office Suite LibreOffice. Workshop: A manual for students/* Publisher Lozovy V.M., Chernihiv: 2013. P.136. [In Ukraine]

Tsybko, G.Yu., 2013: *On the concept of the work of the Department of Computer Science at the Chernihiv Pedagogical University*. The Bulletin of Chernihiv Taras Shevchenko National Teachers' Training University Series: Pedagogical Sciences, issue 113. P. 157-159. [In Ukraine]

Vinnychenko, E. F., 2015: *Basics of computer graphics*. Chernihiv, 2015. P. 52. [In Ukraine]

DIDACTIC FEATURES OF EDUCATIONAL SOFWARE IN TEACHERS' OPINION

Waldemar Lib
University of Rzeszow, Poland
libw@ur.edu.pl

Abstract: *As a result of the research, it has been hierarchically determined which of the characteristics of the book in question in the teachers' opinion are most important and less important. It has been shown that the characteristics which influence teachers' opinion on the didactic process are as follows:*

1. *Ergonomics.*
2. *Self-education with the use of didactic programs.*
3. *Substantive correctness.*
4. *Stimulation of interest in the subject.*
5. *Possibility of smooth running of the didactic process.*
6. *Ability to simulate phenomena and processes.*

Keywords: multimedia, multimedia didactic software, didactic.

INTRODUCTION

The media are now seen as a major factor leading to the formation of a global information society, and a characteristic feature of human beings should be the ability to select and process information. The lack of such skills is contemporary illiteracy (Walat 2007: 65).

An extremely important and yet distinctive feature of didactic work in the form of multimedia didactic software is the individualization of reception, which is accompanied by an increase in the ability to establish contact with the sender. There are also greater opportunities for creative processing of information by the recipient in processing finished texts, but also creating new ones by using, among other things, animations, graphics and video sequences. A separate, broad but significant, aspect influencing the improvement of the information received is the reception of hypermedia by its interactive nature, which, by interacting with the recipient, often makes the message more effective by expressing the same terms with the help of different codes (Walat 2007: 65).

The pilot studies aim to characterize multimedia didactic programs, to determine which of them are more or less important in the view of vocational classes teachers. They will also enable the didactic process to run more effectively and efficiently. The above mentioned characteristics of didactic multimedia programs have been pinpointed to the creators. Further research can lead to enhance the theory of multimedia didactic programs and e-textbooks.

MULTIMEDIA TEACHING PROGRAMS IN THE TEACHING-LEARNING PROCESS

For many years such authors as Juszczyk (1997: 17), Walat (2007: 97-125), Lib (2012: 5), Ciesielka (2013), Myers, Halpin (2002: 133-140), Ashvini (2012: 33-36) and others have emphasized that a program that is well-developed in terms of content and didactics has the potential to increase the assimilation of presented content by a multi-sensory impact on the learning brain. This influence can be expressed as influencing the learners' brains by:

- visual field– graphics, colour scheme,
- hearing perception – sound, music,
- movement perception – tracking of movements visible on a monitor, animation, film,
- speech field –communication by messaging,
- somatic perception –carrying out instructions, exercises, simulations, etc. (see Gajda 2010: 21).

The concept of multimedia education is preferred by a large number of educators. It is also reflected in the core curriculum of general education for primary and secondary and upper secondary schools. In each case, there are numerous advantages to using multimedia.

With reference to Rogulska's innovative teaching aids (2012: 25-26), the following features of multimedia education are mentioned:

- it causes a change in the very important aspect of psychodydactic learning, because often the level of motivation of the learner is changed, for which the use of multimedia is very attractive during school activities where there are other forms of communication besides speaking and reading,
- such a form of teaching requires modification of the way teachers work – it often requires more involvement, use of imagination, a creative approach; there is the possibility of common (teacher with student) creation of teaching materials,

- didactic programs provide the opportunity to individualize education (by selecting the educational pathway that the student follows in the program itself and by the pace of work, the choice of media presentations– text, teacher's voice, animation, film, simulation, etc.), which may positively affect the uptake of knowledge.

A didactic program is any scientific study that addresses specific problems in the pedagogical activity of teachers. Its main purpose is to define the method and form of application of pedagogical factors in order to optimize pedagogical activities in order to optimize activities in view of the adopted objectives. These programs are essentially a subsystem of the education system of a given field of education (Walat 2007: 57).

Apart from the pedagogical aspects of multimedia didactic programs, they contain two important groups:

- substantive – correctness of the content of the presented information,
- ergonomic – technical solutions adopted in the program, including text clarity, presentation format, colour scheme, layout and size of the interface, program colour scheme, font selection and size, screen layout, ease of use, intuitiveness of operation,

PRESENTATION OF THE RESULTS OF PILOT STUDIES

Taking into account the aforementioned features of didactic software, the following categories of features were considered in the study:

- substantive merits,
- ergonomic,
- stimulating interest in the subject matter,
- possibility of efficient flow of the didactic process,
- self-study with the use of didactic software,
- possibility of simulating phenomena and processes.

Each of these categories is described by ten specific characteristics that formed the basis for constructing the Q-test in which the surveyed teachers indicated what they thought were the most important and those that were least important.

CHARACTERISTICS OF THE STUDY GROUP

One hundred and twenty teachers participated in the research working in basic vocational schools, technical schools and Vocational Training Centres located in the city of Rzeszów were involved in the research; they were teachers of both theoretical and practical subjects. These teachers used multimedia teaching software to present information, develop specific skills, and simulate industrial phenomena and processes. A large number also used control blocks included in the program for verifying the level of assimilated knowledge as well as simulation tests to determine how a student behaves in a particular professional situation.

Teachers working in vocational education took part in the study. In the overall group of teachers, a small majority were male, 52% of the respondents.

Most of the teachers were young, 58% under 40 years old, which seems to have been beneficial for the research.

From the observations of the people who took part in the study, it was noted that the younger teachers were more likely and willing (16%) to fill in the test presented electronically than the older teachers. This may be due to the fact that it is this group that more often and more willingly uses computers and computer software in their work, and also used computers while studying at university, so their fears are smaller and their readiness to use such a form of work is greater.

As far as work experience is concerned, there were 15% more teachers who had been working in education for more than 10 years than teachers working less than 10 years. So they were young teachers with more than 10 years of work experience. This leads to an important conclusion that further research needs to be scaled up, as they probably were teachers with a little over 10 years of work but no more than 15years.

Among those surveyed 53% were teachers of theoretical subjects, for which multimedia teaching programs are primarily used as teaching aids to convey information in the form of text, commentary, animations, films, and control blocks with less frequent simulation of phenomena and processes. Programs that simulate phenomena and processes are most often used by practical vocational teachers. These simulations may involve measurements, breakdowns, design of production or operation of equipment. The group of practical vocational teachers is 47% of all respondents.

ANALYSIS OF RESEARCH RESULTS

The results shown in Table 1 show that the most important qualities were those that were related to the ergonomics of the didactic programs (B), followed by self-study (E), and only in third place to the correctness of the content (A). Since substantive merits is in the middle of the hierarchy of qualities, it can be said that the substantive significance of the didactic programs is of medium importance. Another surprising result is that features related to the possibility of simulating phenomena and processes (F) in turn are, according to vocational teachers, the least important feature group. It would seem that substantive merits is the most important feature of all for all types of education. On the other hand, in vocational training, it is also important to be able to simulate phenomena and processes that students can meet in real-life situations and which, due to different conditions (e.g. degree of complexity and price of equipment, scale or process hazards) they cannot carry out on real systems. The ability to perform simulations is also one of the characteristics of the didactic programs, which significantly differentiates them from traditional didactic means based on written or visual text, and is also a more advanced form of knowledge transfer than animation or film. In addition, if we can say that learners, apart from knowledge, acquire skills through the use of didactic programs, they acquire them mainly by running simulations, such as device diagnosis, mechanism assembly, chemical process, heat treatment and so on.

Table 1.

The most important and least important categories of features of multimedia didactic software

Categories of didactic features	**Determination of the main characteristic**	**Average Q-test indicator of the given feature**
Ergonomic	B	5,24
Self-study with the use of didactic software	E	5,17
Substantive merits	A	5,12
Interesting subject matter	C	5,05
Possibility of efficient flow of the didactic process	D	4,94
Possibility of simulating phenomena and processes	F	4,83

Source: *Own Research*

In the case of the analysis of the significance of specific features, the most important opinion of the respondents was the presentation of issues using modern visualization techniques. This feature belongs to the category of features resulting from software ergonomics (B). In second place, one item higher than in the category of features, there is a specific feature related to the correctness of the content (A). It follows that, although this particular feature is important in the opinion of the respondents, the other characteristics related to substantive merits were considerably lower. In third place, we see a feature related to developing interest in the subject (C), while the lowest is a feature resulting from the ability to self-study using didactic software (E), although in the case of feature categories this feature took second place before the correctness of the content. This means that while this particular feature was considered by teachers to be of little importance, the other members of this category rated very high.

Table 2.

Key features in a given category

Categories of didactic features	Determination of the main characteristic	Average Q-test indicator of the given feature
Presentation of issues using modern visualization techniques	B	8,13
Show the practical usefulness of the issues shown	A	8,05
Innovative form of classes makes the students more eager to participate in the classes	C	7,48
Introduction of exercises in less standardized form, such as simulations of real activities and actions	F	7,40
Student time discipline during the solving of tasks	D	6,65
By using the software we shorten the learning time	E	6,42

Source: *Own Research*

Teachers do not think that the most important features of didactic software, which like school textbooks and other teaching materials are teaching tools, is the aim to impart certain and flawless knowledge. Knowledge, in addition to developing substantive content, shapes the professional language of students and their communication skills by developing the vocabulary that belongs to a particular field in the learning lexical resource, but also develops understanding of the vocabulary and skilful use of it. Professional use of vocabulary on the one hand involves decoding of information, e.g. in instructions: for service, for current and periodic maintenance, equipment repairs, occupational health and safety, etc. It also involves encoding information by building and communicating messages to other people associated with a specific profession, such as the transmission of certain and faultless information on breakdowns, ordering of parts, performance of duties, etc.

SUMMARY

As mentioned above, a didactic program is any scientific study constituting a subsystem of the didactic system of a given field of education. And from this point of view it should present the correct scientific knowledge of the subject matter of teaching. Most important is the ergonomics of the program, which included the following features:

- presentation of issues using modern visualization techniques,
- use of only colour illustrations,
- application of correct elements of computer typography that positively affect the student's eyesight,
- layout of the screen that is organized and easy to use,
- work environment based on colours that do not excite emotions,
- presentation of information in a variety of forms,
- adaption of the presentation to the student's perceptual abilities,
- the interactive nature of hypermedia,
- editing of messages – communications,
- messages transmitted through a variety of forms, not only using text, but also illustrations.

As can be seen, teachers place a lot of emphasis on the form of transferring information, not necessarily on the content itself and its correctness.

The results of these studies are consistent with research conducted by W. Walat [2010: 155-157] on the relevance of the characteristics of traditional school textbooks. There, the teachers who took part in the research also recognized the qualities that reinforced the informative function of the school book, so they focused on the form of the message and elements such as infographics, colouring, typographic layout of the pages, transferring the substantive merits of the content presented to the background.

REFERENCES

Ashvini J. 2012: *Multimedia: A Technique in Teaching Process in the Classrooms*. Current World Environment, Vol. 7(1), Nilofar Iqbal, pages 33-36, ISSN: 0973-4929.

Ciesielka M. 2013: *Ocena umiejętności studentów wyższej uczelni technicznej w zakresie tworzenia prezentacji multimedialnych*. Edukacja – Technika – Informatyka: wybrane problemy edukacji informatycznej i informacyjnej, nr 4 cz. 2, Wyd. UR, Rzeszów, pages 214-219, ISSN 2080-9069.

Gajda J. 2010: *Media w edukacji*, Impuls, Kraków 2010, pages 217, ISBN 978-83-7587-352-8.

Juszczyk S. 1997: *Interakcja człowieka z mediami* [in:] Nauczyciel i szkoła 1997, nr 1(2). Pages 10-28, ISSN 1426-9899.

Lib W. 2012: *Narzędzia i techniki informatyczne w procesie dydaktycznym*, Mitel, Rzeszów 2012 pages 68, ISBN 978-83-7667-030-0.

Myers J., M., Halpin R. 2002: Teachers'Attitudes and Use of Multimedia Technology in the Classroom. Journal of Computing in Teacher Education, Volume 18, 2002 - Issue 4, ISTE Routledge Taylor &Francis Group, pages: 133-140, ISSN 2153-2974.

Rogulska A. 2012: *Media globalne – media lokalne. Zagadnienie z obszaru pedagogiki medialnej i edukacji regionalnej*, Impuls, Kraków 2012, pages 274, ISBN 978-83-7850-042-1

Walat W. 2007: *Edukacyjne zastosowanie hipermediów*, Wyd. UR, Rzeszów, 2007, pages 319, ISBN 978-83-7338-329-6.

Walat W. 2010: *Badanie ważności funkcji podręczników do techniki w opiniach nauczycieli szkół podstawowych*, „Prace naukowe Akademii im. Jana Długosza w Częstochowie”, seria „Edukacja Techniczna i Informatyczna” t. V.

Note: The article has not been published so far in this form.

ASPECTS OF DISTANCE LEARNING FOR ENGINEERING SCIENCES

Dmitry Chasov[1], Liudmila Sorokina[2], Serhii Havrylin[3]
Dniprovsk State Technical University, Kamianske, Dniprobudivska st.2,
[1]0969995009@ukr.net, [2]sludmila1906@gmail.com, [3]sgavrilyn@gmail.com

Abstract: *The article deals with advantages of distance education over the classical one. The deficiencies and difficulties of distance education programs in the field of the technical expertise have been revealed. It considers modern innovative study and research methods of mechanical and metallurgical processes to explain complex scientific problems of these areas by applicants of distance education. The publication contains concrete theoretical results obtained by the use of innovative computer technologies to study transportation processes in metal rolling. The results of modelling and forecasting programs have been described.*

Keywords: distance education, innovation, research, transportation, mechanical processes, information, educational process.

INTRODUCTION

The modern world is impossible without technology, the results of which were inherently a part of our social life. The development of innovative solutions concerning the existing issues falls on the shoulders of young scientists and inventors, as scientific progress, for the most part, requires so urgently needed resource-saving and alternative energy sources use. Existing research institutes and applied laboratories of classical school do not meet the progressive needs of the markets, as they are based on the "foundations" which have the roots in the previous periods of establishing statehood. These institutions are desperately needed as supportive bases for the formation of highly qualified professionals. But the times we live in call for new requirements and need qualified staff of new formation with world experience and international education. Such requirements will be further demanded by candidates for various positions of companies which are developing dynamically. And, thus, there is a need for such personnel and this raises the question of creating conditions with the aim of promoting their level of training.

For most students, education in the world-famous universities is not possible for a number of reasons. The main causes are: the financial constraints of living in cities of university location, substantial cost of training and the need to work in the post they have occupied now. So we have two main obstacles to the desired level of education - the need for significant financial costs and lack of time because of the need to work and develop their career.

An alternative that copes with contemporary requests and meets the above conditions, is only distance education. There are many books that demonstrate advantages of this form of education (Vasyuk 2011; Veremchuk 2013; Verba 2010; Warzar 2014; Zhevakina 2009). All existing distance education programs are derived techniques to study humanities. With regard to the technical areas, there is a substantial gap in teaching methods and programs.

The **OBJECTIVE** of the paper is to discuss the introduction of information technology in bachelor and master courses “Metal forming” where professors from DSTU use software package ESV-Deform. This package is unique in its kind due to the description of the process of shape change in the initial profile with the predicted deviations. The purpose of using this software product is to eliminate the defect at design stage.

BASIC MATERIALS

The metal rolling process is accompanied by complex deformations caused by stresses inside the workpiece. The number of runs through the work roll directly affects the quality of the finished surface and is reflected in the technological time, which is included in the calculation formula for the cost of production. The use of programs describing the rolling process helps to prevent the defective products, due to predetermined dangerous sections of deformation of the material. The development of educational innovative technologies will allow, without reducing the quality of educational process and considerable investments, to significantly improve mastering of disciplines due to including new formation elements of skills and abilities in the educational process in solving the practical problems together with means of applied information science both by the teacher and the student.

The application of training programs for distance education in technical areas is based on the classic postulates and theories. Accordingly, the learning of the material obtained is "boring" and narrowly used. Physical, chemical, mechanical properties and laws find their explanation on experimental laboratory stands and installations, giving much wider knowledge and faster perception of certain processes. Assuming that it is distance education, students (student) acquire practical knowledge owing to videos that explain or reveal the themes studied. However, these methods are not effective enough, because even high-quality video cannot capture all the aspects of processes and phenomena studied. The following is necessary for a full and thorough information learning and understanding from video resources:

- psychological preparation of student for the perception of information;

- better understanding of the lecture purpose, key part of the main messages and ideas;

- internal sensation of lecture content.

This software product is designed for educational use, since it allows to import calculations effectuated for specific production conditions. The program allows you to transfer theoretical calculations into the applied and industrial plane. This piece of software is installed on internal electronic resources of the university and can be run offline by full-time bachelor, master and post-graduate students. Distance students can profit from remote access when they do not have sessions of presence classes. The software unit ESV-Deform makes it possible to identify possible deformations and fractures due to the application of forces to prototypes at any time and every point in a three-dimensional body. Remote access allows you to specify the parameters of interest and get the result without getting distracted from the production process itself. Also, remote access simulates real-time production process when the operator cannot assist the control panel all through the production process. Offline use can facilitate the operator's work in cases when the program requires correction of some variable parameters, while the modelling of load is very time-consuming.

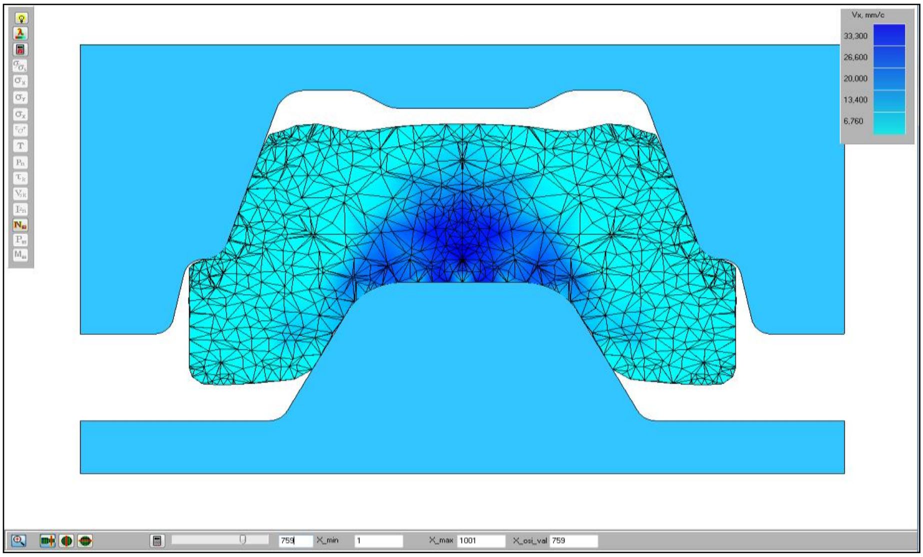

Figure 1. Load and deformation in horizontal plane

Source: *ESV-Deform programme (Developer prof. S.V. Ershov, DSTU)*

The use of the software product will help the future qualified employee and today's student to master the programming skills of rolling processes that help the transition of metallurgy to a new quality level, namely:

- to identify dangerous sections of deformation in all planes – horizontal, vertical, frontal and in intersection (Figure 1);

- to clearly identify the parts of the billet with the greatest loads for specific varieties of forms (Figure 2);

- to calculate the effort necessary to obtain the desired profile at a particular stage of processing;

- to simplify and accelerate the calculations of the predicted profile with detailed and step-by-step control;

- to calculate the minimum initial size of the workpiece for working in a no-waste mode;

- to vary the number of runs through the work roll and their depth to eliminate the risk of defect.

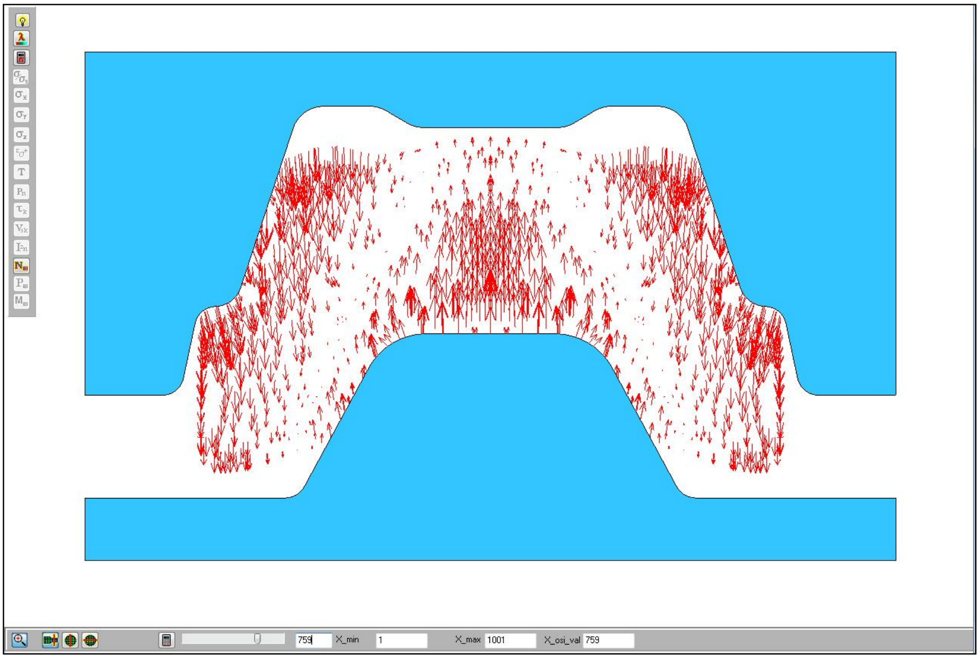

Figure 2. The direction of forces inside the billet

Source: *ESV-Deform programme (Developer prof. S.V. Ershov, DSTU)*

The student's understanding of the need for this material is responsible for psychological training. With regard the understanding and internal sensation of the purpose content, the physical perception of studies performed is necessary. The most effective method of mastering physical processes is to perform the described experiments in video materials without assistance. But it is not always possible to construct or reproduce the experimental or pilot installation in conditions outside laboratories. So we need to create a prototype that corresponds to the existing ones. There are two main ways to implement this goal:

- the use of upgraded research analogues;

- modelling of investigated processes using computer technology.

As for the use of modernized analogues, emphasis should be given to the practical significance and their further possibilities of use and implementation. Any laboratory prototype should be applied in everyday activity, taking into account the essence compliance of compared models. Thus, in the case of complex lift-and-transport mechanisms, we can use derivative structures that are consistent with the principles and laws of interaction of the transported material with structural elements of machines. Educational applicant may be widely consulted with the theoretical justification of the positive impact of additional blades on screw conveyor to reduce lifting-driving force to move the metal chips by decreasing the forces of internal friction of transported materials, which is achieved due to the partial removal of layer load from the general stream in the trough of screw conveyors by additional blades on the example of an ordinary snow-plough. They can also study the laws of plates and belts wear and deflection under the load transportation by belt, scraper and plate conveyors represented with belt conveyors in consumer supermarkets in everyday life.

Modelling of the investigated processes using computer technology is an integral part of distance education and full-time studies, as complex processes in any industry require accurate description in order to control and arrive at rational power-efficient characteristics. Thus, using the set-up parameters the performance of conveyor can be calculated or the most effective parameters of its structural elements can be determined.

Specific examples of innovative use of computer technology for education and science can reveal the following experimental data obtained of the transportation process of materials by screw conveyor with additional blades (Chasov 2015; Chasov 2016):

- mathematical relation for determining the effective angle of metal chips march-off point on additional spiral screw blade which is within 28,7 ° to 8.7 ° in cross section has been obtained and the law of its blade motion has been established;

- the angle of attack influence of additional screw conveyor blades on its transporting capacity has been theoretically established and theoretical dependence, which allows to determine the critical frequency of the screw conveyor rotation with additional blades located within 0,31-0,42 c, has been obtained;- the effective angle of attack value of additional blades within 40-50 ° and the number of additional blades from 2 to 4 pieces and the trough filling of screw conveyors up to 30% have been determined;

- the opportunity to design and predict the desired setting for the original data to model (growth performance of screw conveyors at different angles of extra blades, dependencies on quality growth of screw conveyor efficiency with variable filling of screw conveyor trough, quantitative growth of screw conveyor efficiency with different number of extra blades, the effective ranges of studied growth parameters of screw conveyors effectiveness depending on the amount of energy consumed);

- that no extra blades on the body of the pen auger reduces energy intensity by 25-30% and improve process performance transport of metal chips by 30-40% analytically proven;

- the prototype of screw conveyor, which can be used in the design of similar conveyors for specific shop conditions was designed, developed and tested in laboratory and industrial conditions;

- the results of theoretical research have made it possible to develop a methodology of technological and design factors calculation and give practical guidelines for screw conveyors design with additional blades.

Modern software for modeling allows to process data for other industries, that promotes innovative solutions in science and rapid spread of distance education through a broader scope of information received. An example of this result is metallurgical development (Gavrilin 2016; Ershov et al. 2016):

- the possibility of taking into account the specifications of metal flow characteristic for piling bar profile rolling of "Larsen" type with interlock base of more than 500 mm;

- the ability to identify the factors that have the greatest impact on the flow of metal in the sizes used in rolling of piling bar profile of "Larsen" type with increased interlock base, and monitor locking elements;

- laws governing draft ratio impact of sidewall area to the area of lock element on the filling of the latter in rough caliber in the production of piling bar profile of increased base have been defined;

- design method have been improved and theoretical relations which allow to join rough form of tongue-and-groove caliber with proportionality factor have been obtained;

- the opportunity to calculate figure change of deformation in rough sizes, which are used for the production of sheet profiles of open-pan form has been obtained.

Also, theoretical data of given systems that simulate the processes can be derived by means of innovative programs, for example, the value variation of spatial angle at the start of material motion β depending on the angle of attack α (Figure 3).

Analytical research into the process of transportation of metal shavings by a screw conveyor are based on the condition of equilibrium when passing from a state of rest to motion. When the screw rotates, the chips located on the surface of the additional blade will bear gravitational and centrifugal forces.

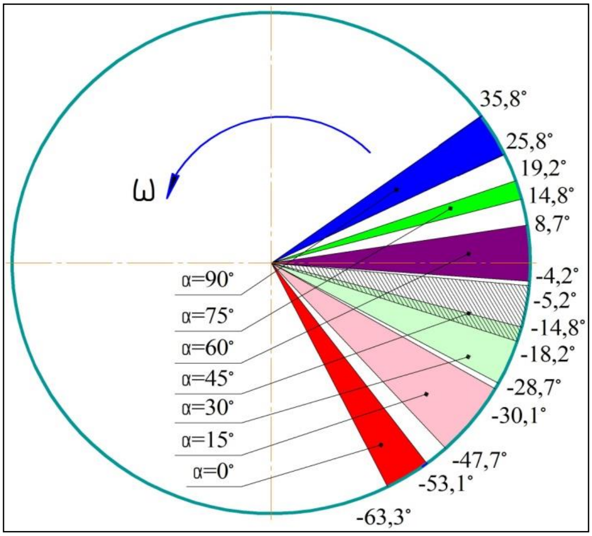

Figure 3. β angle variation depending on the angle of attack α (ω - angular speed of rotation of the screw conveyor)

Source: *ESV-Deform programme (Developer prof. S.V. Ershov, DSTU)*

The numerical value of the angle α where particles of metal chips begin to move depends on its position on the surface of the additional blade, that is, on the value of the angle β.

The transition from a state of rest to movement of a particle of metal chips characterizes the steady movement of the entire mass of metal chips located on the surface of the additional blade.

The influence of the attack angle and of the number of additional blades on the conveying capacity of the screw conveyor can be considered as a change in the magnitude of the driving force of the material being transported.

The physical nature of the motion of metal chip along a spiral along the axis of the screw describes the relationship between the angle of the spiral rise and the resistance force of metal chips.

The current hypothesis of screw conveyor operation is as follows: the productivity of the screw conveyor depends on the movement of the transported material along the groove, which is determined by the auger design and the use of additional blades on the screw conveyor, and by mathematical modelling of the kinematics behind the movement of transported material along additional blades.

Taking into account the aforesaid, we developed a mathematical model of chip motion in the groove of the screw conveyor. Based on this model, a working model of the material transportation was formed. The basis for the design was the dependence of the angle in the beginning of movement of the material on the angle of attack of the additional blade, as well as kinematic characteristics, dynamic loads and forces that act on a piece of material in the conveyor groove.

With the help of computer analysis of interaction between transported material and installed blades of the screw conveyor, as well as the effect of installation angle of the conveyor blades on transporting efficiency of the screw conveyor we obtained a pattern of the motion of material inside the conveyor (Fig.4).

The forecasted distribution of material in the gutter of the screw conveyor has shown that transported material is concentrated on the definite side of the gutter as to the vertical symmetry axis of the conveyor. A part of the material goes up in spiral to a definite angle until it falls down. The rest of the material stays in the formed chip flow.

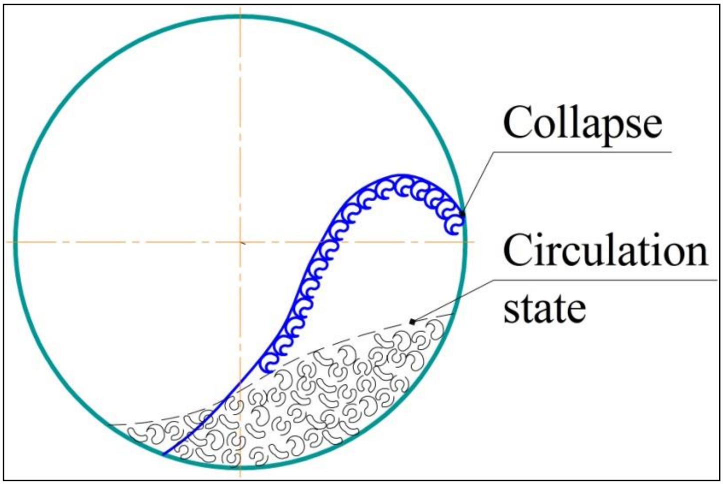

Figure 4. Distribution of material in the gutter of screw conveyor

Source: *ESV-Deform programme (Developer prof. S.V. Ershov, DSTU)*

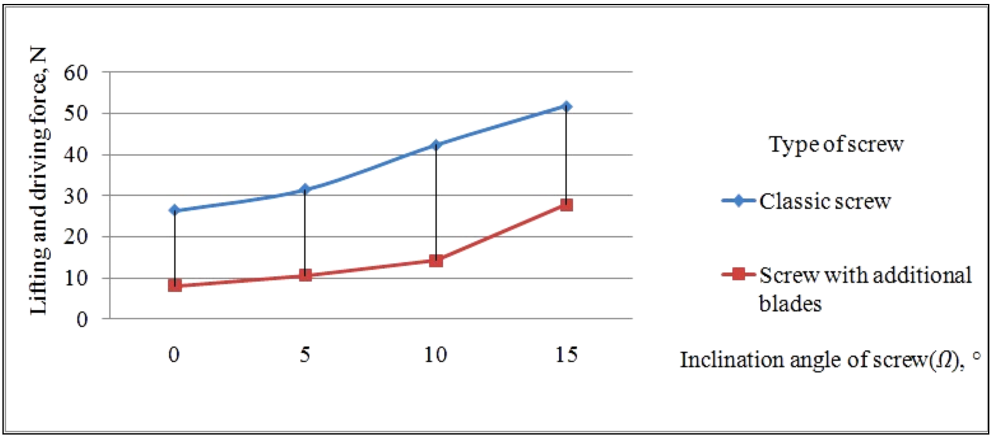

Figure 5. Dependency of lifting and driving force on inclination angle of the screw

Source: *ESV-Deform programme (Developer prof. S.V. Ershov, DSTU)*

There was developed an experimental test bench and we managed to support the theoretical claim about the material transfer process in the groove of the screw conveyor, which confirms the reliability of the computer simulation of the chip transportation process.

Modern software helps calculate amount of the driving force, which argues the predicted superiority of the performance of a screw conveyor with additional blades above the classical structure (Figure 5).

The biggest difficulty in studying the above mentioned process of transportation lies in comparison of theoretical and practical results. The presence classes supported by experimental test bench promote advanced analysis of complex processes taking place in the gutter of the conveyor. During their laboratory practice students can verify the validity of theoretical calculations. Accordingly, in case if there appears a considerable difference in the results obtained, students can hold extra laboratory research in necessary number. This can happen due to a number of aspects: design characteristics of the transporting mechanism (the number of blades, inclination angle, the number of repetitions) and the characteristics of the material transported (type of the material, is size and coefficient of friction). We need to bear in mind that students present in the laboratory can apart from learning about the processes, also affect their running and results – in this way they can get a full idea of the studied process with their own eyes.

Distance students face the problem of partial cognition of the process being studied. This is due to the fact that they are demonstrated only video materials showing the essence of the work. It remains difficult to manufacture experimental test benches outside the laboratory conditions and most distance students are limited only by the theory of the process being studied. The results of analytical calculations may differ from laboratory measurements due to the lack of specificity of conducting an experimental study.

Forecasting program is also used in rolling - transfer of material layers by external forces. The values of moving points were used to determine the field of displacement, distribution of strain rate intensity, intensity and degree of deformation strain and shear deformation degree in deformation zone. Theoretical calculation was carried out for complete evaluation of metal flow mechanism in the above caliber. This calculation was performed using the software package ESV-Deform, developed at the Department of Metal Deformation Processes in Dniprovsk State Technical University by means of finite element method for approximation of the velocity fields of metal flow and variational principle of continuum mechanics.

CONCLUSIONS

The use of the software package ESV-Deform to define risky intersection of the designed metal profile helps students to make the calculations faster, renders them familiar with the interface of similar programs. This piece of software is applied at Joint Venture Dniprovsk Metallurgical Works (Kamianske) and in manufacturing laboratories of Dniprovsk State Technical University. The software is quite intuitive in interface and can be used in distance mode, which permits the professors exchange information with the students and demonstrate the forecasted results visually.

Modern computer technologies help to create programs for quick and easy calculation of difficult problems. Introduction of innovative technologies in the educational process makes it more understandable and interesting for education applicant and attractive for people who independently master modern science. The desire of self-development in the modern world is driven by distance education opportunities which break all barriers and go beyond all possible borders, both geographical and philological, and political.

Innovations in research have become a national property, making science understandable worldview process for everyone who seeks it. In the case of complex phenomena and patterns that can be transferred in practical commonplace, it is getting clear how science is vast and interesting. And thanks to possibilities to take part in distance learning, "attending" lectures of eminent scientists of the world, the audience have a great deal of opportunities, which are not affected by the cost of training or difficulty of chosen profession, or personal relationship with the teacher, or the location of the institution, or living conditions and life. They only need their personal awareness of the importance to acquire knowledge and time.

PROSPECTS

The author sees the prospects in further development of innovative computer technologies and multimedia projects which can give a qualitative leap in the dissemination and promotion of distance education in all areas of knowledge, including technical ones.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Chasov, D., 2016: *Determining the equation of surface of additional blade of a screw conveyor.* Eastern-European Journal of Enterprise Technologies (Engineering technological systems), 2016, № 5/1 (83), P. 4–9.

Chasov, D.P., 2015: *The justification of screw conveyors parameters with extra shovels for transporting chips,* 2015, 20 p. [online] at http://elartu.tntu.edu.ua/handle/123456789/5599?mode=full. [In Ukrainian]

Ershov, S.V., Gavrilin, S.Yu., Andreev V.V., Kavalek A., 2016: *Analysis of the regularities of the flow of metal in the foci of deformation in the production of tiled pile piles of the trough type in rough passages*. New technologies and achievements in metallurgy, material engineering and production engineering, 2016, № 56, P. 244-248.

Gavrilin, S.Yu., 2016: *Substantiation and improvement of the method of calibration of rolls for the production of a shaft profile of the "Larsen" type with increased interclosed base,* 2016, 20 p. [online] at http://cgntb.dp.ua/event_2262.html. [In Ukrainian]

Vasyuk, O., 2011: *Theoretical and Methodical Aspects of Organization of Distance Education.* Bulletin of the Book Chamber of Ukraine, 2011, № 2, P. 30-32. [In Ukrainian]

Verba, S.M., 2010: *Implementation of Modern Methods of Training Civil Servants Using European Standards for the Professionalization of the Civil Service of Ukraine.* [online] at http://www.nbuv.gov.ua/portal/Soc_Gum/ Npchdu/State_management/ 2010_117/117-13.pdf. [In Ukrainian]

Veremchuk, A., 2013: *Problems and prospects of distance learning in universities.* Problems of preparing a modern teacher, 2013, № 7, P. 319-325. [In Ukrainian]

Warzar, T.M., 2014: *Distant Education in Modern Educational Activities.* [online] at http://rius.kiev.ua/institute.html. [In Ukrainian]

Zhevakina, N.V., 2009: *Pedagogical conditions of organization of distance learning of students of humanities in the pedagogical university*, 2009, 20 p. [online] at http://www.nbuv.gov.ua/ard/2009/09jnvspu.zip. [In Ukrainian]

INFORMATION TECHNOLOGIES IN THE OPERATION OF PRIMARY SCHOOLS

Dominika Zegzuła
Eugenia Smyrnova – Trybulska
University of Silesia in Katowice, Poland
zegzula.d@vp.pl; esmyrnova@us.edu.pl

Abstract: *This article examines various aspects of the use of new technologies in the primary school didactic process from a theoretical and a practical perspective. As a basis for this article, the authors used the materials and data obtained during a pedagogical experiment and an analysis of relevant theoretical sources. The pedagogical experiment was carried out in a primary school setting so that practical uses of technology in education, and progress taking place in the teaching process determined by new technologies, could be illustrated. The theoretical analysis looks at the most important factors that determine the effectiveness of the teaching process utilizing IT. Although as such, these factors lie beyond the scope of the methodological process, they undoubtedly constitute indispensable components of the teaching process. The factors include school administration informatization, the teacher's mental and practical approach, the operation of the school library and new literature forms. The article concludes with the results of the research carried out, which quite unambiguously confirm the initial assumptions of the experiment.*

Keywords: new technologies, alternative education, information competencies, Primary School

INTRODUCTION

The progress of digitalization and technology in education undoubtedly has an effect on pupils' cognitive acts and assimilation. However, we should not forget about teachers who also need cognitive and accommodation skills to be able to use new technologies in teaching. The distinctly different character of information processed by computers (text, images, sound, animation) determines changes in one's way of thinking, perception of events and life situations. It extends one's possibilities for activity, for obtaining and communicating information. The introduction of interactive programs, simulators, the promotion of educational virtual spaces, increasingly better classroom equipment all contribute to increasingly widespread use of the educational functions of new technologies. Grants from the government and commercial organisations provide technical opportunities for the development of new technologies in education, and as a result schools receive new equipment as the need arises. Teachers and staff are given training opportunities. On the other hand, pupils not only take advantage, in an indirect way, of the knowledge acquired by teachers but also directly - as the Millennial generation - they have the opportunity to learn in their natural digital environment. As it turns out, the quality of the knowledge acquired does not depend on technical proficiency in using new technologies, but on one's information competency, including the ability to search for information. The education of young people is the final result and key goal of the operation of an educational establishment. Education quality, which is an essential aspect of the operation of educational institutions, is determined by such factors as the effectiveness of school administration, involvement in development projects as well as teachers', pupils' and their parents' mental and practical familiarity with novel teaching methods as well as information technologies. It is therefore worth considering the afore-mentioned aspects in the context of using new technologies and the level of information and search competency.

USE OF OPPORTUNITIES AFFORDED BY IT IN THE DIDACTICS-RELATED ENVIRONMENT OF THE PRIMARY SCHOOL

The didactics-related environment of the primary school is understood as classroom technical equipment, school administration, teachers' work, operation of school libraries as well as all the institutions that contribute to the proper operation of an educational establishment and, consequently, proper delivery of education. In the 21st century, from a technical point of view, it is hard to imagine a primary school operating completely without technologies. For they support not only day-to-day administrative activities but also, above all, support teachers and pupils in their fulfilment of their responsibilities. But above all else, for the present generation of pupils, media are a primary source of information, an information base for versatile activities and independent learning. That is why such great importance is accorded to the material educational environment as a component of the instructional process, this environment being taken to mean appropriate equipment for classrooms and a necessary media framework (Kasperowicz, 2005: p. 99). Provision of extra equipment for classrooms and additional training for teachers is envisaged in such governmental programs as *Digital School, Digitally Safe* or *Safe Internet*. Administrative staff in schools have at their disposal the mandatory Educational Information System (SIO) and either the VULCAN program or other products. A number of measures aimed at the technologization of the Polish education system were specifically designed to improve information competencies and raise Polish schools to European Union level. These included narrowing development gaps between Poland and the more developed countries by funding extra equipment based on new technologies for classrooms, by training staff and changing their work methodology, improving skills to search, process, collect, transfer and internalise information. One of the first initiatives to promote new technologies in education worldwide was the “Safer Internet” program. In 1999 The European Commission, having become interested in the issue of “media impacting children on multiple levels and it being sometimes difficult to clearly state whether given TV or computer content is good or bad”, launched a program targeted at children, aimed at preventing media addiction (Karczmarczyk, 2013). The program was not designed to totally cut off young people from new technologies; rather it was intended to show them how to appropriately use Internet resources or devices themselves. Funding under the “Connecting Europe Facility” EU program is now available in each European Union member state. In Poland a Safety Internet Centre was established in 2005. The centre represents a joint effort of the Empowering Children Foundation and the Research and Academic Computer Network organisation (NASK). Three main forms of support are offered: a telephone helpline and online support: Dyżurnet.pl and Saferinternet.pl websites (Website of the Polish centre for the program Safer Internet; http://www.saferinternet.pl/pl/home/program-saferinternet-w-polsce: [accessed on 10.03.2017], an educational portal for children with a focus on Internet safety Https://sieciaki.pl/ : [accessed on 10.03.2017].

In 2012 the Ministry of National Education jointly with the Ministry of Administration and Digitization launched a pilot program called “Digital School”. The entire project was divided into four main components: e-teacher, educational e-resources, e-school, e-pupil. A public initiative “Digitally safe - a safe school” is another example of a project co-funded by the Ministry of National Education. The activities planned for the years 2015-2018 include three projects spaced one year apart. The project activating components include: school digital safety days, a “digitally safe” contest, a consultation point, nationwide Safe School conventions, training for school digital safety mentors, the portal cyfrowobezpieczni.pl.

As mentioned above, the teacher's potential and competencies are as important as classroom technical equipment. As technology advances, teaching methodology also evolves, embracing new technologies. To a large extent, thanks to the governmental programs, quite many possibilities are now available to teachers to manage teaching methods by means of technical equipment. Features of the education system that have become almost regular include interactive whiteboards in early elementary education classrooms, foreign language learning (instalink.pl) or specific subject teaching (rebel.to) using smartphones, tablets as well as further education itself (edukator.ore.edu.pl, ECDL.pl, openeducationeuropa.eu) and online teacher communication (edu.info.pl, awans.net, publikacje.edu.pl). Besides, teachers and students also have access to such equipment as PCs, e-book readers, tape-recorders, radios, school public address systems, DVD players, cameras, projectors, Internet links. Another aspect worth mentioning is teachers' dual approach to new technologies: there is a quite a large number of teachers who, at professional level, completely ignore both technologies and the opportunities they offer. This does not necessarily result from low information and search competencies, but rather from a mistaken belief that media have a malignant influence on young minds. Consequently, young people are highly skilled in operating equipment but demonstrate very low information and search competencies. By contrast, students whose teachers are open to modern education and dialogue as well as keeping a broad perspective on knowledge acquisition and internalization, have a different set of competencies. Obviously, this method also has its disadvantages, as it carries with it the risk of generating side effects of misunderstood stress-free education. This clear division between teachers surprisingly deepens in direct proportion to advances in technology. It may be due to "nine levels of the teacher's IT competencies, grouped on three global planes (three on each)." (Smyrnova-Trybulska, 2013): basic level (elementary), intermediate level (system), advanced level (functional).

Nevertheless, irrespective of the level demonstrated by teachers, it is important to bear in mind that teaching is a set of processes aimed primarily at activating certain thought systems and emotional attitudes, satisfying young people's cognitive and psychomotor needs. Therefore it is necessary to reclassify teaching methods so that they should be more convenient for Millenials. The current young generation does not appreciate the fact that schools are equipped with latest technologies. And it is not because they deliberately ignore the changes that have happened in Polish education over the past decades. The reason is that they simply have not consciously witnessed the changes. From the M generation's perspective, the ubiquity of technology is so natural that it is more difficult for them to develop hand motor skills when learning to write than when using a tactile device (so-called smart thumbs).

Studies on various determinants factors of the use of ICT and mobile devices in primary schools have been carried out by many research teams in various countries. For example, the needs of the new learner generation are described in detail in (Morze, Smyrnova-Trybulska, Umryk, 2015). Rodriguez, Riaza, Gomez, (2017) discuss studies on the integration of ICT technologies in the teaching and learning process at primary school level. The results of the studies confirm that information and communication technologies provide tools and channels that multiply opportunities for joint projects, ensuring quality of shared use and communication. The experiences described both prove and challenge the prevailing methodology based on the assumption that the teacher should still be the sole source and transmitter of knowledge. A study by Danish academic T. Schilhab (2017) describes quality research based on interviews with 10 pupils from schools in the Copenhagen area in order to examine subjective experiences relating to determinant factors for the use of iPads by pupils during breaks, made available by the local authorities. The results of the study indicate that there are significant differences in experiences between particular age groups. The study suggests that schools help pupils acquire (develop) a certain technological knowledge that allows them to engage in social-emotional learning during breaks between classes.

The studies described further below in this article successfully proved that students naturally and very eagerly use technologies in learning, both when preparing for classes at home and finally in the classroom. Table No 1 sets forth web portals that are the most popular with pupils

Table 1.

Web portals most popular with pupils

Name	Access type	Owner	Type of resources	Purpose for which pupils use website content
Interklasa.pl	Free/access to the forum or educational paths requires setting up an account and logging	Polish-American Freedom Foundation and Ministry of Education	Educational content, compliant with the core curriculum.	Learning and developing one's interests
Ceo.org.pl	Unpaid, free	Civic Education Centre	A knowledge base about competitions, development programs for young people and other youth activities, e.g. volunteering.	Developing one's skills and interests, expressing readiness to participate in contests, to take up volunteering, take part in community initiatives
Squla.pl	Free in demo version only. The user is required to register their account	Commercial educational platform. Owned by the Dutch company futurewhiz media.	Educational platform with games, closely related and compliant with curricula in the countries concerned. Intended for children at 1st education stage	In Poland, according to children, this website provides entertainment
Odrabiamy.pl	Free; more active users can pay to purchase paid services	Commercial website owned by Makalu media sp. Z o.o. in Cracow	A homework help website, allowing for exchange of information between users.	Doing homework; it is hard to call this site an educational portal – essentially it does homework for pupils
Sieciaki.pl	Free, but requires parents to register accounts	A government project co-organised by Safer Internet, Ministry of Education and the Nobody's	Deals exclusively with media education, focussing on Internet threats; Safe source of	Entertainment function: games, music, community etc.

		Children foundation	entertainment for children	
Websites dedicated for course-books	Availability to the student depends on the publisher	The publisher of the course-book that a given school uses e.g. Nowa era, WSiP, etc.	Multimedia version of course-books, also dedicated for use with interactive whiteboards	Learning, doing homework

Source: Own work (D. Zegzuła, Information technologies in the functioning of primary schools: an MA thesis written under the academic supervision of E. Smyrnova – Trybulska. Cieszyn. WEiNOE, 2017, pp. 37-38.

At this point it is important to emphasise that two generations are brought together. On the one hand there are young people growing up in a digital world, and on the other hand, there are young people's teachers and parents who are also learners - learning to use new technologies. A perfect combination comes to mind: while not limiting access to technologies, improving both groups' information and search competencies in a systematic and skilful manner. All of the aforementioned aspects form the basis of the activities of school libraries which have already evolved from dust-covered book collections into school multimedia information centres. Therefore, the modern school library both provides content-related support and functions as an information competencies enhancement centre for teachers and students. In the main, the school library operates on the following planes:

- school information community: understood as cooperation between students, teachers and librarians to make information available, which results in the transfer and internalization of knowledge together with the ability to use it for practical purposes,

- the school library as an institution: its technical and organisational potential in the context of a multimedia and information centre: the quality and quantity of information should be sufficient to satisfy users' needs, helping them both to follow the core curriculum and pursue extra-curricular interests. Providing support for in-class activities, developing competencies, providing entertainment.

The school library is also the office of the librarian: the office of an individual responsible for searching for information, collecting it, cataloguing and making it available. However, the modern librarian should possess certain qualities that set them apart: constant, systematic willingness to pursue further self-education in multiple areas, patience and enormous empathy, as well as characteristics that the other school staff member not necessarily have: this generosity in sharing her or his knowledge with others - generosity that attracts teachers and students to the library and school information centre. Because they should have access to “the library's automated information facilities, other libraries' databases, copying equipment and multimedia computers” (Cybulska, 2005). And such availability should be ensured within time limited only by the library's opening hours, but without any limitations in terms of quality. In a nutshell, the librarian should act as a coordinator for school media activities with a view both to implementing the core curriculum and providing education and entertainment opportunities such as: new literature forms (e-books, audio-books), Rebel.to, Sieciaki.pl, digital storytelling, digital libraries and other formats.

METHODOLOGY OF RESEARCH

During the time period December 2013 - June 2014 a pedagogical experiment referred to as “At school with technology” was carried out in two primary schools in a town. The schools were selected deliberately because they boast similar academic performance and degree of technological advancement. One of the schools set up an experimental group of 35 pupils, the other school was a control group of 34 pupils. Each of the respondents started school at the age of 7. To qualify for the experiment, they had to meet the following requirements: having basic computer literacy and software skills, attending a representative form of a given birth year group and considering participation as non-mandatory. The purpose of the experiment was to illustrate the practical utilization of technology in teaching and learning, and to give an idea of the progress being made in these processes. Indirectly the school environment was also studied, so teachers from the two schools were asked to complete a questionnaire. The experimental group comprised 20 teachers, and the control one - 16. A diagnostic survey was carried out to determine the degree of a given school's technical advancement. The main research problems served as a basis for formulating a hypothesis, identifying and assuming dependent and independent variables as well as selecting adequate research methods, techniques and tools. The following hypotheses were formulated:

H1: Systematic IT use in an educational establishment helps it operate more efficiently. The pre-requisites for that are staff training and further self-education.

H2: Systematically accustoming children to IT has a favourable effect on the quality of knowledge acquired as well as development of pupils' interests and future occupational aptitude.

H3: Using IT in parent-teacher communication contributes to improved cooperation in educating children.

H4: The teacher's systematic further self-education, attending training courses and use of IT in her/his daily work improve productivity and make teaching more efficient. Besides, such activities help improve both teacher-pupil and school-parent communication.

H5: There are areas of school operation where informatization is currently not recommended at all, areas where no IT solutions have been implemented, where IT solutions operate poorly or where informatization hinders effective operation.

H6: If schools implement and participate in IT-related projects, this significantly facilitates school informatization and increases pupil involvement.

However, the researchers' unstated aim was to demonstrate that what determines the quality of instruction is not the presence of technologies as such but the way they are used. In the study strictly related to pupils a pedagogical experiment was used, accompanied by field observation. The experiment was performed in a number of stages. During the first stage, pupils' familiarity with IT was investigated by holding a school contest for the most technologically advanced project. The second stage of the experiment involved a series of classes designed to improve pupils' information and search competencies as well as competencies in technology. The series consisted of one class per month, held during time slots dedicated to computer lessons provided for in the curriculum. In total, there were four thematic components, taught chronologically in this order: copyright on the Internet, safe Internet, educational opportunities provided by available equipment, and programs for audio and video editing programs. During the third, last stage a school contest for the most technologically advanced project was held again. At all times during the three stages the respondents were subjects of field observation. At the second stage of the experiment, the control group attended standard computer lessons. A diagnostic survey and a questionnaire turned out to be sufficient tools for investigating the other experiment participants. The questionnaire contained 15 closed- and open-ended questions.

RESULTS OF RESEARCH

PEDAGOGICAL EXPERIMENT

In summarizing the results of the experiment, it is necessary to compare the experimental group's information and search competencies before and after the experiment as well as comparing these with the control group's results. In order to ensure that the data analysis is correct, 8 control items for the experiment were identified. The first two are control questions, while an analysis of the other 6 is designed to verify the hypotheses made. The results of the experiment are discussed below.

The experimental group consisted of 35 children: 14 boys, accounting for 40% of the children and 21 girls, which accounted for 60% of the children. The control group consisted of 34 children: 15 boys, accounting for 44.1% of the children and 21 girls, which accounted for 55.9% of the children. Each child had a computer, a tablet or a similar device available at home. Bar charts 1-7 show selected questionnaire results and positive responses of respondents, i.e. pupils in the control group and in the experimental group, to survey questions.

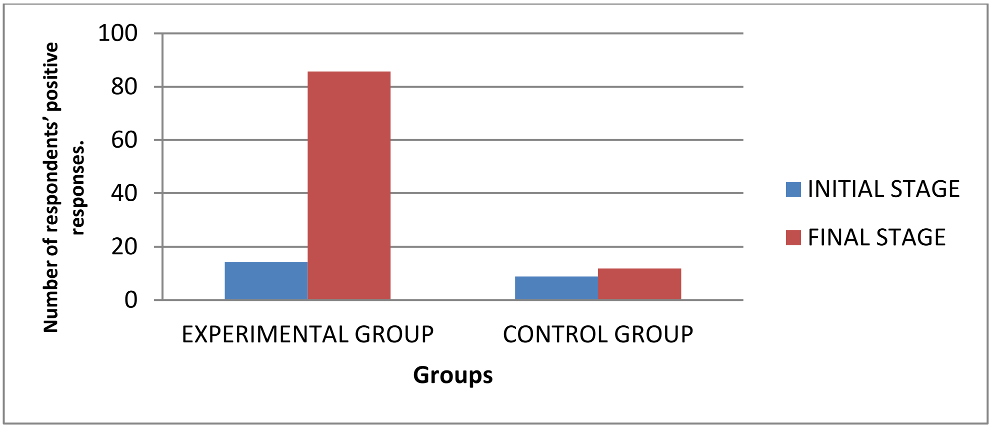

Figure 1. Number of positive answers given by respondents - pupils who know and use the freecommons website when preparing for class and learning
Source: Own work

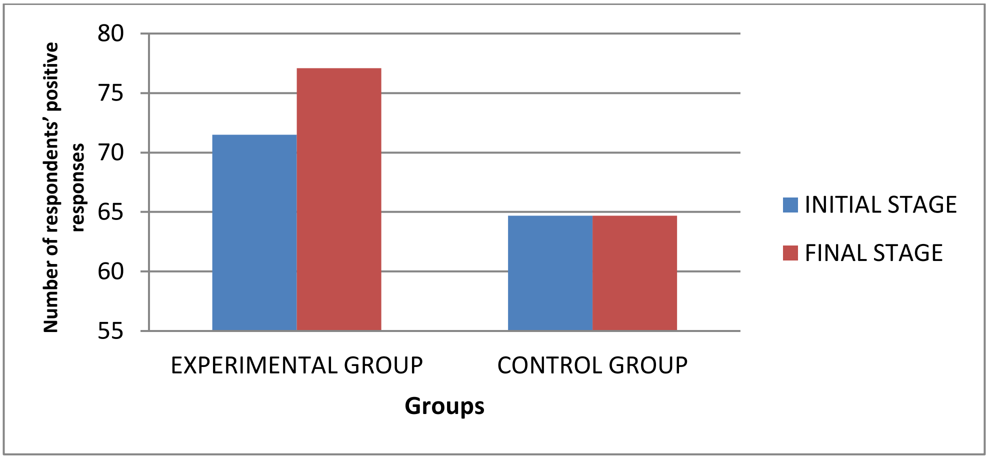

Figure 2. Number of positive answers given by respondents - pupils who know and use safe Internet pages on Sieciaki.pl
Source: Own work

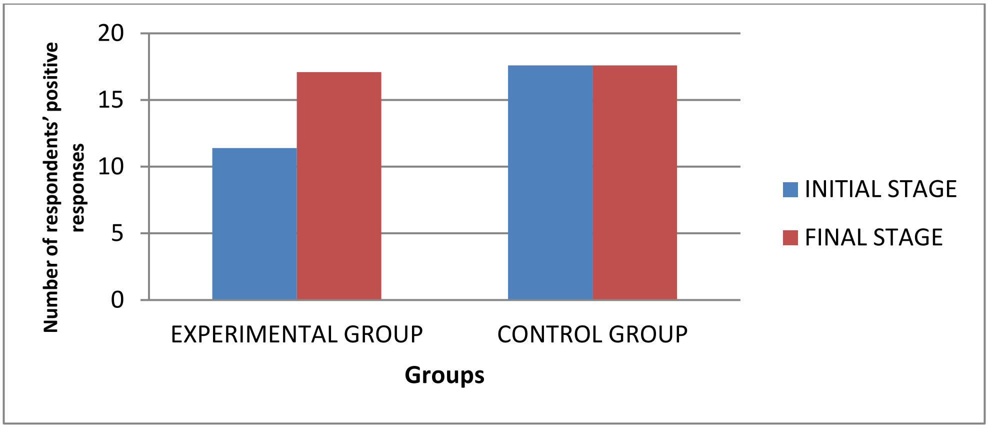

Figure 3. Number of positive answers given by respondents - pupils who know and use safe Internet pages on Cyfrowobezpieczni.pl
Source: Own work

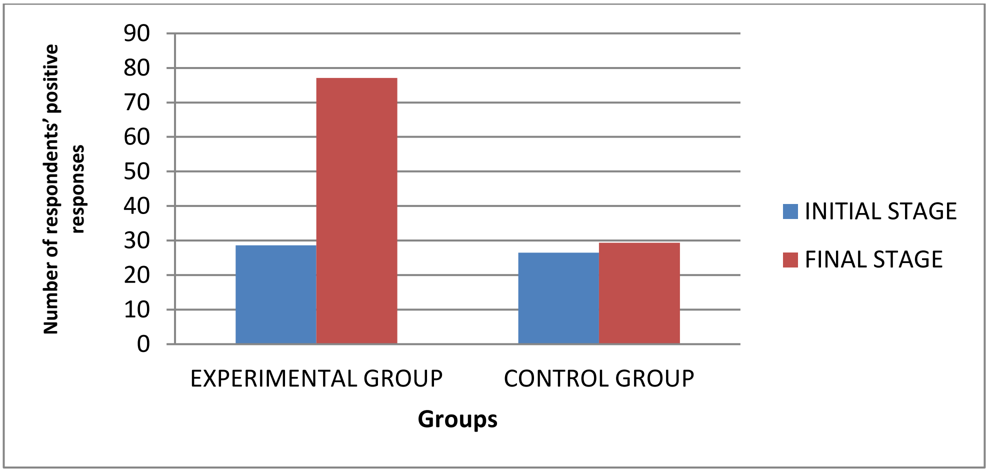

Figure 4. Number of positive answers given by respondents - pupils who know the rules for safe Internet usage
Source: Own work

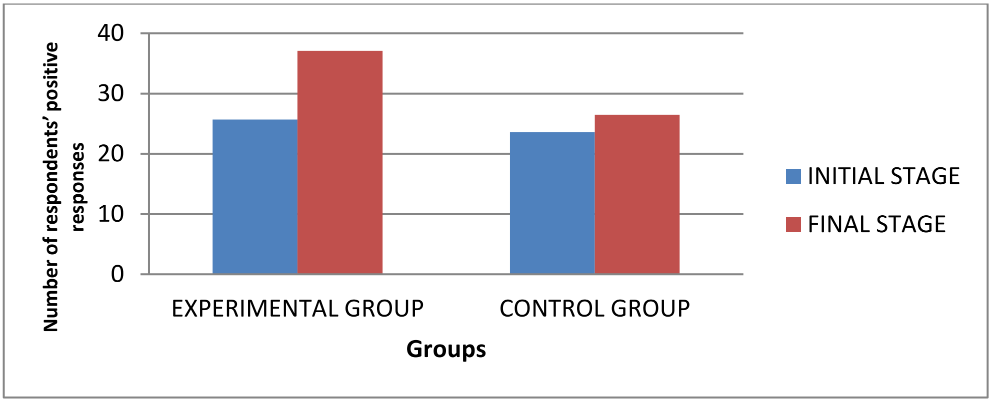

Figure 5. Number of positive answers given by respondents – the most common ways in which pupils use tablets, smartphones, braintrainers, camcorders, digital cameras, computers, multimedia blackboards for learning Multimedia materials for coursebooks

Source: Own work

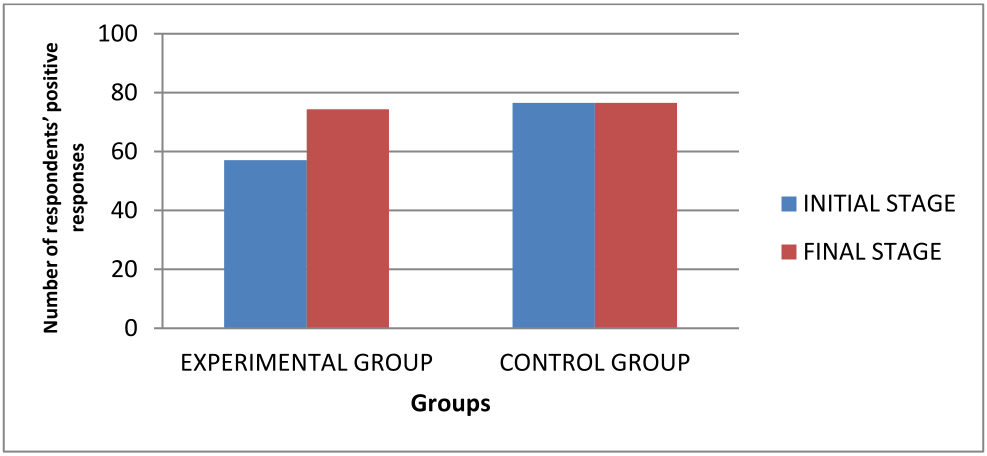

Figure 6. Number of positive answers given by respondents - pupils who are familiar with software for processing images, text, music and movies and use them for learning

Source: Own work

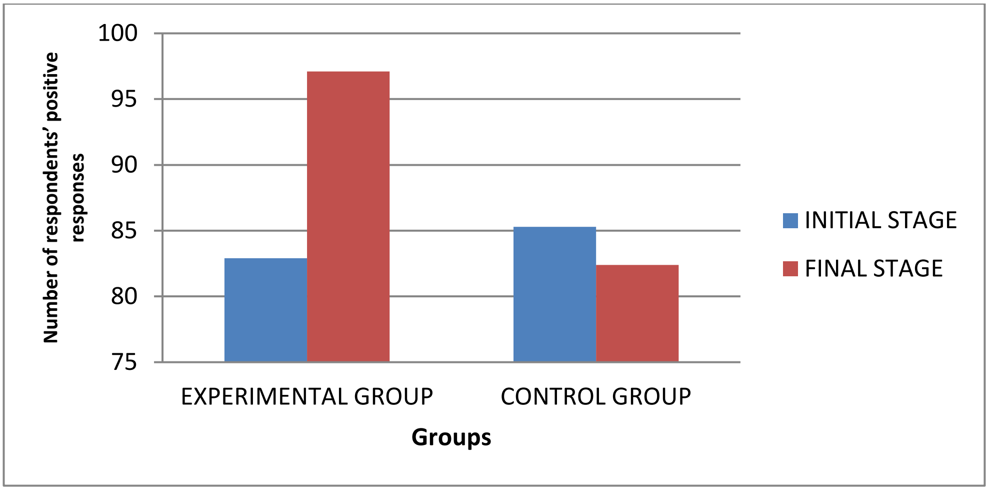

Figure 7. Number of positive answers given by respondents - pupils who are of the opinion that using new technologies improves their functioning in the school environment and facilitates learning

Source: Own work

In order to verify the hypothesis, the Kolmogorov–Smirnov test was used for dependent data.

Null hypothesis: H0: n1=n2

where n1: sample absolute frequency f1

n2: sample absolute frequency f2

Alternative hypothesis: H0: n1<n2

where n1: sample absolute frequency f1

n2: sample absolute frequency f2

Topic 1: Copyright on the Internet – or how to listen to music and not to get into mischief? The Kolmogorov-Smirnov ʎ asymptotic distribution table provides us with the critical value of statistic ʎ for the assumed significance level of a0.05=1.36. As ʎ 0 = 2,9868762≥λ1.36, there are good grounds for rejecting the null hypothesis that the distributions in the populations are identical. However, at the same time, there are grounds for confirming the alternative hypothesis, which, anyway, was expected at the end of the experiment.

Topic 2: Safe Internet – is REALLY my best friend! The Kolmogorov-Smirnov ʎ asymptotic distribution table provides us with the critical value of statistic ʎ for the assumed significance level of a0.05=1.36. As ʎ 0 = 2,3886643≥λ1.36, there are good grounds for rejecting the null hypothesis that the distributions in the populations are identical. However, at the same time, there are grounds for confirming the alternative hypothesis, which, anyway, was expected at the end of the experiment.

Topic 3: Educational potential of our equipment – or whatever you have on hand: the Kolmogorov-Smirnov λ asymptotic distribution table provides us with the critical value of statistic λ for the assumed significance level of $a_{0.05}=1.36$. As $\lambda_0 = 1{,}67332 \geq \lambda 1.36$, there are good grounds for rejecting the null hypothesis that the distributions in the populations are identical. However, at the same time, there are grounds for confirming the alternative hypothesis, which, anyway, was expected at the end of the experiment.

Topic 4: Audio-visual editing programs – or how do they do that: the Kolmogorov-Smirnov λ asymptotic distribution table provides us with the critical value of statistic λ for the assumed significance level of $a_{0.05}=1.36$. As $\lambda_0 = 2{,}0330838 \geq \lambda 1.36$, there are good grounds for rejecting the null hypothesis that the distributions in the populations are identical. However, at the same time, there are grounds for confirming the alternative hypothesis, which, anyway, was expected at the end of the experiment.

Summarising the above data, one can say that the assumptions of the experiment were correct. The method that was used contributed to the increased information and search competencies as well as technical competencies of those covered by the study. On one hand, the experimental group increased their practical familiarity with websites based on free licences, and safe Internet rules as well as demonstrating their increased awareness of the use of new technologies in education. On the other hand, there was a decrease in non-educational, purposeless use of Internet resources by the experimental group pupils. Indisputable confirmation of the assumed hypothesis is provided by the sample analysed using the Kolmogorov–Smirnov test.

DIAGNOSTIC SURVEY OF TEACHERS

A total of 36 teachers took part in the survey. 85% of the teachers at the first school were women, 15% - men. At the other school female teachers accounted for 81.75% of those surveyed, and the remaining 18.75% were men. At both schools the teachers represented a cross-section of all teacher career stages. Chartered teachers accounted for the majority of teachers in the experimental group, while the majority in the control group were appointed teachers. At both schools the following participants volunteered to take part in the survey: early elementary education teachers, specific subject teachers, librarians as well as after-school club and administrative staff. Conclusions drawn from the survey are clear and indicate readiness to use new technologies at work. The following aspects were taken into account: Internet (20% and 25% of the teachers), Office suite (20 and 18.75% of the teachers), educational movies (15% and 18.75% of the teachers), educational portal resources (20% and 6.25% of the teachers); slightly fewer teachers use dedicated website resources (10% and 6.25%) as well as free materials provided by publishers (15% and 12.5% of the teachers). The teachers from both schools rated their information and search competencies as quite high. As many as 40% of the experimental group teachers and 43.75% of the control group teachers indicated that their familiarity was definitely good or quite good (35% and 37.5% respectively). Only 25% and 18.75% demonstrated moderate familiarity, which might indicate that there is a need for relevant training. As far as equipment availability for teachers is concerned, 36.8% and 43.3% of the teachers pointed to traditional office equipment as being most easily accessible. Availability of the other equipment is not an issue either: 29% and 30% of the teachers responded that they had access to a computer at work, 23.7% and 20% - access to multimedia interactive equipment, 10.5% and 12.5% - access to multimedia and computer rooms. The issue of inconvenience associated with the use of information and communication technologies at school was one of the key survey issues, as equipment availability determines, to a large extent, successful IT implementation in schools.

As many as 40% and 51% of the teachers pointed to limited access to hardware and software. The percentages for the other survey questions ranged from 6.25 to 25% and were comparable: unavailability of attractive software, no training in information and communication technologies, insufficient number of computers, excessive class size.

CONCLUSIONS

The aim of the research undertaken was to confirm or refute the hypotheses that jointly or comprehensively addressing the use of ICT in education. Having carried out a comparative analysis of the results produced by the research tools, one can preliminarily confirm the correctness of the statement resulting from the hypothesis that H1: systematic IT use in an educational establishment helps it operate more efficiently. This is contingent on personnel training and continued education itself. However, what is more relevant for confirming the primary hypothesis is the fact that the secondary hypotheses have not been refuted. H2 claimed that systematically accustoming children to IT has a favourable effect on the quality of knowledge acquired as well as development of pupils' interests and future occupational aptitude. That is why a series of lessons for the experimental group, well-thought-out in terms of methods and didactics, was included in the pedagogical experiment as an important constituent part. The outcome is reflected by the results, shown on the bar charts, that were accomplished after the series of lessons. In order to verify hypotheses H3 and H5 a diagnostic survey and a questionnaire were conducted among the parents and, above all, among the teaching staff of the establishments involved. Thus both hypotheses were confirmed, as is shown by the data shown above. Field studies and observations of the educational establishments that accompanied the pedagogical experiment also contribute to the confirmation of hypothesis H6. As the information obtained indicates, a significant portion of the new technologies that the establishments now have at their disposal was acquired with state subsidies or was obtained through participation in grant projects.
As the survey results indicate, information and communication competencies possessed by teachers and school administrative staff are still insufficient. This has

an impact on the quality of the teaching process and relationships with children. What also merits attention is teachers' low level of motivation to continue self-education and to change the existing education system into an “open” education system. Undoubtedly, a condition that contributes to that state of affairs is teachers' poor awareness of the advantages of the technologies. By contrast, as the teachers point out, schools are well equipped with, and continue to be provided with, new technologies.

In summary, one can say that in the 21st century new technologies are an adequate and, by all means, appropriate tool for use in education. Obviously, the preceding sentence reflects oscillation between fascination with teaching resources that not so long ago were unavailable, and fear of the unknown. Therefore the key success factor is the provision of systematic training for teachers coupled with improvements in the education system and in school equipment. The circumstances (and their results) in which pupils function were the most significant component of the survey. Based on the survey results one can draw two opposing, and quite surprising conclusions: in general young people exhibit a high level of technological advancement; unfortunately, however, this, only to a slight degree, translates into information and search competencies. Still, this trend is very changeable, being determined by availability of knowledge on proper use of modern information sources, which requires additional, systematic, comprehensive and thorough research.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Cybulska A., 2005: *Biblioteka szkolna w nowoczesnym społeczeństwie informacyjnym.* „Warsztaty bibliotekarskie” nr 1. [on-line] at http://www.pedagogiczna.edu.pl/warsztat/2005/1/050102.htm [accessed 27 January 2016].

Karczmarczyk M.A., 2013: *Dziecko w wirtualnej galerii*. Warszawa: Wydawnictwo Akademickie Żak

Kasperowicz J., 2005: *Nowe uwarunkowania wspomagania kształcenia. M*. Tanaś (Eds.), Pedagogika @ środki informatyczne i media (pp. 99). Warszawa-Kraków: Oficyna Wydawnicza Impuls

Morze N., Smyrnova-Trybulska E., Umryk M., 2015: *Designing an E-University Environment Based on the Needs of Net-Generation Students*, Int. J.

Continuing Engineering Education and Life-long Learning, Vol. 25, No.4. pp. 466-486. ISSN 1560-4624

Portal edukacyjny dla dzieci o tematyce bezpieczeństwa w sieci Https://sieciaki.pl/ [dostęp 10.03.2017].

Rodriguez, AI, Riaza, BG, Gomez, MCS, 2017: *Collaborative learning and mobile devices: An educational experience in Primary Education.* Computers in Human Behavior, Volume: 72, Pages: 664-677

Schilhab, T., 2017: *Impact of iPads on break-time in primary schools - a Danish context*. Oxford Review of Education. Volume: 43 Issue: 3 Pages: 261-275

Smyrnova-Trybulska, E., 2013: *Systemowe podejście w zakresie informatycznego przygotowania nauczyciel* [W:] Uczyć się, będąc połączonym. Informatyka w edukacji, M.M. Sysło, A. Kwiatkowska (red.), Toruń, 5-7 Lipca, 2013, s.172.

Strona internetowa polskiego centrum programu Safer Internet Http://www.saferinternet.pl/pl/home/program-saferinternet-w-polsce [dostęp 10.03. 2017].

Zegzuła, D., 2017: Technologie informacyjne w funkcjonowaniu Szkoły Podstawowej: praca magisterska wykonana pod kierunkiem dr hab. E. Smyrnovej – Trybulskiej. Cieszyn: Wydział Etnologii i Nauk o Edukacji, Uniwersytet Śląski w Katowicach

IV. EFFECTIVE METHODS, FORMS AND TECHNIQUES IN DISTANCE LEARNING

DEVELOPMENT OF EDUCATIONAL, SCIENTIFIC COLLABORATION AND PROJECT MANAGEMENT WITH IC TOOLS IN UNIVERSITIES

Nataliia Morze
Borys Grinchenko Kyiv University
18/2 Bulvarno-Kudriavska Str, Kyiv, Ukraine
n.morze@kubg.edu.ua

Olena Kuzminska
National University of Life and Environmental Sciences of Ukraine,
Heroev Oborony St. 16a, Kyiv, Ukraine
o.kuzminska@nubip.edu.ua

Tetiana Liakh
Borys Grinchenko Kyiv University
18/2 Bulvarno-Kudriavska Str, Kyiv, Ukraine
t.liakh@kubg.edu.ua

Abstract. *In the job it is shown the structure of IC-competence of the teacher of higher education. It is offered system approach in forming IC-competence at the university. It is defined the need for university teachers to increase the level of educational, scientific collaboration and project management. It is described the experience of implementation distance learning course for the teachers of the postgraduate studies; course on development of educational, scientific collaboration and project management with IC tools in universities is described in order to increase their level of IC-competence. The results of reflection and self-evaluation of the participants of pilot training on the distance course are presented. The prospects for further research are described.*

Keywords: ICT, competence, communication, cooperation, higher education, postgraduate studies.

INTRODUCTION

Modern requirements to a specialist ("Future Work Skills", 2011) formed under the influence of the situation on the labour market, accelerating the pace of development of society and the widespread of information, cause replacement of the authoritarian and reproductive education oriented at obtaining knowledge by the system of productive collaboration and communication.

Based on the recommendations of European institutions and the experience of introducing qualifications frameworks in the EU and countries that are leading exporters of educational services, the basis of meaningful changes in ensuring the conformity of education to the current market requirements is the concept of a competence-oriented approach in education ("DeSeCo", 2002), which can be realized at higher educational establishments of Ukraine due to adopted by the National Qualifications Framework (http://zakon2.rada.gov.ua/laws/show/1341-2011-п).

The competence- oriented approach is interpreted as one that not only affects the structure of knowledge, but also the quality of education in general (Korzhova, 2012). International organizations that are currently working in the field of education, in recent decades have been studying the problems associated with the emergence of a competence-based education; among them are UNESCO ("UNESCO Recommendation", 2013), UNICEF, UNDP, Council of Europe, European Commission, Organization for Economic Cooperation and Development (OECD), the International Standards Department and others. The issues of implementation the competence-based approach in the education system and the formation of information competencies (Morze, 2015, Smyrnova-Trybulska, 2007, Hansen, 2012 and others) are discovered in a significant number of scientific publications.

In recent years, the educational situation is decentralized, for many years, the constants of professional competence of teachers are beginning to change, the formation of a new professionalism is being updated - the teacher of higher education, which for today is not a simple addition to the scientific qualification, but acts as an autonomous and meaningful independent professional unity. At the same time, the analysis of training programs for advanced training revealed insufficient attention to the formation of ICT competence of teachers of modern universities - as a rule, teachers has training for the purpose of raising the level of subject competences. And in most ICT training programs, there are no modules aimed at training moderators or tutors, as well as modules providing for the teaching of teachers of the organization of pedagogical network interaction, where teachers could meet, including the need for self-education and cooperation in networking communities. Therefore, it requires the improvement of the qualifications of scientific and pedagogical workers of universities of Ukraine, capable of producing a new scientific product, to proceed to a qualitatively new level of scientific research, scientific and professional mobility of students and teachers, etc. There is a problem of quality education that corresponds to organizational and content-based European standards for improving the professionalism of a teacher through a system of scientific training.

The article's goal is to describe the model and experience of implementation distance education course for university teachers for the development of educational, scientific collaboration and project management with IC tools in universities in order to increase their level of IC competency.

1. MODEL OF POSTGRADUATE STUDIES OF MODERN EDUCATORS AND EXAMPLES OF IMPLEMENTATION AT THE UNIVERSITY

According to the results of the analysis of different approaches (Bikov et al, 2010), we propose a universal, as we think structure of the IC competence of the teacher of higher education, which consists of motivational-value, cognitive-operational and reflective-designing components (Table 1).

In this case, the IC competence will be considered as a key, because the process includes the dynamics of passing from the basic IC competence, that is, from the formation of the optimal invariant of knowledge and skills at the level of the user to the subject-deepened, corresponding to the conscious methodically balanced use of ICT in teaching his subject, through organizational and management IC competence, which is considered as the ability and readiness to convey their knowledge, and ends with corporate competence.

Table 1.

The structure of the teacher's IT competence

Component	Basic ICT competence (User)	Organizational and pedagogical competence (Tutor)	Subject- Deepened IC-competence (Consultant)	Corporate IC-competence (Consultant-researcher)
Motivational-value	Personal interest in the study of ICT and use in educational process	Desire to transfer their knowledge and experience of using ICT to colleagues and students	Ready for search of pedagogical technologies corresponding (relevant) modern ICT	Readiness for active participation in network pedagogical communities

Cognitive-Operating	Knowledge of the functionality of the PC and software, the technological and methodical methods of preparing e-content, the use of the network and digital educational resources in the pedagogical activity	Havening of methodical methods of using ICT in the educational process, ways of organization of distance training and after course support of students	Ability to select, create and apply in Initial digital education resources, generalize and disseminate the experience of using ICT, including through the network interaction	Inform organizational and scientific and methodological support of all levels of informatization of educational process of higher educational institutions, organization of network interaction, formation of network of pedagogical communities
Reflection and design	Ability to self-assess their own activities in using ICT	Ability to build individual educational trajectories for advanced training in ICT	Ability to provide expert assessment of educational products developed using ICT	Ability to determine the problems of informatization and ways of their solution, in particular through teamwork and reflection

Source: Own work

Because competent graduates can be trained only by qualified instructors, and IC competence is considered to be key, there is a need for designing the content of continuing education programs, taking into account the regularities of the formation of IC competence (Table 1) and the implementation of innovative learning models, namely:

- personalized model with the use of remote learning technologies;

- corporate, which involves studying in your own educational institution, taking into account not only the level of formation of the e-environment of a specific higher school, but also that satisfies the professional pedagogical inquiries of each teacher and the institution as a whole.

At the same time, the necessary condition is the accumulation system of advanced training in the environment of continuous education, which implies continuous updating of its content adequately to the level of development of both the ICT itself and modern educational technologies. For example, in order to obtain the *basic level of IC competence* at the Borys Grinchenko Kyiv University, the following courses are offered in the system of advanced training (http://e-learning.kubg.edu.ua/dn/course/index.php?categoryid=24): Create video presentations in Power Point 2010 and Google Apps; *organizational and pedagogical competence* (tutor) - course Distance Learning Platform Moodle;

subject-deepened IC-competence (consultant) - the course Electronic educational and scientific environment of the modern University.

At the same time, the analysis of the results of the educational, scientific activities of the teachers of the Borys Grinchenko Kyiv University for 2016/2017 academic year showed problems:

- teachers have a certain level of IC competence, but they do not always apply it systematically in scientific activities and scientific communications, do not have appropriate scientific portfolios in open space, do not take advantage of the use of electronic publications and scientific open networks, the results of scientific activity are purely theoretical and not always used in practical activities;
- scientific articles in most cases do not meet international requirements, not oriented to the use of the best European practices;
- scientific studies have weak evidence of the results presented;
- there is a monotony in research designs;
- the methodological base of scientific research is limited to the most typical methods and technologies, not oriented to modern European research designs;
- academics are not aware of international ethical standards and ethical policy of research;
- the scientists are not able to formulate project proposals for conducting scientific researches on a local, at the national and international levels, which eliminates the possibility of conducting joint research with the leading educational institutions of the European Union.

Therefore, an electronic course "Development of Educational, Scientific Collaboration and Project Management with IC Tools in Universities" was created for the purpose of solving these problems and gaining corporate IP competence (consultant-researcher).

2. THEORETICAL BASIS OF THE RESEARCH

Within the framework of the International project "International Research Network for the Study and Development of New Technologies and Methods for Innovative ICT Pedagogy, E-Learning and Intercultural Competencies" (IRNet) of the European Commission's Seventh Framework Program (FP7) within the framework of the International Research Staff Exchange Scheme (IRSES). In 2016/2017 academic year the group of researchers (Morze N., Makhachashvili R., Kuzminskaya O., Lyakh T., Vorotnikova I.) created and implemented an electronic training course for the system of professional development of scientific and pedagogical workers of Boris Grinchenko Kyiv University. The training course "Development of educational, scientific collaboration and project management with IC tools in universities" became a variant part of the obligatory program of postgraduate studies of scientific and pedagogical workers of the Borys Grinchenko Kyiv University.

One of the indicators for determining the expected learning outcomes at the proposed course was considered by the Education Technology Standards for Education and Training ("ISTE", 2016), including the standards for teachers (source: [online] at http://www.iste.org/standards/standards/for-educators).

The guide for implementing collaborative learning is the European Union's standards for building a higher education system and pursuing collaborative research ("Ethics for Researches. Facilitating Research Excellence in FP7", 2013, "Legal Rules of the Scientific Research under the EU Law", 2016).

The basis of the course concept is the ADDIE model (Figure 1).

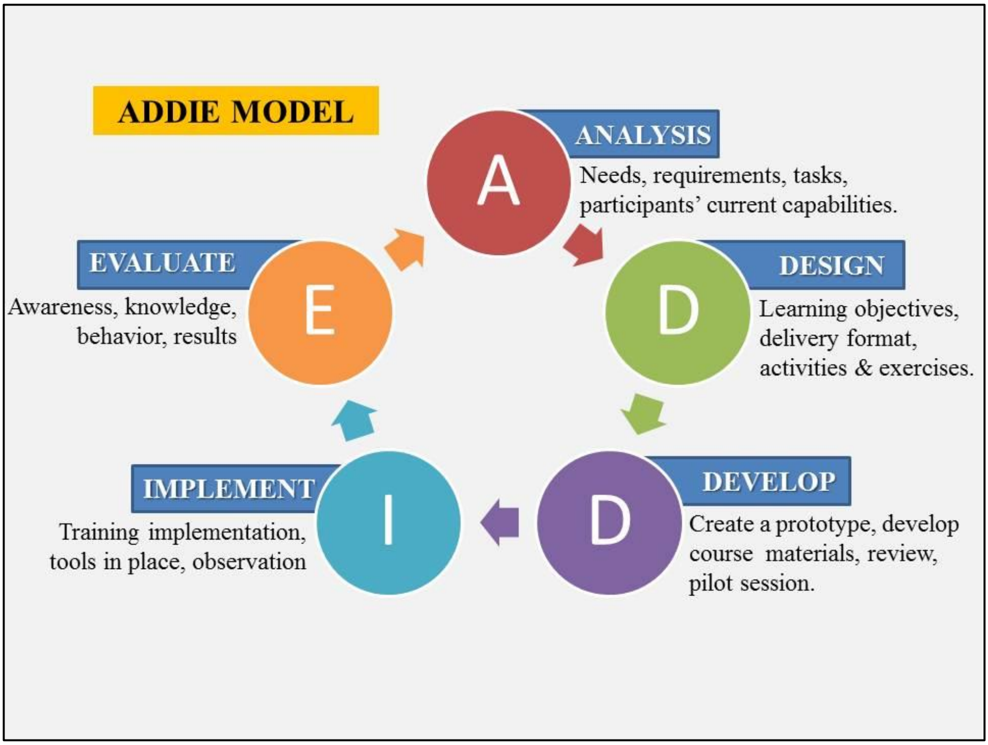

Figure 1. ADDIE model

Source: http://eclipse.mu.ac.in/mod/forum/discuss.php?d=1783

The ADDIE model is a framework that lists generic processes that instructional designers and training developers use. It represents a descriptive guideline for building effective training and performance support tools in five phases: Analysis, Design, Development, Implementation, Evaluation (Durak, 2016).

Analysis Phase. In the analysis phase, instructional problem is clarified, the instructional goals and objectives are established and the learning environment and learner's existing knowledge and skills are identified.

Design Phase. The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning and media selection. The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the project's goals. Specific means each element of the instructional design plan needs to be executed with attention to details.

Development Phase. The development phase is where the developers create and assemble the content assets that were created in the design phase. Programmers work to develop and/or integrate technologies. Testers perform debugging procedures. The project is reviewed and revised according to any feedback given.

Implementation Phase. During the implementation phase, a procedure for training the facilitators and the learners is developed. The facilitators' training should cover the course curriculum, learning outcomes, method of delivery, and testing procedures. Preparation of the learners include training them on new tools (software or hardware), student registration. This is also a phase where the project manager ensures that the books, hands on equipment, tools, software are in place, and that the learning application or Web site is functional.

Evaluation Phase. The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific criterion-related referenced items and providing opportunities for feedback from the users.

Quality assurance in e-learning premises (Grifoll et al, 2010):

1. The first basic principle declares that providers of higher education have the primary responsibility for the quality of their provision and its assurance. This is a principle that should be developed and implemented in a deeper way. However, e-learning programmes are progressively enrolling students and hiring teachers situated in different countries. Facing this situation, how do we match the primary responsibility with the needed “secondary” responsibility of QA agencies and other stakeholders? How will international e-learning programmes be externally assessed?

2. The second basic principle that the interests of society in the quality and standards of higher education need to be safeguarded; the concept of society here, and taking into account again the possibilities of e-learning programmes to be delivered worldwide, needs also deep reflection. Who represents the society? That is important if we wish to include the voice of society in the quality of study programmes, and in the definition of new proposals.

Assessment challenges include the following components:

- *Context*. Context evaluation is different from that of a conventional university, and it emphasises the specific characteristics of e-learning as to conventional higher education. On-line distance study has potentialities, on the one hand, but it also suffers from limitations, such as the type of degree that can be obtained.

- *Inputs*. The profile of students enrolled in an e-learning education is different from that of students attending a bricks-and-mortar university. E-learning students usually work full time (they are employed in the labour market), they have family responsibilities and they tend to be more mature. The teaching staff profile is also different from that of conventional universities. The own teaching staff propose courses, define the contents and aims, look for authors for the teaching materials, select and coordinate student counsellors, etc. Collaborating teaching staff consists of two posts: the student counsellor and the tutor. The student counsellor gives incentive and impetus to learning activities from the very beginning through assessment (by proposing and monitoring the student's activity, moderating discussions and debates, resolving doubts regarding the subject, etc.). The tutor supports and advises the students on matters connected with the running of the virtual campus and course enrolment, and gives guidance regarding possible professional opportunities. Lastly, technology infrastructure forms the core of a virtual university, as the university has to guarantee that the services for study and learning purposes are satisfactory.

- *Process*. The main difference concerning the delivery process is the high degree of homogeneity. All classrooms used for the same subject have exactly the same learning documentation, tools (forum, guidance, etc.) and assessment process. Distance learning education implies a high level of teaching process homogeneity: the same author for all materials in one particular subject, the same learning and assessment activities, the same student support system for all programmes, etc. This degree of homogenisation has advantages, such as the fact that the institution can make a cascade of changes quickly and effectively, although it also implies risk, such as the hegemony of a single culture to the detriment of plurality, as well as the possible devaluation of teachers as mere mediators of knowledge described by UNESCO.

- *Product evaluation*. Product evaluation identifies and assesses three kinds of outcomes: academic outcomes (progress rates, drop-outs, etc.), personal outcomes (skill development) and professional outcomes (employment rates and adequacy, etc.). It is important to state that the evaluation of e-learning programmes should be of the same quality as that of non-distance learning degrees (i.e. conventional degree programmes).

The ECB-checklist method ("ECB-Check Quality Criteria", 2016) is employed to assess the open e-course, created to implement the IRNet project groundwork findings (Figure 2).

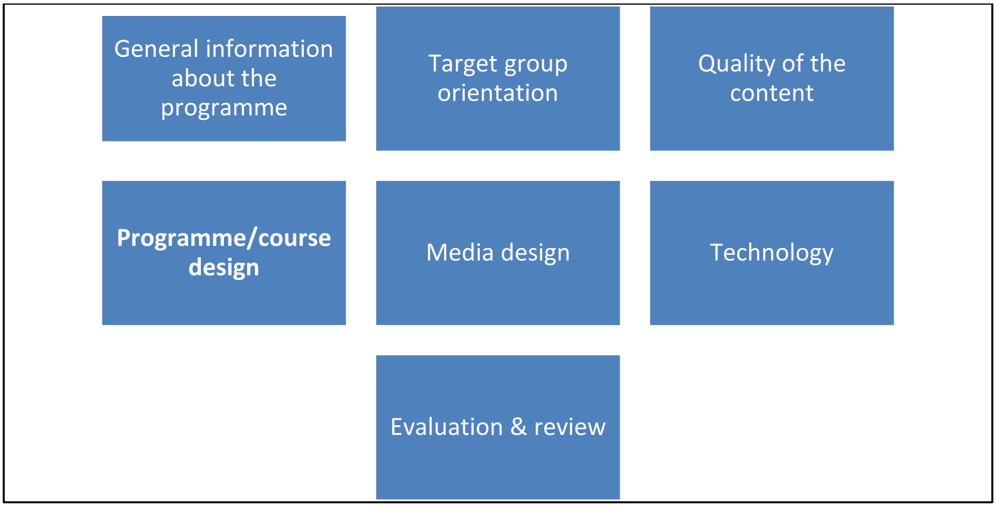

Figure 2. The ECB Check Criteria to analyse a course

Source: Own work based on http://www.ecb-check.net/criteria-2/

3. ELECTRONIC TRAINING COURSE "DEVELOPMENT OF EDUCATIONAL, SCIENTIFIC COLLABORATION AND PROJECT MANAGEMENT WITH IC TOOLS IN UNIVERSITIES"

Electronic Training Course "Development of educational, scientific collaboration and project management with IC tools in universities" (http://e-learning.kubg.edu.ua/course/view.php?id=2879) covers the actual issues of organization of cooperation in education, assessment and application. IC-tools in scientific communication, collaboration, development of scientific projects and research.

The purpose of the course is to: increase the level of competence of scientific and pedagogical staff of the University in the field of educational and scientific communication, collaboration and project management by introducing into the professional activities of the IC tools.

The main tasks of the course:

- to develop general ideas about directions and perspectives of application of collaboration (cooperation) in educational activity;

- develop the ability to profiling, evaluating, applying innovative pedagogical and information and communication technologies in educational and scientific cooperation;

- develop the ability to organize training with the help of IC tools;

- develop the ability to organize scientific collaboration and project management with means of IC tools;

- to increase the competence on modelling and implementation of educational, research projects.

The course is aimed at the formation of such professional competencies:

- possession of basic methods, methods and means of receiving, storing, distributing information, computer skills as a means of organizing scientific collaboration and communication;

- ability to work in a team and organize team work with information in global computer networks;

- designing educational tasks for organizing student cooperation and for solving educational problems;

- usage of various types of IC tools for online learning, collaboration, cooperation;

- creation and use of different models of cooperation according to the purpose using the IC tools;

- assessment of the effectiveness of the organization of cooperation;

- the ability to collect, analyse and process the data necessary for solving the research tasks;

- development of educational and scientific projects;

- the willingness to identify and use the most effective IC tools in the course of scientific collaboration, to make effective choices and decisions, to rely on correct estimates and rationally to prioritize the best possible alternatives;

- monitoring and evaluation of projects;

- organization and coordination of scientific partnership and interaction.

The curriculum program consists of six content modules (Figure 3).

Let's look at the topics of the modules and the list of issues that are considered during the study of individual topics.

1. *"Cooperation in educational activities"*: 21st Century Skills and Assessment of their Formation; The concept of soft skills; Place of cooperation in the 21st century skills system; Participants and subjects of cooperation in educational activities, forms of cooperation organization, environment for cooperation, model of organization of cooperation, criteria of effective cooperation.

2. *"Analysis of IC tools for the organization of cooperation"*: the preconditions for the organization of mixed learning; A typology of effective IC tools for cooperation based on criteria of effectiveness, time-spatial criteria and aspects of

collaborative activity; Trends and modelling of the effectiveness of IC-tools of cooperation; Criteria and categories of evaluation of cooperation tools; Classification of elements of user requirements for the effectiveness of cooperation.

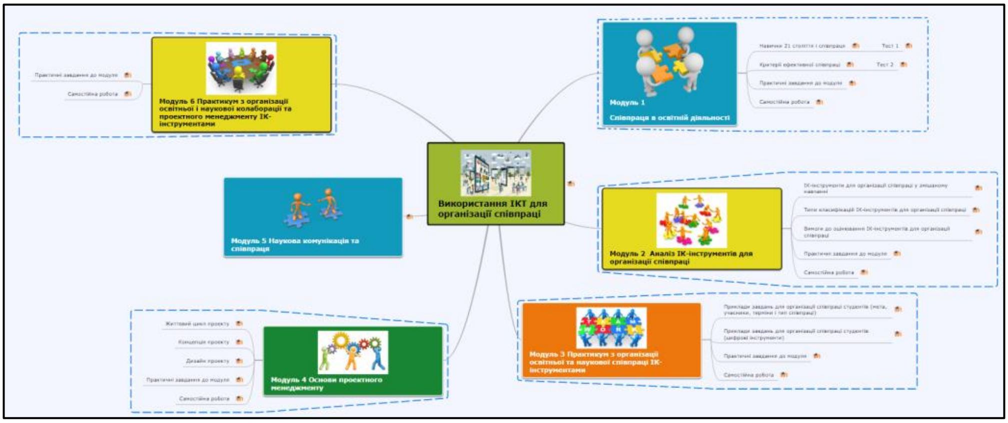

Figure 3. Structure of the course

Source: Own work [online] at: http://e-learning.kubg.edu.ua/course/view.php?id=2879

3. *"Workshop on the organization of educational and scientific cooperation with IC-tools"*: SMART approach in defining the goals and objectives of cooperation; Examples of educational, scientific cooperation; Classification of learning styles Vark; Analysis of mistakes in the formulation of tasks for cooperation; Digital research and search tools; IC tools for creating e-products and shared content; IC services for communication and data collection; Assessment and ranking in the capacity of ICT; Examples of using IC tools for learning management.

4. "*Fundamentals of project management"*: project as a system vision of positive changes; Components of the project activity; "Problem" - "causes" - "consequences" in the concept of the project; Constituents of the project concept: project purpose and objectives, requirements for their formulation (SMART), target audience of the project, term of project implementation, geographic coverage of the project; Project design: project planning, definition of short-term and long-term results; Project assumptions and risks; Monitoring and evaluation of the project; Project budget.

5. *"Organization of scientific communication by IC tools"*: electronic scientific communications: the structure of scientific communications, the initiative of open access, tools for the implementation of electronic scientific communications, ethical issues of electronic communications; Evaluation of the results of scientific activity: the classification of scientific publications, tools for publishing publications in the online space, indexes of citation; Creation of a profile of a scientist in various science-based databases; Social networks for scholars.

6. *"Workshop on the organization of educational, scientific collaboration and project management with IC tools"*: features of planning and implementation of individual and collective projects; IC-support for implementation of collective projects; Creation of a project (individual and group) for educational, scientific collaboration with the use of IC tools.

Students' training is based on mixed technology with the maximum share of distance learning (80%). When designing the course, a practical approach was used: 80% of the training material was aimed at training practical skills and competencies through the application of applied tasks and independent work on the organization of educational and scientific cooperation.

Here is an example of a task for self-executing from module 5 "Organization of scientific communication with ICT-tools".

Independent work 8. *Model of scientific communication*.

Case: "You have decided to explore the models of scientific communication in your own experience. To do this, you plan to create a community and simulate several processes".

Progress:

1. Investigate the services for establishing scientific communication:

- Office 365 Services (https://products.office.com/uk-ua/student/office-in-education);
- G-Suite Services (https://www.google.com/intl/uk);
- Social network Facebook (https://www.facebook.com/);
- Social network Research gate (https://www.researchgate.net);
- Social network Linkedin (https://www.linkedin.com).

2. Discuss the benefits of using one or another tool in the forum.

3. Identify and simulate several processes of scientific communication, such as setting up personal contacts, disseminating research results, finding experts or partners to participate in projects;

4. Invite members of the group to establish communication: presentation, sending of invitations, etc. (is an integral part of the integrating collective project, in this work is not evaluated).

The fulfilment of the tasks of independent work requires from the participant a profound knowledge of the material obtained during lectures and practical classes (Figure 3), develops the ability to independently explore the problem through the search and analysis of special literature from various fields of knowledge, develops the ability to teach and defend their own point of view, develops creativity (Figure 4).

Criteria for evaluating independent work (Table 2).

Table 2.

Criteria for evaluating

Criteria	Sign	Point
Tool Representation and Choice Argument	2 tools	2 points
Proposals for the implementation of scientific communication processes online	1 proposal	2 points
Comments on other proposals	1 comment	1 point
Total for answers and comments		5 points

Source: Own work

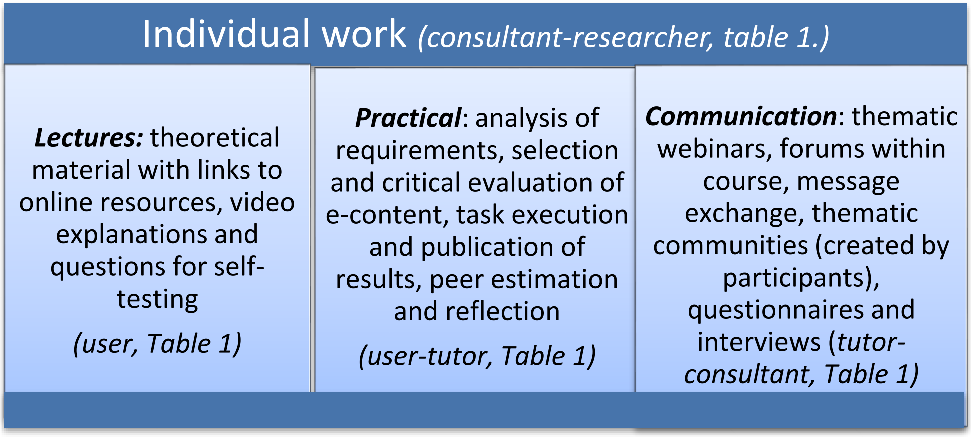

Figure 4. Structural model for acquiring competences through the implementation of educational activities
Source: Own work

The training activities of the students of the course were designed in accordance with the theory of connectivity (Andreev et al, 2012) and Project-Based Learning (Ni, 2015). Thus, during the entire course, each course participant not only creates an individual project for organizing scientific collaboration, presents it on the forum, evaluates the projects of other participants (Figure 5), but also finds a common theme with other participants, engage in discussions and create a joint project.

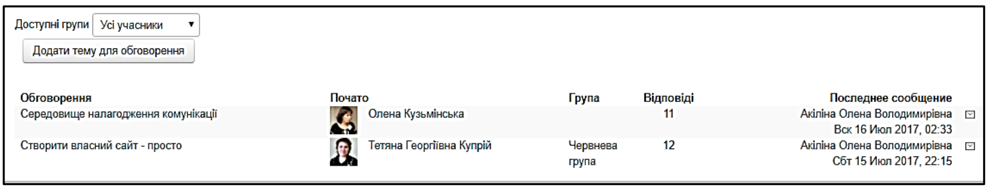

Figure 5. An example of discussion in the course forum
Source: Own work

And studying the course "Development of educational, scientific collaboration and project management with IC tools in universities" ends with the implementation of the project task, in which students of the course create individual and group projects for educational and scientific collaboration.

4. RESULTS OF THE STUDY

Approbation of the electronic course was carried out during June 2017 at the Borys Grinchenko Kyiv University. 26 teachers took part in the approbation process.

Learning achievements of the students of the course are estimated by the modular-rating system, which is based on the principle of operational reporting, mandatory modular control, accumulation system for assessing the level of knowledge, skills and abilities; Expanding the number of final points to 100. Each student was able to monitor his or her own learning activities using the LMS Moodle tools (used to accommodate e-course resources): independently mark individual activities, review current ratings and comments of teachers in the evaluation journal, and track Progress in completing the course.

To correct the training and design of the course, students at the end of each module were offered to answer the questions of the feedback form of the participant (https://goo.gl/forms/QSFtNsCzyOmBCNQk2). The questionnaire concerned to the monitoring of expectations from training for each module, the quality of the proposed materials and resources, support and counselling, the time allocated to study each module and the practical significance of the results. According to the results of the survey, approximately 82% were satisfied with their achievements at the end of the course (Figure 6).

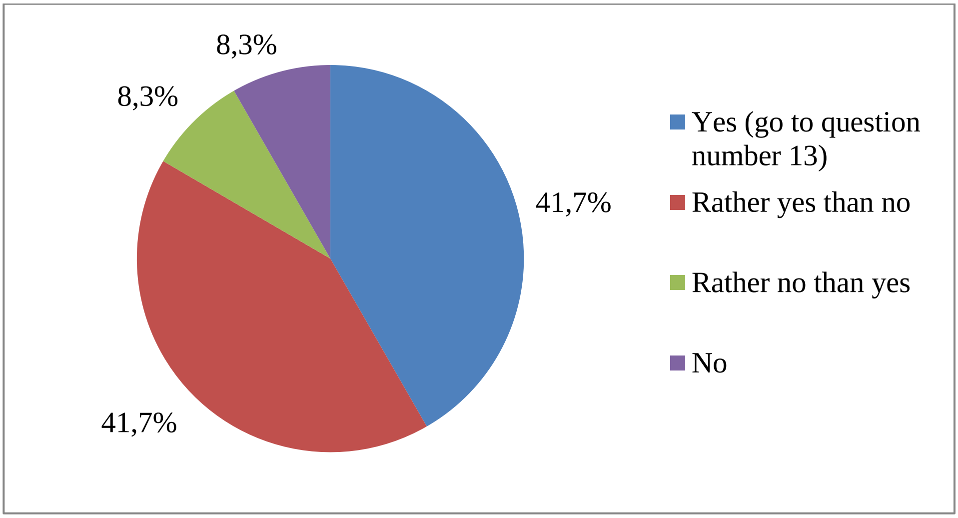

Figure 6. Evaluation of the students' satisfaction with their own results
Source: Own work

Students also were asked to evaluate the level of the competence by acquiring a 5-point scale, where 1 describes the lack of competence, and 5 - characterized as mastery of it.

The results of self-assessment (https://goo.gl/2YWMYt) of the participants at the beginning and at the end of the course are presented in Table 3.

Table 3.

Results of the respondents self-competence the beginning and at the end of the study course "Development of educational, scientific collaboration and project management with IC tools in universities" (average)

Competence	Before beginning of studying course	After finishing course study
Knowing the basic methods and ways of receiving, storing, distributing information, computer skills	3,5	4,5
Ability to work in a team and organize teamwork with information data in global computer networks.	2,15	3,45
Designing educational tasks for organizing student cooperation and for solving educational problems	3,1	4,2
Using various types of IC tools to organize online learning, interaction, collaboration	2,4	4,15
Creation and use of different cooperation models according to the purpose using the IC tools	2,5	3, 85
Evaluation of the effectiveness of the organization of cooperation	2,5	3,1
Ability to collect, analyse and process the data needed to solve the research tasks	3,6	4,7
Development of educational and scientific projects	2,5	3,75
Readiness to identify and use the most effective IC tools in the course of scientific collaboration, to take effective ways and decisions, to rely on correct estimates and rationally to give preference to the best possible alternatives.	2,5	3,6
Organization and implementation of project monitoring and evaluation	3	3,8
Organization and coordination of scientific partnership and interaction	2,5	3,4

Source: Own work

CONCLUSIONS

The positive dynamics of self-esteem by the scientific and pedagogical staff of Borys Grinchenko Kyiv University after completing the study of the electronic course "Development of educational, scientific collaboration and project management with IC tools in universities" during the lecturer's postgraduate studies indicates its effectiveness and can be recommended for implementation into the system of training of teachers of higher educational institutions.

The developed e-course will also be attractive not only for university lecturers, researchers, professionals who seek to use IC tools for collaborating in distance learning and in blended learning (in private or in the educational institution or company structure), but also teachers, lectures and trainers who want to learn about the modern technology of application and training based on design techniques; heads of social and public institutions, enterprises, who need tools for the rapid outspread of knowledge, skills and modern tools of competence in the knowledge economy; A general public who is interested in learning the technologies of blended learning and implementing these guidelines in the process of lifelong learning.

ACKNOWLEDGMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Andreev, O., Bugaichuk, K., Kalinenko, N., Kolgatin, O., Kucharenko, V., Lulkun, N., Lyahotska, L., Sirotenko N., & Tverdohlebova, N., 2013: *Pedahohichni aspekty vidkrytoho dystantsiinoho navchannia* [Pedagogical aspects of open distance learning]. Kharkiv, «Miskdruk». 212p. [in Ukrainian]. Retrieved from http://dl.kharkiv.edu/file.php/1/book-pedagogy-2012.pdf

Bikov, V., Bilous, O., Bogachkov, U. et al., 2010: *Osnovy standartyzatsii informatsiino-komunikatsiinykh kompetentnostei v systemi osvity Ukrainy : metodtchni rekomendatsii* [Fundamentals of standardization of information and communication competences in the system of education of Ukraine: methodical recommendations]. Kyiv, Atiкa, 88p. [in Ukrainian]. Retrieved from http://lib.iitta.gov.ua/455/1/zb4.pdf

Ni, D., 2015: *Applying Project-Based Learning to Design Teaching Part 4: Strategies*. [on-line] at http://engage.franklin.edu/i4/2015/11/06/applying-project-based-learning-to-design-teaching-part-4-strategies/

ECB-Check Quality Criteria, 2016 [on-line] at http://www.ecb-check.net/ (accessed 10 August 2017)

Grifoll, J., Huertas, E., Prades, A., Rodríguez, S., Rubin, Y., Mulder, F., & Ossiannilsson, E., 2009: *Quality Assurance of E-learning.* European Association for Quality Assurance in Higher Education. Helsinki, 50 p. [on-line] at http://www.enqa.eu/indirme/papers-and-reports/workshop-and-seminar/ENQA_wr_14.pdf

Durak, G., Ataizi, M., 2016: *The ABC's of Online Course Design According to Addie Model*. Universal Journal of Educational Research, 4, 2084-2091. doi: 10.13189/ujer.2016.040920.

ISTE STANDARDS, 2016 [on-line] at http://www.iste.org/standards/standards (accessed 10 August 2017)

Ethics for researchers (2013). *Facilitating Research Excellence in FP7* / European Commission. Directorate-General for Research and Innovation. Science in society /Capacities FP7. Luxembourg, Publications Office of the European Union, 36 p. Doi: 10.2777/7491

Ethical Principles of Research in EU and International Law. (2016). [on-line] at http://www.rightsandscience.eu/project/ethical-principles-of-research-in-eu-and-international-law (accessed 10 August 2017)

DeSeCo. (2002). Definition and Selection of Competencies. Theoretical and Conceptual Foundations (DESECO). Strategy Paper on Key Competencies. An Overarching Frame of Reference for an Assessment and Research Program – OECD (Draft). [on-line] at http://www.voced.edu.au/content/ngv%3A9408 (accessed 10 August 2017)

Future Work Skills 2020. 2011. [on-line] at http://www.iftf.org/uploads/media/SR-1382A_UPRI_future_work_skills_sm.pdf (accessed 10 August 2017)

Hansen N., Postmes, T., van der Vinne, N., & van Thiel, W., 2012: *Information and communication technology and cultural change*. Social psychology. (Vol. 43(4), pp. 222–231). doi: 10.1027/1864-9335/a000123

Korzhova, M., 2012: *Competence approach to assessing the quality of education*. Analytical review, Innovative Education, pp. 12-60. [on-line] at http://inobr.mrsu.ru/downloads/1_2012.pdf (accessed 10 August 2017)

Morze, N., Barna, O., Kuzminska, O., & Vember, V., 2015: *Formation of ICT competences through the system of competency tasks: from idea to practical implementation*. In: IT Tools - Good Practice of Effective Use in

Education. Monograph Sc. Editor Eugenia Smyrnova-Trybulska, Studio Noa for University of Silesia, Katowice-Cieszyn, 2015, 408 p. ISBN 978-83-60071-82-3 pp. 219-234. [on-line] at https://depot.ceon.pl/handle/123456789/11742

Smyrnova-Trybulska, E., 2007: *Osnovi formirovaniia informaticheskikh kompetentnostei uchitelei v oblasti distantcionnogo obucheniia* [Bases of formation of IT competence of teachers in distance learning]. Monograph. Scientific editor: Academician of Sciences of Ukraine, prof. M.I. Zhaldak. Kherson, “Aylant”, 704 p. [in Russian]

Structure of the ICT Competency of teachers. UNESCO Recommendation, 2013: [on-line] at http://iite.unesco.org/pics/publications/ru/files/3214694.pdf (accessed 10 August 2017)

TELECOLLABORATION PROJECTS IN TRANSLATOR EDUCATION – DESIGN, IMPLEMENTATION AND EVALUATION

Jarosław Krajka
Maria Curie-Skłodowska University, Lublin, Poland
Plac Marii Curie-Skłodowskiej 4a, 20-030 Lublin

Mariusz Marczak
Jagiellonian University, Kraków, Poland
al. Mickiewicza 9a, 31-120 Kraków

Abstract: *With increased emphasis on openness and mobility in higher education, seeking ways of authenticating the training of language professionals at the university level has become a great challenge for many modern philology departments. Opening classrooms to the world and inviting partners to collaborate and co-construct knowledge are regarded as the possible solutions towards increasing the quality of professional training of language teachers and translators.*

The paper will address important concepts in the process of designing, implementing and evaluating telecollaborative projects in translator education. Special focus will be placed on pedagogical implications, practical tips and tricks and success criteria for projects.

Keywords: teacher education, translator education, telecollaboration, course design, assessment

INTRODUCTION

Effective translator education should meet the requirements of the present day translation market, but at the same time, it should also be in line with the current educational standards, at large. In other words, contemporary university courses in translation are supposed to respond to two realities: the professional reality in which translators function today and the reality which students are likely to face in present day educational settings.

All in all, both the reality of the professional translation market and that of contemporary education – undeniably share the common denominator of the implementation of digital technology. Consequently, it seems to be only a natural conclusion that if translator education is to be effective in preparing students for the job market, it must involve the technologies and work modes which they are most likely to be required to use in their professional practices, i.e. cloud computing, translation technologies and telecollaboration, respectively.

1. TRANSLATOR COMPETENCE

1.1 Reasons beyond conceptualising translation competence

Attempts to define *translation competence* or *translator competence*, with each of the notions relating to a slightly different construct, intensified in the 1980s as a corollary of the then-increased interest in the notion of communicative competence in foreign language didactics (Piotrowska, 2007) as well as the nature/nurture debate over the character of people's capacity for translation, fuelled by the writings of Toury (1984), Gerver and Sinaiko (1977) and Hönig (1988). Since then, it has been affirmed that translation is not an innate talent, but can – and given an increased demand for language service provision in the contemporary world *must* – be trained. After all, "(…) there are just not enough spontaneously generated translators around to meet market demands (…)" (Gouadec, 2007: 327).

While the outcome of the nature/nurture debate gives meaning and purpose to translation pedagogy (Dybiec-Gajer, 2013), the notion of translation competence informs the outcomes of translator and interpreter (T&I) education as well as T&I education research (Klimkowski, 2015). As it has been signalled, although the terms of translation competence and translator competence have been used interchangeably in the professional literature, they denote different – albeit not mutually exclusive – viewpoints on translation *per sé*. As Kiraly (2006) posits, translator competence is the more inclusive term, which covers not only the linguistic and communicative competences in L1 and L2 that bilingual language users are credited with but shifts attention towards the very person of the translator and highlights the complexity of the translation profession. Piotrowska (2007) rightly observes that it is translator competence that constitutes the domain of translation pedagogy, by which she subscribes to the belief that translator competence exceeds the boundaries of bilingual competence.

1.2 Selected models of translation competence

A wide range of models of translation/translator competence have been proposed to date, e.g. by Pym (2003), PACTE (2005), EMT (2009), Göpferich (2009) and Kiraly (2006; 2013) – to name a few. They represent various epistemological standpoints, illustrate the evolving conceptualisations of the competence and imply the pedagogical underpinnings of the methodologies through which it should be developed. Given their nature, the models can be ascribed to three distinctly different categories: (i) minimalist, (ii) multicomponential and (iii) emergent.

1.2.1 The minimalist approach

The minimalist category is represented by Pym's (2003) model, which places at its core the very act of "(…) translating and nothing but translating" (Pym, 2003: 489), and defines translation competence as:

- "The ability to generate a series of more than one viable target text (TT_1, TT_2 ... TT_N) for a pertinent source text (ST);
- The ability to select only one viable TT from this series, quickly and with justified confidence" (Pym, 2003: 498).

Simple as the model may seem, it illustrates that at the translational level, the translator's practices are neither purely linguistic nor commercial. Instead, they involve problem-solving which fundamentally boils down to the generation of a number of versions of the target text and ultimately, the selection of the most optimal version out of the ones produced. At the same time, the model may easily be seen as implicitly inclusive of a range of unspecified competences that the translator needs to utilise when performing a translation task.

1.2.2 The multicomponential approach

The multicomponential category is best illustrated by models proposed by PACTE (2005) and EMT (2009), which emphasise the compartmentalised and often hierarchical nature of translator competence.

The *PACTE (2005) research group's model* is epistemologically grounded in the positivist views of its representatives, e.g. Orozco and Hurtado Albir (2002), who believe that translator competence should be investigated through empirical research and the implementation of quantitative research techniques.

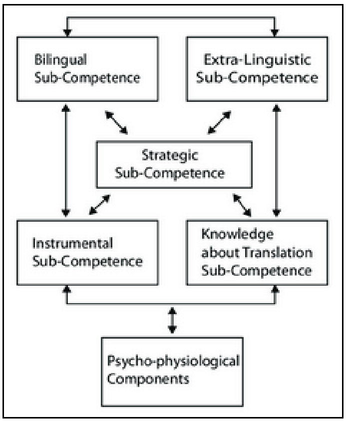

Figure 1. PACTE model of translator competence.

Source: PACTE (2005: 610)

The pivot of the model is strategic sub-competence, which is procedural knowledge, used by the translator to activate all the other sub-competences, identify and counteract problems as well as compensate for deficiencies with a view to effectively planning, performing and evaluating the translation process. Bilingual sub-competence encompasses the procedural, pragmatic, sociolinguistic, textual, grammatical and lexical knowledge which enables one to communicate in two languages. Extra-linguistic sub-competence embraces general knowledge of the world and field-specific knowledge. Knowledge about translation sub-competence refers to the knowledge of processes, methods and procedures involved in translation *per sé* as well as that of the profession. Instrumental sub-competence comprises knowledge relating to the use of documentation sources and information technologies which are applicable to translation (PACTE, 2005).

The European Master's in Translation (EMT, 2009) model, proposed by the Directorate General for Translation of the European Commission, seems to lack a particular epistemological grounding. Yet, as Dybiec-Gajer (2013) observes, it is currently one of the most influential models in Europe, as it informs programme design at EU institutions providing Master's degree courses for translators. The EMT model is strongly oriented towards the recognition of the translator's professional role as that of a service provider (cf. EMT, 2009 for details), and its second most essential element seems to be intercultural competence.

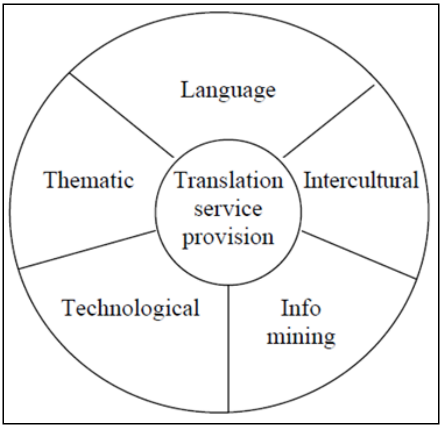

Figure 2. EMT model of translator competence.

Source: EMT (2009: 104)

Intercultural competence is described in two dimensions: sociolinguistic and textual. In its sociolinguistic dimension, it denotes the recognition of function and meaning in socially, geographically, historically and stylistically demarcated language variations, the identification of community-specific rules of interaction and the application of the appropriate situation- and document-dependent register.

The textual dimension, at its receptive-analytical end, designates the ability to analyse and understand documents in terms of their macrostructure and the subtle allusions, stereotypes, presuppositions, values and cultural references that they carry; the ability to extract and summarise essential information; and to evaluate and resolve one's own comprehension problems. At the productive end, it is the ability to compose documents in keeping with the rules of specific methods of composition, conventions and standards.

The remainder of the constituent competences seem to have been given auxiliary, roles. Information mining competence pertains to various aspects of information management. Thematic competence covers field-specific knowledge and relating skills, the metacognitive element of learning to develop one's field knowledge and the more general component of "Developing a spirit of curiosity, analysis and summary" (EMT, 2009: 7). Finally, technological competence embraces the ability to utilise software tools while performing various stages of the translation task, awareness of the limitations of machine translation and the metacognitive component of being able to learn and adapt to new multimedia translation tools.

All in all, the multicomponential models of translator/translation competence discussed above recognise translation as both an act of communication and a professional activity; hence the presence of the strategic component in each of them, which – at least, partially – situates them in the realities of the translation market, as recommended by Piotrowska (2007). Yet, they have provoked criticism based on a number of premises. In Pym's (2003) view, they lack a clearly defined methodological foundation, and can be expanded endlessly. They also appear to strangely coincide with the teaching content of their proponents' institutions. Therefore they are a projection of the idealised beliefs about translation competence held by researchers, and rather than a reflection of actual market reality.

1.2.3 The emergent approach

An alternative to the multicomponential models is Kiraly's (2013) emergent view of translation competence. Basing on post-modernist epistemology and complexity theory, Kiraly (2013) suggests that translator competence is a non-static entity, which is indefinable via *a priori* reasoning, and as such cannot be acquired via the accretion of compartmentalised, transmittable knowledge. Instead, it is a complex adaptive system which emerges "(…) through the translator's embodied involvement (habitus) in actual translation experiences" (Kiraly, 2013: 203). By and large, Kiraly's (2013) model recognises the fact that knowledge is not pre-set but enactive, processual and socially-situated. Kiraly (ibid.) sees translator competence as manifesting itself in translatory moments, when the translator solves specific translation problems by drawing upon memories of translational experiences, results of learning and intuitions. From this perspective translator competence is the interplay of the components of a complex network of the aforementioned elements as well as human and material resources, and personal, interpersonal and psycho-physical dispositions, which all come to interact dynamically whenever the translator is on a given translation task.

The concept of emergent competence is epistemologically grounded in social constructivism, or – as Klimkowski (2015) demonstrates – anthropocentric social constructivism, reflective of Grucza's (1997) anthropocentric view of learning and knowledge. Yet, it reaches beyond social constructivism in that it shifts the locus of competence development from the mind, or the brain of an individual, to their interactive experience with others. It transforms interaction into a prerequisite for the emergence of competence, which is not only situation-bound and context-dependent, but also construed socially through collaborative problem solving. Kiraly (2013) explains that students interact with peers and the teacher in the learning context as much as translators interact with all the parties involved in the translation process. In effect, they each develop their own idiosyncratic competences which are an outcome of a number of individual traces, including past learning, creativity and individual dispositions. In the light of Risku's (1998) perspective, the competence that develops in individuals is inherently complex and recursive, as it is subject to constant evolution. Kiraly (2015) underlines that it is difficult to estimate what sub-competences emergent competence comprises at a given point in time, they are a unique combination for particular individuals and they develop in a non-parallel fashion.

2. INTERCULTURAL COMMUNICATIVE COMPETENCE AS PART OF TRANSLATOR COMPETENCE

2.1 The relevance of (inter)cultural competence for translation

Links between intercultural competence – or even more broadly, intercultural communicative competence – and translation are indisputable on a number of grounds. After all, translation is not only a form of intercultural mediation, as illustrated by the very titles of publications such as *Translation as intercultural communication* (1995), the likewise titled publication by Katan (2009) or *Translation as intercultural mediation: setting the scene* by Liddicoat (2016), but it is also contributes to culture by creating it (Piotrowska; Piotrowska, 2007; Piotrowska, 2012).

As a matter of fact, the very conceptualisation of the notion, as it was coined by (Byram, 1997), already designates its relevance to translation. At its simplest, intercultural communicative competence is an amalgamation of two the notions of communicative competence and intercultural competence, where communicative competence comprises linguistic competence, sociolinguistic competence and discourse competence, while intercultural competence embraces attitudes, knowledge, skills and critical cultural awareness, which one needs in order to act as an intercultural speaker (Byram & Fleming, 1998) – in other sources, alternatively referred to as intercultural diplomat (Corbett, 2003), intercultural mediator (Irishkanova, Röcklinsberg, Ozolina, & Zaharia, 2004), or intercultural intermediary (Council of Europe, 2008).

As Byram and Fleming (1998) explain, an intercultural speaker is a person capable of communicating and functioning in intercultural contexts for which he/she has not been specifically prepared. Clearly, what this definition denotes is exactly what a translator needs to be prepared to do, i.e. mediate between users of different languages and members of different cultures with a view to facilitating effective communication. As Małgorzewicz (2014) maintains, cultural and intercultural awareness – *inter alia* – "(…) guarantees communicative effectiveness and confidence in professional performance which would respect the linguistic, cultural and cognitive characteristics of participants the communicative act of translation" (Małgorzewicz, 2014: 6).

The relevance of the concept of mediation for translation becomes even more evident what one looks at Irishkanova et al.'s elucidation of intercultural mediation, which they perceive as the ability to "(..) understand, explain, comment, interpret, and negotiate various phenomena in the target language culture (…) [which results in] (…) a shared understanding by people of different cultural backgrounds and identities" (Irishkanova et al., 2004: 101).

The components of intercultural communicative competence listed above are very comprehensive and cover a multitude of components which are likely to fall into translator competence.

Linguistic competence refers to the ability to perform, both receptive and productively, correctly in the target language by using the language rules that one has internalised. Sociolinguistic competence is the ability to attribute appropriate meanings to messages expressed by one's interlocutor, while discourse competence is constituted by the ability to construct particular text types in keeping with the conventions of the target language, including situations where the language of communication acts as a lingua franca (Byram, 1997).

It is all complemented with the components of intercultural communication, which comprise: attitudes of curiosity and open-mindedness, which are supposed to foster the exploration of other cultures and permit one to cope with difference; knowledge about social groups, cultural products and practices as well as the rules of societal and individual interaction; skills of interpreting and relating, i.e. the ability to interpret and relate documents or events from different cultures; and skills of discovery and interaction, which are supposed to foster one's actual performance in real time communicative interaction with strangers (Byram, 1997).

Last but not least, cultural awareness is to enable one to use explicit criteria to evaluate cultural products, practices and perspectives with a view to recognizing conflicts arising in intercultural encounters and negotiating them – should they arise – in real time, and accepting the existence of difference (Byram, ibid.).

It is not difficult to envisage how the competences which fall into Byram's (1997) model of intercultural communicative competence, including intercultural competence *per sé*, can serve as a manifold apparatus of which the translator can avail themselves while dealing with a translation task, which in itself is an act of intercultural mediation, after all.

2.2 The presence of cultural components in selected models of translator competence

The usefulness of (inter)cultural competence for translators also finds reflection in models of translator competence proposed to date. It is perhaps less evident in the case of Pym's (2003) minimalist model and Kiraly's (2013) emergent model, due to their respective nature; however, it is reasonable to suggest that (inter)cultural components are also likely to constitute translator competence there.

EMT model. As it has been mentioned before, out of the componential models, it is the EMT model that most overtly foregrounds intercultural competence – delineated in its two dimensions: sociolinguistic and textual. On closer inspection of the sociolinguistic component, one finds descriptors indicating that intercultural competence in the EMT model has been operationalised in a manner congruent with Byram's (1997) model of intercultural competence, as it refers to the ability to: recognise function and meaning in language variations; identify community-specific rules of verbal and non-verbal interaction; and to produce a sociolinguistically appropriate register for written or spoken text (EMT, 2009).

A similar degree of similitude is observable with regard to the textual component, which embraces the ability to understand and analyse multimedia documents in terms of their macrostructure and overall coherence; apprehend (multimedia) documents at the level of presuppositions, implicit content, allusions, stereotypes and intertextuality; describe, evaluate and resolve one's own comprehension problems; extract and summarise essential information; recognise and identify culture-specific elements, values and references; juxtapose and compare culture-bound elements and composition methods; apply genre-specific conventions and rhetorical standards while composing documents; and to effectively introduce rapid modifications to a text by drafting, rephrasing, restructuring, condensing and post-editing in one's languages A and B (EMT, 2009).

PACTE model. The most obvious references to (inter)cultural competence in PACTE's (2003; 2005) model are made in the descriptors of bilingual sub-competence, which involves pragmatic knowledge, defined as "(...) pragmatic, socio-linguistic, textual and lexical-grammatical knowledge in each language" (PACTE, 2005: 610) and extra-linguistic sub-competence, which comprises largely declarative general world knowledge, knowledge about translation, encyclopaedic, declarative knowledge, field-specific knowledge as well as bicultural knowledge, i.e. knowledge about source and target cultures.

Other culture-related elements are perhaps discernible within other sub-competences. For instance, procedural elements can be found – at least, implicitly – in strategic sub-competence and instrumental sub-competence, while attitudinal elements are part of psycho-physiological sub-competence, which involves"(...) intellectual curiosity, perseverance, rigour, critical spirit, knowledge of and confidence in one's own abilities, the ability to measure one's own abilities, motivation (...) " (PACTE, 2003: 17).

Kiraly's (2006) non-emergent model contains an explicitly cultural – albeit undefined – component, which constitutes part of what Kiraly (2006) labels as "translation competence per sé" (Kiraly, 2006: 72). Judging by the list of the culture-related components of the above-cited competence, which include norms and conventions, world knowledge and simply *culture* – most probably relating to the knowledge of language-specific cultures and perhaps, the notion of culture as such – it may be inferred that culture in this case is understood primarily as a body of transmissible, encyclopaedic knowledge, without a procedural or attitudinal dimension. However, procedural aspects of cultural competence seem to have been implicitly incorporated into social competence as the ability to follow the professional etiquette, " (…) negotiate effectively with the client (…) [and] function effectively as members of a team" (Kiraly, 2006: 74).

3. TELECOLLABORATION IN TRANSLATOR EDUCATION

3.1 Rationale for collaborative learning

Telecollaboration is a form of collaborative learning, enhanced with the implementation of Computer-Mediated-Communication (CMC) tools. Collaborative learning modes have been promoted as an effective educational solution since the turn of the 20th and 21st centuries by a number of scholars, including Rogers (1983), who viewed it as a means of facilitating learners' behavioural and affective change, and Kolb (1984), who emphasised reflection-enhanced experimentation and adaptation in learning. In addition, collaboration has been credited with the potential to develop learner autonomy and a sense of responsibility for one's own learning (Dooly, 2008), foster knowledge retention (Beckman, 1990), and enrich the learning experience via the synergy effect (Dooly, ibid.).

Collaboration has been used on a range of epistemological grounds. It converges with – and perhaps derives from – the theories of learning advocated by the proponents the social-constructivist approach to education (Dewey, 1938; Vygotsky, 1978; 1994), democratic learning (Dewey, 1916; 1938) and postmodernist/postpositivist learning, as perceived by Doll (2008), Summara and Davis (1997).

It may be seen as a work mode which, through teamwork, facilitates cognition as an individual process whereby learners construct their own interpretations of the world, which resounds with the tenets of Piaget's radical constructivism (cf. Summara & Davis, 1997). It may be perceived as a didactic solution which helps learners both acquire idealised knowledge that is to be discovered as well as construct their own understanding of the world, which seems to be the approach adopted by Gonzáles-Davies (2017) in her collaboration projects. It may also be viewed as anthropocentric social constructivist learning mode which facilitates translator education for career (cf. Klimkowski, 2015)

Alternatively, as posited by Kiraly (2015), it may be viewed as an opportunity for context-dependent emergent learning, where learning is embodied action, a reiterative, recursive process that ultimately leads to *"dynamic knowing"* (Kiraly, 2015: 23), which is unpredictable, subject to non-linear development, and which instantiates as learners tackle real problems in authentic translation projects (Kiraly, 2015). Overall, it may be stated Kiraly (2015) views cognition is an emergent adaptive system ameliorated by situated learning.

In this kind of learning particular learners' subjective knowledge constructions in a given context are to be congruent with those of their peers (Summara & Davis, 1997), and all that is to be achieved in the course of the collaborative exploration of problems at hand from multiple perspectives (Doll, 2008).

Consequently, the teacher is no longer expected to transmit idealised and supposedly objectivised knowledge, but to relinquish control to students, who interact while performing teamwork. As Gonzáles-Davies (2017) explains, the teacher's authority is diffused, and instead of instructing students, they can observe, monitor, or – in Nord's (2005) words – act as a fire brigade. To describe the teacher's facilitative role in collaboration projects fostering emergent learning, which Kiraly (2015) advocates, he uses Davis and Stimmt's (2003) notion of *occasioning* translator competence, whereby he explains the teacher does not only facilitate and scaffold the students' learning experience but also becomes involved in learning. Klimkowski (2015) also suggests that collaborative translation projects are supposed to provide a learning opportunity for both students and the teacher. They all learn and assist one another in their learning, as there is no preset image of reality for them to discover. In Wood, Bruner, and Ross's (1976) terms, they scaffold one another's learning, whereby those in a position to do so help others with less experience to progress. After all, all the parties involved in a collaboration project are to contribute to teamwork and work towards a common goal.

3.2 Telecollaboration translation projects

The use of telecollaboration in translation education corresponds to Kiraly's (2006, 2015) call for shifting translation pedagogy from the still-pervading transmissionist, teacher-centred model of teaching towards the learner-centred, learner-empowering, collaborative model, which has been advocated as a solution for translator education by a number of other scholars, including Nord (2005), Gonzáles-Davies (2005, 2017), Massey (2016), Hoffman (Kiraly & Hoffman, 2016) and Marczak (forthcoming, 2016), who has been focused on telecollaboration in particular.

The affordances which telecollaboration brings to translator education are numerous. First and foremost, it permits students to "(…) reconcile theory and practice (…) and helps students resolve both translational and social issues (…)" (Gonzáles-Davies, 2017: 71), which are relevant to the contemporary professional setting, where translation is a social activity (O'Hagan, 2011,), and where a demand for effective collaboration (Choudhury & McConnell, 2013) necessitates efficient telework and collaborative translation (DGT, 2016).

In the light of Lankshear and Knobel's (2006) writing, online learning scenarios foster the development of linguistic and communication skills at large, along with an array of operational, cultural and critical literacies. Operational literacy is largely procedural knowledge, necessary to use CMC tools, search the Web effectively, share cognitive and instrumental resources and perform multitasking. Cultural literacy is constituted by declarative knowledge about the context-specific communication principles and guidelines, the Netiquette, i.e. the overt and covert rules of Web-based communication, and digital content ownership rights. Critical literacy is emotive in character and pertains to awareness of the subtleties of online communication, e.g. context-based and CMC tool-dependent power relations.

The list of literacies can be expanded to also cover: collaboration skills, critical consumption of information, learning, unlearning, and relearning, which Davidson (2012) sees as 21st century skills, while Herk (2016) refers to a very similar set of job-independent, transferrable skills as soft skills, which increase a person's employability in the contemporary job market (cf. Herk, 2016; NACE, 2016).

Numerous classifications of soft skills have been proposed by academic and professional organisations and researchers (cf. Szulc, 2008; Bartel 2011; Mathias 2013; NACE, 2016), and – irrespective of the actual taxonomies used – they irrevocably include a discernible common core, which contains: communication skills, new media skills, teamwork, interpersonal skills, cultural awareness, flexibility, strategic planning, self-organisation, creativity, analytical and critical thinking skills and leadership skills. Telecollaboration appears to create opportunities for the development of all these skills, which enriches the likely resulting learning experience.

(Tele)collaboration translation projects largely expand the repertoire of didactic solutions available to translation teachers, as they may be administered in different modes. They may be simulated or genuine, blended with face-to-face work or limited to online work. They may also involve varied teacher roles, as it has been demonstrated. Similarly, as Nord (2005) posits, they offer students an opportunity to play not only various professional roles, e.g. the role of a client, reviser, terminologist, or documentation assistant, but also experience the part and parcel of the profession, i.e. the negotiation of working conditions, fees and deadlines.

In addition, they may vary in terms of project duration (short-term, mid-term, long-term projects), design (pre-project, post-project stage, follow-up stages), teacher presence (degree of teacher intervention), learner autonomy (role assignment, selection of tools), reflection modes (diaries, journals, TAPs, corpus-based) and assessment modes (self-, peer-, teacher-assessment).

All in all, the multifarious designs of telecollaborative translation projects and the resulting work modes involved in them create "(...) unplanned learning opportunities [which] optimize a planned syllabus by adjusting its goals to the real needs of the students" (Gonzáles-Davies, 2017: 78).

4. INTEGRATING TELECOLLABORATION IN UNIVERSITY TRANSLATOR TRAINING - THE STUDY

The data for the present study were collected over a long-term telecollaborative project implemented to assist graduate teacher and translator training. The details of the research context, together with some of the characteristic features, as well as the findings on practical issues of integration of telecollaboration into the modern philology curriculum, are given below. The findings from the telecollaborative study presented below highlight the way translator training telecollaborative projects should be designed, implemented and assessed.

4.1. Research questions and aims

The aims of the study into supplementing teacher and translator training with the telecollaborative component were as follows:

- to give students the opportunity to evaluate ready-made tests and examinations from different countries and to reflect on their applicability and adaptability in their own context;
- to foster students' skills of designing tests and scoring procedures as well as provide feedback on their peers' products;
- to show students how to tailor assessment to fit the needs of given students, especially in multilingual and multicultural context;
- to examine the change of attitude towards language assessment and peer feedback;
- to see what technologies are selected to mediate student-initiated interaction;
- to investigate the process of knowledge co-construal in the telecollaborative framework;

- to verify the applicability of telecollaboration as a supplement to face-to-face teacher training and investigate the practical constraints of integrating these into the teacher training framework.

Out of these, the current paper deals with the final three objectives, which refer to the selection of technologies, the viability of the process of knowledge co-construal in developing professional skills and to find out solutions to the problems of integration of telecollaborative projects into graduate teacher/translator training. The results of the study as regards the remaining objectives will be specifically addressed in further publications.

4.2. The participants and the instructional context

The project was conducted at the post-graduate (M.A.) programme in English teacher/translator education, supplementing the course in "Language testing", taught over the summer semester of 2016/2017 academic year. The course had 9 bi-weekly meetings over the period of the whole semester, followed a fixed syllabus of learning how to design and evaluate testing instruments for specific language subsystems and language skills. Even though more teacher-oriented, the results of the study as given below are applicable to all possible courses of the teacher and translator training university curricula.

The participants of the project were 30 MA students (1 year post-graduate course – Polish, henceforth referred to as PL) and 60 BA students (Turkish – TR). Great care was paid to make sure that the Polish and Turkish partners were matched with characteristics as closely as possible: the same "Language testing" class, a very similar syllabus (which was negotiated by both instructors to fit the project), the same coursebook (H. D. Brown's *Language Assessment: Principles and Classroom Practice*). However, there were also some differences which had to be struggled with throughout the project:

- day students (TR) vs. extra-mural students (PL);
- three times as many TR students as PL ones;
- undergraduates (TR) vs. graduates (PL);
- pre-experienced (TR) vs. mixed (job-experienced and pre-experienced – PL);
- collaboration-focused vs. assignment-focused (mixed on both sides).

As regards the computer environments in which the participants of the telecollaborative project were gaining knowledge and practising skills, it was decided that the project was going to take place in two virtual spaces – on the one hand, teacher-controlled Moodle set up at the Polish university's e-learning campus made it possible to provide a wealth of learning resources (readings, videos, PowerPoint presentations, sample materials for analysis) and set up activities serving as data collection points (forums, diaries, questionnaires, assignments).

However, apart from this teacher-controlled learning environment, the participants were free to interact in whatever application they wanted in order to establish relationships, communicate, create the assignments together. As it turned out, most used email or Facebook, some Moodle internal messaging, while others opted for messengers, Skype or Voicethread.

The schedules of partner classes were compared and the following project timeline was created by the two instructors. The timeline took into account different calendars at Polish and Turkish universities, differences between extra-mural and day students' expected workload, reasonable and achievable deliverables as well as most convenient deadlines for them.

As the project yielded a wealth of data whose analysis is still under way, the present study will only focus on the issues of designing telecollaborative exchanges and integrating them into regular study programmes. Therefore, selected pieces of data retrieved from different instruments will be used below to substantiate our discussion.

4.3. Integrating telecollaboration into teacher and translator training – quantitative findings

The quantitative findings from the study were gained from a close-ended, anonymous, post-course evaluation survey, administered to both PL and TR students via Google Forms. The survey was completed by a significant number of project participants – 81 respondents, including 65 (80%) from Turkey and 16 (20%) from Poland, 75% males and 25% females. Obviously, these numbers need to be viewed from the perspective of the sample taking part in the project – given that there were 90 Turkish and 30 Polish participants, the response rates of 72% for the Turkish subsample and 50% for the Polish subsample should be regarded as relatively satisfactory.

An overwhelming majority of participants (almost 70%) agreed or strongly agreed that working with students from other countries is a motivating experience (Q2), which is corroborated by a similar figure (almost 60%) opting for "Strongly disagree" and "Disagree" in a reverse-coded statement "I am still not interested in problems of students from other countries." Almost 60% of participants agreed that communicating with partners from a different country helps find creative solutions to classroom problems. In terms of practical aspects of telecollaboration which should be attended to while designing and running exchanges, the following problems of telecollaborative exchanges were perceived by participants:

1. long response times - 52 (64.2%)
2. lack of physical contact - 46 (56.8%)
3. different semester schedules - 41 (50.6%)
4. insufficient or incomprehensible feedback from partners - 37 (45.7%)

5. cultural differences between partners - 11 (13.6%)
6. problems with incorrect language used by partners - 13 (16%)

It is evident that the logistical aspects of online presence have to be given more attention in future telecollaborative projects. Participants need to be informed of different kinds of online learners and of possibly varied intensity of participation. At the same time, clear regulations on response times need to be set in advance by both instructors and included in the syllabus, in order to make sure that once such response lags appear, they are reported by students and instructors take necessary precautions to prompt students to participate.

The second area of interest to think about effective designing, running and evaluating telecollaborative projects in teacher and translator training was the perception of technology-mediated learning environments by participants. As illustrated in Figure 1 below, since students were free to choose technologies for their individual collaboration, they mainly opted for email (two-thirds of the sample) or Facebook (almost a half). Around one third used Moodle's internal messaging system, while WhatsApp messenger was used by only 10 out of 91 respondents. It is quite surprising that Skype was reported by only 2 students – a greater amount of real-time voice/video contact could be expected.

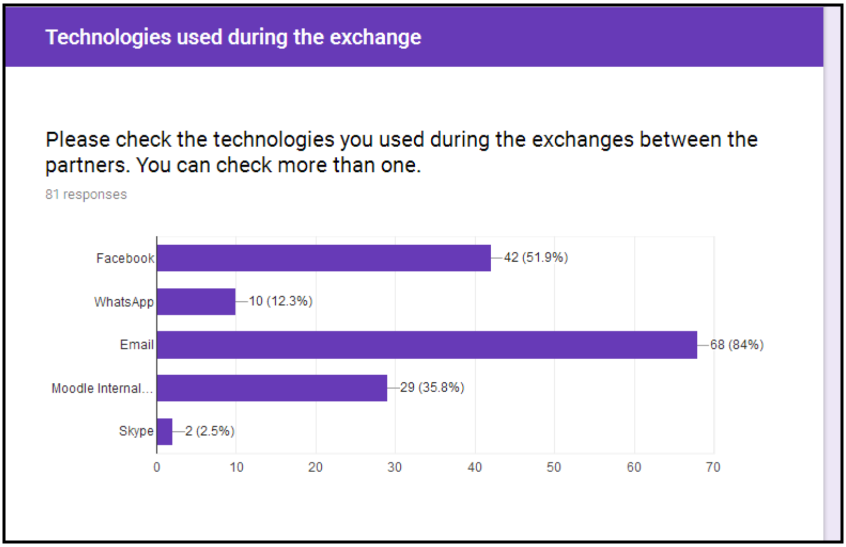

Figure 3. Technologies selected by project participants for their individual communication and collaboration (N 91).

Source: own work

4.4. Integrating telecollaboration into teacher and translator training – qualitative findings

The section below will summarise major qualitative results of the study, together with implementation guidelines and project success tips, taking into account the major issues involved in integrating a telecollaborative component into regular study programmes: conceptualising, planning, monitoring and assessing.

1. Include a telecollaborative component in the main class syllabus

If telecollaboration is supposed to supplement regular instruction, as was the case in the study, both strands need to be regarded as equally important, supporting each other, providing opportunities for more practice in terms of acquisition of knowledge and skills. The relationship between both strands needs to be made clear from the beginning in all possible ways, communicated clearly to students – in the syllabus, in the assessment system, in the workload expected of the face-to-face class. The final aspect is particularly sensitive, as online work generates much more effort and consumes more time than equivalent pen-and-paper or in-class tasks. Hence, sensible precautions need to be made so that the student workload for the F2F+TC course is equivalent to the standard class without the online component. Most importantly, if students are to fully benefit from the synergy between both, they need to clearly see that TC is not only an add-on, on top of regular class instruction, but both are equally important.

The project was designed according to the tri-partite model of Pre-project/Project proper/Post-project, in which the three phases were suited to the timetables of the two classes:

1. Pre-project – explaining the ideas of the project, making students familiar with Moodle tasks and activities, reviewing the concept of telecollaboration, increasing students' awareness of pitfalls of telecollaboration;
2. Project proper – multi-staged procedure, during which student teachers from both countries were involved in the telecollaborative online learning in various modes (whole-class or group Moodle forum discussions, individual Moodle diaries, individual and group tasks);
3. Post-project – evaluating the experience, providing feedback on student-made products, rounding up the whole experience.

In case of the present study, there was a clear assessment scheme that would take into account both strands, F2F workload was significantly reduced only to a minimum set of 1-2 tasks and 1 reading per two meetings, students were instructed straight from the start how the two strands are indispensable for the full success of their competence building.

2. Use F2F class time for stimulating reflection and providing support

Difficult as it may seem due to time constraints, it is necessary to devote some F2F class time to addressing various issues that appear as a result of telecollaboration. This may be a necessity to explain the tasks, to give models, to show students how to solve intercultural communication problems. In-class discussions are essential also to make students develop realistic expectations about their partners' contributions or to make them familiar with specific nature of online learning. Specific cases contributed by different students can be brought up (contributed anonymously before class) as critical incidents, to elicit solutions proposed by students. Participants should be encouraged to reflect on how they felt when they were corrected/corrected others, how to take and give turns in online synchronous interaction, how to handle sensitive comments expressed in direct and indirect way.

Obviously, such cases need to be depersonalised, so that a composite of different people's issues is created for the benefit of the whole class. The instructor should also make sure that in-class reflection time is not only focused on the problems, obstacles and pitfalls, but these negative issues are balanced also by the cases of successful interaction.

In the current study, due to the severe time limitations (only 9 meetings over the whole semester), it was not possible to devote enough time of the F2F classes to the discussion of online issues, which proved to be one of the shortcomings of the telecollaborative study.

3. Monitor task progress and partner participation during F2F sessions

Regular F2F class time devoted to discussing the TC component is also necessary to make sure the groups work smoothly, in accordance with the timeline and in the proper direction. Explaining the task once, during the first class, proved to be insufficient, task explanations, together with models, had to be provided during quite a few classes, especially towards the end of the project, when the participants were already working intensively towards the task completion. This was so even though full documentation was available in the written form on the project's Moodle all the time throughout the study. During those regular meetings the instructor needs to check whether all participants get on with their partners, making sure that there are no cases of non-response on the one hand, but they also understand there are different forms of online social presence on the other. Obviously, instructor availability by email and constant everyday contact by email/Skype/Facebook or any others between both instructors are pre-requisites to prevent demotivation of students due to non-response.

As explained in point 2 above, the research showed that integration of TC into F2F instruction in the extra-mural context can be troublesome for practical reasons. Students have F2F classes every two or three weeks, they might attend to coursework only 2-3 days before each course weekend, without doing any other work in between.

4. Analyse timetables and set realistic deadlines

The discrepancy between the two partners in the mode of class, coupled with differences in course timetables (the term for TR students lasted since mid-February till mid-May, for PL ones from 1 March till 1 July) and different work intensity periods (TR students were very active just before deadlines, but they could not do telecollaborative tasks during the two weeks of May due to exams), resulted in problems with meeting deadlines and completing tasks for some groups. Even though the two instructors took necessary notice of timetable differences and tried to suit deadlines and workload to them, still meeting deadlines and fitting online work with regular study duties proved to be a problem. Due to the changes in timetables the partners, even though relatively well-matched as for a number of characteristics as outlined above, were in different 'study mode' – when Turkish students were completing all tasks and were worried about meeting deadlines, Polish partners were just after a long (almost a week long) "beginning-of-May weekend", which is, traditionally, the time of short holidaymaking for most Polish people. On the other hand, while Polish students finally started to attend to all the online tasks due to upcoming end of semester, the Turkish students had already completed their term (4-6 weeks ago!) and they were, naturally, unavailable for collaborative work.

When designing similar projects in the future, a good deal of discussion needs to be done by the instructors not only to find out the differences in timetables, but also about festivals, exams, expected additional events such as student culture weeks, which could result in response lags and jeopardise meeting deadlines with collaborative tasks. Consequently, rather than distributing tasks at regular intervals (as was the case in the study, two-week intervals), groups might be presented with the whole task, without sequencing it into substages with their specific deadlines, so that partners could negotiate and decide on the most appropriate time to work on them.

5. Design carefully assessment schemes using a whole range of techniques

Assessing telecollaborative projects, in particular, balancing assessment of students' work in the F2F class with that done in the TC component, indicating the relative significance of both components with the assessment scheme, finally, acknowledging and referring to established teacher education evaluation instruments (e.g. *European Portfolio for Student Teachers of Languages* (Newby et al., 2007)), is the highly sensitive area demanding great consideration, careful negotiation between coordinators, as well as awareness-raising and confidence-building discussions with students. Assessment can be institutionalised and culture-dependent, which means that partners may have their evaluation schemes and techniques that are imposed by the authorities and cannot be changed for the purposes of the TC project. At the same time, different assessment instruments (especially alternative assessment techniques such as portfolios, peer assessment or journals) might have varying level of acceptance and suitability in different countries. Due to that, even though ideally the assessment scheme should be the same for both partners, it is not a must. In fact, a much more sensible solution, adopted also in the current study, was mixing different assessment areas and instruments, ending up with some tasks that are common to both partners but also being flexible about some other components (e.g., using fewer journals and more forums by one class, or expecting students to participate in virtually all forums and diaries vs. giving them the freedom to choose which ones to contribute to).

Moreover, instructors might be free to reflect on which of the following areas of student performance would be assessed and in what proportions:

- language competence (e.g., by referring to CEFR or European Language Portfolio descriptors);
- content of online contributions;
- active participation in online interactions;
- technical mastery and skill (e.g., exhibited while preparing certain multimedia products in telecollaboration).

Assessment instruments might be individual or group, and groups might be either local (created of F2F class members) or remote (composed of participants on both sides). Even when group assessment portfolios or products are used, an individual evaluation element is also important, for instance, in the form of private learning diaries, not assessed with traditional grades, but rather responded to in a more socially-constructivist fashion.

As evidenced by the present study, since there might be asymmetrical participation, motivation and expectations on both sides of the project, the instructors could consider designing the assessment scheme in such a way that the whole range of evaluation instruments encompasses both those that require collaboration with remote partners as well as those that are students' individual contributions. Thus, 2-3 Polish students who were frustrated because of inadequate contribution of their Turkish partners could compensate for the tasks demanding telecollaboration with their increased involvement in individual tasks done online at the project's Moodle.

CONCLUSION

In the light of the research findings, it may be concluded that from the institutional perspective telecollaborative projects might be difficult to design, implement and evaluate successfully, especially if the two partner classes differ in some of the important features. The study showed that especially great care devoted to planning task sequences, coordinating timetables, drawing up a common syllabi as well as establishing necessary links between the face-to-face component and the telecollaborative module guarantees successful completion of the project in terms of achieving the objectives both on the instructional level (what products remote groups are expected to produce) and on the individual level (what are the personal gains of students from the partnership in terms of intercultural communicative competence as well as intercultural teaching awareness).

REFERENCES

Beckman, M., 1990: Collaborative Learning: Preparation for the Workplace and Democracy. *College Teaching, 38*(4), 128–133.

Byram, M. 1997: *Teaching and assessing intercultural communicative competence*. Clevedon: Multilingual Matters.

Byram, M., & Fleming, M. 1998: *Language learning in intercultural perspective: Approaches through drama and ethnography*. Cambridge: Cambridge University Press.

Choudhury, R., & McConnell, B. 2013: *Translation Technology Landscape Report*. DeRijp: TAUS BV.

Corbett, J. 2003: *An Intercultural Approach to English Language Teaching* (1st). *Languages for Intercultural Communication and Education*. Bristol: Multilingual Matters.

Council of Europe. 2008: *White paper on intercultural dialogue: "Living Together as Equals in Dignity"*. Strasbourg: Council of Europe.

Davidson, C. 2012: *Now You See It: How Technology and Brain Science Will Transform Schools and Business for the 21st Century*. New York: Penguin.

Davis, B., & Stimmt, E. 2003: Understanding Learning Systems: Mathematics Teaching and Complexity Systems. *Journal for Research in Mathematics Education, 34*(2), 137–167.

Dewey, J. 1916: *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.

Dewey, J. 1938: *Experience and education*. New York: Simon & Schuster.

DGT. 2016: Strategic Plan 2016-2020. Retrieved from https://ec.europa.eu/info/sites/info/files/strategic-plan-2016-2020-dg-epsc_may2016_en.pdf

Doll, W. E. 2008: Complexity and the Culture of Curriculum. In M. Mason (Ed.), *Complexity Theory and the Philosophy of Education* (pp. 181–203). Malden, GA: Wiley-Blackwell.

Dooly, M. 2008: *Telecollaborative Language Learning: A Guidebook to Moderating Intercultural Collaboration Online*: Peter Lang Publishing Group.

Dybiec-Gajer, J. 2013: *Zmierzyć przekład? Z metodologii oceniania w dydaktyce przekładu pisemnego*. Kraków: Towarzystwo Autorów i Wydawców Prac Naukowych Universitas.

EMT. 2009: European Master's in Translation - Competences for professional translators. Retrieved from https://ec.europa.eu/info/sites/info/files/emt_competences_translators_en.pdf

Gerver, D., & Sinaiko, W. (Eds.). 1977: *Language, Interpretation and Communication*. Oxford: Plenum Press.

Gonzáles-Davies, M. 2005: Minding the process, Improving the product: Alternatives to traditional translator training. In M. Tennent (Ed.), *Training for the new millennium. Pedagogies for translation and interpreting* (pp. 67–82). Amsterdam: John Benjamins Publishing Company.

Gonzáles-Davies, M. 2017: A Collaborative Pedagogy for Translation. In L. Venutti (Ed.), *Teaching Translation. Programs, Courses, Pedagogies* (pp. 71–78). London, New York: Routledge.

Göpferich, S. 2009: Towards a Model of Translation Competence and its Acquisition: The Longitudinal Study of TransComp. In S. Göpferich, A. L. Jakobsen, & I. M. Mees (Eds.), *Copenhagen studies in language: Vol. 37. Behind the mind. Methods, models and results in translation process research* (pp. 11–37). Frederiksberg: Samfundslitteratur.

Gouadec, D. 2007: *Translation as a profession*. *Benjamins translation library. EST subseries, |x 0929-7316: v. 73*. Amsterdam: J. Benjamins Pub. Co.

Grucza, F. 1997: Języki ludzkie a wyrażenia językowe, wiedza a informacja, mózg a umysł ludzki. In M. Dakowska (Ed.), *Podejścia kognitywne w lingwistyce, translatoryce i glottodydaktyce* (pp. 7–21). Warszawa: Wydawnictwo Uniwersytetu Warszawskiego.

Herk, M. 2016: The Skills Gap and the Seven Skill Sets that Employers Want: Building the Ideal New Hire. Retrieved from https://www.ced.org/blog/entry/the-skills-gap-and-the-seven-skill-sets-that-employers-want-building-the-id – 25.07.2016

Hönig, H. G. 1988: Wissen Ubersetzer eigentlich, was sie tun? *Lebende Sprachen, 33*(1), 10–14.

Irishkanova, K., Röcklinsberg, Ozolina, O., & Zaharia, J. A. 2004: Empathy as part of intercultural mediation. In G. Zarate (Ed.), *Cultural mediation in language learning and teaching* (pp. 101–131). Strasbourg: European Centre for Modern Languages; Council of Europe Pub.

Katan, D. 2009: Translation as Intercultural Communication. In J. Munday (Ed.), *Routledge Companions. The Routledge Companion to translation studies* (pp. 74–92). London, New York: Routledge.

Kiraly, D. C. 2006: Beyond Social Constructivism: Complexity Theory and Translator Education. *Translation and Interpreting Studies*, *6*(1), 68–86.

Kiraly, D. C. 2013: Towards a View of Translator Competence as an Emergent Phenomenon: Thinking Outside the Box(es) in Translator Education. In D. C. Kiraly, S. Hansen-Schirra, & K. Maksymsk (Eds.), *New Prospects and Perspectives for Educating Language Mediators* (Translationswissenschaft, pp. 197–224). Tübingen: Narr Verlag.

Kiraly, D. C. 2015: Occasioning Translator Competence: Moving Beyond Social ConstructivismToward a Postmodern Alternative to Instructionism. *Translation and Interpreting Studies*, *10*(1), 8–32.

Kiraly, D. C., & Hoffman, S. 2016: Towards a Postpositivist Curriculum Development Model for Translator Education. In D. C. Kiraly (Ed.), *V&R academic. Towards authentic experiential learning in translator education* (pp. 67–88). Göttingen: V & R Unipress; Mainz University Press.

Klimkowski, K. 2015: *Towards a shared curriculum in translator and interpreter education*. *Languages in Contact: vol. 3*. Wrocław, Washington, D.C.: Wydawnictwo Wyższej Szkoły Filologicznej; Polska Akademia Nauk. Oddział; International Communicology Institute.

Kolb, D. A. 1984: *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs: Prentice-Hall.

Lankshear, C., & Knobel, M. 2006: *New Literacies: Everyday Practices and Classroom Learning: Second Edition*. Maidenhead: Open University Press.

Liddicoat, A. J. 2016: Translation as intercultural mediation: Setting the scene. *Perspectives*, *24*(3), 347–353. https://doi.org/10.1080/0907676X.2015.1125934

Małgorzewicz, A. 2014: Językowe i niejęzykowe kompetencje tłumacza: Próba zdefiniowania celów translodydaktyki akademickiej. *Lingwistyka Stosowana*, *11*, 1–10.

Marczak, M. (forthcoming). Concordancer-Enhanced Reflection in Telecollaborative Translation Projects at University Level. *Między oryginałem a przekładem*, *Dydaktyka przekładu*(37), ?-?

Marczak, M. 2016: Students' perspective on Web 2.0-enhanced telecollaboration as added value in translator education. In S. Jager, M. Kurek, & B. O'Rourke (Eds.), *New directions in telecollaborative research and practice. Selected papers from the second conference on telecollaboration in higher education* (pp. 245–252). Dublin: Research-publishing.net. https://doi.org/10.14705/rpnet.2016.telecollab2016.514

Massey, G. 2016: Collaborative feedback flows and how we can learn from them: Investigating a synergetic learning experience in translator education. In D. C.

Kiraly (Ed.), *V&R academic. Towards authentic experiential learning in translator education* (pp. 177–199). Göttingen: V & R Unipress; Mainz University Press.

Newby, D., Allan, R., Fenner, A.-B., Jones, B., Komorowska, H., & Soghikyan, K. 2007: *European Portfolio for Student Teachers of Languages*. Graz: Council of Europe.

Nord, C. 2005: Training functional translators. In M. Tennent (Ed.), *Training for the new millennium. Pedagogies for translation and interpreting* (pp. 209–224). Amsterdam: John Benjamins Publishing Company.

O'Hagan, M. 2011: Community Translation: Translation as a social activity and its possible consequences in the advent of Web 2.0 and beyond. *Linguistica Anverpiensia*. (10), 11–23.

Orozco, M., & Hurtado Albir, A. 2002: *Measuring translation competence acquisition*. Canada: Presses de l'Universite de Montreal.

PACTE. 2003: Building a Translation Competence Model. In F. Alves (Ed.), *Triangulating Translation. Perspectives in Process-Oriented Research* (pp. 1–26). Amsterdam, Philadelphia: John Benjamins Publishing Company.

PACTE. 2005: Investigating translation competence: Conceptual and methodological issues. Übersetzungskompetenz. *Meta*, *50*(2), 609–619.

Piotrowska, M. 2007: *Proces decyzyjny tłumacza: Podstawy metodologii nauczania przekładu pisemnego*. Kraków: Wydawnictwo Naukowe Akademii Pedagogicznej.

Piotrowska, M. 2012: *Kompetencje tłumacza*. Kraków: Tertium.

Pym, A. 2003: *Redefining translation competence in an electronic age: In defence of a minimalist approach*. Canada: Presses de l'Universite de Montreal.

Risku, H. 1998: *Risku, Hanna. 1998. Translatorische Kompetenz.: Risku, H. 1998. Translatorische Kompetenz. Kognitive Grundlagen des Kognitive Grundlagen des Übersetzens als Expertentätigkeit*. Tübingen: Stauffenburg.

Rogers, C. R. 1983: *Freedom to learn for the 80's* ([Rev. ed.] / with special contributions by Julie Ann Allender … [et al.]). Columbus, London: Merrill.

Snell-Hornby, M., Jettmarová, Z., & Kaindl, K. (Eds.). 1995: *Translation as Intercultural Communication: Selected papers from the EST Congress - Prague 1995*. Amsterdam: John Benjamnins Publishing Company.

Summara, D., & Davis, B. 1997: Enactist Theory and Community Learning: Toward a Complexified Understanding of Action Research. *Educational Action Research*, *5*(3), 403–422.

Toury, G. 1984: The Notion of "Native Translator" and Translation Teaching. In W. Wills & G. Thome (Eds.), *Translation Theory and its Implementation in* *the Teaching of Translating and Interpreting* (pp. 186–195). Tübingen: Gunter Narr Verlag.

Vygotsky, L. S. 1978: *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. 1994: Extracts from Thought and Language and Mind in Society. In B. Stierer & J. Maybin (Eds.), *Language, literacy and learning* (pp. 45–58). Clevedon: Multilingual Matters.

Wood, D. J., Bruner, J. S., & Ross, G. 1976: The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, *17*(2), 89–100.

Note: We hereby confirm that the manuscript to be published in the Monograph is our own original work, and it has not been printed before in any other sources.

NETWORK COMMUNICATION AS A MEANS OF IMPROVING THE EFFICIENCY OF TEACHER-STUDENT INTERACTION

Oksana Shelomovska
Dniprovsk State Technical University, Kamianske, Dniprobudivska st.2,
o_nix@ukr.net

Natalia Sorokina
Dnipropetrovsk regional institute of Public Administration
National Academy of Public Administration under the President of Ukraine
Dnipro, Hoholia st., 19, nata.sorik@gmail.com

Maryna Romaniukha, Kostyantin Bohomaz
Dniprovsk State Technical University, Kamianske, Dniprobudivska st.2,
romanuks@ukr.net, socis@i.ua

***Abstract**: The article investigates the scope of use of network communication in higher education of Ukraine. The paper establishes the existing and potential possibilities of network communication tools in increasing the efficiency of interaction between teachers and students. The most common types of network communication used by teachers are determined. The authors highlight the advantages and disadvantages of e-mail, social services, network discussions as means of communication with students. Presented are the goals of the teachers concerning the use of network communication in the educational process, the importance of which is provided for individual student counselling, assessment and commenting on the tasks performed as well as discussion of educational problems. Particular attention is paid to the changing role of scientific and pedagogical staff in the organization of students' educational activities. The research helped establish modes of electronic counselling and discuss the potential of network communication as to controlling and diagnosing students' progress. The best variant of network communication is determined, according to which students take initiative and coordinate with the teacher the means of network communication. There are a number of problems that hinder the development of network communication, the main of which is the passivity of students and the resistance of teachers. The ways of increasing the efficiency of teacher-student interaction via network communication.*

Keywords: network communication, computer communication, network communication tools, e-mail, social networks, forum, blog, wiki, counselling.

INTRODUCTION

The topicality of this research is determined by the fact that in the modern world one of the indicators of success of higher education institutions and teachers is the level of implementation and use of ICTs in education. ICTs are already not only one of a myriad of additional tools for increasing the motivation of students to study, but are becoming an integral part of a holistic educational process, which greatly increases its effectiveness. Most teachers understand that modern information technology is a means of teaching that improves the teaching process, improves its quality and effectiveness, promotes the development of learners' creative abilities, simplifies and automates the processes of control, testing and diagnostics. The special significance of ICT in the educational process lies in the fact that they allow organizing an efficient system of teacher-student communication to exchange educational and methodological literature, solve current organizational issues, pass control tests and check them efficiently in an on-line mode, etc.

1. NETWORK COMMUNICATION AND LEARNING

1.1 Previous research

Network communications are particularly popular due to widespread use of open and distance learning in modern educational space. Interactive network communications provide additional possibilities for simulation of the educational and informational environment where we do not observe teachers transfer information to the audience while students passively perceive, but we see a new way of communicative (individual or group) interaction "teacher-student", "student-student", "teacher-teacher". Through network communication with the teacher, students are involved in the modern educational space of electronic culture and teachers gain new opportunities for the implementation of personality-oriented learning, the formation of cognitive and communicative competences of students: the ability to understand the interlocutor and get involved in a dialogue, participate in the discussion, argue each other' position, etc.

The scientific community has been widely discussing the issue of ICT use in education in the last decade. G.Siemens quite sensibly states that former educational theories, mainly behaviorism, cognitivism, and constructivism were overshadowed by a new one – the connectivist theory, due to profound changes brought in by new technologies (Siemens).

The principles of connectivism are well known:

- learning and knowledge rests in diversity of opinions;
- learning is a process of connecting specialized nodes or information sources;
- learning may reside in non-human appliances;
- capacity to know more is more critical than what is currently known;
- nurturing and maintaining connections is needed to facilitate continual learning;
- ability to see connections between fields, ideas, and concepts is a core skill;
- currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities;
- decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Connectivism is the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to contrast and traverse those networks. …there is no real concept of transferring knowledge, making knowledge or building knowledge. Rather, the activities we undertake when we conduct practices in order to learn are like growing and developing ourselves and our society in certain (connected) ways (Downes 2012).

With the changes in the way knowledge is received many scientists discuss problems of improving the quality of higher education through the use of information and communication technologies in the educational process, in particular: N.Apatova, V. Bevz, V. Bykov, I. Bulakh, A. Verlan, V. Gabrusev, O. Goncharova, Yu. Goroshko, A. Gurzhiy, V. Demyanenko, M. Zhaldak, I. Ivaskiv, V. Klochko, P. Malanyuk, Y. Mashbits, N. Morze, S. Rakov, Yu. Ramsky, I. Robert, V. Rudenko, Z. Seidametova, S. Semerikov, Yu. Trius, T. Cheprasov and others.

Various aspects of establishing an effective communicative interaction between participants in the traditional educational process and distance learning are the subject of research by scholars: V. Bondarenko, N. Volkova, E. Vernich, I. Voznia, L. Gorodenko, V. Hrytsenko, S. Druzhilov, V. Kolos, S. Kudryavtseva, B. Kuzikova, A. Kupenko, V. Kukharenko, T. Lavryk, V. Lyubchak, N. Moulina, E. Polat, M. Rudenko, T. Sviridenko, V. Soldatkin, G. Yatsenko.

V. Shcherbyna, L. Filippova, O. Oliynyk, O. Ryazantseva, P. Gurevich, M. Kademiya took special interest in the study of network communications between the subjects of educational process (Shcherbyna 2014).

Key types of communication for the distance education system are thoroughly analysed by L. Filipova and O. Oliynyk, who note that interaction as one of the leading functions of distance learning is represented by dialog form of communication between students and the teacher. It is the interaction that distinguishes teaching from simple dissemination of information, because in such a process teachers use their skills to help each individual student to turn information into personal knowledge. Scientists emphasize that interaction is important and necessary for any educational model; simultaneously they are recognized as key for distance education models, which they are represented through content and modes of learning in the form of indirect and direct models. Modern Internet network tools create a new educational and communicative environment for distant education models, in which the content remains unchanged, while communication forms of education are new (Filipova, Oliinyk 2013).

O. Ryazantseva carried out comprehensive research into the teacher's skills necessary for a successful communicative interaction with learners. The researcher states that any educational. process build up on top of communication, since the education of the individual is carried out only in a communicative environment. The instructor should be aware that the main responsibility for the success process. In particular, V. Shcherbyna, leaning on the results of a special sociological study on the use of computer technologies in education, suggested that teachers attach more value to live discussion as an educational tool than students. It is important for our work to conclude that there is a distinct line dividing teachers who use ICTs massively and those ones who are indifferent (of communication lies with him as a specialist who can and must find a way out of any communicative situation. The information society dictates the new role of teachers and requires dynamic adaptation to the specifics of the system, which is due to the indirect interaction of participants of the learning process (Riazantseva 2016).

The processes of the introduction of interactive learning technologies, based on the use of ICT technologies and networks, as well as barriers along the way were explored by Gurevich and M. Kademiya. These technologies included e-mail, forum, chat, videoconferencing, project technology, web quest, blog, blog quest, analysed their influence on the nature of students' educational and cognitive activity and their inclusion in the process of cognition. The authors proved that the systematic application of these technologies in the educational process greatly improves the quality of professional training of future specialists in higher educational institutions (Hurevych, Kademiia 2014).

Noskova and Pavlova stress the need for profound changes in teachers' work, as to the following basic concepts e-enhanced educational interaction: social information (development of the electronic resources of the educational environment), communication (in the "activity key" solutions various classes of educational tasks), management of educational activities (multidimensional feedbacks based on telecommunications). New educational efficiency can be achieved with purposeful systemic changes in these fields of networked educational environment.

1.3 Research objective

However, despite the relatively close interest of academic community in the role of ICTs in modern education, scholars tend to focus on the advantages and disadvantages of using ICT in the student's learning process. At the same time, there still remains a lot to be discussed as to the possibilities of using network communication as a means to improve the teacher-student interaction and we can state the fact of insufficient attention of modern researchers to this topic. All this suggests that the study of existing and potential opportunities of network communication in the environment of higher education potentially reveals new perspectives in raising the quality of higher education and integrating Ukraine into the world of scientific and educational space.

1.2 Specifics of network communication

Before we dwell on the peculiarities of network communication, it should be noted that vocational and pedagogical communication is implemented as a system of various direct and indirect connections between learners and teachers. The leading subject of vocational and pedagogical communication is the teacher, whose professional and communicative activity should be aimed at fulfilling the social order - the formation of harmoniously developed personality. Communication (or interaction) in pedagogical processes covers three interrelated aspects: communicative (information exchange between people); interactive (organization of interaction between people); perceptive (involves the process of perceiving each other as communication partners and achieving mutual understanding).

Types of pedagogical communication are:

- verbal communication - the process of exchange of information through the language (oral, written, internal), which takes place under its internal rules, requires active mental activity and is based on a certain system of established norms;

- non-verbal communication - the process of information exchange by means of non-native communications for the transmission of messages;

- computer communication - the process of information exchange between subjects through verbal and nonverbal communicative systems, mediated by computer means of communication (e-mail, teleconferencing, web conferencing, chat, forum). It is computer or network communication that is a typical example of mediated professional and pedagogical communication, which involves communication between a teacher and students (the system "man - computer - man") with the help of special technical means (CDs, computer networks, audio-visual form, videoconferences, etc.) (Volkova 2006).

Implementation and active use of network communications is one of the main principles of constructing a virtual educational environment, which has recently become more widespread. Among other things, the main features of this environment include:

- support of collective and individual trajectories of training;
- encouragement of students' project activity;
- classes in interactive and distance learning modes;
- maintenance of various forms of network interaction;
- provision of tools for electronic educational resources.

The toolkit of computer communications is a global Internet and Internet broadcasting network, e-mail, electronic conferencing, videoconferences, etc. These tools help educators and students share information, interact in solving common problems, publish their ideas and comments, participate in solving problems and discuss them, create collaborative projects, and just chat with friends and colleagues.

These new opportunities also create new patterns of communication (or interaction) and their perspectives. Teachers can manage the curriculum by creating or using different "social and intellectual spaces" on the network. For example, L. Harasim of the Simon Fraser University in Canada began to apply online training in 1985. To this end, she developed a communication online structure using the following types of "spaces": a relief zone; Library area; Virtual student cafe; Workshop area; Discussion area; Conference area This combination of training zones encourages students to study and helps create a virtual society that unites teachers and students for a certain period of study. Often, such contacts are not reminiscent of conferences because they extend over a longer period of communication and have a more complex structure.

In addition, these new technologies enable teachers, students and university staff to make business contacts in online mode (university admission, tuition, registration), as well as many other student life issues. Often communication tools act as an e-learning agent, linking learning groups and creative teams to each other. The speed and quality of network communications often correspond to the quality of educational tasks performed. According to experts, soon all the questions of student life and study will be presented on the Internet as a separate zone of "social spaces". American teachers are convinced that they are already "infonauts" (employees of the information age) (Filipova, Oliinyk 2013).

There are currently four types of computer-aided communication on the Internet:

- the first kind is an asynchronous communication between two communicators in the e-mail mode (e-mail). It characterizes the use of electronic communication channels for the transmission of information between users remote to each other who at the moment may not be present on the Internet;

- the second is a connection between many users of electronic subscriptions through special programs – litservers, usenet, electronic bulletin boards. In this case, the user orders the service or subscribes to the program which sends him a message from a certain group, most often - on a specific topic;

- the relations of the third type are built in the search mode of the site in order to obtain asynchronous information, which serves as the basis of people's relations. The sites can be used in the format of FTR (file transfer protocol - rules for transferring files to the Web), in the form of websites, Gopher (system for searching information on the Internet);

- synchronous communication is the fourth kind of Internet communications. It is one-on-one communication, communication with multiple or many users. An example is the programs of network computer games, chats, social networks (Sharkov 2012).

1.3 Sociological survey on student ICT use for learning

To analyse the current state of network teacher-student communication we will use the results of a sociological survey conducted in 2015 at the Dniprovsk State Technical University. It was intended to reveal the scope of use of ICTs in various areas of teaching activity. This study was carried out within the framework of the international project "International Research Network for studying and developing new tools and methods for advanced pedagogical science in the field of ICT tools, e-learning and intercultural competences". The project is funded by the European Commission under the 7th Framework Program within the Marie Curie Actions International Research Staff Exchange Scheme. According to its characteristics, DDTU is the average university of Ukraine, which suggests the possibility of applying the results of research to a wide range of technical universities in Ukraine.

The sociological survey was conducted using a specially designed toolkit, by which the teachers and heads of the structural units of the DSTU were interviewed through an electronic questionnaire. The survey was attended by 53 university staff members, of which 89% are scientific and pedagogical staff (59% associate professors, 26% teachers, 4% professors) and 11% - the heads of structural units. The empirical basis of the study makes it possible to draw some conclusions about the peculiarities of the use of ICT in teaching.

In particular, it was found that the most common type of network communication, which almost 44% of professors use in their professional activities is the exchange of messages (Figure 1). Presently e-mail really became an integral part of teacher-student interaction, because with its help they can freely transfer organizational and educational information, send educational materials and tasks, as well as review them and consult. E-mail, thus, allows learning to be targeted and individualized. The main advantage of this means of communication lies in its simplicity and reliability. The delivery of any message and educational materials by e-mail is practically instantaneous, thus providing regular timely communication between the subjects of educational process. E-mail is an effective technology that can also be used in day-to-day training for the delivery of educational literature and counselling. In contrast to mobile communication, where there isn't always access to the subscriber and where student can forget the received oral message, the e-mail message is stored indefinitely and serves as a permanent reminder of the required action or response to the information received (Barvinok).

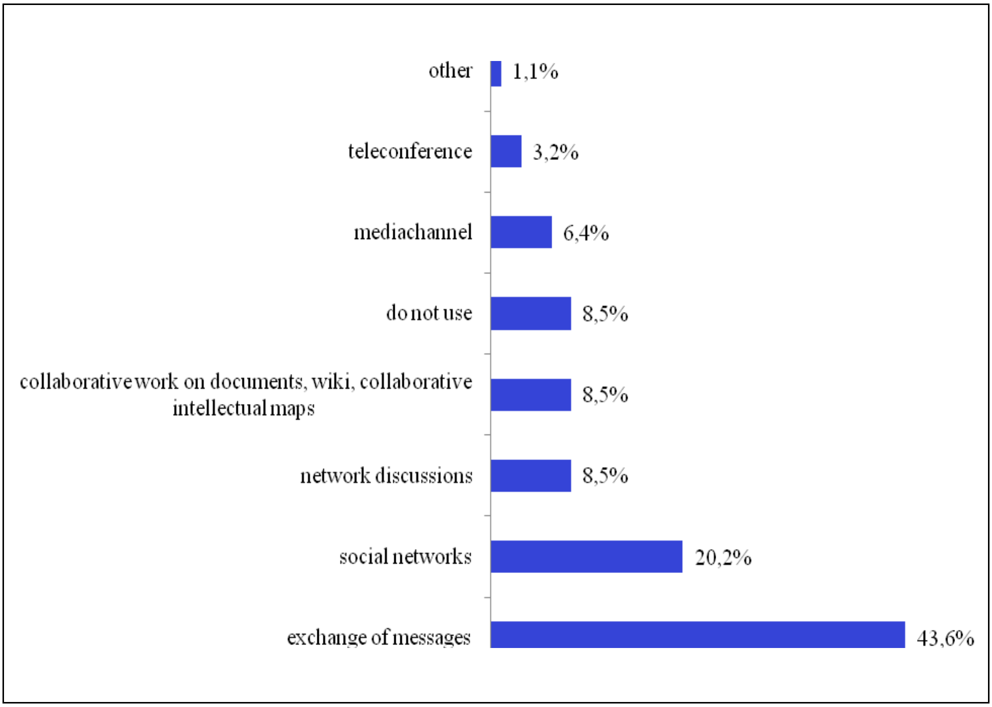

Figure 1. Kinds of network communication, used by the professors in teaching courses

Source: Own Work

Along with traditional e-mail, network-based means of interaction between teachers and students can also be used for various social services on the Internet (social networks, blogs, forums), which, unlike the mail, are more open, here we mean the absence of any restrictions or prohibitions. According to the results of our study, every fifth teacher uses social networks as a means of Internet communication with students. 8.5% of teachers create network discussions and use collective work on documents, wiki, collective, intellectual maps. The least common types of network communication were media channels (6.4%) and teleconferencing (3.2%).

From the results of research on the use of social services in education in the United States it was concluded that first-year students who study using ICTs and especially social networks are more successful in learning than full-time students (Barnes). Currently, many university accounts are registered in different countries, where academic staff and students, independently or collaboratively, create educational content, which in turn stimulates independent cognitive activity in others. In Ukraine the practice of using social networks for educational purposes is rapidly gaining in popularity. Their advantages in this context include the possibility of informal communication between the teacher and the student, since in a social network the teacher becomes an assistant, a friend and a mentor. Social networks ensure the continuity of student-teacher interaction. In a class learners and professors meet once or twice a week, while via social networks this can happen at least daily. The educational process does not necessarily stop because of student's or teacher's illness. It is possible to carry out the learning process in on-line mode. Continuous interaction of students and teachers in the network (at the time convenient for them) ensures continuity of the educational process.

The advantages of social networks as to improving the efficiency of teacher-student interaction lie in the fact that they represent a familiar environment for the students where they spend most of their time. They have a simple user interface; they incorporate many additional services that can be used to create their own educational content. All this allows you to save time bypassing the stage of adaptation of students to the new communicative space. This, in turn, contributes to improving students' interest in a particular subject. For a modern generation Z it is more interesting to search and learn educational material not in printed form, but through the Internet. It becomes possible to create educational content in collaboration (learner and teacher). Instead of simply consuming information, learners create messages, discussions and other resources. All this contributes to the enhancement of the communicative relationship between students, strengthens the student community, which learns to organize their own work outside the classroom. Social networks have the advantage from an economic point of view, because this service is free, which does not require expensive software for data storage (Kuchakovska 2014).

The use of social networks as a communication platform allows to organize independent work of students in extra-curricular time. After all, methodically correct and purposeful involvement of online services in the educational process potentially promotes self-regulated self-study, since learning through electronic social networks is an active, dynamic process, initiated and managed by the students themselves. In addition, the use of network technology services as a modern educational tool improves the quality of educational process, promotes formation of media literacy in learners, which allows to quickly respond to the new requirements of the information society (Shulska 2017).

By using social networks as a means of learning, students acquire skills that are incited by the challenges of the 21st century, namely, mastering the means and modes of communication with other people, the ability to correctly and creatively use data to solve problems. The social network allows the teacher to understand their interests' personality deeper through their interests, activities and communities. This empowers the teachers to offer students the kind of information, topics or tasks that should interest them.

Openness of network communication can have both positive and negative impact on the interaction process. It is believed that social networks distract from the initial process and cannot become an additional pedagogical tool, since it is traditionally a virtual environment to spend free time. The main problems associated with the introduction of social networks in the educational process are permanent connection to the network, compliance with the etiquette of communication among participants, failure to constantly monitor the use of social networks for educational purposes, etc. In addition, the teacher will not always be able to check the credibility of the educational materials that students download (Kuchakovska 2015).

Besides, a somewhat common problem of all network communications is the lack of space-time limits in this process – a message can be sent at any time interval (on business days and on weekends, during the day and at night, after a specified period). In these circumstances, it is important for teachers to monitor and track the time when messages arrive, while for the students to limit their communication with professor by working hours. All this requires from all participants the skills of self-organization and self-management. Teachers are advised to develop a personalized timetable to deal with incoming messages (Strekalova 2016).

1.4 Instruments for networked communication

Currently, there is an increasing interest of professors in blogs where we can find short notes to quickly upload educational information and research results. A blog (weblog) is defined as a personal network journal, which regularly adds notes containing text, images and multimedia. It is designed to express the views of the blog's author and hold a discussion of the author with its readers. The blog may be open for feedback and questions or it can also be closed. In the context of education blogs can be used, on one hand, as teacher notebooks that empower students to discuss news related to learning, publish materials that contain additional information beyond the scope of the training course, present their opinion on the development of technology and science related to the training course, and on the other hand, a blog can be a students' notebook where they can describe the learning process, share experiences and impressions with their friends or groupmates. This type of communication provides the opportunity for the participants to express their thoughts on different topics, which undoubtedly contributes to the learning and development of students, as well as the development and improvement of teachers.

A forum is one of the most accessible and yet effective means of remote communication, which is a means of network communication via text messages between students and teachers in the mode "everyone to all" or "all with all" in real or delayed time. Traditionally, the forum is implemented as a component of the informational and educational environment and it is its separate service; you can also consider the forum as an electronic educational resource that serves to provide communication activities within the course curriculum and is an integral part of the e-learning syllabus. In general, the Web forum provides structuring of information, which greatly facilitates students' search and access to information, lets draw a dividing line between studying discussions from other kinds; it allows to store information and discussions for a long time, enabling new students to familiarize themselves with the experience of the past; forum frees the teacher from answering questions that he answered in the previous training cycle; it gives the participants a sense of equality in the educational process - both the teacher and the student can initiate a discussion to discuss issues of interest to them (Holoshchuk, Dumanskyi, Sierov 2008).

Research has shown that even a small period of study in group mode greatly enhances the efficiency of distance learning. The development and increasing access to telecommunication facilities promotes the dissemination of such methods of distance education that involve working in groups. To date, little has been done to systematize the possibilities of interpersonal interaction of students in the remote mode of work. Learning in groups is especially beneficial - it reduces the isolation of students inherent in distance education and open ways to help students with instructions and tasks. Learning in groups is a way to overcome the isolation of a distance student (Riazantseva 2016).

As a medium to work with texts one can use wiki-sites. Wiki is a system that provides linking text pages with each other and the ability to organize users to create new ones or to edit existing pages of other people. The benefits of wiki-sites (for example, wikipedia) consist in a large number of unadapted texts on various topics, the ability to jointly edit almost any page, with the exception of the main and official pages, the simplicity of registration and the creation of personal pages in the wiki system, the creation of a system of "internal" links, the ability to view the history of changes and return to previous versions of the page. However, the disadvantage is that several users cannot edit a single page at a time. But this disadvantage can be turned by a teacher into an additional pedagogical tool for developing student competences, such as the ability to negotiate, to develop a unified strategy of action, the ability to work according to guidelines. The opportunity to discuss articles allows to organize work aimed at developing the skills of critical thinking, while the structuring of similar articles on topics, the launching of general categories of articles on wiki-site extends the field of teacher's help – aiding students to deeply understand the essence of the concepts considered, to find the core ideas, analogies, to generalize, draw conceptual connections.

With the use of e-mail and social services as a means of communicating with students, it should be noted that the instructor must have excellent skills of professional written communication. By entering into a dialogue with a person via email in asynchronous or synchronous mode, participating in various thematic teleconferences, the teachers, through their written communication, demonstrate their own level of knowledge, culture, reveal their spiritual world. Thus, the efficiency of communication, its educational, upbringing and development potential depends on teachers' vocabulary scope, literary skills, the ability to choose appropriate functional styles, proper language and speech means in accordance with the requirements of the statement (Riazantseva 2016).

According to K. Gilyarova, within electronic teacher-student communication the style of their messages is almost the same. Both teachers and students can be adherents of the literary language, as well as they both can opt for colloquial register and network jargon. The language of the letters is more likely to correlate more with the age of the one who writes and the skills of Internet use rather than with their professional status. Young teachers keep their youthful style while e-mails of middle-aged and elderly teachers are close in their characteristics to paper letters. The most annoying excuses in the letters of the students are the absence of uppercase letters, paragraphs and punctuation, the lack of proper address, greeting and signature (which at some points leads to anonymity), the absence of an accompanying letter when sending files or confirmation at receiving, abundance of spelling mistakes and typos, too many Emoticons (smileys). At the same time, the use of spoken language and even slang vocabulary does not incite complaints. Many teachers complained about familiarity and ignorance (Hyliarova 2011).

According to a study held by the European Commission to identify new ways of obtaining education and training in Europe in 2020-2030, the experts forecast the following trends:

• open learning through the Internet will become a traditional form of education;

• mobile Internet devices will become the main tools for learning;

• paper books will be replaced by electronic multimedia content;

• multi-user virtual worlds will make physical visits to schools and universities unnecessary;

• open educational resources will be widely used by all subjects of the educational process;

• the community will not rely on experts as to the quality of knowledge and training programs, but will move towards quality knowledge, verified through Internet resources;

• systems and services will be developed to provide group mutual learning among interested teachers and students;

• blogs and other multimedia materials posted on the Internet will be recognized as "legitimate" publications for scientists;

• virtual mobility will break the barriers between national education systems;

• personal learning environments will replace existing virtual learning environments, etc. (Osvita u Yevropi).

In this context, it should be noted that the high rates of use of messaging services and social networks in the modern Ukrainian educational space are reflecting the goals of teachers regarding the use of network communication in the educational process. In particular, based on the analysis of the results of the aforementioned sociological survey, it has been established that for now more than a third of teachers of DSTU (35.3%) use network communication tools for individual student counselling (Fig. 2). At the same time, 30.3% of the interviewed staff of DSTU noted that they use network communication to check and comment on the tasks performed. Indeed, e-mail and social networks are the most convenient ICTs to achieve these goals. Discussion of educational issues, online discussions (we can assume that it is via Skype, forums, blogs, media channels), unfortunately, are not yet widely spread, since only 12.6% of teachers are pursuing this goal. At the same time, 7.6% professors use Internet technologies to attract students for peer-to-peer evaluation and 5.9% do so to create a network community of educational or scientific nature.

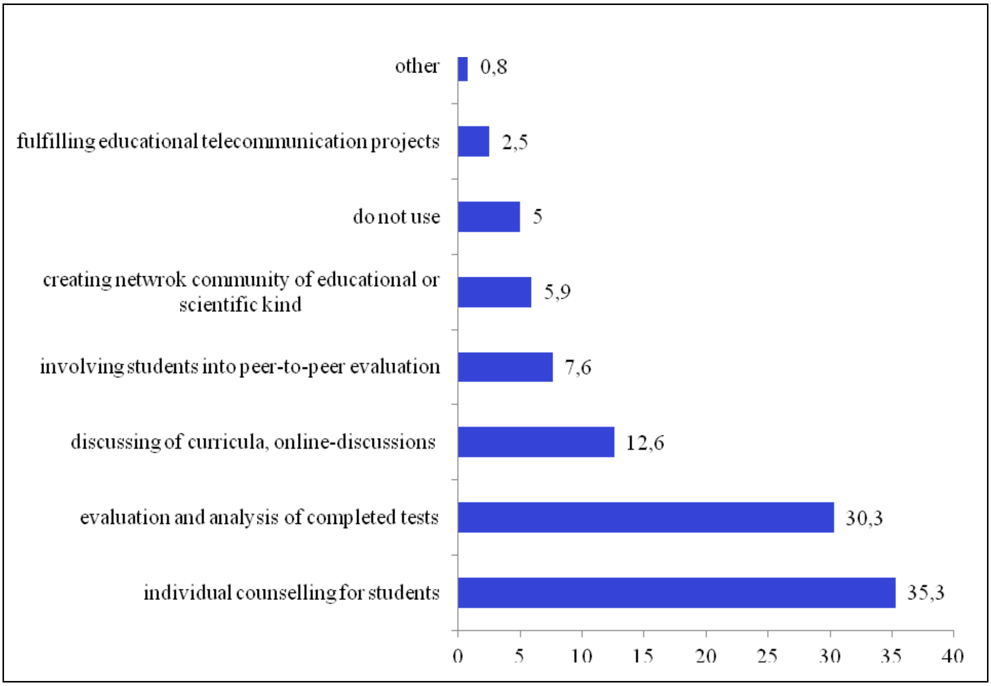

Figure 2. Goals of network communication in teachers' communication

Source: Own Work

Today, the role of the teaching staff in organizing the student's educational activities requires to be reconsidered. Instead of broadcasting educational information during lectures and consolidating the theoretical knowledge on practical classes, the teacher's primary task is to organize methodical support for the student's independent work on the course and to evaluate the results of this activity. In essence, there is a shift in the role of a teacher from a person who gives knowledge in the finished form to a consultant who directs the development of the students' personality in the proper way for them to obtain effective educational and professional results. The teacher is to solve the tasks of professional and personal development of students in a new working mode of a consultant. Owing to the possibility of electronic counselling, students not only gain deeper knowledge of the course, but they also become more motivated to study and more focused to study this exact course, students develop computer-mediated communicative skills and skills of independent learning within the taught course. E-Counselling helps to develop initiative, creative approach to solving communication tasks via e-mail - students themselves initiate counselling, offer possible solutions to educational problems and tasks, as well as to tasks that arise in the process of mediated communication (Blahovysnaia, 2010).

N. Morze, considering the ways of using ICTs for learning, notes that the teacher ceases to be the sole source of information for the student. At the same time, the emphasis shifts from the formation of reproductive skills such as memorization and reproduction, to the development of analytical skills based on comparison, synthesis, analysis, evaluation of identified relations, planning of ICT-aided group interaction (Morze, 2011).

At the same time, triggered by the shortage of class hours, the problem of objective student assessment gets even worse and the diagnostic function of the teacher gains paramount importance in organizing the students' educational activities. Due to the use of information technologies, the diagnostic function of control and evaluation of knowledge becomes more complete and more comprehensive as to the information diagnosed (for example, a review of activity on the website, calculating the total average score for each student and academic group, etc.). Due to its technical capabilities, ICTs help to systematize, rank and correlate evaluation information (for example, the choice of the assessment scale). With the help of network communication it is possible to organize multiple assessment of learning - operational control in tests, remote assessment for distance learning, when the student responds by e-mail. With the help of email, any student action is boosted, his mood is supported through encouraging, friendly comments and instructions for further actions. The interactive dialogue activates educational, cognitive and speech-thinking activity as a result of multimodal presentation of information.

It should be noted that the practice of using network communication in Ukrainian universities is gaining in popularity, but the scope of its use depends mainly on the subjects of learning. Teachers, on one hand, understand the benefits of computer communication and send e-mails or other messages to students with course materials and tests, and on the other hand - teachers of humanities consider it a disadvantage that they cannot always determine the level of students' mastering a certain topic or course without personal communication with them in the classroom. Of course, Skype-communication and video conferencing can help in this matter; however, not all lecturers can access these tools during their working hours. In turn, students who, for good reason, did not attend training sessions, use network communication to get acquainted with the materials that were discussed at classes, fulfil certain control task, such as an essay or abstract. But, given that teachers cannot control the autonomy of this work, computer communication triggers students' plagiarism in the network.

In general, characterizing the current state of network communication between the teacher and the students, let us note that most of the teachers (37.8%) indicate that the best option for network communication is when students demonstrate initiative and agree with the teachers on the ways of network communication. In contrast, 29.7% of teachers point out that it is best to offer all students the only means of communication, as it lets them stay to objective to learning and evaluating the results of all students without exception. In this case, every fourth teacher prefers giving students the choice of network communication tools - either with a teacher individually or in a joint group with all students who are attending a course.

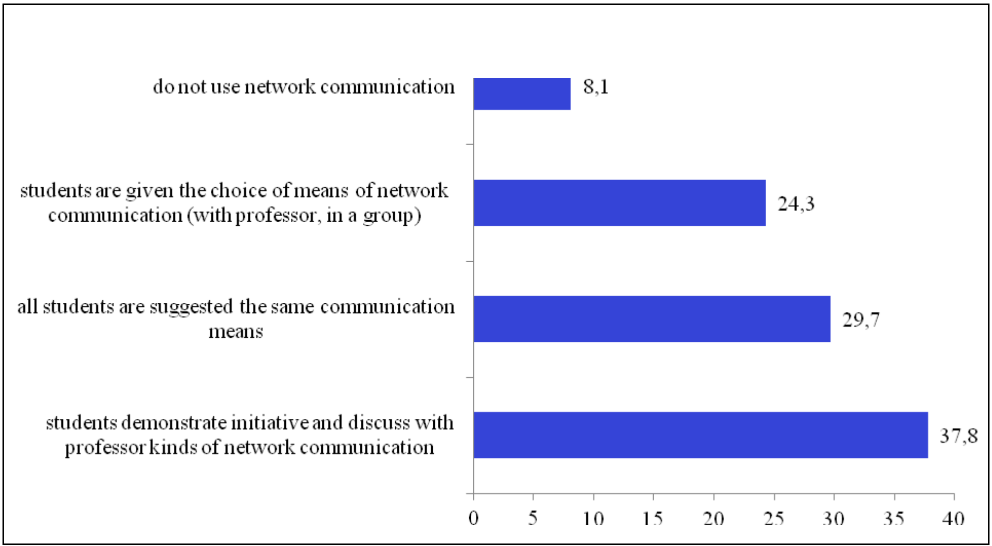

Figure 3. Preferred mode of network communication with students for the learning purposes

Source: Own Work

Currently, one of the most important pedagogical problems is student passivity in communication, lack of skills for constructive dialogue with a teacher, inability to fully demonstrate their abilities and creative initiative. It is highly likely one of the most relevant and at the same time the most difficult pedagogical tasks to form the abilities that allow the student to capture non-obvious associations, to produce non-standard ideas and solve problems. Objectively, such emancipation of thinking may become possible due to the complex properties of the informational educational environment, which allows the student, in collaboration with the teacher, to design an individual educational trajectory, selecting the most suitable training schedule, information resources, and, finally, teaching methods. Subjectively, the most important role here is played by the chance of self-expression for everyone, when the teacher and students do not make hasty conclusions and superficial judgments, but open the way for initiative. In an asynchronous environment, by emailing the teacher or participating in an e-conference, each student, even shy or reserved, has the opportunity to present his point of view on a problem that runs counter to the generally accepted. The students' personal Web pages serve the same purpose, since they allow the author to demonstrate original thinking in the very conceptual structure of the page, its content and design (Zakharova 2010).

The success of educational and search-and-productive activities is the main factor in the personal growth of an active student, who exhibits reflexivity, initiative, a sense of personal worth and dignity, the ability to self-control, which supports conscious self-regulation. At the same time, new needs for self-change are developing. There is a breakdown in the stereotype of the relationship between the teacher and the student: a teacher shifts away from the rank of mentor or "omnipotent oracle" and becomes the leader, consultant for the collaborative activity, while the student, feeling the support and trust of the elder, shows true interest and initiative in interacting with teacher.

In conclusion, we would like to address the topic of the readiness of teachers and students to use the means of network communication to communicate with each other, which is rapidly gaining special significance. The lack of skills to use modern network computer communications manifests itself in the relative passivity of participants in the learning process, inability to express their own opinion accurately and correctly, inability to use modern means of communication for obtaining consultations and protect the work done in unusual conditions of interaction. In order to improve the efficiency of interaction between teachers and students via network communication, subjects of the educational process should above all be prepared for a very intensive exchange of information through the channels "teacher - teacher", "teacher - student" and "student - student". The teacher, in turn, should have a high level of ICT competence and be an internally well-organized person capable of preparing all the necessary components of the network course in advance, developing a clear calendar of events during the course and all types of reporting on the training tasks. The special role of the teacher in terms of network communication is that he must be able to work with virtual students, who he might not see, sometimes, even during the entire period of study. On the one hand, he should actively stimulate and encourage the joint work of students when performing academic tasks with the help of network technologies, and on the other hand, actively inform students about their current academic performance, test results and control tasks with the help of network technologies.

CONCLUSION

Thus, as a result of studying the possibilities of network communication as a way of improving teacher-student interaction it has been established that the most common types of network communication used by teachers are the exchange of messages and social networks. The benefits of email are their anonymity and the ease and speed of sending, as well as widespread and affordable means of communication. The main goals of communication for the teacher are individual student counselling, evaluation of knowledge and commentary on the tasks performed. At the same time, teachers' preferred options of network communication with the student is when students take initiative and coordinate with the teachers the ways of network communication in order to provide all students a single communication means. In general, we can say that network communication provides free access to course materials, facilitates the development of communication skills of teachers and students that are implemented in forums, webinars, chat rooms while discussing educational issues. It is the most effective means of interactive and delayed counselling for students in the information society.

The authors see the prospects for further research into issues of ICT use in teaching in the analysis of the potential of social networks as a means of communication between teachers and students.

ACKNOWLEDGMENTS:

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Barnes N. *Social Media Adoption Soars as Higher-Ed Experiments and Reevaluates Its Use of New Communications Tools* / N. Barnes, A. Lescault. [online] at http://sncr.org/sites/default/files/higherEd.pdf (accessed 15 May 2017)

Barvinok, M.V. *Using e-mail in distance education* [online] at http://informatika.udpu.org.ua/?page_id=1753, (accessed 15 May 2017) [In Ukrainian]

Blaovisnaya A.N., 2010: *Foregrounding of ICT resource as an impetus for personal and professional growth of university students* // Developing information technologies in education: the use of new-age study materials in educational process In: Proceedings of All-Russian scientific-practical conference, March 23-25 2010, Tomsk / Ministry of Education and Science of Russian Federation [online] at http://ito.edu.ru/2010/Tomsk/IV/IV-0-4.html. (accessed 15 May 2017) [In Russian]

Downes, S. *E-learning 2.0.* eLearn Magazine, October 17 [online]. Available at <http://www.downes.ca/post/31741>. (accessed 1 December 2015).

Education in Europe in 2020-2030. Forecast [online] at http://www.pontydysgu.org/2010/01/crowd-sourcing-the-europeanforesight-study-your=chance-to-be-an-expert/. (accessed 15 May 2017) [In Ukrainian]

Gilyarova K. A., 2011: *Characteristics of Student-Professor E-Mail Communication*. In: Computer Linguistics and Intellectual Technologies: Proceed. Of Annual International Conference «Dialog» (Bekasovo, May 25-29, 2011). Ed. by A. E. Kibrik. Issue 10. Moskva: PH RSYU, 2011, P. 219–248. [In Russian]

Goloshchuk R. O., Dumanskiy N. O., Serov Yu. O., 2008: *Web-communities in distance learning*. Scientific Herald of National Forestry University of Ukraine, 2008, Issue 18.10, P.286—292. [In Ukrainian]

Gurevich R.S., Lademiya M.Yu., 2014: *Modern Interactive Technologies of Teaching Students*. In: Theory and Practice of Administrating Social Systems, 2014 Vol. 4, P. 99-104. [online] at http://nbuv.gov.ua/UJRN/Tipuss_2014_4_14. (accessed 15 May 2017) [In Ukrainian]

Kuchakovska G.A., 2014: *Use of Social Networks for Teaching Students.* In: Scientific Youth - 2014: Proceedings of 2nd Ukrainian Scientific-Practical Conference of Young Scientists (Dec. 11 2014). Kyiv: Institute of Information Technologies and Study Means of NAPS of Ukraine, 2014, P. 43–45. [In Ukrainian]

Kuchakovska G.A., 2015: *The Role of Social Networks in Improving the Learning Process of Informatics Courses by Future Primary School Teachers*. In: Information Technologies and Means of Study, 2015, Vol. 47, Issue 3, P. 136-149. [In Ukrainian]

Morze N.V. 2011: *Distance Technology as a Foundation or Modern Information Technologies in Education.* In: New Educational Technologies : Collection of Scientific Papers, Vinnitsa: Academy of Pedagogical Sciences of Ukraine; Vinnitsa Social-Economical Institute of the University «Ukraine», 2011, Issue 30, P.32-42 [In Ukrainian]

Noskova, T.N., Pavlova T.B. *Pedagogical support for student in university learning network environment* [online]. Available at <http://portalsga.ru/data/2494.pdf>. Accessed 15 June 2017).

Philipova, L., Oliynik O., 2013: *Conceptual Foundations of Distance Learning in a Foreign University Educational Space: Communication Aspect*. In: Herals of Kharkiv State Academy of Culture, 2013, Issue 40, P. 86-96. [In Ukrainian]

Ryazantseva, O.V., 2013: *Specificity of Pedagogical Communication in Distance Learning.* In: Pedagogy and Psychology, 2013, Issue 43, P. 41-48. [In Ukrainian]

Ryazantseva, O.V., 2016: *The Skills of the Teacher of Distance Learning System Necessary for Successful Communication with the Participants of the*

Educational Process. In «Young Scientist», 2016, Vol. 12.1 (40), P. 531–535. [In Ukrainian]

Sharkov, F. I., 2012: *Interactive Electronic Communications (The Emergence of the Fourth Wave)*: Tutorial, 2nd ed-n, M. : Publishing-commercial corporation «Dashkov and C°», 2012, 260 p. [In Russian]

Shcherbina, V.L., 2014: *Socio-Psychological Factors of the Information Environment Development in Higher Educational Institutions of Ukraine*. In: Technologies for the development of intelligence, 2014, Vol. 1, № 6 [online] at http://psytir.org.ua/index.php/technology_intellect_develop/article/view/116. (accessed 15 May 2017) [In Ukrainian]

Shulska, N.M., Matviychuk N.M., 2017: *Social Networks as an Effective Environment for Teacher-Student Communication in the Educational Process*. In: Information Technologies and Means of Education, 2017, Vol. 58, Issue 2, P. 155-168. [In Ukrainian]

Siemens, G. *Connectivism: A Learning Theory for the Digital Age.* [online] Available at <http://www.connectivism.ca>. (Accessed 1 December 2015).

Strekalkova, N.B., 2016: *Network Communications in Modern Education.* In: Pedagogical Experience: Theory, Methodology, Practice: Proceedings of 6th Internat. Scient.–Pract. Conf. (Cheboksary, Febr. 19 2016)/ Ed. board O. N. Shirokov [et al.], Cheboksary: CSR «Interactiv plus», 2016, № 1 (6), P. 116–117, ISSN 2412-0529. [In Russian]

Volkova N.P., 2006: *Professional-Pedagogical Communication* / Teaching Aid. K.: PH «Academia», 2006, 256 p. [In Ukrainian]

Zakharova I.G., 2010: *Information Technologies in Education* : Teaching Aid for Students of Pedagogical Higher Education Institutions. Moskva: PH «Academia», 2010, 192 p. [In Russian]

HOW TO REDUCE DIFFERENCES BETWEEN REQUIREMENTS OF MODERN LMSS AND THEIR REAL USE

Martin Drlík, Peter Švec, Júlia Tomanová, Martin Cápay
Constantine the Philosopher University in Nitra, Slovakia
Tr. A. Hlinku 1, 949 74 Nitra,
mdrlik@ukf.sk, psvec@ukf.sk, jtomanova@ukf.sk, mcapay@ukf.sk

Abstract: *The paper provides some practical notes based on the real experience and long-term use of the university e-learning portal at the UKF. It summarizes how teachers use the Moodle and summarizes the steps and gives several recommendations, which should be led by the university management with the aim to engage the teachers in implementing new features of LMS Moodle to the learning process and encouraging students to be more active in the virtual environment.*

Keywords: e-learning, virtual learning environment, Moodle, advanced features.

INTRODUCTION

The paper tries to contribute to the debate about the features, which should be provided by contemporary LMS to be more useful for all stakeholders. The authors try to summarize the steps and describe processes, which should be led by the university management with the aim to engage the teachers in implementing new features of Moodle to the learning process and encouraging students to be more active in the virtual environment.

The rest of the paper is as follows. The first section introduces the main requirements to modern LMS and characterizes the expectations of the LMS stakeholders. At the same time, it provides a short discussion on how the current version of LMS Moodle meets the requirements to modern LMSs. The next section adds some practical notes based on the real experience of the authors and long-term use of the university e-learning portal at the UKF.

Finally, the discussion section is focused on the issues, which prevents the wider use of new features of the LMS Moodle and its applications. At the same time, this section provides several suggestions, which the administrators of the e-learning system, as well as management of the university, should implement to utilize the LMS Moodle features, engage the teachers in implementing new features of Moodle into their e-learning courses, and encouraging students to be more active in on-line environment and prepare themselves to the era of MOOCs and lifelong learning.

1. REQUIREMENTS TO MODERN LMS

The second decade of the 21st century reaches its halfway point, and the requirements to the modern LMSs have markedly changed in comparison to the previous decades. Contemporary LMSs should be optimized to provide (Skalka et al. 2012; www.canvaslms.com, 2017):

- Self-directed learning
- Individual learning paths
- Learner-generated multimedia content
- Simple and intuitive GUI
- Availability anywhere, anytime, with any device
- Closer interconnection to the social networks
- Targeted tailor-made solutions
- Distributed and easily maintainable Cloud solutions
- Standardized integration using APIs
- Robust learning analytics

These requirements should be a part of the decision process, in which the university management tries to improve the effectiveness and quality of the education process. If the management considers the current state of the LMS Moodle deployment, it should consider not only the range of the provided features, but also their real use in the e-learning courses, the number of users, who have a real experience with these features, availability of the best practices and sufficient support and documentation. Modern LMSs prefer the simplicity and intuitiveness against features. Therefore, choosing and mainly effective using of LMS is not just about features. It's about asking the right questions and getting the right answers. The following questions can help to consider if the used LMS still provides a concurrent advantage and is prepared for the rapidly changing e-learning environment (www.canvaslms.com, 2017):

- Is it easy to use?
- Does it do what the teachers and students need it to?

- Does it provide easy mobile access?
- Is it dependable?
- Does it make teachers/admins jobs easier?
- Does it save time?
- Will it adapt to the institutional needs?
- How much can it be characterized as open, customizable, pedagogically flexible and support?
- Does it provide a reliable and modern architecture focused on speed, availability, security, scalability, and low-risk?

2. LESSON LEARNT FROM THE UKF E-LEARNING PORTAL

The e-learning portal at the UKF has celebrated ten years of its deployment on the university level. It can be used as an example of the case study, and the results will be used in the next section, in the discussion about the requirements, which should modern university e-learning solution should meet in order to satisfy all stakeholders' needs.

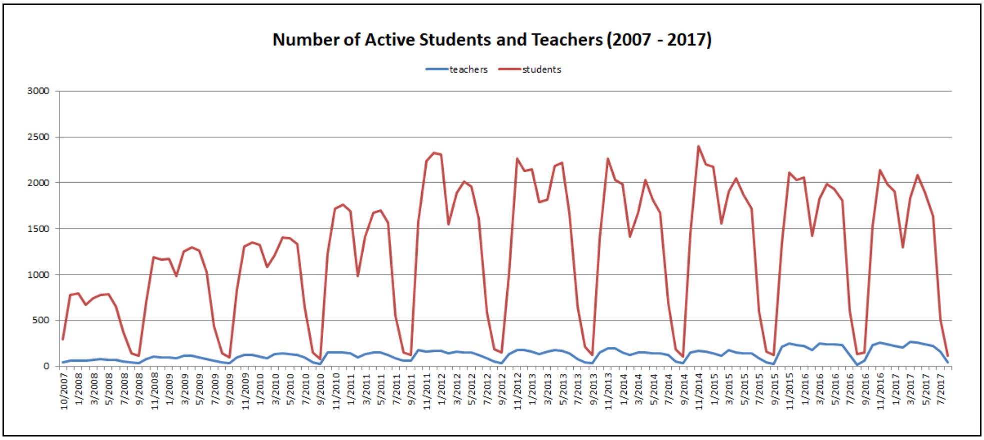

Figure 1. The number of unique active students and teachers per month during ten years.

Source: *Own Work, edu.ukf.sk*

The number of users is the first indicator, which provides the evidence of real use and usefulness of the e-learning system at the university. Figure 1 shows the number of unique students' and teachers' logins in a given month during the period of ten years. It follows that about 2000 students have logged in the system each month during the last six academic years. More interesting results relate to the number of active teachers. Figure 1 depicts that the number of teachers who use the system is slightly increasing. Actually, the number is about 250 teachers each month during the term. Having considered this, the university is attended by around 8000 students; the regular visit rate of the e-learning portal represents about 25% of all students and around 30% of all teachers.

These numbers can be considered a solid basis for the discussion about the real preferences of the LMS Moodle users, their behaviour, and about the steps, which should be done by the university management and administrators in the near future considering the above mentioned improvements of the LMS Moodle.

The next statistical data, the overall users' activity shown in Figure 2 represents another evidence of rising activity as well as involving stakeholders in e-learning. Besides the fact, the logging mechanism has changed, it can be assumed, that the users are more active. These findings are in accordance with the rising number of unique users.

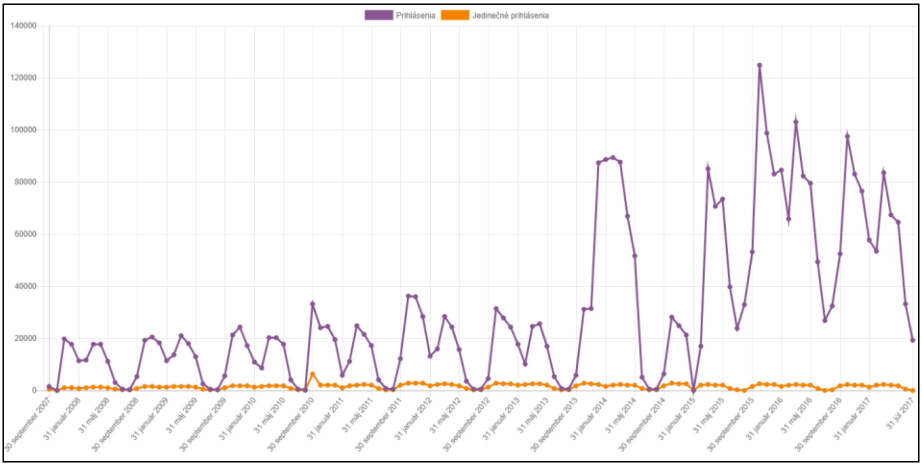

Figure 2. The overall activity of users during the last ten years.

Source*: Own Work, edu.ukf.sk*

The age structure of the users of the e-learning portal shown in Figure 3 confirms another fact that the courses are used in both forms – present and distance form. Based on this, the students in distance form represent the largest group of users (33.5%), who visit the e-learning website. This result is also surprising because the number of students in distance form is continually decreasing and the ratio between present and distance students is strongly tilted on the side of students in present form of study.

The distribution of the devices used for connecting to the e-learning portal is shown in Figure 4. It can be seen, the classical approach using computer highly dominates. Even though the Moodle mobile is promoted for download directly on the main page of the portal from its first stable version, its usage is surprisingly low.

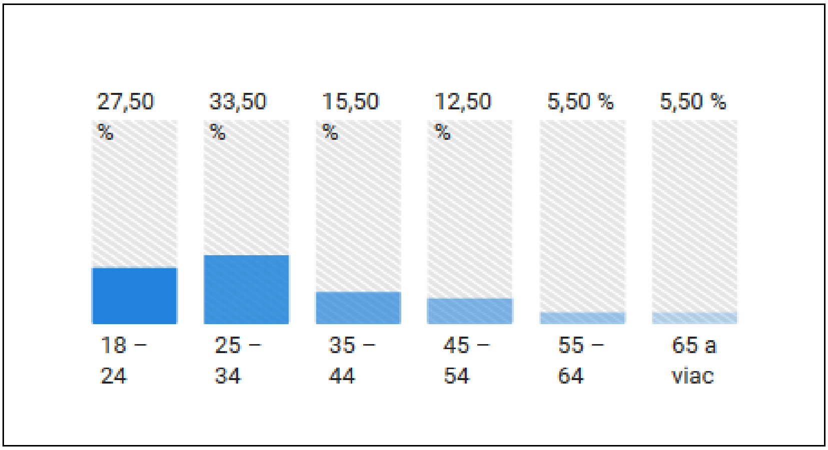

Figure 3. The age structure of the users of the e-learning portal.

Source: Own Work, Google Analytics

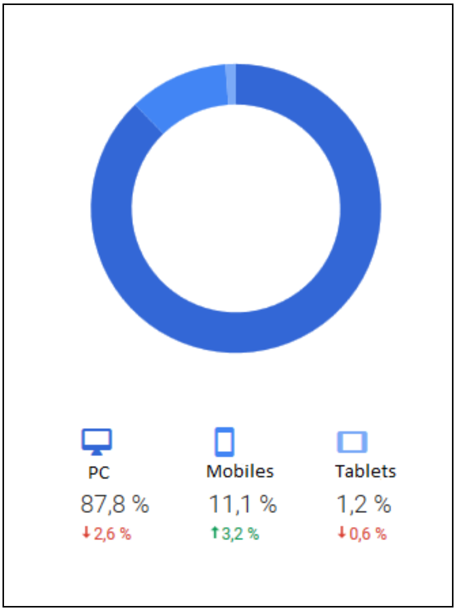

Figure 4. Distribution of devices used for logging in e-learning portal (2007 – 2017)

Source: *Own Work, Google Analytics*

Figure 5 uncovers the main issue of using Moodle. Even though the Moodle developers provide more and more sophisticated features focused on collaboration, interaction, and interactivity, the teachers use the same limited group of resources and activities, which were available in the system at the beginning.

The e-learning courses contain mostly resources like files, URLs, webpages, and books. The assignments, discussion, and quizzes represent the most frequently used activities. Other activities, which allow wider collaboration or support peer-to-peer evaluation, like workshops, databases, wikis are not very frequently used.

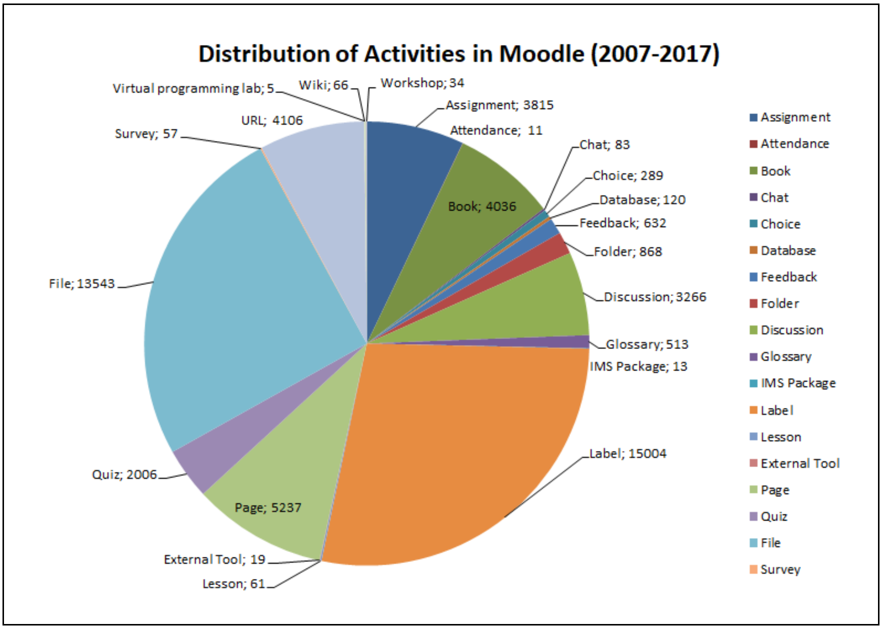

Figure 5. Distribution of activities and resources in university e-learning portal (2007 – 2017)

Source: Own work, edu.ukf.sk

A closer look at the statistical data related to the effective using of current improvements of LMS Moodle confirms the fact that the teachers and/or course creators have not discovered or used them yet.

The portal provides 1164 courses. The quizzes are available in 351 courses but used only in 273 of them. 5849 students have a real experience with them. Teachers of 144 courses use grading.

The learning progress has been allowed by the administrators for several years. Even though 517 courses have available activity completion tracking, only 37 courses use course completion. Moreover, only seven teachers use an additional block called completion progress.

New trends, which can be used in e-learning, like gamification (represented by Badges) or competencies are totally missing. They are not used in any courses.

3. DISCUSSION AND CONCLUSION

The increasing gap between the LMS Moodle possibilities and a real use at the university is evident. The list of possible activities and resources and their meaningful use in courses represent the first issue. No one can deny that LMS Moodle is packed full of amazing and useful features. However, it is impossible to use all of them all the time. Many complaints at Moodle regard the fact that despite its myriad features and capabilities it is often difficult or complicated to use them. The distribution of different kinds of activities and resources shown in Figure 5 confirms that implementing the activities with more advanced settings remains challenging for many teachers and course creators. Therefore, the effective use of these activities requires also the existence of examples of best practices, the availability of short, but easily repeatable tutorials, as well as changes in teachers' practical and pedagogical skills.

The LMS should be as easy to use and intuitive as possible because the last thing a learner or instructor needs is to be confused. Even though a lot of work has been already done to the better responsibility, navigability, and intuitiveness of the GUI, the rigid structure of the courses remains one of the main limitations (https://www.paradisosolutions.com/blog/moodle-shortcomings, 2017).

Considering the previously listed requirements of modern LMSs, LMS Moodle satisfies most of them. It is dependable and flexible enough for adapting to the institutional needs. Simultaneously, it provides self-directed learning, creating individual learning paths, learner-generated multimedia content as well as a robust collection of APIs. It is available almost anywhere, anytime, with any device through its native applications.

On the other hand, it lacks several points like missing simple and intuitive GUI and navigation, closer interconnection to the social networks, limited dashboard functionality, and flexibility, as well as learning analytics and reporting options. Its robustness creates an impression that the system is not easy to use, does not meet the teachers and students need, and does not save time. However, it is true predominantly at the beginning. As other complex information systems, it requires time to obtain necessary skills and knowledge to be able to optimise everyday tasks and save time.

The mitigation of the above mentioned issues can be reached by systematic and coordinated work of the e-learning portal's stakeholders. The following lists provide short recommendations divided into the groups according to the target audience (Drlík and Skalka, 2011):

Recommendations for teachers:

- Experiment with the activity settings,
- Emphasize the role of student in the process of assessment,
- Make courses more social,

- Add interactivity to the lectures using Moodle Mobile and Moodle desktop,
- Put deadlines to the activities, publish them using calendar and regularly notify students,
- Track students' progress and motivate students in case of troubles,
- Gamify the course using badges, ranking, top list, stealth mode of the activities,
- Talk about the limitations of the system.

Recommendations for administrators:

- Inform stakeholders not only about the upgrade of the system but mainly about new interesting features or improvements,
- Emphasize the role of native mobile applications in communication with courses,
- Provide examples of best practices,
- Create short tours for beginners (students as well as teachers),
- Share short video tutorial from the Moodle website,
- Publish regularly some statistical reports or ratings,
- Analyse stakeholders' behaviour in line with the ethical rules and privacy,
- Continually improve user's dashboard,
- Provide feedback and support.

Recommendations for university management:

- Accept e-learning as a fact or as a tool for obtaining skills necessary for lifelong learning using MOOCs,
- Create a long-term strategy,
- Appreciate the stakeholders' initiatives,
- Develop IT infrastructure,
- Simplify the process of e-learning course development,
- Join institutional networks and share experience and best practices,
- Implement e-learning to the internal quality standards.

Considering all previously mentioned positives, it is clear, the LMS Moodle is amazing for a lot of reasons, not least because it's open source. It is in continual evolution, constantly provides new improvements and extensions, and is used all around the world to deliver e-learning to millions of students.

ACKNOWLEDGEMENTS

The research leading to these results has received, within the framework of the IRNet project, funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement No: PIRSES-GA-2013-612536.

REFERENCES

Canvaslms.com, https://www.canvaslms.com/higher-education, (accessed 21 July 2017)

Drlík, M. Skalka, J., 2011: *Virtual Faculty Development Using Top-down Implementation Strategy and Adapted EES Model*, Procedia - Social and Behavioral Sciences, Volume 28, 2011, Pages 616-621, ISSN 1877-0428, http://dx.doi.org/10.1016/j.sbspro.2011.11.117.

European LMS market dynamics, Fall 2016 report, [online] at http://mfeldstein.com/, (accessed 5 August 2017)

Lewis, S. We need to talk about Moodle – Moodle shortcomings. At https://www.paradisosolutions.com/blog/moodle-shortcomings, (accessed 5 August 2017)

Moodle.org, http://moodle.org, (accessed 20 July 2017)

Moodle Desktop, [online] at https://download.moodle.org/desktop/, (accessed 20 July 2017)

Moodle Mobile, [online] at https://docs.moodle.org/33/en/Moodle_Mobile, (accessed 25 July 2017)

Skalka, J, Drlik, M. and Švec, P., 2012: *E-learning courses quality evaluation framework as part of quality assurance in higher education*, 15th International Conference on Interactive Collaborative Learning (ICL), Villach, 2012, pp. 1-5.

Note: We hereby confirm that the manuscript to be published in the Monograph is our own original work, and it has not been printed before in any other sources.

TRAINING FOR PRIMARY SCHOOL TEACHERS IN TEACHING MATHEMATICS USING INFORMATION TECHNOLOGIES

Svetlana Skvortsova
South Ukrainian National Pedagogical University named after K.D. Ushynskyi
Odesa, Ukraine
skvo08@i.ua

Marina Haran
Kherson State University, Kherson, Ukraine
m.s.garan3009@gmail.com

Abstract: *The thesis focuses on the possibility of solving the problem of using information technologies in mathematics teaching training for pre-service primary school teachers which involves teaching mathematics by the means of multimedia methodical complex of the discipline «Teaching methodology of the educational branch "Mathematics"». The structure of multimedia methodical complex is presented as a constructor of video presentations of lectures, bank of multimedia materials of laboratory and practical tasks, bank of multimedia materials for students' independent work, tests' bank. The pedagogical experiment proved the efficiency of the multimedia methodical complex in forming all of the components of future primary school teachers' methodical competency in teaching mathematics.*

Keywords: methodical competency, informational technologies.

INTRODUCTION

The level of mathematical education determines the economic, social and, above all, intellectual potential of the society. It is entirely reasonable to have the mathematical competency in the list of the eight key competences recommended by the European Parliament and the Council of Europe. Forming pupils' mathematical competency as a key one must take place at primary school. This fact emphasises the problem of finding not only effective ways of teaching mathematics to primary school pupils, but also training of future primary school teachers to implement such a process.

The issue of training for pre-service primary school teachers in teaching mathematics is the subject matter of research carried out by many leading Ukrainian and Russian scientists (O. Borzenkova, Ya. Haievets, N. Hluzman, O. Komar, L. Koval, Y. Korol, Ye. Lodatko, O. Mytnyk, R. Romanyshyn, S. Skvortsova, etc.), who emphasize the need to form a professional, in particular, methodical competency. The methodical competency of a teacher in teaching Mathematics to pupils was studied by I. Akulenko, Ya. Haievets, A. Kuzminskyi, O. Larionova, A. Liebiedieva, I. Malova, O. Matiash, V. Motorina, S. Skvortsova, N. Tarasenkova and others, who understand it as an integrative professional skill of the individual, realized in the theoretical readiness and practical ability to perform all types of methodical activity, as the ability to solve standard and problem methodical tasks.

One of the ways to increase the effectiveness of methodical training for pre-service primary school teachers is to apply information technologies (IT) in the university educational process. The research conducted by V. Imber, V. Kotkova, L. Petukhova, O. Spivakovsky, O. Sukhovirsky, V. Chychuk and others is devoted to this issue. V. Viun, I. Huz, A. Demydenko, M. Shyshlakov, S. Mezhenska, M. Kalashnikov, S. Ryzhenko and others pay attention to the possibilities of using multimedia as modern information technologies.

Despite rather thorough presentation in the scientific literature of common approaches to using IT in pre-service teachers' training, the spectrum of multimedia means of teaching is still quite limited, in particular, the issue of their use in the course of mastering the academic discipline «Teaching methodology of the educational branch *Mathematics*» remains unresolved; the components and structure of the multimedia methodical support of this course are not substantiated.

1. THE THEORY AND PRACTICE OF PRE-SERVICE PRIMARY SCHOOL TEACHERS' TRAINING IN USING INFORMATION TECHNOLOGIES

1.1. Methodical competency in teaching mathematics as the goal and result of pre-service primary school teachers' training

In our study, based on the definition of S. Skvortsova and Ya. Gaieves (Skvortsova, 2013) we interpret the methodical competency of a primary school teacher in teaching mathematics to students as a system of personal formation, reflected in the ability to organize and conduct the process of teaching mathematics to pupils of the grades 1-4 at the level of modern requirements, the ability to solve methodical issues successfully, based on theoretical and practical readiness to teach the subject.

We understand the complex of components – competencies of the lower order: normative, variative, special-methodical, technological, design-modelling, control and evaluation in the structure of the methodical competency of future teachers in teaching mathematics to primary school pupils (Skvortsova, 2015).

The normative component of the teacher's methodical competency in the field of teaching the subject is prevalent among the others and is shown as the ability to realize the goals and objectives of the subject training, regulated by the State Standard of Basic Primary Education and the program based on the readiness of a teacher to use the normative documents.

Variable competency of a teacher means the readiness of a teacher to work with any learning and teaching set; the ability to choose the most effective learning and teaching set for achieving the goals and objectives of teaching a certain subject, approved by the State Standard and the curriculum.

Special methodical competency is characterized as the ability to form pupils' all the elements of the content of the subject, based on the theoretical and practical readiness to teach pupils any program issues.

The activity of a teacher involves constant monitoring of the quality of education, therefore, the control and evaluation competency is identified, it is in the readiness of a teacher to implement the criteria of assessing the academic achievements of pupils and the ability to assess the educational achievements of pupils adequately.

Qualitative Mathematics teaching is impossible without the introduction of modern educational technologies, innovative approaches to the study of certain issues of the course, advanced pedagogical experience, therefore the technological component is based on the knowledge of modern educational technologies, innovative methodical approaches, advanced pedagogical experience, and the ability to apply them.

The normative, variative, special-methodical, control and evaluation and technological components of methodical competency serve as the basis of designing the systems of lessons and individual lessons, during which they realize a certain goal and tasks, they find appropriate means, methods, forms of organization and teaching methods. The design and modelling component of the teacher's methodical competency is the ability of a teacher to design the process of teaching a subject during the school year, to design lessons for different teaching sets, in accordance with modern requirements, the ability to model the activities of a teacher and the activities of pupils at each stage of the lesson, aimed at achieving educational outcomes.

We emphasize that each of the components of methodical competency has its complex structure and contains the motivational-value, cognitive, activity and reflexivity-building components.

1.2. The course «Teaching methodology of the educational branch *Mathematics*» and its methodical support

Training pre-service primary school teachers in teaching mathematics is understood by us as one of the aspects of the general system of training, namely, as the process of methodical training, which is carried out, in particular, during pupils' mastering of the discipline «Teaching methodology of the educational branch *Mathematics*» , its purpose is to form pre-service teachers' methodical competency.

The clarification of the status of the training of pre-service teachers in teaching mathematics, carried out by us within the framework of the conducted experiment by studying the normative programs of the discipline «Teaching methodology of the educational branch *Mathematics*» at 12 universities of Ukraine, testifies to differences in the distribution of the academic load for classroom and independent work even for the same total academic hours for mastering the discipline; in the number of lectures and practical / laboratory classes as in the whole course, as well as in separate content modules; in the content of the discipline and its distribution by modules.

Paying attention to the autonomy in the activities of the university, the content may vary, the university has the right to license and approve at the Ministry of Education and Science of Ukraine its standard, which allows certain differences in the content of the course at various universities. However, the content of the discipline should reflect the content of the educational branch "Mathematics" in accordance with the State Standard of Primary Education clearly, therefore it is essential that there is an invariant core that provides the formation of general competencies and special professional competencies, including methodical competency.

As a result of the study dealing with the analysis of the branch standard of the specialty 6.010100 "Primary Education" of the direction of training 0101 "Pedagogical Education" and the State Standard of primary general education, the rational content of this discipline is proved (Skvortsova, 2015). It includes the following sections: 1) "General questions of the methodology of teaching mathematics at primary school"; 2) "Modern lesson of mathematics at primary school: a technological approach"; 3) "Method of training content lines: numbers, actions with numbers; quantities; mathematical expressions, equations and inequalities; plot tasks; spatial relationships, geometric shapes". This content meets the requirements of the Branch Standard, reflects the content of the educational branch "Mathematics" of the State Standard of Primary General Education and the curriculum of mathematics for grades 1-4, and is aimed at forming all the components of methodical competency of pre-service primary school teachers in the teaching of mathematics, although it may be structured in content modules differently.

1.3. Using multimedia in the process of studying the course «Teaching methodology of the educational branch *Mathematics*»

It has been scientifically proved that using IT is an effective means of activating educational and cognitive activity of students in the educational process of higher education institutions (Heba, 2009). In the context of our study, we understand training for pre-service primary school teachers in ~~for~~ teaching mathematics with the use of IT is the process of methodical training, which is carried out when students study the discipline «Teaching methodology of the educational branch *Mathematics*» with the appropriate use of IT. Information technologies, which involves integrating audiovisual information in a computer system in various forms and using it in the form of an interactive dialogue with the possibility of choosing the line of development of the given plot or situation, is understood by us as multimedia (Kostolányová, 2009).

To find out about the possibilities of using multimedia in the teaching process «Teaching methodology of the educational branch *Mathematics*» and the relevance of creating multimedia provision of this discipline, within the framework of the ascertained experiment (2012-2014), 20 questionnaires were distributed as part of the survey conducted among the teachers of this discipline (Skvortsova, 2016).

As a result of processing the responses to the questionnaires, it was found that all the teachers of this discipline (100% of the respondents), without exception, feel the need to use information technologies during teaching pre-service primary school teachers to teach mathematics. Thus, most teachers are convinced of the expediency of using information technologies during lectures (95%) and practical classes (95%), control measures (80%), independent work (70%). Significantly fewer respondents (40%) see the need for information technologies to be used during laboratory studies, which may be due to the lack of planning of this type of training in the higher education programs of the educational discipline of TMEBM. Despite the teachers' awareness of the necessity and expediency of using information technologies in the process of teaching TMEBM, only 20% of them confirm that they always use them during in-class work, 55% of the respondents do this quite often, 25% – sometimes. In our opinion, this is due primarily to the fact that not all teachers understand the possibilities of using information technologies during classroom work for students to master this discipline completely. So, 90% of the respondents consider information technologies as a means of video demonstration of a lesson; as the means of presenting academic content in the structured form – 80% of the teachers; as the means of demonstration of videos of reasoning of real students in the classroom – only 45% of those who answered; as the means of work with electronic versions of current textbooks on mathematics – 35%, with electronic versions of normative documents – 30%; as the way of presenting task–resolution entries using animations – 30% of the respondents.

Almost all teachers of the methods of teaching mathematics (95%) have confirmed that they use information tools to ensure the independent work of students of the discipline. Most of them consider it expedient to use electronic documents (60%); Internet sites (60%); audio video files (60%); E-books (55%) for that. A much smaller proportion of methodologists seek to apply distance courses (40%); curriculum (35%); electronic test systems (30%); interactive tutorials (25%). In our opinion, these indicators are primarily related to the absence or limited access to such facilities.

Regarding the use of information technologies during monitoring activities, it should be noted that although most teachers (95%) use testing among other forms of control, not all do resort to computer tests to assess the academic achievement of students in the studied discipline. Thus, the results of the questionnaire showed that only 10%

of the teachers, while conducting a survey in a test form, always use computer tests; 20% of the respondents indicated that they often conduct tests in a computerized form; 50% of the respondents confirmed that they sometimes use computer tests to assess the academic achievements of students in the discipline TMEBM; 20% – never practice this form of control. However, the majority of teachers are convinced that computer tests will enable the process of training students for practical classes, and the teacher – to control its level effectively among students, which in its turn will reduce the number of students who appear on a practical lesson without proper training.

All the teachers who participated in the survey (100%) agreed to use presentations during classes as part of TMEBM. The results of the conducted survey indicate that teachers already demonstrate presentations of lectures, teaching TMEBM (80% of the respondents); however, the majority does not do that regularly – only 20% of the respondents confirm that they always use presentations during lectures. Despite using presentations of lectures by the majority of lecturers, according to the results of the questionnaire, the presentations are the title slide with the theme (100%); lecture plan (100%); problem issues (70%); literature (85%); the main content of the topic in the form of abstracts (65%) or in full measure (5%); reflection (50%). Quite often, teachers include in their presentations video extracts of mathematics lessons taught at primary school (65%); fragments from the current mathematics textbooks (60%); fragments of normative documents (55%); examples of done task solutions (55%). Significantly, fewer teachers of methods of teaching mathematics use visual means in presentation (40%) or visual means, with simulation of work using animation effects, with a dynamic demonstration (25%); examples of the teacher's work on individual tasks with visual fixing of the steps of the teacher (40%) or examples of solving tasks that are deployed in animation dynamically (15%); real pupils' pictures at mathematics lessons (30%). This, in our opinion, is not very optimal using possibilities of presentations during lectures, first of all due to the fact that most of the teachers do not have enough knowledge about the program «Microsoft Power Point» for their creating (this program, according to the results of the survey, is used by 100% of the respondents to create, view and demonstrate presentations). So, only 30% of the teachers have thorough knowledge of the program; the rest use only the basics of «Microsoft Power Point»: they use templates (65%); add texts to slides (75%); add tables, graphs, charts (65%); adjust the animation of the transition between slides (50%); adjust the animation of the text (45%); add and format images (45%); add hyperlinks and controls (45%); use SmartArt objects (40%); add video and sound (35%); apply animation effects in the records of solutions (35%). Most teachers cannot customize animation on presentation slides, but they consider animation effects that illustrate actions with visibility, or the process of solving tasks that significantly increase the rate of lectures, visualize its content, facilitate better understanding of the information by students (Smyrnova-Trybulska, 2012). In addition, it is concluded that those teachers who already use presentations at TMEBM lectures mainly created them on their own and submitted the main theses of the lecture on the presentation slides, but did not use the means of structuring the theoretical material (tables, flowcharts, "SmartArt" objects, etc.), although 90% of the teachers agreed that the structuring of educational material in schematic form facilitates students' perception and comprehension of educational information significantly.

The problem of using presentations at practical and laboratory classes is open, despite the fact that most of the training time for these studies should be planned to imitate the teacher professional work and analysis. Instead, information technologies allow at practical / laboratory classes in terms of classroom to watch video of the best lessons in mathematics or their fragments for analysis of the teacher's activity, clarifying goals of pedagogical influences, used by him at certain stages of the lesson, finally, selecting the most attractive educational strategy of organizing a mathematics lesson and organizing communication with pupils. 80% of the interviewed teachers use in the process of teaching TMEBM video materials (video recordings of fragments of mathematics lessons). Only 10% of the respondents confirmed that already have all the necessary video lessons in mathematics, and the rest (90% of the teachers) would like to have a bank of video to improve mastery of the discipline TMEBM (images of individual phases of lessons, use of learning technologies in the mathematics lessons, forms of work or individual methodical approaches, etc.).

As a result of analysis of the responses of teachers to questions about the use of lecture presentations, use of the bank of video lessons, electronic textbooks, etc., we found that only 30% of the teachers are satisfied with their own multimedia software of the discipline TMEBM, 20% – partially satisfied and 50% of the respondents are not satisfied with the available multimedia courseware. Most of the teachers (85%) expressed the wish to have an electronic educational and methodical discipline, only 10% of those polled already have it, 5% have not been determined yet, their wish will depend on the quality of the product. Most teachers would like to have a part of multimedia software: presentation slides of lectures with animation, with the possibility of independent design of lectures (presentations, lectures designer; 85%); a bank of multimedia materials for practical classes (85%); video recording of real math lessons (80%); computer tests (80%); presentations of practical classes (75%); electronic teaching sets (60%); electronic textbooks on the methodology of teaching mathematics (55%); video lectures or presentations of lectures with audio (55%); Legal documents in electronic form (50%); Electronic textbooks on mathematics 1 – 4 grades (40%); 5% want to have other materials for control. Therefore, the analysis of questionnaires and interviews with teachers of the discipline TMEBM can be summarized by stating that efficient organizing the training process with the discipline TMEBM now is impossible without the use of educational means, developed on the basis of information technologies (Smyrnova-Trybulska, 2016).

The analysis of the ascertained experiment became the grounds for separation of components of multimedia software of the discipline «Teaching methodology of the educational branch *Mathematics*» and allow one to determine its components: the designer of multimedia presentations, lectures (created with the help of the program MS PowerPoint) with a possibility of choosing individual slides by the teacher and creating own lecture presentation on their basis; bank of multimedia materials for practical / laboratory work (videos, electronic versions of textbooks, regulations, manuals for teachers, etc.); bank of multimedia software for independent work of students (electronic textbooks, video presentations of lectures, online resources, etc.); test bank (created in Moodle). All these elements form the media and methodical complex of the discipline «Teaching methodology of the educational branch *Mathematics*» (hereinafter – MMC) (Skvortsova, 2016).

2. THE MULTIMEDIA METHODICAL COMPLEX AS THE MEANS OF TEACHING THE DISCIPLINE «TEACHING METHODOLOGY OF THE EDUCATIONAL BRANCH *MATHEMATICS* »

2.1. General requirements for the multimedia methodical complex of educational discipline «Teaching methodology of the educational branch *Mathematics* »

Understanding the fact that the MMC should perform the function of facilitating the perception, comprehension and memorization of educational information by students, should have an effective influence on the formation of methodical competency and should be organized in a special way, we have identified a number of general requirements – psychological, didactic, methodical, organizational (Skvortsova, 2016).

We understand the psychological requirements to the MMC as the requirements for the design of its components in accordance with the psychological patterns of educational knowledge and age characteristics changes of students' cognitive processes: taking into account the structure of educational and cognitive activity, adaptability and emotional saturation of education.

Didactic requirements for the MMC contain requirements to the detailed content of multimedia means, which is manifested in the features of the structure of individual components of the complex, and the requirement for the methods of organizing the educational and cognitive activities of students: competency orientation, scientific, systematic and consistent, accessibility, visualization and presentation, professional orientation, interactivity , ensuring conscious getting of knowledge, activity and independence of students.

The methodical requirements for the MMC provide consideration in the detailed content of the specifics and features of the educational discipline, its conceptual apparatus, methods and regularities of its knowledge: the focus on the formation of individual components of methodical competency, quasi-professional activity.

We understand the organizational requirements for the MMC as the requirements to organizing the structure of the complex, revealing the peculiarities of the ordering of its components and the structural features of each of them, and are manifested in ensuring the completeness of the discipline teaching cycle, the hierarchy of the structure of the complex, the variability of the forms of presentation of educational information; requirements to organization of the work with the MMC, providing for the provision of instructions and equipment.

The main means by which students are acquainted with the content of the discipline «Teaching methodology of the educational branch *Mathematics*» are multimedia presentations of lectures. According to this, we specify the general requirements for the MMC (taking into account psychological peculiarities of perception, awareness and memorization of educational material by students in accordance with their training, age and even gender characteristics), the requirements for the structure and content of presentation slides, use of fonts, colours are formulated, etc., as well as requirements for the visual and sound series, text, design and navigation.

2.2. The structure of the multimedia methodical complex of the educational discipline «Teaching methodology of the educational branch *Mathematics*»

The components and structure of the MMC are given in Figure 1. The complex has a two-tier structure: the multimedia support is structured in accordance with the organizational forms of training and in accordance with the appropriate content of the discipline. Each of the elements which is a part of the MMC promotes the formation of methodical competency in general or its individual components (Figure 2) (Haran, 2016).

The constructor of presentation of lectures – the catalogue of files structured according to the three thematic sections in accordance with the reasoned content of this discipline is given for multimedia support of lectures on the discipline «Teaching methodology of the educational branch *Mathematics*» in the MMC.

The constructor of presentations of lectures is a clear hierarchical structure, in which the levels of the lower order are separate presentations, detailing the content of the subject and can be used by the teachers to create their own multimedia presentations of lectures.

We understand the multimedia presentation of the lecture on the discipline «Teaching methodology of the educational branch *Mathematics*» as the presentation in which the educational content is presented in structured form; methodical approaches are illustrated with the help of using colour and animation effects; the method of work on certain mathematical issues is given by the means of dynamic deployment of the solution; the natural visuality is replaced by electronic and the technique of work with it is demonstrated with the help of animation effects; hyperlinks to electronic versions of normative documents and mathematics textbooks of primary school, to video fragments of real mathematics lessons at primary school, illustrating an appropriate element of educational content (the structure of the lesson, teaching technologies, etc.), as well as video fragments with the arguments of pupils demonstrating the ways to calculate, work on tasks, etc. (Skvortsova, 2016).

To organize a lecture, a teacher can use the multimedia presentation of the lecture offered in the presentation designer for each topic in the completed form, or select a question from the proposed list and the necessary slides to create his own presentation. The method of organizing the lecture using the presentation designer is presented as a step-by-step arrangement and demonstrated on specific examples of guidance papers of lectures.

The multimedia materials bank for practical / laboratory classes on the discipline «Teaching methodology of the educational branch *Mathematics*» is provided for multimedia support of practical and laboratory classes the MMC, it is understood as a set of files containing the following blocks: video materials; textbooks; normative provision of the educational branch "Mathematics"; multimedia presentations. Each block can be used by a teacher for multimedia support for a particular stage of practical or laboratory work or included in a presentation that will be used during the class (Skvortsova, 2016). The methodology of organizing practical and laboratory classes is illustrated by examples of methodical developments of these organizational forms of study.

The bank of multimedia materials for independent work of students is the expanded bank of multimedia materials for practical / laboratory classes, including such blocks: textbooks and teaching and methodical manuals on the discipline «Teaching methodology of the educational branch *Mathematics*»; video presentations, video records of comments on specific questions of the Math program for the 1-4 grades, etc (Skvortsova, 2016). Bank materials can be used by students for preparation for training sessions and control activities, as well as for the self-mastering of the content of the topic.

The MMC has the bank of test tasks in order to provide control measures, it contains a set of test tasks on specific topics of discipline, sorted by categories according to the given above appropriate content of the discipline «Teaching methodology of the educational branch *Mathematics*» (Skvortsova, 2016). Using this bank, a teacher can create the necessary test for a certain course topic by selecting questions from the proposed list and choosing the settings for the duration of the test, the method of evaluation, etc.

The methodical recommendations for using the materials of the complex by the teachers of the academic discipline (Haran, 2016) is created in order to regulate the organization of work with the MMC. The recommendations contain guidelines for the activities of the teacher to create his own presentation of the lecture with the help of the designer of presentations of lectures, the development of a practical / laboratory class using the bank of multimedia materials and the bank of test tasks; description of the opportunities provided to students in case of using the bank of multimedia materials for their independent work.

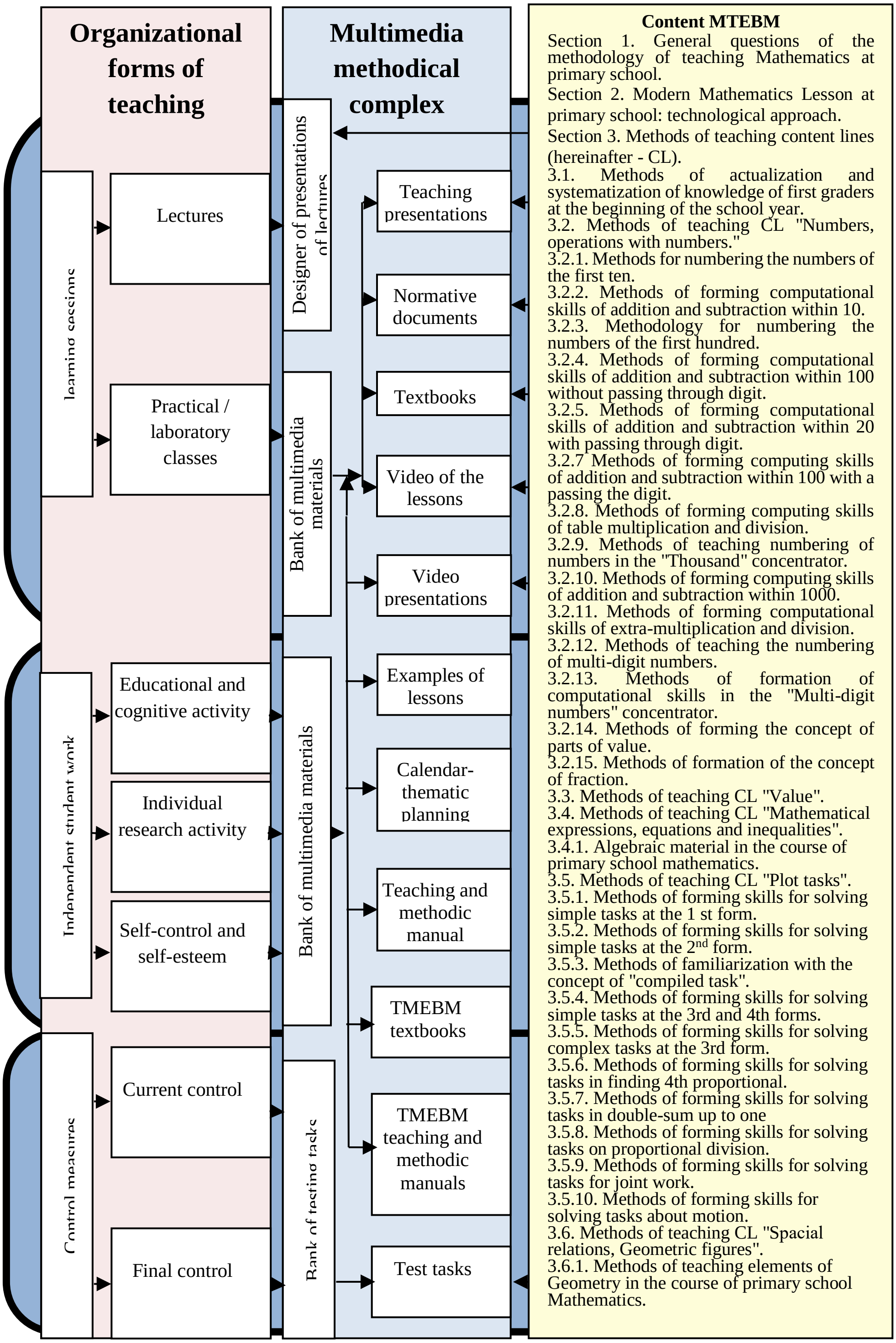

Figure 1. The structure of the multimedia methodical complex on the discipline «Teaching methodology of the educational branch *Mathematics*» (TMEBM)

Source: Own work

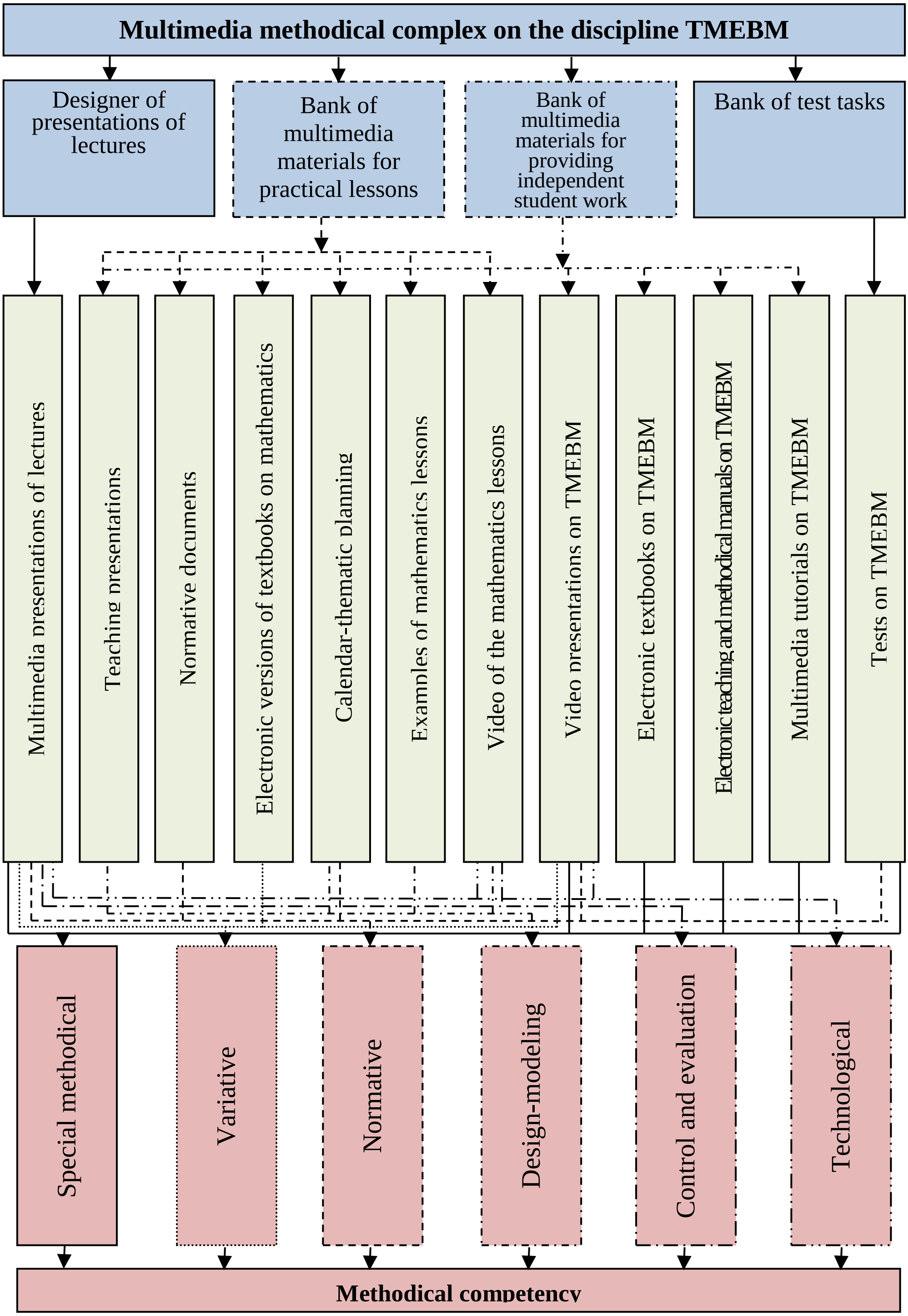

Figure 2. Scheme of the methodical provision of the process of forming methodical competency of future teachers of primary school in the discipline «Teaching methodology of the educational branch *Mathematics*» (TMEBM)

Source: Own work

3. EXPERIMENTAL TEACHING OF THE COURSE «TEACHING METHODOLOGY OF THE EDUCATIONAL BRANCH *MATHEMATICS* WITH USING THE MULTIMEDIA METHODICAL COMPLEX

Experimental efficiency testing of the developed multimedia methodical complex for the training of future primary school teachers in mathematics teaching was carried out from 2012 to 2016 in the process of the pedagogical experiment that was implemented in three stages.

At the ascertained stages of the experiment (2012-2014), the Branch Standard analysis was conducted. Also normative programs of the discipline «Methodology of teaching of the educational branch *Mathematics*» at higher educational establishments of Ukraine that train pre-service primary school teachers was conducted; the methodical support of this educational discipline available in Ukraine was analysed; the questionnaire for the lectures of the course «Teaching methodology of the educational branch *Mathematics*» in the higher educational establishments of Ukraine was conducted with the aim to determine the condition of the usage of multimedia facilities in the training practice.

The search stage of the pedagogical experiment, the purpose of which was to develop the MMC and the methods of its usage, lasted during 2012-2014. At this stage, the components and the structure of the multimedia support of the educational discipline were specified; the requirements that the MMC of this discipline is up to quality, were determined; according to the specified requirements, the MMC was developed; the method of usage of the MMC individual components was proved.

The efficiency checking of the usage of the developed MMC took place in the process of methodical training for pre-service primary school teachers in mathematics teaching. It was carried out during the forming stage of the experiment, that lasted during the academic years 2014-2015, 2015-2016.

The uncovering of efficiency of the MMC in the training process of pre-service primary school teachers included: the conducting of student incoming diagnosis to form control and experimental samples; statistical grounding of the samples; the development of criterial-level study instrument; to determine how to divide students according to the levels of formation of certain criteria (motivational, content and operational-activity) components of the methodical competency; the comparison of student distributions of experimental and control samples; the statistical grounding of differences in distributions.

Experimental verification of the efficiency of the usage of the developed multimedia methodical complex and its work methods took place while students are obtaining the specialty 013 Primary education of the educational discipline «Teaching methodology of the educational branch «Mathematics»».

325 students participated in the experiment: 154 students were in the experimental group (students of the K. D. Ushynskyi South Ukrainian National Pedagogical University and Kherson State University) and 171 students were in the control group (students of the V. V. Sukhomlynskyi Nikolayev National University and the P. Tychyna Uman National Pedagogical University).

During the forming experiment, the MMC TMEBM was used in the educational process of the EG according to the methodical recommendations. In particular, during the lectures teachers of TMEBM used the materials of the construction of lectures' presentations. During practical and laboratory classes the materials of the bank of multimedia materials for practical / laboratory classes were used. In the process of independent work of students, the teachers offered them materials of the bank of the multimedia materials for maintenance of their independent work. Students were offered training and control tests for checking and self-testing the knowledge, developed on the basis of the test bank materials. In CG, the training for students in teaching mathematics was traditional without the introduction of the information technologies.

The efficiency of pilot testing is evaluated according to motivational, content and operational-activity criteria in accordance with the following exponents: aspiration, knowledge and skills that correspond to the components of the methodical competence of the primary school teacher in mathematics teaching. The differences in the performance of exponents (by the persistence of aspirations, the fullness and generality of methodical knowledge, by the awareness of methodical skills of students, etc.) are put to the basis of the characteristics of the levels of the methodical competency formation of primary school teachers - low, medium, sufficient and high. The low level testifies to the existence of a discrepancy between the development of methodical competency and the requirements of methodical activity; the medium level of methodical competency allows the teacher to perform professional functions only partially according to the examples of methodical activity that he has; the sufficient level testifies that the primary school teacher has the ability to carry out methodical activity and achieve the intended purposes of teaching and developing of students; the high level provides that the teacher has a creative approach to mathematics teaching to pupils, the ability to create innovative methodical approaches and his proprietary technology.

After the experimental study had been finished, the student survey was conducted in order to determine the level of methodical competency formation according to motivational criterion. The survey has shown the increase of the corresponding indicators of the experimental sample compared with the control sample. This testifies to the existence of the positive influence of the application of the developed MMC on the formation of all components of the methodical competency (based on the motivational criterion). The differences in distributions were confirmed by the statistical processing according to Fischer's criterion. In addition, students of the experimental groups have demonstrated a stable desire to use IT in the process of their own pedagogical activities.

In order to identify the level of the formation of methodical competency under the content and operational-activity criteria, the testing was carried out. The test tasks were aimed to diagnose all the components of methodical competency: normative, variative, special-methodical, technological, design-modelling and control-evaluation. The formation level of each of these components was higher in the experimental group than in the control group. The summarized results of diagnostic tasks performing (Figure 3) testify that the developed MMC has a positive influence on the level of the methodical competence formation. The absence of high level of the methodical competence formation is quite logical, since this level involves a creative approach to mathematics teaching to pupils and the ability to create innovative methodical approaches. Therefore, it can only be achieved by some teachers in the process of professional development.

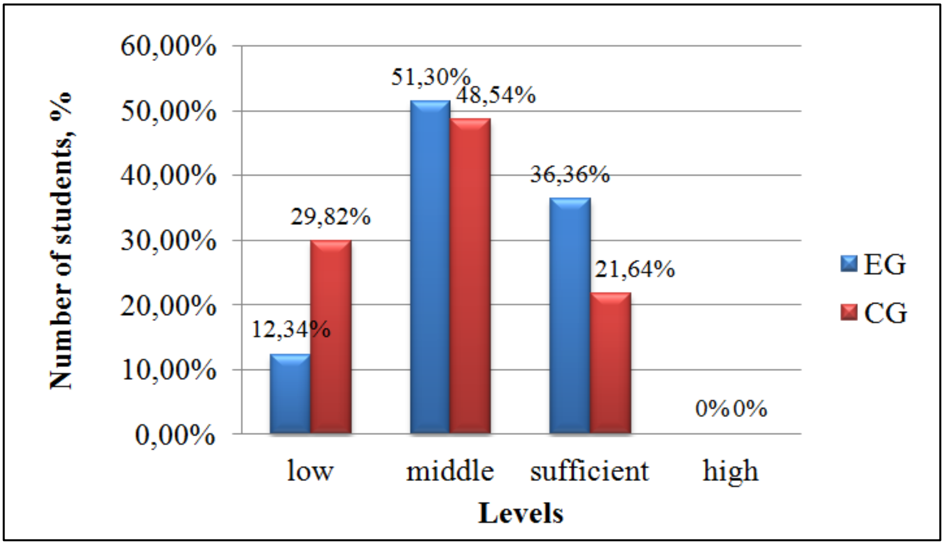

Figure 3. Distribution of students of the experimental and control groups according to the levels of the methodical competency formation

Source: Own work

As a result of the statistical justification of differences in student distributions, according to the Pearson criteria ($\chi 2$), the value $\chi^2_{exp} = 17{,}77$, was obtained, while $\chi^2_{cr} = 5{,}99$. Thus, $\chi^2_{exp} > \chi^2_{cr}$, this indicates that there are statistically significant differences in the respondents' distribution in the control and experimental samples (Haran, 2016).

Thus, there are grounds to conclude that the statistical differences are valid as to the distribution of students of the experimental and control groups according to the levels of the methodical competency formation. The mentioned above gives us the possibility to confirm that these differences are the result of the MMC introduction in experimental groups and it proves the hypothesis of our research.

CONCLUSION

The efficiency of acquisition of the discipline content «Teaching methodology of the educational branch *Mathematics*» by students is provided through the escalation of the educational process, the presentation of information in various forms and the use of information in the form of interactive dialogue, that is provided through multimedia means of teaching. As part of the multimedia methodical complex of educational discipline, the presence of the presentation designer of lectures is provided; the bank of multimedia materials for practical / laboratory classes (video records of mathematics lessons, electronic versions of current mathematics textbooks for grades 1-4, the normative documents for primary education, the methodical aids for teachers, etc.); the bank of multimedia materials to provide students with self-guided work (video records of lessons, electronic versions of current mathematics textbooks for grades 1-4, the normative documents for primary education, the methodical aids for teachers, electronic textbooks and manuals for students, video records of lecture presentations, video records of comments on specific aspects of the program, links to the resources on the Internet etc.); the bank of test tasks.

The multimedia methodical complex of educational discipline «Teaching methodology of the educational branch *Mathematics*» satisfies the set of requirements: psychological, didactic, methodical and organizational ones. The observation of these requirements enables the effective formation of methodical competence of future primary school teachers in mathematics teaching with means of multimedia.

The two-level structure of the multimedia methodical complex is offered: according to the content of the educational subject (under three sections, and there are units in every section that contain separate topics and these topics are developed through the system of questions) and according to forms of organization of the educational process (lectures, practical / laboratory classes, student self-guided work).

As a result of conducting the formative experiment, during which the multimedia methodical complex of educational discipline «Teaching methodology of the educational branch *Mathematics*» was introduced and as well as the method of its usage, the statistically significant changes in the levels of formation of methodical competence of pre-service teachers in Mathematics teaching were recorded in the experimental groups. It has also been found out that students of experimental groups have more opportunities to use IT in Mathematics teaching to pupils and show the steady aspiration to do that. According to the analysis of the experimental data obtained, the conclusion on the efficiency of the developed multimedia methodical complex for future primary school teachers in Mathematical teaching was made.

The conducted research does not cover all aspects of the problem of using IT in the process of pre-service primary school teachers' training in mathematics teaching to pupils. The perspectives of further research may deal with the improvement of the multimedia methodical complex of the educational discipline «Teaching methodology of the educational branch *Mathematics*» due to the improvement and development of its components.

REFERENCES

Haran M., 2016: *Checking the effectiveness of the use of multimedia methodical complex in the process of methodical preparation of future primary school teachers to mathematics training*. Pedagogy and psychology: the current state of development of scientific research and prospects, Zaporizhzhia, 2016, P. 43-47.

Haran M., 2016: *Method of multimedia methodical complex using for educational subject «Teaching methodology of the educational branch «Mathematics»»: [methodical recommendations]*. Kherson: PE Vyshemyrskyi V., 2016, 108 p.

Haran M., 2016: *Requirements to multimedia didactic and methodical complex of the discipline Methods of teaching of the educational branch «Mathematics».* Vzdelávanie a spoločnosť, Prešov, 2016, P. 151-164.

Heba A., 2009: *Information and Communication Technologies in the Process of Developing Mathematical Competences among High School Students In:* Theoretical and Practical Aspects of Distance Learning, edited by E. Smyrnova-Trybulska, Cieszyn: Studio TK Graphics for University of Silesia, 2009, p. 308. ISBN: 978-83-925281-4-2. P. 169-179.

Kostolányová K., 2009: *New Approaches of Information Technology Applied in Education*. Theoretical and Practical Aspects of Distance Learning, Cieszyn, 2009, P. 60-65.

Skvortsova S., Haran M., 2016: *The using multimedia means in the training of primary school teachers in Ukraine: realities and prospects*. Science and Education a New Dimension. Pedagogy and Psychology, IV (43), Issue 88, Budapest, 2016, P. 41-45.

Skvortsova S., Haran M., 2015: *Training of primary school teachers for teaching mathematics pupils*. Mountain School of Ukrainian Carpaty, № 12–13, Ivano-Frankivsk, 2015, P. 209-215.

Skvortsova S., Haran M., 2016: *Multimedia support of the discipline"Methods of teaching educational branch "Mathematics" (MTEBM) as a means of forming methodical competency of future primary school teachers*. Bulletin of Chernihiv National Pedagogical University named after T.G. Shevchenko, № 137, Chernihiv, 2016, P. 284-288.

Skvortsova S., Haran M., 2016: *The consideration of psycho-physiological peculiarities of students as a requirement for presentation of educational* *information in presentations of lectures*. Social and Economic Priorities in the Context of Sustainable Development : Monograph, Opole, 2016, P. 371-377.

Skvortsova S., 2015: *Structural and functional model of the methodical competency formation of future Mathematics teachers in teaching primary school pupils.* Pedagogical sciences: a collection of scientific works, Issue 6, Kherson: KSU, 2015, P. 270-276.

Skvortsova S., Haievets Y., 2013: *Future primary school teachers' training for teaching primary school students to solve narrative mathematical problems: monograph.* Kh.: Ranok-NT, 2013, 332 p.

Smyrnova-Trybulska E., 2012: *Teachers' Competence in Using Information and Educational Internet Resources in the Education Process.* In: *Distance Learning in Applied Informatics DIVAI 2012*, 9th International Scientific Conference on Distance Learning in Applied Informatics, 2012. Conference Proceedings. *Editors:* Martin Cápay, Miroslava Mesárošová, Viera Palmárová. Constantine the Philosopher University in Nitra, Nitra-Sturovo, Slovakia, 2012, p. 289–300. ISBN: 978-80-558-0092-9. <http://conferences.ukf.sk/index.php/divai/divai2012/paper/view/901>

Smyrnova-Trybulska E., Ogrodzka-Mazur E., Szafrańska-Gajdzica A., M. Drlík, Martin Cápay, J.Tomanová, P. Švec, N. Morze, R. Makhachashvili, M. Romanyukha, M. Nakazny, L. Sorokina , T.Issa, T. Issa, 2016: *Recommended Applications for Making Presentations and Didactic Videos. Some Research Results*. In: DIVAI 2016 – Distance Learning in Applied Informatics. 11th International Scientific Conference on Distance Learning in Applied Informatics Conference Proceedings, 2–4 May 2016. Editors: Milan Turčáni, Zoltán Balogh, Michal Munk, Ľubomír Benko, Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Informatics, Editors Nitra, Publisher: Wolters Kluwer, p. 235–246. ISBN 978-80-7552-249-8. ISSN 2464-7470 (Print) ISSN 2464-7489 (On-line).

THE APPLICATION OF COMPUTATIONAL TOOLS OF IT IN MATHEMATICAL TASKS

Dana Országhová
Slovak University of Agriculture in Nitra,
Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic,
dana.orszaghova@uniag.sk

Abstract: *Changes in university education are caused, among others, by integrating tools of information technology into the teaching and self-study of mathematics. In the paper we present some samples of applying graphical and computational tools in mathematics. We focused on the graphical interpretation of the definite integral of a function with one variable via free computational software. By method of two-sample t-test we have verified the statistical hypothesis about the significant differences between the assessment results of compulsory study subjects Mathematics IA and Mathematics IB in the bachelor economics study programs. Based on the obtained results, there is a statistically significant difference between the exam results in the evaluated study subjects.*

Keywords: mathematics tasks, application of information technology, knowledge level, exam grades, statistical hypothesis testing.

INTRODUCTION

The engineering education is performing in the era of globalization and the important question is how to educate students of engineer study programs to be successful in the changing world and to cope with the different aspects of information explosion. In the competitors' fight it is possible to be winner with permanent innovations and high quality production.

Now that the issue of integrating technological tools into the teaching and learning of mathematics has become urgent, one can wonder what the existing theoretical perspectives have to offer. Can they be applied to this new context? Technological devices have become smaller and handheld devices such as graphing and symbolic calculators are widespread. Communication has become a more integrated part of technology use: software can be distributed using the Internet, and students can work, collaborate, and communicate with peers and teachers in digital learning environments (Drijvers et al., 2009).

The current time is considered as information age in which the conditions, content and methods of education change significantly. Information technology (IT) as an important phenomenon of the information society has become part of university education and its tools are used in a variety of ways. Teachers of mathematics use IT tools to promote active participation of students in education, to create electronic learning resources, to create assignments, to verify the correctness of the solution, or for graphical interpretation of tasks. Students can apply IT tools in solving exercises, during seminar work and projects, or in an individual mathematics study during the exam preparation.

A critical part of students' development and persistence as engineers is their acquisition of a professional identity. Prior research indicates that science, technology, engineering, and math (STEM) students tend to over calibrate their level of professional identity (Villanueva and Nadelson, 2017).

The part of the creation of an information society is education with new qualities and modern methods, including the use of multimedia and virtual elements in education (Országhová et al., 2010). One component of the work of university teachers of mathematics is the implementation of modern methods in the study system and the creation of electronic courses in mathematics (Gregáňová, 2009). E-learning courses as a practical application of new educational approaches and methods provide opportunities for the application of the specific requirements of individual subjects (Országhová, 2009).

When searching for free software, we found interesting information for students on a website (For Students - Calculators on the Web) with direct links to calculators that can be used by students to check the correctness of the result after the calculation, e.g.:

1. Function calculator (calculates function derivation, Taylor polynomial, iterations and displays function graph).

2. Matrix calculator (for a given matrix, it calculates the inverse matrix, its determinant and simple expressions).

3. Matrix multiplier (calculates matrix product).

4. Linear solver (solves a system of linear algebraic equations).

5. Solucia (solves differential equations).

6. Alcula (counts linear and quadratic regression).

An important goal of education is to provide students with the latest knowledge via modern methods, including e-learning through information technology. E-learning in education can take many forms and thus perfectly adapt to the needs of individual students, groups and organizations. As it is known, learning can be referred to as the blended if about 50 per cent of the learning interaction is mediated by ICT (Sekret and Hrubý, 2013). Blended learning is connecting the traditional way of education with the multimedia assisted learning. The "mobile" learning, especially mobile learning involving mobile telephony, is seen as becoming a new sector of education and training.

The result of mathematics study is the mastering of mathematical methods and procedures that students will use to solve economic questions from practice. This area includes various analytical tasks such as market conditions that are important for enterprises for the involvement in international business (Mura et al., 2012), the analysis of consumer opinions and preferences when buying food products (Vietoris et al., 2016), the creation of appropriate production and consumption models; the accounting and fiscal issues related to agricultural land in the case of the Slovak Republic (Krajčírová et al., 2016), and so on.

1. MATHEMATICS TOPICS IN ECONOMICS STUDY PROGRAMS

The content of compulsory subjects in mathematics at the Faculty of Economics and Management of the Slovak University of Agriculture (SUA) in Nitra is underlying the main aim – to teach the students basic knowledge of higher mathematics and to point out the possibilities of the application of the mathematical apparatus in professional subjects and in practice. Mathematics also develops logical thinking, which is necessary when solving the different situations and problems in the professional or private life.

In Table 1 we summed up the thematic units of mathematics subjects taught at the Faculty of Economics and Management. Study subjects Mathematics IA and Mathematics IB are obligatory and students have to take the exam. The evaluation system includes: a partial test during the semester, a seminar project and an exam test. Students are expected to have prepared printed literature for individual study and electronic educational courses created in LMS Moodle.

Table 1.

Main mathematics topics taught at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra

Mathematics IA, 1st year, winter term	Mathematics IB, 1st year, summer term
Function with one real variable	Indefinite integral
Limit of a function with one real variable	Definite integral and applications
Derivative of a function with one real variable	Linear algebra: vectors, matrices, systems of linear equations
Function with two real variables	Theory of probability

Source: Own work

2. MATHEMATICAL TASKS SOLVED WITH IT TOOLS

Applied tasks are important motivating factors of the study of mathematics for economists and managers. The applications of mathematical methods can be demonstrated to students by means of tasks with different levels of difficulty. Students can lose logical relationships in time-consuming applied tasks and this could result in the distraction from studying. Table 2 lists IT tools and software applied in mathematical topics and tasks.

Table 2.

IT tools and software used in teaching and individual study of Mathematics IA and Mathematics IB

MS Excel	Calculations with expressions, values of functions, probability, functions graphs
GraphSight v.2.0.1.	Graphs of functions with one variable, limits and asymptotes
WolframAlpha (free)	Derivative of a function, indefinite and definite integrals, graph of a function with two real variables. Linear algebra: vectors, matrices, systems of linear equations
GeoGebra	Functions, local extremes and graphs

Source: Own work

2.1 Definite integral and graphic interpretation

Indefinite and definite integrals have many applications. We focused on the area of a plane figure which has application in economics as consumer and producer surplus. The plane figure is usually bounded by two functions. The formulation of the task is: evaluate the area of a plane body bounded by functions $f: y = x^2 - 4x$, $g: y = 2x - 5$ and sketch the graphs (Figure 1).

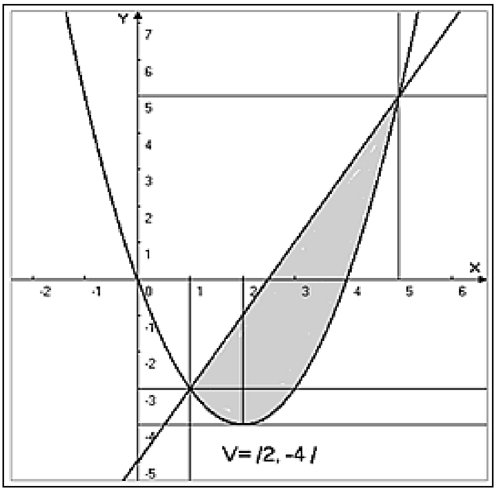

Figure 1. Graphs of functions created in the software GraphSight v.2.0.1.
Source: GraphSight v.2.0.1., own work

In the Graphics menu, program GraphSight v.2.0.1. offers the following options:

• Graph in Cartesian coordinate with expression $y = f(x)$ or $x = f(y)$,

• Graph for function given parametrically,

• Graph for function in polar coordinates,

• Table chart.

Students consider the creation of images and function charts as a difficult task, so they prefer graphic software for graphs. This approach develops their ability to combine knowledge and apply graphics programs in mathematics as well. A maths teacher can apply this program very effectively when creating new assignments for exercises, testing student knowledge, and creating test assignments. The graphs of functions are the means for the presentation of events and processes from different scientific areas and from different areas of practical life. Solving of applied tasks with graphical interpretation of a function enables students to acquire knowledge and skills that they can utilize in other specialized economic subjects.

2.2 Indefinite and definite integrals calculated in free software WolframAlpha

The following outputs were created in free software WolframAlpha. The formulation of the task is: find indefinite integral and evaluate the definite integral.

Case I

Indefinite integral:

$$\int (x^2 - 4x)\, dx = \frac{x^3}{3} - 2x^2 + \text{constant}$$

Definite integral:

$$\int_0^4 (x^2 - 4x)\, dx = -\frac{32}{3} \approx -10.667$$

Visual representation of the integral:

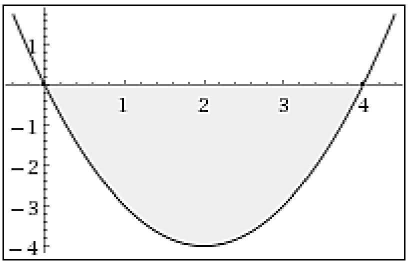

Figure 2. Graph of the function $y = x^2 - 4x$.

Source: WolframAlpha, own work

To compare two different cases we solved the task formulated as a case II. The bounded area is under axis x (case I) and above axis x (case II). Therefore the definite integral is minus or plus according to the situation.

Case II

Indefinite integral:

$$\int(-x^2 + 4x)\,dx = 2x^2 - \frac{x^3}{3} + \text{constant}$$

Definite integral:

$$\int_0^4 (-x^2 + 4x)\,dx = \frac{32}{3} \approx 10.667$$

Visual representation of the integral:

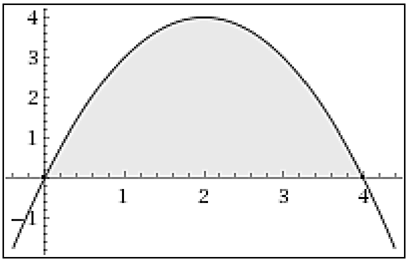

Figure 3. Graph of the function $y = -x^2 + 4x$.

Source: WolframAlpha, own work

Part-time students have fewer hours of contact study than full-time students. Mutual communication with teachers confirms that these students use the created study materials in electronic form. Mathematical educational tools for individual study are accessible through courses created by the Department of Mathematics (the Slovak University of Agriculture in Nitra) in the LMS Moodle environment and include examples with the solving procedures and tasks for self-study with solutions. Students can join the university's web sites at the time that suits them best for study.

3. ANALYSIS OF STUDY OUTPUTS IN MATHEMATICS

3.1 Analysis of tasks solving

Presented examples of solved tasks confirm that their solution is conditioned by the combining knowledge of mathematics: calculus and geometry. The data for analysis were obtained from the compulsory subjects Mathematics IA (winter term) and Mathematics IB (summer term) in the 1st study year of the bachelor's degree at the Faculty of Economics and Management.

We selected mathematical tasks from the partial and final tests with topics: integral calculus and linear algebra. The themes in the assignments were as follows:

Task 1 (T1): inverse matrix,

Task 2 (T2): system of linear equations,

Task 3 (T3): the area of a plane figure (use of a definite integral),

Task 4 (T4): graphs of functions,

Task 5 (T5): indefinite integral.

In Figure 4 the tasks are presented with the percentage rank of earned points. Students gained better results in solving the tasks from linear algebra (T1, T2). They achieved the smallest number of points in solving the task with graphs of functions (T4). The decrease in the number of mathematics hours at secondary schools resulted in the reduction in the scope of analytical geometry.

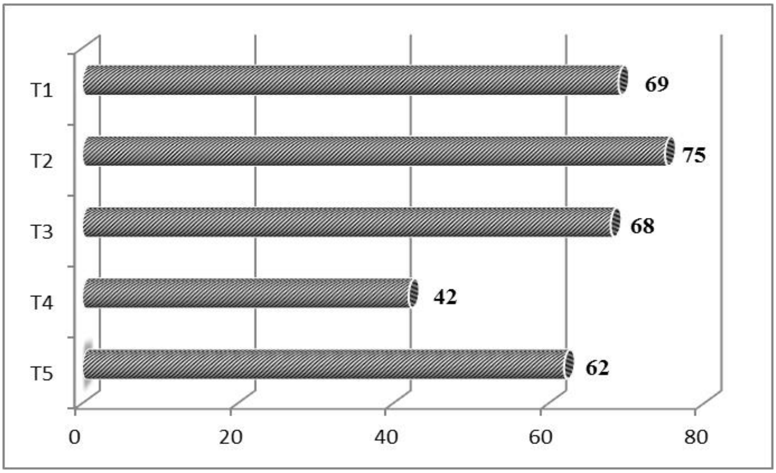

Figure 4. Results of tasks analysis expressed in a percentage.

Source: Own work

3.2 Mathematics exam grades

In this part we present the results of the analysis of exam grades of mentioned subjects Mathematics IA and Mathematics IB taught in academic year 2015/2016. In Figure 5 it is displayed in the graphic form of evaluation with the standard scale from A(1) to FX(4). We see that the final evaluation of knowledge by the grade E(3) is the most common in both subjects. The comparison shows that in the summer semester (Math IB), students have worse evaluation grades. This fact is caused by leaving from the university study after the first semester; the reason for leaving is also insufficient knowledge from the secondary school. Moreover, students do not have a great ambition to get a better grade in the summer semester.

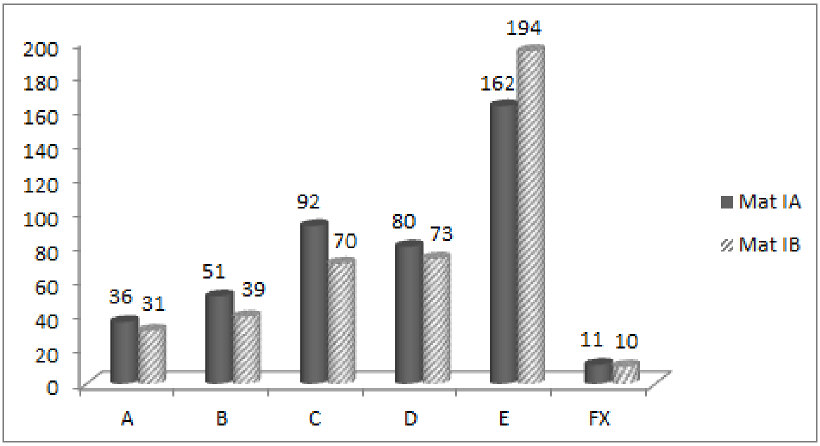

Figure 5. Comparison of final grades in Math IA and Math IB.

Source: Own work

Using the two-sample t-test in MS Excel, we tested the null hypothesis about the differences in the knowledge level of students represented by final grades in the study subjects Math IA and Math IB.

Table 3.

Results of statistical testing of exam grades of subjects Mathematics IA and IB

t-Test: Two-Sample Assuming Equal Variances		
	Mat IA	*Mat IB*
Mean	2.334	2.442
Variance	0.444	0.427
Observations	421	407
Pooled Variance	0.433	
Hypothesized Mean Difference	0	
df	826	
t Stat	-2.374	
P(T<=t) one-tail	0.009	
t Critical one-tail	1.647	
P(T<=t) two-tail	0.018	
t Critical two-tail	1.963	

Source: Own work

In Table 3 there are presented the results obtained. Because the calculated value (two-tail) $P = 0.018 < 0.05$, the null hypothesis about the equal knowledge level of students in the given subjects at the significance level $\alpha = 0.05$ cannot be accepted. Therefore, we can state that there is statistically significant difference between the exam results achieved by the students in Mathematics IA and Mathematics IB.

4. DISCUSSION

The implementation of IT tools into the educational process at universities also means changes in the system of education. Students have to work more actively, individually, search for the necessary information and to discover relevant relationships more easily with IT. The education with usage of new technologies is more flexible and widely available at any location and with access anytime (Hornyák, Gregáňová, 2016).

New opportunities are open by using IT in mathematics:

- Display of function graphs,

- Rationalizing complex and time-consuming calculations,

- Graphical interpretation of solved tasks,

- Development of spatial imagination of students,

- Using the appropriate application or program (e. g. MS Excel, Mathematica, GraphSight v.2.0.1., GeoGebra, free WolframAlpha, etc.).

As Turek (2006) states, the transition from an industrial society to an information society (learning society) is characterized by the fact that in the industrial society the capital is the main strategic source of development, while in the information society knowledge and information become the source for the progress. This results in new learning objectives: to develop the ability of students (people) to create and use information, to orientate and to apply them, or in other words, it is necessary to develop an interest in learning, to be able to learn effectively throughout the whole life and to adapt flexibly to the changing circumstances of our life.

It is obvious that teachers are the important component in this process, so the change in the preparation of future teachers is also needed.

All educational institutes should implement effective tools for knowledge management in order to sustain in competitive world. Barbara Friehs (2003) mentioned following assignments for the effective usage of knowledge management:

- Mobilize the hidden implicit/tacit knowledge,

- Integrate knowledge from organization and make it accessible to all,

- Identify the missing knowledge, create new knowledge,

- Make knowledge more accessible and usable,

- Create knowledge sharing culture to experiment and learn,

- Evaluate and reflect learning processes,

- Codify new knowledge.

CONCLUSION

- One of the many advantages of implementation of IT tools into the process of mathematics education is better explanation and visualization of the mathematical concept. A key factor in the functioning of the information society is education, whose aim is to ensure that people are able to find and understand the information, then apply it correctly.
- In the paper we focused on topics with graphical interpretation of functions and integrals via software products. This method should help students studying at the university (from different types of secondary schools) to realize computations and display graphs.
- The evaluation of knowledge level of students is the important part of pedagogical research. By two-sample t-test we analysed the exam grades in two obligatory study subjects: Mathematics IA (winter term) and Mathematics IB (summer term) taught in the first study year at the Faculty of Economics and Management. The statistical results obtained proved that there is a statistically significant difference between the exam results in these evaluated study subjects. In this sample the study outcomes are worse in Mathematics IB.
- By solving tasks with IT support we improve and develop:

  - Students knowledge level to apply theoretical principles of mathematics,

  - Activity, autonomy and creativity of students,

  - Permanent and systematic knowledge,

  - Interdisciplinary relationships,

  - Quality of learning outcomes.

REFERENCES

Drijvers, P., et al. 2009: *Integrating technology into mathematics education: theoretical perspectives*. In Mathematics education and technology − rethinking the terrain (pp. 89-132). Springer US.

For Students - Calculators on the Web (Pro studenty - kalkulátory na webu), http://www.petrg.wz.cz/IntKalk.php, (accessed 18 May 2017)

Friehs, B., 2003: *Knowledge Management in Educational Settings,* [online], at:

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.214.9542&rep=rep1&type=pdf, (accessed 13 April 2017)

GraphSight v.2.0.1., http://www.cradlefields.com/gs/graphsight.html, (accessed 19 June 2017)

Gregáňová, R. 2009: *Kurzy v prostredí LMS Moodle – prostriedok e-vzdelávania v matematike*. In Trendy ve vzdělávaní 2009, Olomouc: Votobia, 2009, p. 428-431, ISBN: 978-80-7220-316-1

Hornyák Gregáňová, R., 2016: *About the using of IT tools in mathematical education in FEM SPU in Nitra*. In eLearning 2016, Hradec Králové: Gaudeamus UHK, 2016, p. 57-61. ISBN: 978-80-7435-657-5

Krajčírová, R., Ferenczi Vaňová, A., & Munk, M., 2016: *Agricultural Land and Land Tax – Significant Indicators of Agriculture Business Activities in the Slovak Republic.* European Countryside, 8(2), p. 98-108, ISSN: 1803-8417

Mura, L., Buleca, J., Zeleňáková, L., Qineti, A., & Kozelová, D., 2012: *An analysis of selected aspects of international business in Slovak dairies in the EU framework.* Mljekarstvo, 62(3), p. 219-226, ISSN: 1846-4025 (Online)

Országhová, D., 2009: *Seminar assignment in mathematics and IT tools*. In Trendy ve vzdělávaní 2009, Olomouc: Votobia, 2009, p. 532-535. ISBN: 978-80-7220-316-1

Országhová, D., Gregáňová, R., Baraníková, H., Tóthová, D., 2010: *Multimédiá vo vyučovaní matematiky*. Nitra, SPU, 2010, 168 p., ISBN: 978-80-552-0405-5

Sekret, I., and Hrubý M., 2013: *E-learning in foreign language education for academic purposes: Ukrainian and Czech practices*. In Distance learning, simulation and communication 2013, Proceedings, Brno: University of Defence, 2013, p. 133-139, ISBN: 978-80-7231-919-0

Turek, I., 2006: *Globalisation and its impacts on innovation of engineering education,* [online], at:

http://www.fhpv.unipo.sk/~persica/pod/studenti/3.%20rocnik/Inov%E1cie%20v%20s%FA%E8asnej%20diddaktike.pdf, (accessed 26 May 2017)

Vietoris, V., Kozelová, D., Mellen, M., Chreneková, M., Potclan, J. E., Fikselová, M., Kopkáš, P., & Horská, E., 2016: *Analysis of Consumer Preferences at Organic Food Purchase in Romania*. Polish Journal of Food and Nutrition Sciences, *66*(2), p. 139-146, ISSN: 1230-0322

Villanueva, I., & Nadelson, L., 2017: *Are We Preparing Our Students to Become Engineers of the Future or the Past?* International Journal of Engineering Education, 33(2), 2017, p. 639-652, ISSN: 0949-149X

WolframAlpha, Computational knowledge engine, http://www.wolframalpha.com, (accessed 12 June 2017)

Author's declaration

I, Dana Országhová (author of this contribution) honestly declare that I send own original work for publishing, not printed before in other sources in the same form.

V. E-ENVIRONMENT, SMART-UNIVERSITY AND CYBERSPACE

MAKING A MOVE TO TEACHING IN AN E-LEARNING ENVIRONMENT – GUT PERSPECTIVE

Iwona Mokwa-Tarnowska
Politechnika Gdańska
Gabriela Narutowicza 11/12, 80-233 Gdańsk
imtarn@pg.gda.pl

Abstract: *Incorporating e-learning resources and activities into a university course curriculum involves restructuring the whole teaching programme to achieve a synergistic effect. It also requires the teachers to acquire appropriate knowledge and develop new skills necessary to supervise the educational process in a new and more versatile environment. The development of web 2.0 technologies has enabled educators to move from instructivism towards constructivism, constructionism and connectivism, that is towards interactive, collaborative and active learning. Not all teachers, however, realise that the shift will help them create a more effective environment. The ideas presented above will be supported by Gdansk University of Technology (GUT's) academics' opinions and attitudes expressed in a survey.*

Keywords: teaching, e-learning, web-enhanced learning, online activities and resources

INTRODUCTION

Incorporating e-learning into teaching is always a challenging move, and it can be successful or unsuccessful. Whichever result will be obtained depends on a wide range of factors – competencies of the staff, their understanding of the possibilities of online environments and their dedication to using new technologies to improve learning experiences being among the most significant ones. The inclusion of e-learning resources and activities in the syllabus involves restructuring the whole teaching programme. It also requires the teachers to gain and develop new skills necessary to supervise the educational process. If such a new environment is to be successful, all the staff responsible for changes in the faculty curricula, i.e., the decision makers, the developers of online modules and the faculty tutors have to understand both the potential benefits and drawbacks of new learning design.

Technology-supported learning such as e-learning, blended learning or web-enhanced learning is not about replacing or supplementing traditional face-to-face sessions with as many e-learning technologies as possible, and is not about delivery channels. The most important thing in the move is to effectively blend classroom activities with online ones for pedagogic gain.

Although multimedia learning supported by the Internet has been around for approximately twenty years, it can be stated that the rapid advancement of online technologies has not yet resulted in a substantial increase in the number of innovative courses across Polish universities. It seems that numerous academic staff are reluctant to incorporate online technologies into their teaching if they are not obliged to do so by the university authorities. The reasons can be different – unfamiliarity with their affordances, no pedagogical knowledge about how to use them effectively, and heavy workload can be the major factors in academics not wanting to experiment with new methods and environments.

The paper aims to show how the academic teachers who are involved in e-learning at Gdansk University of Technology (GUT) perceive web-enhanced classes and e-learning (Smyrnova-Trybulska 2016), and whether they can engage their students in an active and collaborative development of knowledge and skills through the use of online tools. The presented hypotheses are supported by survey results and discussions with the staff supervising the development of e-learning at Gdansk University of Technology.

1. HOW TO PREPARE TEACHERS FOR A CHANGE IN THE PEDAGOGICAL PARADIGM

An interest in incorporating new technologies into the learning and teaching process has grown considerably over the last years. With the application of web-based systems to education in the 1990s, behaviourist ideas, which flourished in a face-to-face classroom, also entered the realm of virtual learning environments. This was seen in the design of the first e-learning resources, which were very instructivist, and the wording of the aims and objectives of online courses (Heriot-Watt University 1999). Since then the behaviourist paradigm has substantially affected the learning design of educational programmes with online components, and the understanding of learning outcomes, which is visible in many present-day study offers and in the way advisors employed in e-learning support centres structure their sample courses[1].

[1] Association of Academic E-learning in Poland certifies the skills required of e-tutors and holds examinations on passing of which the candidate becomes AEE Certified in Online Learning Design and Development. Being the supervising member of the examination

The development of Web 2.0 technologies has enabled educators to move towards constructivism (Koohang, Riley and Smith 2009), constructionism (Papert, Harel 1991), and connectivism (Siemens 2005). Some of their principles can be seen, e.g., in the affordances of Moodle tools and in the MOOCs provided by the UK's Open University (Mokwa-Tarnowska 2015c). The focus on the collaborative nature of knowledge development and various interactions between and among course participants allows designing resources and activities which shift control to students, increasing their engagement in the learning process (Mokwa-Tarnowska 2015b). Working with authentic sources under the supervision and guidance of the tutor, participating in projects, developing new knowledge through discussions and being part of a community of learners, course participants can exercise more freedom in structuring their own educational paths, which may lead to them becoming self-directed learners in the years to come. The constructivist environment provides a variety of opportunities, methods and tools to build mental models, thus it can better satisfy adult learners' needs. Formative and summative assessment based on problem-solving tasks and open-ended questions could be more beneficiary both for students and tutors, because it focuses on more real-life like interactions. Designing a learning environment which is constructivist in nature is not an easy task. It requires from an educator to acquire a deeper understanding of its pedagogy and the ways of its application to online education.

Involving course participants in the learning process which takes place in a virtual classroom, i.e., increasing their willingness to actively participate in various course activities as well as motivating them to learn on their own at a steady pace, is the responsibility of online tutors. If the learning design of a course with any e-learning components or a course enhanced with web tools does not include pre-emptive or responsive tutor support structures, the learning outcomes may not be as assumed during the preliminary development phase. Even the best resources and activities, effective in a traditional face-to-face classroom, when transferred to an online environment are likely to cause a number of difficulties. Potentially, this contributes to a high drop-out rate and leads to the attendants not meeting the course aims or objectives or both.

An online environment may not be of substantial benefit to students unless it is designed by trained staff who can help less experienced tutors or total beginners in the realm of online education to successfully supervise their courses (Krajka 2012, Allen 2016). Moving from a solely instructive to at least partially constructive approach to teaching opens up new possibilities of creating a successful learning environment. Blending traditional and online education leads to a unique design, which can have a synergistic effect. However, to achieve this goal appropriate conditions for a move towards more innovative educational environment have to be laid down by decision makers, who should devote more

board, over the last three years I have analysed and assessed a significant number of applications and written examinations. The vast majority of both of them in every certification included the description of courses structured only around behaviourist ideas.

time to evaluating online teaching and learning (Tobin, Mandernach and Taylor 2015).

2. GUT TUTORS' APPROACH TO ONLINE TEACHING

Gdańsk University of Technology has a domestic and worldwide reputation of being a significant scientific centre. Its nine faculties give opportunities to create a superior climate for intellectual and personal growth. They provide education for more than 25000 students offering undergraduate, postgraduate and doctoral courses. The total number of academics amounts to approximately 1200. Lectures, seminars and laboratory workshops run in a traditional face-to-face environment are a dominant form of teaching, online assignments and courses being a marginal percentage of the workload assigned to the students. Whichever educational paths GUT students are offered depends on the faculty board, and the directors of the supportive centres in the case of language, mathematics and physical education, as well as on individual academics. There are no full-time courses run online, and only some include online modules or are enhanced by web-based materials. The latter category could be assumed to be the major field of e-learning activity at GUT. The statistics are difficult to obtain because it is not necessary for the academics to report the exact composition of their courses to the authorities. The syllabus must include a division into traditional and online learning only if the course is provided in a blended format – and such types are infrequently delivered at GUT.

2.1 Aims of Introducing Online Resources and Activities

Over the last academic years different online components have been designed to enhance learning opportunities for students attending regular courses offered by the Faculty of Applied Physics and Mathematics, the Faculty of Electrical and Control Engineering, the Faculty of Electronics, Telecommunications and Informatics, the Language Centre and the Mathematics Teaching and Distance Learning Centre[2]. They have mainly aimed: to introduce novelty into teaching and learning, to increase learning opportunities, to provide support, to enable revision, and to prepare the students for blended programmes and self-directed learning. The last few years have seen the emergence of different Web 2.0 tools, so an additional goal has been established, namely to develop various competencies in students such as

[2] The faculties and centres enumerated in the section are more interested in incorporating e-learning into the curricula of their courses, which is visible in the syllabi uploaded to the university LMS. The other faculties are significantly less advanced in restructuring their educational programmes to include e-learning modules and purpose-designed web-enhanced activities. All the faculties and centres provide their students with additional materials uploaded to Moodle, which constitutes pre-emptive and responsive support coming from the course structure, resources and teachers (Mokwa-Tarnowska 2015a: 81-83).

soft skills, i.e., collaborative, analytical, critical-thinking and reflective skills. To achieve it, website creation and data publishing technologies have been chosen to support web-based tasks.

2.2 Design and Implementation

Academics in the faculties and centres mentioned above have started developing online educational materials using different Web 2.0 tools. Most of them have been uploaded to Moodle, which is the main course management system used at the university, some have been made available through other learning platforms or free Internet technologies. The learning design of the modules is not consistent throughout all the ones that have been made so far as the courses differ in nature, they also serve faculty-specific purposes and are supposed to produce different learning outcomes. The majority of them are still instructive. However, a paradigm shift towards constructivism can be seen. Some tasks developed by the Language Centre involve moving control over the learning process to the students, which helps to create a positive atmosphere encouraging learner engagement in class and outside it, as well as the sense of community.

2.3 Research Methods

The qualitative and quantitative research into the nature of web-enhanced classes and blended courses at GUT, their impact on an increase in student competencies, the quality of online teaching and learning (Półjanowicz, Roszak, Kołodziejczak and Bręborowicz 2014), the tutor' role in a versatile educational environment, and an interest in a move towards e-learning and incorporating more Internet technologies into education is in its initial stage and may include subjective results. Students' and teachers' opinions shown in comments presented in class and outside it, as well as open-ended questions in surveys will help to uncover trends to be further tested using quantitative research, which has just been initiated. Two basic tools have been used so far to produce a qualitative analysis: direct observation and group discussions. The quantitative research whose results are presented in this paper involved a paper survey carried out in June 2017. The research questions were as follows: *How do the teachers and academics at GUT perceive e-learning and web-based education?*, *How do they assess their readiness for teaching in these environments?* and *Do the staff understand the difference between teaching in a traditional and online environment?*.

It can be assumed that the composition of the study group was quite homogeneous with respect to many factors: intellectual capacity, interest in e-learning and experience in teaching students of science and engineering. The respondents' technical skills necessary to develop online materials differ substantially and depend on their qualifications, eighteen respondents are ESP teachers whereas the other twenty six academics are science and engineering degree holders.

2.4 Findings

In 2013 I was part of the team who developed and run short, four-hour courses on teaching in an e-learning environment with a focus on Moodle for GUT's academics. They were not compulsory and targeted people who either had some experience in using online technologies or were eager to see how they could enhance their teaching with new opportunities. The attendants, who amounted to 122, came from every faculty and centre. On enrolment they themselves specified their ITC skills necessary to use online tools and were divided into three different-level groups. The course was successful – the participants declared in the survey that they would use e-learning to support their classes, which could improve their students' learning opportunities[3]. Thus, it seemed that online resources and activities would gain in popularity and that more academics, encouraged by their co-workers, would become interested in web-based education. However, it has not happened so far, the reasons being different. The lack of interest in increasing the rate of e-learning or web-enhanced learning/teaching can be seen in the number of the staff who decided to participate in the survey – it was addressed to the academics who had some knowledge about or experience in using e-technologies and online materials. These who are not involved in online education in any way were reluctant to complete the questionnaire.

Table 1.

Completed courses/workshops on e-learning

Have you ever attended courses/ workshops on e-learning?	Yes, many (%)	Yes, a few (%)	Yes, only one (%)	No (%)	I do not remem ber (%)	Total number of teachers
Language Centre	11.11	72.22	11.11	–	5.56	18
Mathematics Teaching and Distance Learning Centre	33.33	66.67	–	–	–	3
Faculty of Applied Physics and Mathematics	15.38	7.7	15.38	61.54	–	13
Faculty of Electrical and Control Engineering	–	16.67	16.67	66.66	–	6
Faculty of Electronics, Telecommunications and Informatics	–	25.0	50.0	25.0	–	4

Source: Own work

[3] The respondents were asked to rate the usability of e-learning to support their teaching, and the majority of them stated that the course would help them enhance their classes to a great extent (*very good usability* answers: 61% of the beginners, 78% of the participants with intermediate skills, 45% of the participants with advanced skills; *good usability* answers: 33%, 18% , 41% respectively).

The survey shows that almost all the respondents from the centres except one teacher of English[4] have completed at least one training programme on e-learning, and that more than half of the faculty academics have not participated in any one (Table 1). Training completion is not a prerequisite for running e-learning courses at GUT, because the authorities recognise self-education as a sufficient way of developing knowledge and skills in this field. That is probably why the respondents from the faculties are not very interested in attending such courses (Table 2). However, it can be seen that the teachers from the centres want their training to be more formal, which may be explained by them not being obliged to do research as part of their academic duties. Whereas they can focus on improving their teaching skills, academics in all the faculties have to concentrate on investigating new technological solutions and innovative applications. They are assessed on the basis of their scientific achievements and not on teaching outcomes.

Table 2.

Willingness to attend courses/workshops on e-learning

Would you like to attend a course/workshop to improve your e-learning skills?	Definitely yes (%)	Probably yes (%)	Probably no (%)	Definitely no (%)	I do not know (%)	Total number of teachers
Language Centre	61.11	27.78	5.55	–	5.56	18
Mathematics Teaching and Distance Learning Centre	33.33	33.33	33.33	–	–	3
Faculty of Applied Physics and Mathematics	23.08	46.15	30.77	–	–	13
Faculty of Electrical and Control Engineering	16.67	33.33	33.33	–	16.67	6
Faculty of Electronics, Telecommunications and Informatics	–	50.0	50.0	–	–	4

Source: Own work

[4] Only teachers of English participated in the survey. There are very few teachers of other languages in the Language Centre, and they have not enhanced their classes with any e-learning or web-enhanced learning so far.

The workshops run in 2013 showed that GUT's academics struggled with the pedagogical aspects of learning design far more than with the technological ones. This is also visible in the way the respondents in the present survey assess their knowledge about how to teach in an e-learning environment. A substantial number of them are not satisfied with it (Table 3). Their lack of understanding teaching methods and support structures characteristic of online education is also seen in their answers to the open-ended questions concerning assessment, community of learners, motivating and engaging students in learning. The majority of them think that tests, forums and chats are the only engaging activities in an e-learning environment.

Table 3.

Knowledge about how to teach in an e-learning environment

Are you satisfied with your knowledge about how to teach in an e-learning environment?	Very satisfied (%)	Moderately satisfied (%)	Neutral (%)	Slightly dissatisfied (%)	Very dissatisfied (%)	Total number of teachers
Language Centre	5.55	38.89	5.55	38.89	11.11	18
Mathematics Teaching and Distance Learning Centre	33.33	66.67	–	–	–	3
Faculty of Applied Physics and Mathematics	7.69	38.46	–	30.77	23.08	13
Faculty of Electrical and Control Engineering	–	16.67	–	83.33	–	6
Faculty of Electronics, Telecommunications and Informatics	25.0	75.0	–	–	–	4

Source: Own work

Table 4 illustrates how the respondents perceive their skills in developing e-learning materials. It is not surprising that compared with ESP teachers, more academics with a background in science and engineering regard them as excellent or above average. However, more than 60% of the respondents in every group think that their skills are not sufficient, rating them from "average" to "poor". Many of them would like to participate in a workshop on using tools to produce online materials, which they stated in the comment section that followed the question on attending a training programme in the future.

Table 4.

Skills in developing e-learning materials

How would you describe your skills in developing e-learning materials?	Excellent (%)	Above Average (%)	Average (%)	Below Average (%)	Poor (%)	Total number of teachers
Language Centre	5.55	5.55	33.33	38.89	16.67	18
Mathematics Teaching and Distance Learning Centre	33.33	–	66.67	–	–	3
Faculty of Applied Physics and Mathematics	15.38	15.38	38.46	7.69	23.08	13
Faculty of Electrical and Control Engineering	–	16.67	50.0	33.33	–	6
Faculty of Electronics, Telecommunications and Informatics	25.0	–	75.0	–	–	4

Source: Own work

The teachers have experience in developing both online resources and activities for use in class and outside it (Table 5). Depending on the subject and the delivery mode of educational materials, the teachers can use web-based resources and activities in class to support their teaching, which is the case for many courses at GUT as most lecture and seminar rooms are equipped with computers and TV screens, which allow displaying and sharing content, as well as collaborating when doing exercises. The focus on active learning is visible in the answers given by the language teachers and ETI academics – both groups develop more online activities than resources. The number of the respondents who have not created their own materials amounts to eight (18.18%). The reasons were not provided in the questionnaire.

Table 5.

Developing e-learning materials

– **Have you developed your own e-learning materials?** – **Have you developed your own web-based learning materials for use in class?**	Language Centre	Mathematics Teaching and Distance Learning Centre	Faculty of Applied Physics and Mathematics	Faculty of Electrical and Control Engineering	Faculty of Electronics, Telecommunications and Informatics
Yes, resources (%)	38.89	100.0	69.23	50.0	75.0
Yes, activities (%)	83.33	66.67	15.38	33.33	100.0
No (%)	16.67	–	30.77	33.33	–

Source: Own work

The answers slightly differ if the question concerning using e-learning materials developed by somebody else is taken into account (Table 6). Assigning online resources made available by other scientists or teachers seem to be popular with the majority of the science and engineering degree holders except the ETI ones, who, like the ESP teachers, find online activities to be of more use. This is consistent with the nature of the courses they run whose syllabi are structured around practical tasks and hands-on experience. Besides, some of the teachers worry that developing online materials and supervising online work will take too much time, so their workload will increase dramatically. However as the literature shows (Bezrouk et. al 2017: 12, Afzal, Safdar and Ambreen 2015) the tutors spend less time explaining the basics, and can devote more time to quality teaching.

Table 6.

Developing web-based materials for use in class

Have you used online learning materials or web based activities developed by somebody else?	Language Centre	Mathematics Teaching and Distance Learning Centre	Faculty of Applied Physics and Mathematics	Faculty of Electrical and Control Engineering	Faculty of Electronics, Telecommunications and Informatics
Yes, resources (%)	44.44	100.0	76.92	50.0	25.0
Yes, activities (%)	83.33	66.67	7.69	–	75.0
No (%)	16.67	–	23.08	50.0	–

Source: Own work

The frequency of using e-learning materials (Table 7) does not allow defining the dominant trend. It seems that the answers are correlated with the subjects the respondents teach. As GUT does not offer any entirely e-learning courses, the courses with e-learning modules or enhanced with web-based materials contain some online work, either compulsory or optional, and this supplements or replaces some traditional resources or activities. The respondents do not consider increasing the scope of e-learning within a course as an option, which they stated in the questionnaire. Neither are they interested in becoming online tutors or changing their traditional courses into e-learning ones.

Table 7.

Frequency of using e-learning materials

How often do you enhance your face-to-face classes with some e-learning?	Language Centre	Mathematics Teaching and Distance Learning Centre	Faculty of Applied Physics and Mathematics	Faculty of Electrical and Control Engineering	Faculty of Electronics, Telecommunications and Informatics
Every week (%)	16.67	100.0	38.46	66.66	–
Every 2 - 3 weeks (%)	22.22	–	15.38	–	75.0
Every month (%)	38.89	–	23.08	–	25.0
Every 2 - 3 months (%)	16.67	–	7.69	–	–
Never (%)	5.55	–	15.38	33.33	–

Source: Own work

The staff who completed the questionnaire would appreciate introducing online collaborative projects into the curriculum for degree courses (Table 8). Approximately 60% of the respondents think that they could be either extremely or very effective, and another 25% will accept them as an option. Only one person cannot see their suitability, and one has no opinion. Some of the respondents explained in the comment section that such an assignment would increase workload both for them and for the students, but it would open up new possibilities of acquiring different skills than those that have been targeted now. Although they were not explicitly named, what they meant in their comments were probably soft skills

Table 8.

Online collaborative projects

Do you think that online collaborative projects can be effective?	Extreme ly (%)	Very (%)	Moderate ly (%)	Slightly (%)	Not at all (%)	I do not know (%)
Language Centre	20.45	40.91	25.00	9.09	2.27	2.27

Source: Own work

However, the staff are virtually uncertain about whether they would like to supervise online collaboration or not (Table 9). Only almost 30% of the teachers with some knowledge about e-learning are willing to face the new challenge – none of them has ever taken up such a responsibility – and 50% cannot decide if they would like to be involved in that. This probably results from their lack of experience and appropriate competency, which they noticed when they were asked about teaching in an e-learning environment. For such projects to be effective, they must be supervised by tutors with expertise in constructivist, constructionist and connectivist paradigms, because these approaches support collaborative and co-operative studying, help to understand how to build a community of learners, and allow designing highly interactive activities.

Table 9.

Supervising online collaborative projects

Would you like to supervise online collaborative projects?	Yes (%)	No (%)	I do not know (%)
Language Centre	29.55	20.45	50.00

Source: Own work

The survey shows that there is a move towards e-learning at Gdansk University of Technology, but it is very slow. More teachers than research academics are interested in changing their teaching practice. It can be explained by the fact that the latter are under serious pressure to devote their efforts to scientific work, and that their teaching experience is of secondary importance to the university authorities, which is the case for all Polish universities as they are assessed on the basis of the quality of their research activity. However, a limited number of the staff are interested in enhancing their classes with web-based resources and activities because they are looking for an environment that will better motivate and engage young digital natives (Prensky 2001a, 2001b).

FINAL REMARKS

A post-modern understanding of teaching can enhance the learning process by providing course participants with a versatile environment structured around online technologies. When students learn from materials prepared using different tools, they develop new literacies, which help them become more inventive and efficient pursuers of knowledge and skills in a new digital age. According to Lamy and Hampel (2007, 43), who agree with Kress and van Leeuwen (2001), literacy involves the ability to understand not only a written text but also images and sounds (El-Hindi 1998; Leu et. al. 2004). Resources and activities that involve a new mode of delivery, which is possible to achieve by implementing web-based education, can trigger various interactions between the students and the teacher. They can effectively engage them in learning and teaching if the environment is properly designed.

Blending and enhancing face-to-face classes with Web 2.0 technologies can lead to a very successful outcome if the pedagogical approach is based on the principles of constructivism, constructionism and connectivism – the paradigms which support learner autonomy, community integration and social interactions, cognitive processing strategies, problem solving through interactive processing of information to develop new mental models, peer review and collaborative learning by doing. A carefully structured environment by course developers and tutors can result in better learning outcomes measured by instruments available through the use of online tools. It is not sufficient to replace some traditional resources and activities that have always taken place in the classroom with their equivalents developed in a new environment, using innovative technologies. An online component for use in class or outside it has to be incorporated into the learning design in a meaningful way so as to enhance and improve the learning experience.

Both educators and students must feel comfortable using new solutions and must be positive about the shift (Kisanga 2016). The former should realise what they can achieve by changing the environment, and the latter must understand why web-based education has been incorporated into the curriculum of the course. An online environment can pose a challenge for inexperienced or untrained teachers who have never dealt with web-based courses or for those who do not see the synergy that can be gained through interactions offered by the blend of environments. Raising teachers' awareness may result in them being more willing to make a move towards web-enhanced learning or even e-learning.

REFERENCES

Afzal, M., T., Safdar, A., Ambreen, M., 2015: *Teachers perceptions and needs towards the use of e-learning in teaching of physics at secondary level*, Alberta Journal of Educational Research, August 2015, [online] https://www.researchgate.net/publication/280920751_Teachers_Perceptions_a nd_Needs_towards_the_Use_of_E-Learning_in_Teaching_of_Physics_at_Secondary_Level (accessed 11 July 2017)

Allen, M, 2016: *Guide to e-learning*. Wiley, Hoboken, 2016, pages 408, ISBN: 971119046325

Bezrouk, A., Nosek, T., Smutný, M., Kopeček, M., Voda, P., Hanuš, J. amd Stránský, P., 2017: *(MSL) Multiple step e-learning practical – computed tomography*. In *Distance learning, simulation and communication 2017, proceedings*, ed. M. Hrubý. University of Defence, Brno, 2017, pages 9-14, ISBN: 978-80-7231-415-7

El-Hindi, A., E.. 1998: *Beyond classroom boundaries: constructivist teaching with the Internet.* The reading teacher. International Reading Association, [online] https://eric.ed.gov/?id=EJ567322 (accessed 9 July 2017)

Heriot-Watt University, 1999: *Lola: Learning About Open Learning, Training Manual*: Heriot-Watt University, Glasgow.

Kisanga, D., H., 2016: *Determinants of teachers' attitudes towards e-learning in Tanzanian higher learning institutions*, International Review of Research in Open and Distributed Learning, 17/5, ISSN: 1492-3831, [online] http://www.irrodl.org/index.php/irrodl/article/view/2720/3879 (accessed 11 July 2017)

Koohang, A., Riley, L., and Smith, T., 2009: *E-learning and constructivism: from theory to application*, Interdisciplinary Journal of E-Learning and Learning Objects, 5, 2009, [online] http://ijello.org/Volume5/IJELLOv5p091-109Koohang655.pdf (accessed 20 July 2017)

Krajka, J., 2012: *The language teacher in the digital age – towards a systematic approach to digital teacher development*. Maria Curie-Skłodowska University Press, Lublin, pages 344, ISBN: 978-83-7784-131-0

Kress, G., van Leeuwen, T., 2001: *Multimodal discourse: the modes and media of contemporary communication*. Arnold, London, 2001, pages 152, ISBN-13: 978-0340608777

Lamy, M-N., Hampel, R., 2007: *Online communication in language learning and teaching*. Palgrave Macmillan, Basingstoke, 2007, pages 260, ISBN: 1-4039-1185-1

Leu., D. J. Jr., Kinzer, Ch., K., Coiro J., L., Cammack, D., W., 2004: *Toward a theory of new literacies emerging from the Internet and other information and communication technologies,* [online] https://www.researchgate.net/publication/265628542_Toward_a_Theory_of_New_Literacies_Emerging_Fr om_the_Internet_and_Other_Information_and_Communication_Technologies (accessed 6 July 2017)

Mokwa-Tarnowska, I., 2015a: *E-learning i blended learning w nauczaniu akademickim: zagadnienia metodyczne*. Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2015, pages 178, ISBN: 978-83-7348-613-3

Mokwa-Tarnowska, I. , 2015b: *How to engage students in online learning – web-enhanced and blended ESP classes*. In *IT tools – good practice of effective use in education*, ed. E. Smyrnova-Trybulska, Studio Noa, Katowice, Cieszyn, 2015, pages 81–88, ISBN: 978-83-60071-82-3

Mokwa-Tarnowska, 2015c: Motywowanie uczestników MOOC-ów, Eduakcja 1 (9). 4-11, ISSN: 2081-870X

Papert, P., Harel, I., 1991: *Constructionism*. Ablex Publishing Corporation, [online] http://www.papert.org/articles/SituatingConstructionism.html (accessed 6 July 2017)

Półjanowicz, W., Roszak, M., Kołodziejczak, B. and Bręborowicz, A., 2014: *An analysis of the effectiveness and quality of e-learning in medical education* In: *E-learning and intercultural competences development in different countries, monograph*, sc. ed. E. Smyrnova-Trybulska, University of Silesia, Studio-Noa for Katowice-Cieszyn, 2014, pages 177-196, ISBN: 978-83-60071-76-2

Prensky, M., 2001a: *Digital natives, digital immigrants*. On the Horizon, 9 (5), 2001, 1-6, ISSN: 1074-8121

Prensky, M., 2001b: *Digital natives, digital immigrants, part 2: Do they really think differently?* On the Horizon, 9 (6), 2001, 6, ISSN: 1074-8121

Siemens, G., 2005: *Connectivism: a learning theory for the digital age*, [online] http://www.elearnspace.org/Articles/connectivism.htm (accessed 19 July 2017)

Smyrnova-Trybulska, E., ed., 2016: *E-learning, vol. 8, E-learning methodology – implementation and evaluation*. Studio NOA for University of Silesia, Katowice, Cieszyn, 2016, pages 479, ISBN: 2451-3644

Tobin, T., Mandernach, B., J., Taylor, A., H., 2015: *Evaluating online teaching: implementing best practices*. Jossey-Bass, San Francisco, 2015, pages 304, ISBN: 978-1-118-91036-8

MODEL OF HYBRID CLOUD-ORIENTED EDUCATIONAL ENVIRONMENT FOR FORMAL AND INFORMAL LEARNING OF IT STUDENTS

Olena Glazunova, Tetyana Voloshyna
National University of Life and Environmental Sciences of Ukraine
o-glazunova@nubip.edu.ua, t-voloshina@nubip.edu.ua

Abstract. *Educational process of IT specialists' training should be based not only on formal education, but also to use various forms and tools of non-formal and informal learning. Main practical professionally oriented skills and abilities are retained only due to students' individual work while doing tasks in programming, algorithmization, designing etc. Development of effective academic resources for formal learning will help students to work individually as well as provide comfortable ways of delivering such materials with the help of Internet guarantees enhancing the quality of studies. The present article describes the most effective tools and technologies of formal and informal learning of IT students, considers the issue of creating and using a hybrid cloud-oriented environment. It solves the problem of designing and creating such an environment which will provide effective development of students' professional competencies as well as Soft Skills.*

Keywords: formal learning, informal learning, hybrid cloud-oriented environment, professional competencies, Soft Skills, IT students'

INTRODUCTION

The professional level of training for IT specialists of higher education establishments meet the new requirements that are bound with the dynamic development of an information society. A modern IT developer must not only possess professional knowledge and skills, but also gain the so-called "soft skills" (Soft Skills). Modern employers in IT industry expect that a candidate will have dozens of different skills such as the ability to think creatively and to manage time, communication skills, networking, project management, effective teamwork. It is possible to form professional skills and Soft Skills in future IT specialists in a traditional classroom and outside the classroom work. A great deal of methods and technologies can solve the problem of effective training of future IT developers, including blended learning, flipped classroom, problem learning, project method and so on. These methods usually use ICT, e-learning environment (ELE), web resources.

The aim of higher education in IT is to provide quality fundamental knowledge that can serve as a solid foundation for rapidly building commercial IT variables and technological superstructures. This article discusses the issue of ELE for training future IT specialists, in particular the design of ELE based on cloud technologies as well as the issue of the efficiency of its using during formal, non-formal and informal education.

1. THE CONCEPT OF FORMAL, NONFORMAL AND INFORMAL EDUCATION

Formal education anticipates the existence of structural programs that are recognized by a formal system of education, the probability to receive generally defined certificates and documents (Maslova, 2004). That is to say this education is based on the structural academic materials, tasks that are made by a teacher according to curricula and branch academic standards (Glazunova, Voloshyna, 2014).

A big amount of useful information that helps a student's professional development he receives from other sources outside an educational establishment. This form of getting the knowledge is known as non-formal education. Non-formal education is defined an academic activity determined by educational demands, by youth's ambition to gain necessary knowledge and abilities and this education is done beyond educational establishments curricula (Lugovyi, 2008). This education is associated with one's desire to gain knowledge and acquire abilities necessary for one's personal life and for professional work.

Informal education is defined as education that is still not organized (Hart, 2011), which means that such education is based on one's own experience and on the experience of other people. Studies in informal education can be purposeful (for example, watching TV programmes, reading books and magazines, meetings) and unplanned as well (accidental as everyday activity).

Investigating the indicators of quality of formal education, many scientists make conclusions on the need to use modern ICT to provide students with academic resources, educational communication and evaluation training results.

2. DIGITAL RESOURSES FOR FORMAL EDUCATION

Academic resources for formal learning can be made in some electronic academic course, for example based on a CLMS platform - Moodle (Educational portal of NULES of Ukraine, 2017). Moodle Platform is oriented towards the organization of cooperation between a teacher and students with the help of an electronic academic course where different types of academic resources can be placed for students' individual work. At the beginning of an academic semester students receive access to an electronic academic course and have an opportunity to work with academic resources at any place and at any time suitable for students. Let's study some of such resources which during a pedagogical experiment was conducted with students of Computer sciences; these resources showed the best results, study quality and students' satisfaction.

To apply theoretical and practical training material effectively used video lesson. Video lesson is one of the resources that we recommend in our research. It is a systematic, successive presentation of academic material that does not demand a teacher's personal presence before students, using a wide range of possibilities of working, keeping and transferring audio and video information (Nozdracheva, 2014, Seytvelieva, 2010). The resource of the type "Video lesson" is widely used for studying professionally oriented courses focused at Computer sciences in the form of a screencast of work of some program or practical realization of program coding of scripts with obligatory textual and voice supporting (Figure 1). Video lesson use in individual work enables students to attain the information in individual regime and if needed simultaneously revising what is being demonstrated in the video lesson and the highest effect will be reached using all sources of perception and attaining the information such as visual, audial and kinesthetic.

Another type of resources that will enable individually at one's own speed to gain academic information with the help of visual and audio types of perception. It is a video lecture. The mentioned types of resources such as a video lesson and a video lecture can be included into passive ones as for controlling individually learned material one needs an additional test of reflective papers.

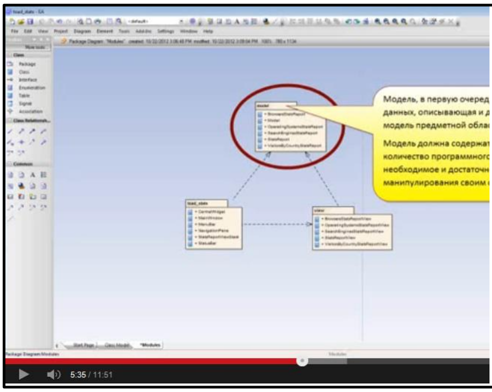

Figure 1. An example of using a resource of the type "Video lesson"

Source: Own work

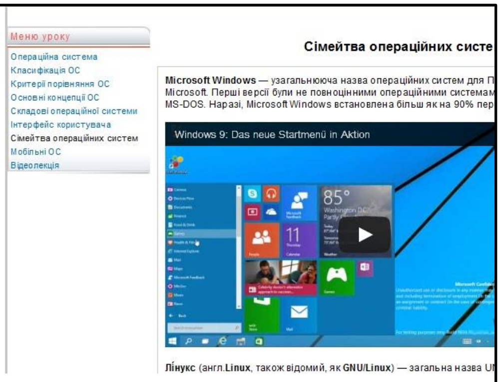

Figure 2. Example of pages of resource "Lesson"

Source: Own work

Moodle Platform allows one to make active resources that anticipate a student's activeness while doing some activity. One of such resources is "Lesson" that is a structural continuity of pages where a text, graphics, video, text tasks can be placed.

We can organize individual step-by-step learning academic material, and the opportunity to revise it impacts on the level of mastering this material. An example of such a resource on the subject "Information Technology" for the students' field of study "Computer Science" is shown in Figure 2. The resource type "Lesson" on "Operating Systems" offered students the theoretical material in the form of text with additions in the form of videos and graphics.

Between informative parts of a lesson we can place testing tasks for periodic testing of individually learnt material. Giving a wrong answer, a student can be sent back to the lesson page with enough information to answer the question correctly or moved back to the beginning of the lesson. Thus we receive an effective instrument for students' individual mastering of the learnt material, that helps do a current testing and provide students' work assessment automatically that frees a teacher from checking students' done task.

To determine the degree of satisfaction in each of the study groups with student's field of study "Computer Science" were surveyed. The grading scale was distributed on the following points: 5 points – fully satisfied, 4 points – satisfied overall, 3 points – satisfied, 2 points – partly satisfied, 1 point – generally dissatisfied. The survey results are presented in Figure 3.

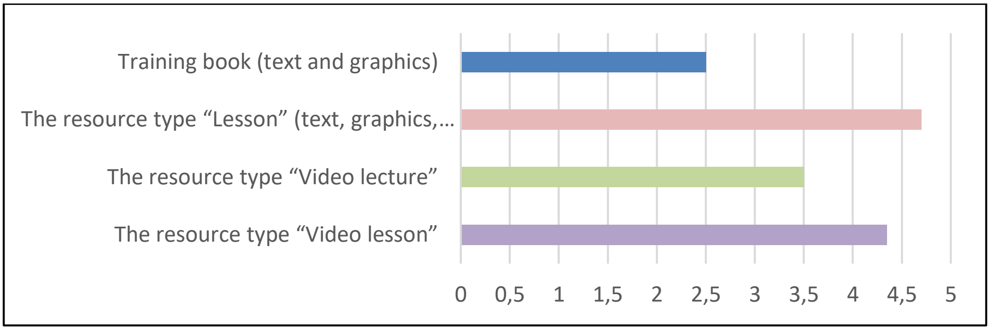

Figure 3. The level of satisfaction with various types of resources for formal learning

Source: Own work

The greatest satisfaction with resources show students who have used the resource type "Lesson". This once again confirms that the most convenient and effective resource for independent work is exactly the resource.

To provide students with academic and research activities, the university has institutional knowledge repository that contains full-text electronic academic and research resources. It is available at elibrary.nubip.edu.ua and can be used by students for their self-study. Students have access to a virtual desktop via appropriate links for laboratory or individual work. With virtual desktop DaaS users are able to access necessary applications. All resources which support every subject are integrated into an electronic training course. (Glazunova, 2015) studies the efficiency of such an environment; this research states the efficiency increases by 6%, the consent increases by 12%, individual work increases by 8%, motivation increases by 17%.

The incentive of constant practice plays a significant role during the process of training future IT specialists in programming languages and standard algorithms. Therefore, the automated system ejudge was integrated into EEE of the university which enables students to get a significant amount of programming tasks as individual work and thus provides automated assessment of their progress.

3. DIGITAL RESOURCES FOR NONFORMAL AND INFORMAL EDUCATION

Besides the revealed methods of organization of formal element of individual work, in a modern information society there are widely used instruments for providing non-formal education, one of which is a social net. A social net is structure that is based on people’s relations or mutual interests. As an Internet service, a social net can be regarded as a platform helping people make connections and group themselves according to their interests. Tasks of this site are to provide the consumers with all possible ways for interaction such as video, chats, pictures, music, blogs etc.

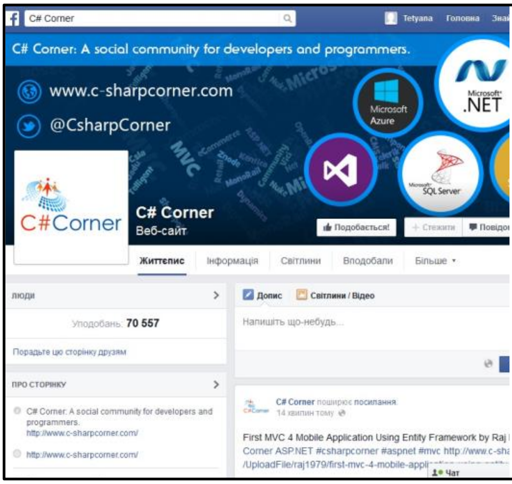

Figure 4. A blog picture of a programmer on a social page “Facebook”

Source: https://www.facebook.com/

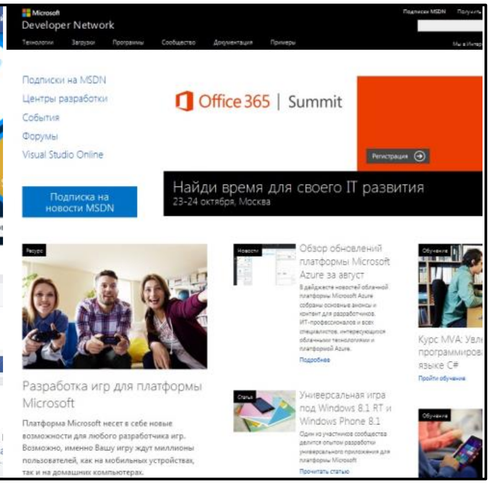

Figure 5. A professionally oriented web-site

Source: https://www.microsoft.com/

Using social nets, IT specialists can get new knowledge individually as they have a free access to professionally-oriented information, that is revealed in magazines, books, video, blogs etc. to make a quick exchange of information between the participants of groups who are users of social nets and have mutual professional interests, discuss questions that touch the sphere informative technologies. One of the examples of groups that are united to discuss professionally interesting questions in the sphere of IT technologies is a programmer blog (a social net "Facebook") and it is given in Figure 4.

Blog is the most effective instrument of non-formal education that enables to conduct Internet register of events, online diary in the form of notes that are constantly added, containing a text, pictures or multimedia. Future specialists can not only familiarize themselves with professional programmers' experience but can ask questions, share their achievements, take part in discussions and projects etc. besides social nets there are special professionally focused sites in the sphere of IT, containing a big amount of users' instructions, code examples, links for downloading programs, debatable forums, blogs etc. For example, resource DeveloperWorks reveals themes from open industrial technologies (Java, Linux, SOA, PHP etc.) to products IBM (Figure 5), resource Microsoft MSDN thematically focused at Microsoft goods, though it is characterized with less filling (Microsoft.com).

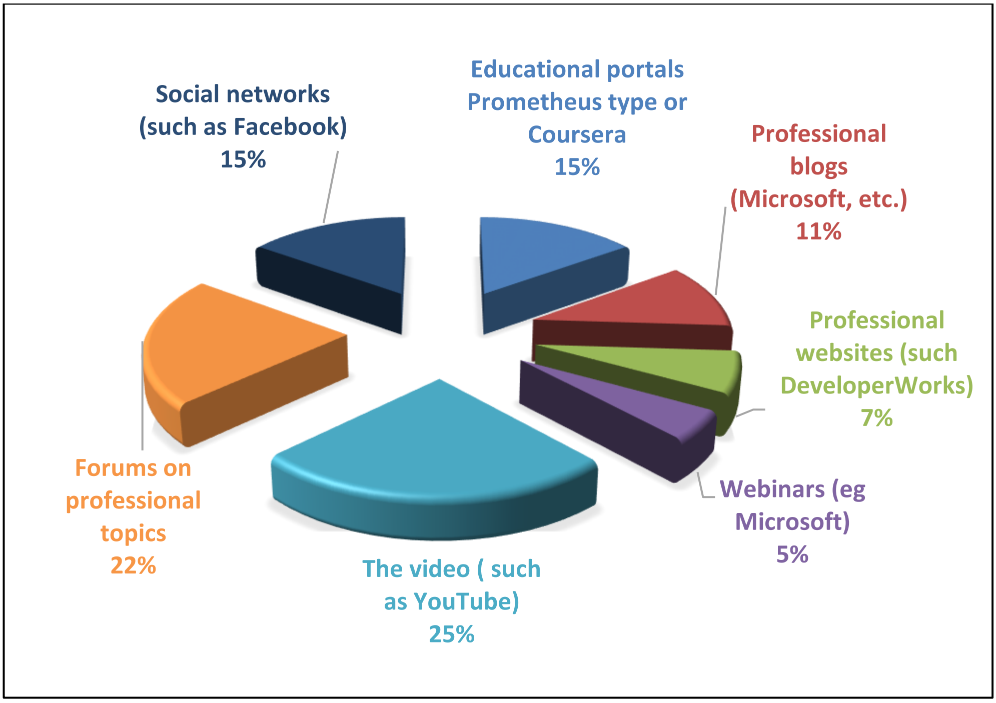

Figure 6. Social services used by students for professional growth

Source: Own work

To familiarize users with new informative technologies leading educational centres in the sphere of IT conduct webinars, for example in the educational system Microsoft in the academic centre CyberBionic Systematics etc.

Webinar is an interactive seminar or a training session using a computer, Internet and means of communication, broadcasting video, audio, documents sharing voice and text chat – all this helps a teacher conduct a class on the high level of interaction with the audience.

To identify the most frequently used tools for informal education in independent work of students of IT specialties a questionnaire was developed and under were surveyed students in the area of training courses 1-4 “Computer Science” for educational and informational portal NULES of Ukraine.

Figure 6 shows that social services are used for professional development of students.

4. ACADEMIC RESOURCES OF IT COMPANIES

Such global companies – producers of IT products as Cisco, IBM, Intel, Microsoft open wide opportunities for universities. Companies of such level create their own academic clouds that include online courses, cloud services to access the practical use of the latest developments and tools for organization of training in their own technologies (Goncharenko, Tyutyunnik, 2014, Suhonyak, Kovalchuk, Danilchenko, 2002, Tsirulnik, Zagorsky, Metelitsa, 2014, Martsenko, 2014).

In terms of cooperation with Universities IT companies offers full support of technologies being developed for distribution among users. Most developed technologies are accompanied by online course or Microsoft Virtual Academy or Imagine Academy, IBM academy of Technology, Cisco Academy, Intel Academy.

Microsoft offers a cloud platform for studying technologies such as O365, Azure and the ability to go through the MOS certification lines, MCE, MTA. In addition, Microsoft provides many other resources to support its own technologies that envisage for every developed IT product the creation of platform for access to this product, online courses for studying the features of the product and the opportunity of professional certification for this IT product (Microsoft.com, 2017).

Microsoft is one of a few companies that offer free academic resources and services for training. With the help of these resources it is possible to gain new knowledge and skills required also for career promotions. In particular, Microsoft provides an opportunity to study such technologies as databases, programming, virtualization, duplication, server technology for training students in the IT profession.

To explore each technology Microsoft offers training resources in the form of online courses, software and cloud environment that provide practical use of software such as virtual machines – Azure Virtual Machines.

At the same time, Microsoft educational policy is to attract as many teachers of secondary, vocational and higher education institutions as it can to study modern educational technologies based on the use of ICT in education.

Microsoft resources such as: Imagine Academy, Virtual Academy, Channel9, Educator Community, Developer Network include online courses, informative educational materials for different types of users from beginners to professional software developers.

Services O365, Azure, Imagine, CodePlex and others serve as modern tools of working with the latest versions of software, software development, as well as tools of co-work with documents, communications, creation of an educational e-environment.

Within the study of various disciplines and practical training, a teacher makes the curriculum in the Imagine Academy which consists of a set of online courses. Students take these online courses during laboratory and independent works planned for the relevant discipline. The Academy Administrator creates curricula for groups of students, based on the lecturer's formal request, makes reports.

The evaluation system in the university involves the accumulation system of scores for various activities. Therefore, mastering these online courses within the discipline is assessed with a certain number of points and is obligatory for students. It is also possible for students themselves to choose courses in the academy and study without any additional motivation from the teacher (Figure 7, Figure 8).

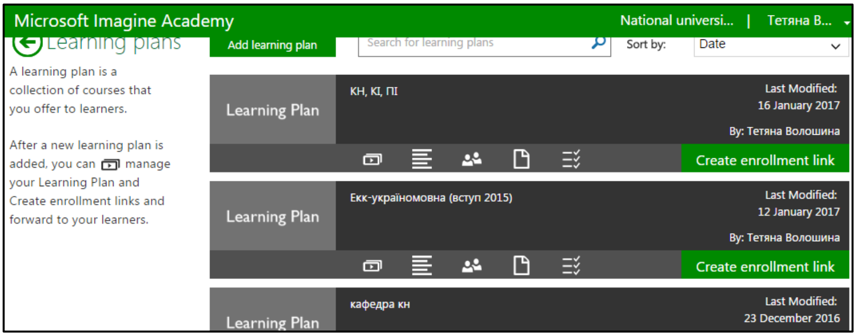

Figure 7. Curricula of faculty groups in Microsoft Imagine Academy

Source: https://imagineacademy.microsoft.com/administration?whr=urn:federation:MicrosoftOnline

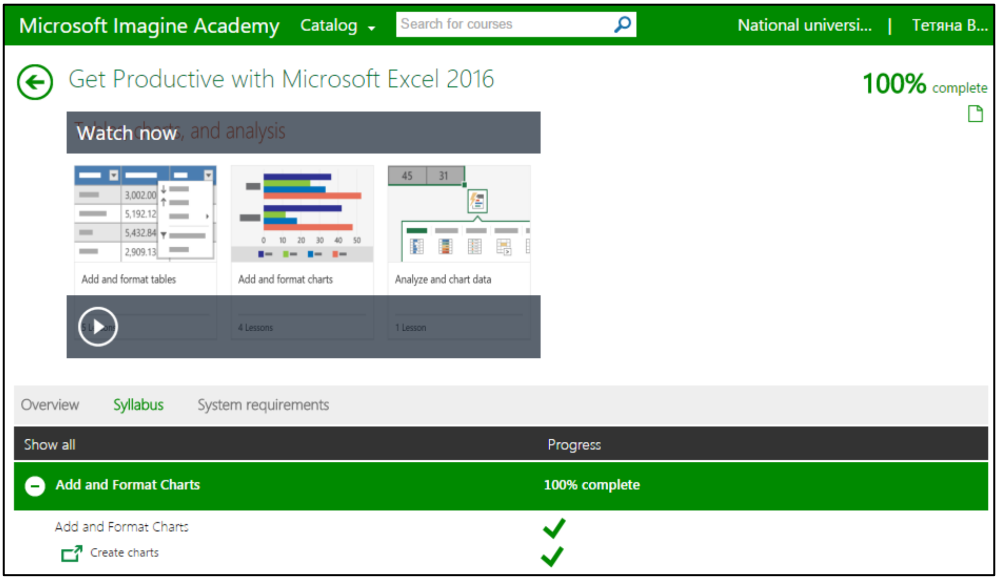

Figure 8. A page of an on-line course «Get Productive with Microsoft Excel 2016»

Source: https://imagineacademy.microsoft.com/?whr=urn:federation:MicrosoftOnline&courseId=17062

Courses of the network academy Cisco gave students an opportunity to learn functioning of hardware and software components, structure of networks, security problems and methods of solving them, obtain skills to collect and set up a computer, to install operating systems, software, and to identify and correct errors connected with hardware and software (Figure 9).

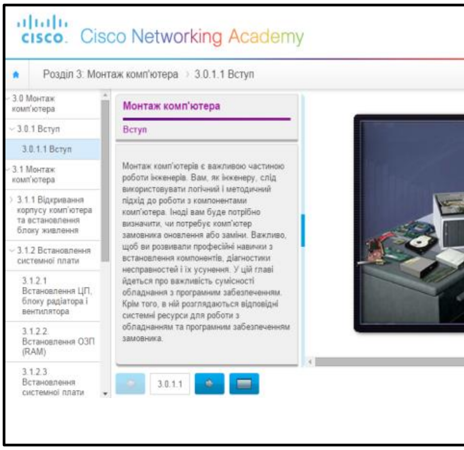

Figure 9. Course «IT Essentials: PC Hardware and Software»

Source: https://www.netacad.com

Figure 10. Course «Introduction to Programming with Python»

Source: https://mva.microsoft.com/

Intel Academy (Figure 11) offers both free and paid resources and activities for learning technologies.

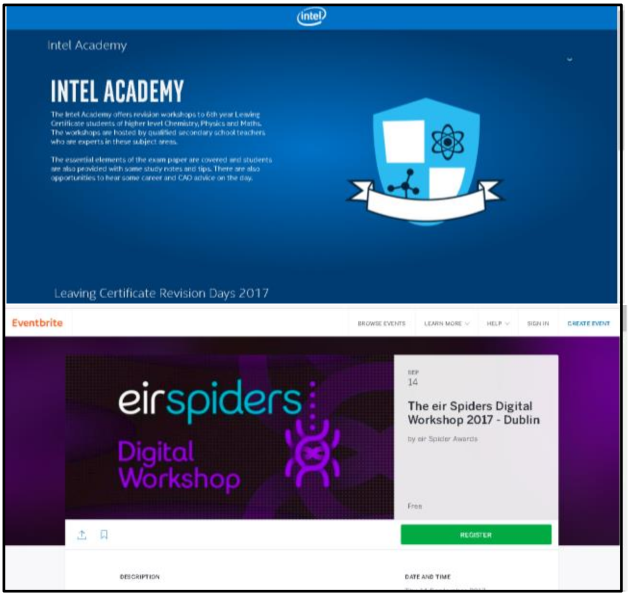

Figure 11. Intel Academy

Source: https://www.intel.ie/content/www/ie/en/education/ie-intel-academy.html

IBM's Academy of Technology (Figure 12) opens up access to a large number of IT courses hosted on YouTube Channel (Figure 13).

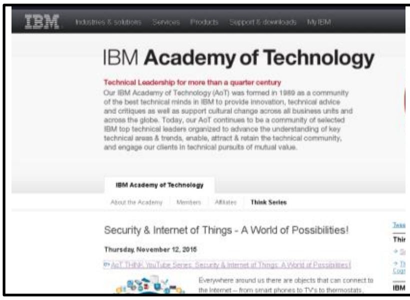

Figure 12. IBM's Academy of Technology

Source: http://www-03.ibm.com/ibm/academy/index.html

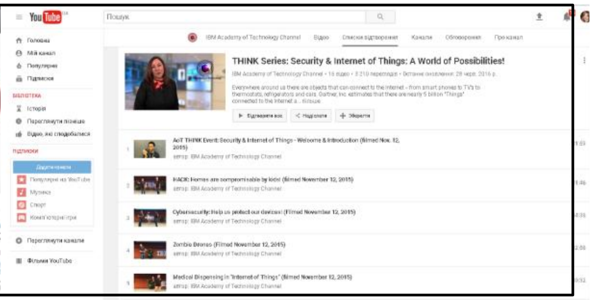

Figure 13. YouTube Channel

Source: https://www.youtube.com/channel/UC2GPxz3UaLBDktz5tp2qAMQ

Such academic resources of IT companies can be used both for formal and non-formal education. On the one hand, the courses are embedded in the curriculum and then become part of formal education. On the other hand, students, having access to the academies, have the opportunity to independently choose the following courses and study outside the curriculum.

5. MODEL OF A HYBRID CLOUD-ORIENTED ENVIRONMENT

There are two main types of cloud infrastructures that is internal and external. In an internal cloud, servers and software are used inside the system in order to form a scalable infrastructure that meets the requirements of cloud computing. In an external cloud environment, providers offer services at the request of an educational establishment. IT support, services and experience will be included in the package which must work only in providing applications and services.

Services for educational cloud computing represent a growing number of relevant services available online, and is the most innovative and fastest growing element of technology and education. It also promises to provide several services which will be very useful for students, faculty and staff (Richard M. Felder, Rebecca Brent, 2004).

The term "academic cloud" becomes more and more popular which is defined as information and communication technology of education which is built in the principles of cloud technologies and aims at providing education services at educational establishments. The "academic cloud" of a university is a cloud-oriented environment of an educational establishment which combines technical, software and technological, information resources and services and which functions on the basis of technologies of cloud computing and provides academic process of a university by means of a local network of an educational establishment and Internet (Glazunova, 2015).

Higher educational establishments mostly use hybrid cloud environments to organize learning process by integrating internal and external cloud. Thus, hybrid cloud-oriented educational environment of a higher educational establishment is the system that combines academic cloud of an educational establishment and external academic clouds on the basis of integration of resources into the educational environment of an educational establishment (Glazunova, O., Kasatkin, D., Kuzminska, O., Mokriyev, M., Blozva, A., Voloshyna, T., Sayapina, T., 2016).

At National University of Life and Environmental Sciences of Ukraine a hybrid cloud-oriented environment was designed to train IT major bachelors. This environment combines internal and external platforms and uses for formal and informal education (Figure 14).

EEE of the university provides IT students with:

- Electronic academic course in every subject;

– Electronic books;

– Software to do practical and laboratory activities by means of a virtual desktop;

– Environment to improve practical skills in programming (automatic system ejudge).

Components of the hybrid model of ELE	**Internal ELE**	**Relation**	**External ELE**
Architecture	"Academic" cloud of the university, Server infrastructure, campus network, Internet Channel, IT Infrastructure of Universities	Integration (one user database)	Academic Clouds: Microsoft CISCO IBM Google
Technological	Electronic training courses Video materials, full-text educational materials	Content	Microsoft Imagine Academy, Cisco Academy, Microsoft Virtual Academy, MOOCs
	Methods: problem-searching, interactive, project activity, coaching		
	Virtual desktop, training portal	Tools	Professional websites, blogs, forums, Video portal (youtube channel)
	Forms: classroom, non-auditorium, individual, group		
	Regulations on the e-learning environment Regulations on eLearning The procedure for managing the information and	Management	Regulations on the training laboratory of Microsoft Imagine Academy Regulations on the Cisco Training Laboratory

	educational environment		The procedure for managing the resources and services of Microsoft at NUBiP Ukraine
Informational-competent	STUDENT: Competence: professional, integral, informational and communication, self-education, foreign-language communicative, communicative, intercultural		
	TEACHER: • competence in the possession of ICT and the use of technology in teaching activities, organization of independent work, teamwork of students • advanced training in the use of ICT in the learning process, the use of cloud services Microsoft in the learning process • Microsoft Certified Microsoft Certification Educator (MCE), Microsoft Technology Associate (MTA)		
Communica-tive	Mixed communication, face to face	Forms of communication	Teamwork, online communication

Figure 14. The Model of hybrid cloud-oriented environment for training future IT specialists

Source: Own work

The main element of this environment is an e-course based on the Moodle CLMS platform, which contains different types of learning resources. To teach IT specialists using a virtual learning environment it is necessary to upload academic videos, video tutorials, video lectures and other video resources (http://video.nubip.edu.ua).

The incentive of constant practice plays a significant role during the process of training future IT specialists in programming languages and standard algorithms. Therefore, the automated system judge was integrated into EEE of the university which enables students to get a significant number of programming tasks as individual work and thus provides automated assessment of their progress.

A systematic use of external academic clouds such as Microsoft, Cisco, IBM is significant to form professional skills and Soft Skills in a future IT specialist. For example, students are advised to use a virtual academy Microsoft Virtual Academy (MVA), educational portal, where there is available an interactive academic course in programming (Figure 10), complements development, Windows Server 2012, Windows 10, visualization, complements developments for HTML5, Windows i Windows Phone, Microsoft Office365, SQL Server, Azure System Center and

Microsoft Imagine Academy. To provide students with learning software we have access to Microsoft DreamSpark, that enables students to get a free access to tools of projecting and developing software. Platform Microsoft (Windows) Azure enables students and faculty to develop, doing software in storing data which are primarily placed in distributed data servers.

Hybrid cloud oriented environment for students of IT specialties, which combined possibilities of electronic learning environment of the university (internals) and external services of Microsoft, Cisco, IBM where the university gained its part of “academic” cloud (externalities) made it possible to develop Soft Skills together with developing professional skills (Glazunova, Voloshyna, 2016). Table 1 presents the results of the experiment on the use of the developed hybrid cloud model for students of computer science during the study of the discipline "Information Technologies". The total number of students participating in the experiment: in control groups - 75 students, in experimental groups - 78 students. The results of student academic progress measured by tests of performance and control tasks in 100-point system. The average value of students' achievement in this discipline based on the results of the entrance testing was 63.3 points in the control groups and 64.5 in the experimental ones. The hypothesis about the equality of general averages was checked against the t-criterion of Student. The experimental value criterion T missed a critical region (0.25 <1.96), so the null hypothesis was accepted. After the completion of the experiment, the average value of success in the experimental groups significantly increased (to 77.5 points), which significantly differs from the value in the control groups. The hypothesis of equality of general averages (verified by the T-criterion) was rejected. The hypothesis of the equality of variances (Fisher's criterion) was adopted.

Table 1.

The results of the experiment using the system of training of future IT specialists

Indicator	**Control group**			**Experimental group**		
	high	medium	low	high	medium	low
Academic progress (average), maximum – 100 points		64,8			77,5	
Individual work, %	17	35	48	29	47	24
Motivation, %	15	55	30	34	58	8

Source: Own work

According to the results of the experiment, individual work increases significantly when students solve problems, fulfil other tasks. The development of self-education competencies was determined by three levels: low, medium, high, and measured using the expert method. The level of autonomy in solving problems in the classroom, during individual and group work, was determined by the teachers on the basis of observations. The number of students who demonstrated high and middle level in the control and experimental groups differ by 24% (Figure 15).

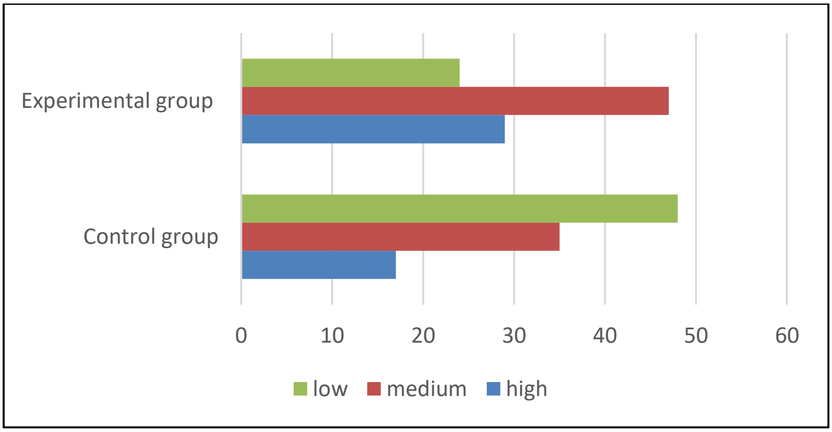

Figure 15. Results of the experiment relating to the level of development of the students' self-educational competence
Source: Own work

The level of motivation of the students was measured using questionnaires. According to the students' responses there were identified groups with high, medium and low motivation to learn (Figure 16). Students of the experimental groups are more motivated and ready to solve non-standard tasks.

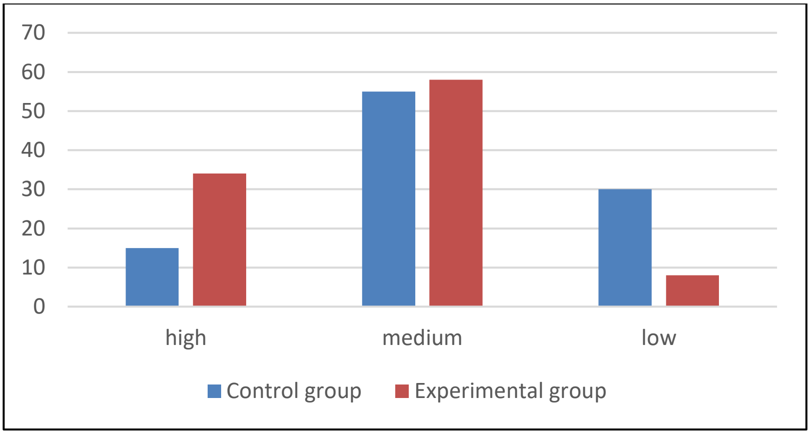

Figure 16. Results of the experiment relating to the level of the students' motivation
Source: Own work

6. CONCLUSIONS

Designing and utilizing a hybrid cloud oriented environment that integrates the components of a university academic cloud such as e-learning courses, electronic tools and electronic manuals, video resources, virtual desktop and environment for automated assessment of tasks in programming; with academic components of Microsoft, Cisco, IBM clouds and external cloud services enabling students to actively develop professional and soft skills. Combining the resources and services of the internal and external e-learning environment with innovative teaching methods and technologies - design methodology, flipped classroom, blended learning makes it possible to increase the level of self-education competence of students and their motivation to obtain the appropriate level of education. A significant amount of resources offered in the framework of formal education, encourages students to systematic independent work, finding new resources for development, professional communities for communication.

REFERENCES

Educational portal of NULES of Ukraine, http://elearn.nubip.edu.ua/, (accessed 19 August 2017) [in Ukraine].

Glazunova, O., 2015: *Theoretical and methodical principles of designing and application of the system of electronic education of future specialists in information technologies at universities of agricultural profile* [Text]: Diss. Dr. Ped. Sciences: 13.00.10, National Academy of Pedagogical Sciences of Ukraine Institute of Information Technologies and Learning Tools, Kyiv, 2015, p. 450. [in Ukraine].

Glazunova, O., Voloshyna T., 2014: *Types of academic internet-resources for it students' individual work management.* Journal of Information Technologies in Education (ITE), issue 21, 2014, pp. 78-86, ISSN: 2306-1707.

Glazunova, O., Kasatkin, D., Kuzminska, O., Mokriyev, M., Blozva, A., Voloshyna, T., Sayapina, T., 2016: *Integration of educational resources and services of IT companies into the university's educational environment [collective monograph]*. LLC "NVO Interservis", Kyiv, 2016, p. 285, ISBN: 978-617-696-547-3. [in Ukraine].

Goncharenko, T., Tyutyunnik, A., 2014: *Using Microsoft IT Academy to create the ICT competence of students.* Educational Discus, volume 3, issue 7, 2014, pp. 28-37, ISSN: 2312-5829. [in Ukraine].

Glazunova, O., Voloshyna, T., 2016: *Hybrid Cloud-Oriented Educational Environment for Training Future IT Specialists.* Information and Communication Technologies in Education, Research, and Industrial Applications, Communications in Computer and Information Science, Vol.

1614, pp. 157-167, [online] at http://ceur-ws.org/Vol-1614/paper_64.pdf, (accessed 19 August 2017).

Lugovyi, V., 2008. *The formation of continuing education in the countries of the organization of economic cooperation and development (experience for Ukraine).* Continuing Education in Ukraine: Realities and Prospects: Thematic Issue 4 (dodatok 1), 2008, pp. 7-9. [in Ukraine].

Gram, V., 2011: *Mapping Informal and Formal Learning Strategies to Real Work*, [online] at http://performancexdesign.wordpress.com/2011/05/04/ mapping-informal-and-formal-learning-strategies-to-real-work, (accessed 19 August 2017).

Maslova, V., 2004: *Bases of andragogy. Terminological dictionary directory for students of social and humanitarian specialties.* Mariupol, 2004, p. 19. [in Russian].

Microsoft.com, http://www.microsoft.com/uk-ua/default.aspx, (accessed 19 August 2017). [in Ukraine].

Prometheus – Ukraine on-line platform of education, [online] at http://terytoriya.com.ua/index.php/samovdoskonalennya/260-prometheus-ukrajinska-platforma-onlajn-osviti, (accessed 19 August 2017). [in Ukraine].

Sugoniak, I., Kovalchuk, A., Danylchenko, A., 2016: *Professional certification as a means of improving the level of practical training of students in IT specialties*. Information Technologies and Learning Tools, volume 3, issue 53, 2016, pp. 109-122, ISSN : 2076-8184, [online] at http://journal.iitta.gov.ua/index.php/itlt/article/view/1424, (accessed 19 August 2017). [in Ukraine].

Tsirulnik, S., Zagorsky, V., Metelitsa, A., (2014): *Problems and approaches of training IT industry*, [online] at http://ir.lib.vntu.edu.ua/ bitstream/handle/123456789/9371/27.pdf?sequence=1&isAllowed=y, (accessed 19 August 2017). [in Ukraine].

Felder, Richard, M., Brent, Rebecca, 2004: *The ABC's of engineering education: abet, Bloom's taxonomy, cooperative learning, and so on.* American Society for Engineering Education, session 1375, 2004.

Nozdracheva V., *Some ways to create avi-movies for a math course*, [online] at http://vio.uchim.info/Vio_30/cd_site/articles/art_4_1.htm, (accessed 19 August 2017). [in Russian].

Seytvelieva, S., 2010: *Video tutorial as an element of educational technology*. Modern information technology and innovation methodology of training in the training of specialists: methodology, theory, experience, Problems: Sb. Sciences Works of Vinnytsia state. Ped Un-th Them M. Kotsyubinsky, issue 24, 2010, pp. 131-135. [in Russian].

Martsenko, S., 2014: *Implementation of international programs in training foreign students*. International Conference on Actual Problems in International Students Teaching and Learning within European Higher Education Area (pp. 42-43), Ternopil, [online] at http://elartu.tntu.edu.ua/bitstream/123456789/8396/2/Conf_2014_Martsenko_S-Implementation_of_international_42-43.pdf, (accessed 19 August 2017). [in Ukraine].

Webinars – a modern form of online learning, [online] at http://edu.cbsystematics.com/ua/education/webinars.aspx, (accessed 19 August 2017). [in Ukraine].

Hart, Jane, 2011: *You can't manage informal learning – only the use of informal media*, [online] at http://www.c4lpt.co.uk/blog/2011/10/28/you-cant-manage-informal-learning-only-use-of-informal-media/, (accessed 19 August 2017).

FORMATION OF DIGITAL COMPETENCIES IN THE PROCESS OF CHANGING EDUCATIONAL PARADIGM FROM E-LEARNING TO SMART-LEARNING AT PEDAGOGICAL UNIVERSITY

Nadiia Balyk, Galina Shmyger
Department of Computer Science
Volodymyr Hnatiuk Ternopil National Pedagogical University, Ukraine
Kryvonosa 2, 46027 Ternopil
nadbal@ukr.net, gal.sh27@gmail.com

Abstract: *The article analyzes the transformation of the educational paradigm of higher education from e-learning to SMART-learning and describes theoretical and practical aspects of the digital competencies formation of future teachers in the context of creating new knowledge in the SMART-University environment. A model for the formation of digital competencies in the context of creating new knowledge became the methodological basis for the IT-course for undergraduates of the pedagogical university. An experimental study was conducted in order to implement this model into the educational process of Pedagogical University. The results of the study showed that the role of university is changing from providing knowledge to creating the conditions for students' forming appropriate digital competencies in the context of creating new knowledge.*

Keywords: e-learning, SMART-learning, model of digital competency formation, creation of new knowledge, research.

INTRODUCTION

Development of competencies is an important task of any modern educational system. The realities of the present impose the need for competencies formation. Modern education should prepare a person who is able to use the gained knowledge for a competitive activity in various spheres of public life. Therefore, the issue of organizing the learning process from the point of view of the competency-based approach is relevant.

The educational process must form a modern system of universal competencies. Objectives of education, which foresee the commitment of teachers to the competency-based approach concerning the organization of the educational process, lead to a change in the requirements for existing educational technologies.

Achievement of the set goals is possible provided scientifically organized and theoretically grounded development of the competencies of future teachers in the process of changing the educational paradigm from e-learning to SMART-learning. Professional requirements for a teacher are updated, and in particular, emphasis is placed on the level of professional competency rather than on professional knowledge.

The tasks of competency development are examined in many scientific studies conducted both abroad and in Ukraine. The problem of identifying and describing competencies and the process of their formation was solved by many scientists: B. Oskarsson, S. Sho, R. Selman, A. Shelton, V. Baidenko, A. Bondarevska, I. Yakymanska, Ie. Novykov, V. Kalnei, E. Zeer, D. Jung, I. McClellan, P. Gillet, G. LeBoterf, V. Oros and others. In particular, such scholars as (Zhaldak 2009; Morze, Kocharian 2014; Smyrnova-Trybulska 2007) disclosed the content of competencies during the application of information and communication technologies. According to modern researchers of this issue (Williams, Coles, Wilson, Richardson, Tuson 2000; Guasch, Alvarez, Espasa 2010), these competencies include the orientation in the information space, receiving information and operating it in accordance with own needs and requirements of the modern high-tech information society.

1. RATIONALE. COMPETENCY-BASED APPROACH IN EDUCATION

The competency-based approach involves mastering knowledge and skills of future teachers in complex. This leads to the definition of a new system of teaching methods. Selection and design of these methods are based on the structure of the respective competencies and functions that they perform in the learning process.

A variety of approaches to the definition of the term “competency” causes problems in its comprehension and understanding the competency-based approach content. The issue of forming the digital competencies of future teachers remains unresolved in conditions of functioning of SMART-University.

The purpose of the article is to determine the theoretical and practical aspects of forming the digital competencies of future teachers in the context of creating new knowledge in the SMART University environment, defining organizational and pedagogical conditions, principles and pedagogical methods of forming digital competencies in the process of changing the educational paradigm from e-learning to SMART-learning.

The competency-based approach in education implies prior orientation towards the aims. They are educational vectors of learning ability, self-determination, selfactualization, personality development and socialization. The main units for evaluating the quality of education results are competencies (Zeer 2000).

In the literature (Morze, Kocharian 2014; Ovcharuk 2013; Smyrnova-Trybulska 2016; Jung 2005) this concept is considered ambiguous, due to the complexity of the structure of professional activity in various fields and differences in the theoretical approaches of researchers.

Based on the works (Approving the national qualifications framework, http://zakon2.rada.gov.ua/laws/show/1341-2011-п; A common European frame work for ICT Professionals in all industry sector, http://www.ecompetences.eu) a competency is considered here to be a set or an array of theoretical and practical knowledge, skills and values that can be readily called upon and put into action in a situation and context that is different from prior situations. Although training may provide initial necessary elements, such competency is considered to develop with varied experience, and with the ability and confidence of the individual to adapt.

In the Concept of a New Ukrainian School (New Ukrainian School: Fundamentals of the Standard, http://nus.org.ua/wp-content/uploads/2016/12/nova-schkola1pantone-363-EC-1.pdf) competency is considered to be a combination of knowledge, skills, ways of thinking, views, values, personal qualities that determine the ability of a person to successfully conduct activities in new unpredictable conditions.

Thus, a competency-based approach in learning is characterized by complex acquisition of knowledge and skills and orientation of the learning process on the final practical result. The competency-based approach is a bridge that combines an educational institution with the real world and its requirements.

A competent graduate and a future teacher is a person who possesses the competencies necessary for a successful life. A competent graduate is able to reveal, develop, maintain and constructively actualize life opportunities in the complex present conditions. These characteristics should be formed during the learning process and include knowledge, skills, attitudes, experience and behavioural patterns of personality (Zablotska 2008).

Let us consider the digital competencies of future teachers in the context of changing the educational paradigm from e-learning to SMART-learning at a pedagogical university. The notion of digital competencies presumes the ability of the teacher to use information and communication technology to carry out information activities in their professional work. These competencies namely mean to be able to:

– carry out information activities on the collection, processing, transmission and preservation of informational educational resources;

– evaluate and actualize the possibilities of educational electronic publications and open informational educational resources;

- organize information interaction between the participants of the educational process on the basis of ICT;
- create and use psychological and pedagogical diagnostic methods for controlling and assessing the level of students' knowledge;
- carry out educational activities using ICT tools in aspects that reflect the specifics of a particular school subject.

In our opinion, one of the important components in the structure of digital competencies is the competency to organize the educational process in the electronic environment. Scientists (Qualification characteristics of the teacher of distance learning as one of the aspects of the quality of the whole distance learning system, http://www.elw.ru/reviews/detail/1047/; Kommers, Smyrnova-Trybulska, Morze, Noskova, Yakovleva, Pavlova, Drlik, Malach, Delgado, Pinto, Issa, Issa 2014; Smyrnova-Trybulska 2016) distinguish the following groups of competencies of the teacher of e-learning:

- professional;
- informational and pedagogical (for the development of an electronic course), communicative, communication competencies and competency of personal self-improvement (for the implementation of the electronic course).

For a teacher to develop an e-course, it is necessary to form informational and pedagogical competencies that consist of:

- competency of methodological design of a professional e-learning product;
- competency of the development, creation, implementation and application of educational and methodological complex in the educational process;
- competency of control of joint (group, co-operative) professional activity, teamwork, cooperation in the process of organizing e-learning;
- competency to possess methods of creating various kinds of pedagogical control materials, designing a system for assessing the quality of control materials, selecting software and control techniques.

In order to implement an e-course a teacher ought to form the communicative competencies and self-improvement competencies:

- in the field of pedagogical technologies of electronic and distance learning skills in practice (conducting virtual discussions, webinars, round tables, project activities, etc.);

- in the field of educational and organizational activity, acquisition of software and technology in education, and knowledge of e-learning systems;
- in the field of independent, cognitive activity, based on mastering of the methods of acquiring knowledge from different sources of information.

Digital competencies, including the field of e-learning, should be complemented by new competencies due to inevitable changes in the field of education. Educational institutions, universities and schools begin to lose their importance to students, as they are no longer the only places where a student can apply for knowledge. Now knowledge can be obtained with the help of social networks, various educational services and corporate sector.

We believe that providing an ongoing process for obtaining new knowledge is possible only with electronic technologies, as well as technologies for creating new knowledge. Today, they are not only a resource for the successful functioning of the educational process, but also the guarantor of the transformation of universities into innovative scientific, educational and cultural centres, which implement the principle of "lifelong learning" (Balyk, Shmyger, Oleksiuk 2017).

A single information space is created on the basis of modern ICT. A new task for a high school is to integrate students into this space, thus giving them the opportunity to access the relevant knowledge and technologies that will be in demand in their future profession. In turn, educational technologies that allow teachers to teach not only in the classroom but also outside the classroom are actively used. Therefore, e-learning is giving place to SMART-learning that allows you to adapt the educational process to the needs of the student. (European Investment Bank. JESSICA for Smart and Sustainable Cities, http://www.eib.org/attachments/documents/jessica_horizontal_study_smart_and_sustainable_cities_en.pdf).

SMART-learning is a concept that involves comprehensive modernization of all educational processes and resources, as well as the methods and technologies used in these processes. It should be noted that the scientists (Oros 2015, Tikhomirov, http://conf.it-edu.ru/sites/default/files/sbornik_2015_vypusk_1.pdf) consider the following basic principles of SMART-learning:

1. Usage of the topical information for solving educational tasks as part of the educational program.

2. Organization of independent cognitive, research and project activity of students.

3. Implementation of the educational process in the distributed learning environment.

4. Interaction of students with a professional community.

5. Individualization of training.

6. Variety of educational activities, providing broad opportunities for students to study curricula and courses according to their financial situation, social conditions and health.

2. METHODOLOGY OF FORMATION OF DIGITAL COMPETENCIES IN THE CONTEXT OF CREATION OF NEW KNOWLEDGE

The process of changing the educational paradigm from the traditional model of learning to e-learning and further to SMART-learning is also taking place in Ukrainian education. It should be noted that the evolution of education in the Volodymyr Hnatiuk Ternopil National Pedagogical University made the way from traditional learning to SMART-learning:

- traditional learning and computer-based learning;
- "e-learning" (electronic / distance learning), which operates on the basis of modern information and communication and pedagogical technologies;
- "blended learning", which involves a combination of different methods of classroom and out-of-class learning;
- coaching, informal teaching;
- SMART-learning.

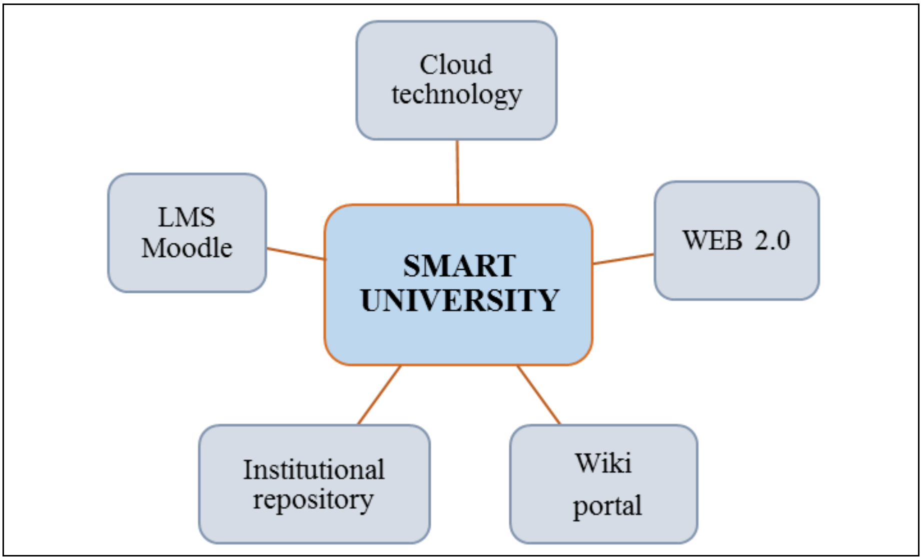

Figure 1. SMART-University Environment at the Volodymyr Hnatiuk Ternopil National Pedagogical University

Source: Own work

Let us dwell on the main principles of the creation of SMART-University at TNPU. Infrastructure of SMART-learning is based on the use of the university LMS server, cloud technologies, university digital repository and the Wiki-portal (Figure 1).

It is worth noting that the development of social partnership and cooperation was the basis of the SMART philosophy formation in Ternopil National Pedagogical University (Figure 2).

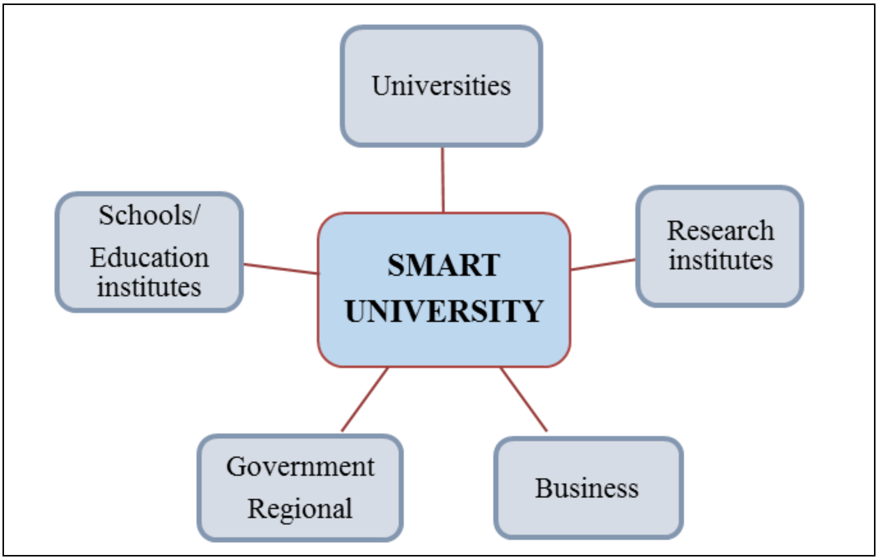

Figure 2. Social Partnership and Cooperation at the Volodymyr Hnatiuk Ternopil National Pedagogical University
Source: Own work

Table 1.

Changes in the educational process at the Volodymyr Hnatiuk Ternopil National Pedagogical University

	Pedagogics of e-learning	Pedagogics of SMART-learning
Teacher	Providing content and information	Accompanying students in creating new knowledge, developing practice-oriented projects
Student	"Consumption" of content and information	Creating new knowledge, practice-oriented projects

Source: Own work

Previously, programs of professional training of future teachers at TNPU were focused more on comprehension of learning material, and now the attention is paid on self-consistent acquisition of new knowledge and on the ability to use it in solving life issues (Table 1).

2.1 Experimental Research Procedure

Our express survey on the formation of competency in creating new knowledge showed that students and teachers rarely publish their own ideas and materials online (9% – students, 26% – teachers). They reported their weak competence in this area.

A model for the development of digital competencies in the context of creating new knowledge was developed. It comprises three components: technical, informational, and social. Formation of digital competencies took place within the course "Information and communication technologies in education and science" for undergraduates of all specialties of the pedagogical university. The course was built on the basis of this model. During the training of future teachers, the focus was on the competency to create new knowledge and to solve practical and research tasks, aimed at integrating the experience gained earlier and mastering the new one in the process of joint activities with teachers or under their guidance.

The process of forming the digital competencies of undergraduates took place under the following organizational and pedagogical conditions (Figure 3):

1. Ensuring the integration of knowledge in the process of creating and implementing practice-oriented projects.
2. Application of forms and methods of training focused on the professional development of the personality of the future teacher, acquiring practical experience and pedagogy of constructing knowledge. Developing such skills of the 21st century as complex problem solving, critical thinking, creativity, human management, coordination with others, emotional intelligence cognitive flexibility, ability to assess the situation and make decisions, and ability to negotiate.
3. Organization of an effective informational SMART-environment.

Basic principles of digital competencies formation at our university:

- interdisciplinarity of knowledge and project approach;
- realization of creative and innovative approaches;
- support for professional and social development;
- integration: university – local community – business.

Pedagogics of E-learning	Pedagogics of SMART-learning
– gaining knowledge – digital content – blended learning – ICT-integrated learning	– pedagogy of 21st century skills formation – a method of the formation of digital competencies in the aspect of creating new knowledge – cooperation with practicing partners – SMART-environment organization

Figure 3. Conditions for the formation of digital competencies in the pedagogical SMART University

Source: Own work

Based on our own experience in developing digital competencies in the context of creating new knowledge, we identified the pedagogical peculiarities of the use of ICT tools during the learning process, which included the use of search, problem and active teaching methods, research organization, group work and work in pairs.

We note that for the development of digital competencies in the context of creating new knowledge, it is worth using ICT tools such as knowledge maps, wikis, blogs, Google Apps, 3D books, electronic boards, etc.

Under the conditions of ICT tools use, active teaching methods were chosen as the most suitable for the development of digital competencies in the context of creating new knowledge. Among them are such methods as brainstorming, design thinking, case method, project method, etc. During the development of educational tasks, emphasis was placed on the creation of social practice-oriented projects by undergraduates (Shmyger, Balyk 2016). This approach means the transition from a traditional model of education to the acquisition of a predetermined set of knowledge for SMART-learning, with its emphasis on knowledge and innovation.

2.2 Results

Approbation of the model we created took place in 2015/2017 in the process of teaching the course "Information and communication technologies in education and science" and the courses for teachers training (2016).

After completing these courses, we conducted a survey on the development of students' digital competencies in the context of creating new knowledge. 264 undergraduate students and 23 teachers of the Volodymyr Hnatiuk Ternopil National Pedagogical University took part in this survey. The questionnaire contained 25 questions; in particular, seven questions concerned acquisition of the technical component of the competency for creating new knowledge, nine questions concerned acquisition of the information component and nine questions concerned acquisition of the social component. Let us consider and analyse some of the results of the questionnaires of teachers and students about their acquisition of the three components of digital competencies in the context of creating new knowledge.

The technical component of digital competencies in the context of creating new knowledge includes the practical skills of working with:

- local university network, server of university electronic courses;
- university learning network;
- personal learning network;
- mobile technologies;
- ICT tools for creating new knowledge.

We present the results of the questionnaire concerning the acquisition of ICT tools for creating new knowledge (Table 2).

Table 2.

ICT tools for creating new knowledge (technical component)

	Teacher	**Student**
LMS Moodle	68%	75%
Platform for the institutional repository	31%	25%
Platforms for video conferencing	39%	52%
Cloud services	57%	62%
Mobile services	42%	73%

Source: Own work

The information component of digital competencies in the context of creating new knowledge includes the practical skills of working with:

- information search;
- structuring and organizing information;
- critical evaluation of information;
- creation of information;
- distribution of information;

– obtaining new knowledge by analysing and synthesizing various data (conclusions, predictions).

We present the results of the questionnaire concerning the acquisition of ICT tools for creating new knowledge (Table 3).

Table 3.

ICT tools for creating new knowledge (information component)

	Teacher	**Student**
Productivity software	85%	72%
Google Apps services	77%	62%
Microsoft Office 365	34%	21%
Web 2.0 services	81%	63%
Custom-made software	43%	44%

Source: Own work

The social component of digital competencies in the context of creating new knowledge includes the practical skills of working with:

– collective thinking strategies online;

– different ways of interacting with others on the Internet;

– safety of interaction with others on the Internet;

– ethics of interaction with others on the Internet.

We present the results of the questionnaire concerning the acquisition of ICT tools for creating new knowledge (Table 4).

Table 4.

ICT tools for creating new knowledge (social component)

	Teacher	**Student**
Electronic mail	78%	46%
Message board	14%	48%
MOOC (Massive open online courses)	3%	12%
Social network	71%	94%
Quick messaging tools	81%	92%

Source: Own work

The study showed (Figure 4) that among three components (technical, social, informational) of digital competencies model in the context of creating new knowledge teachers are ahead of students only regarding the information competency.

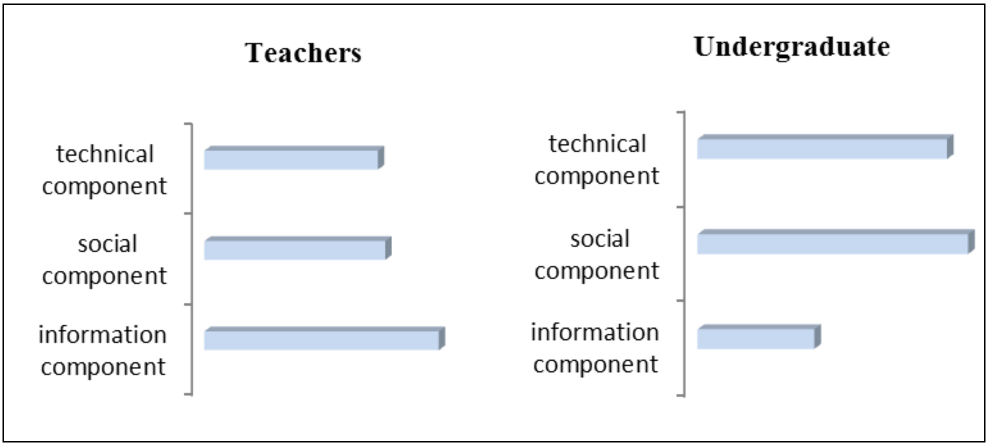

Figure 4. Levels of digital competencies acquisition by teachers and undergraduates of TNPU (based on the digital competency model)

Source: Own work

Largely, such a result is due to a change in the activities of a university teacher in the context of modern educational changes and pedagogy of constructionism. In particular, a teacher organizes a process, and students construct new knowledge, seek their own understanding, and form their own judgments, conclusions, views, defining a personal position in the knowledge of scientific theories, objective phenomena and processes.

Students demonstrated a high~~er~~, higher than teachers did, level of competencies with technical and social components. Technology is integrated in their life; they have free and unrestricted access to information and interpret it in their own way. They make their own contribution to the construction of new knowledge in the process of interaction with others. Educational communications and social networks contribute to their maximum social and cognitive interaction.

The obtained results have shown that today the educational model “the student as a passive recipient of knowledge from a teacher” requires the transition to a model “students’ independent acquisition of new knowledge”. Currently, the role of a pedagogical university is changing from the provider of knowledge to the creation of conditions for students to independently acquire new knowledge and form digital competencies in the context of creating new knowledge.

CONCLUSION

The study and analysis of research and publications on the development of digital competencies of future specialists, including teachers, gives grounds for concluding that the transformation of the educational paradigm of higher education is taking place. E-learning is giving place to SMART-learning, which makes possible the adaptation the educational process to the needs of the student. E-learning focuses mainly on technology. SMART-learning involves the comprehensive modernization of all educational processes and resources, as well as the methods and technologies used in these processes.

A three-dimensional model for the formation of digital competencies in the context of creating new knowledge became the methodological basis of the pilot course “Information and communication technologies in education and science” for the undergraduates of the pedagogical university.

The process of formation of digital competencies of undergraduates took place under the following organizational and pedagogical conditions: ensuring the integration of knowledge in the process of implementation of practice-oriented projects, application of forms and methods of training focused on professional development of personality and 21st century skills formation and organization of effective information SMART-environment of the university.

The results of the pedagogical research conducted among undergraduates and teachers of the Volodymyr Hnatiuk TNPU regarding the development of digital competencies in the context of creating new knowledge have shown that the university educational model where “student is a passive recipient of knowledge from a teacher” requires the transition to a model of “students’ independent acquisition of new knowledge”.

Nowadays, the development of a knowledge society is becoming more and more relevant. This society will give advantages to the knowledge work. Therefore, in the long view, for training of future teachers for master's degree, it is planned to design and create e-courses using modern means of personal knowledge management in order to form the epistemological level of digital competencies.

REFERENCES

A common European frame work for ICT Professional in all industry sector, http://www.ecompetences.eu, (accessed 29 May 2017).

Approving the national qualifications framework. Resolution of Cabinet of Ministers of Ukraine November, 23th (2011), http://zakon2.rada.gov.ua/laws/show/1341-2011-п (accessed 29 May 2017) [In Ukrainian]

Balyk N., Oleksiuk V., Shmyger G., 2017: *Development of E-Learning Quality Assessment Model in Pedagogical University*. ICTERI 2017 ICT in Education, Research and Industrial Applications. Integration, Harmonization and Knowledge Transfer. – 2017, P.440-450. [In Ukrainian]

European Investment Bank. JESSICA for Smart and Sustainable Cities//Horizontal Study Smart Technology based Education and Training// Netherland: Amsterdam: IOS Press BV, http://www.eib.org/attachments/documents/jessica_horizontal_study_smart_and_sustainable_cities_en.pdf (accessed 29 May 2017)

Guasch, T., Alvarez, I., & Espasa, A., 2010: *University teacher competencies in a virtual teaching/learning environment: Analysis of a teacher training experience*. Teaching and Teacher Education, 26(2), 2010, P.199-206.

Jung, I., 2005: *ICT-pedagogy integration in teacher training: Application cases worldwide*. Educational Technology and Society, 8 (2), 2005, P.94-101.

Kommers P., Smyrnova-Trybulska E., Morze N., Noskova T., Yakovleva T., Pavlova T., Drlik M., Malach J., Delgado S.C., Pinto P., Issa T., Issa T., 2014: *Contrastive analysis and e-learning competences in Australia, Czech republic, the Netherlands, Poland, Portugal, Russia, Slovakia, Spain and Ukraine within the Framework of the IRNET international research network project in E-learning and Intercultural Competences, Development in Different Countries edited by SMYRNOVA-TRYBULSKA E.*,. Katowice-Cieszyn: Universities Silesia in Katowice, 2014, ISBN 978-83-60071-76-2.

Morze, N.V., Kocharian A.B., 2014: *Model of standard for the ICT competence of university professors in view of improving the quality of education.* Information technologies and means of education, 2014, Vol. 43, Iss. 5, 2014, P.27-39. *[online]* at http://www.nbnv.gov.ua/UJRN/ITZN_2014_43_5_5. (accessed 20 May 2016) [In Ukrainian]

New Ukrainian School: the basics of the standard, http://nus.org.ua/wp-content/uploads/2016/12/nova-schkola1pantone-363-EC-1.pdf, (accessed 29 May 2017) [In Ukrainian]

Nikulicheva N. *Qualification characteristics of distance education teacher as one of the aspects of the quality of the whole distance learning system,* [online] at http://www.elw.ru/reviews/detail/1047/ (accessed 12 June 2017) [In Russian]

Oros, V., 2015: *The formation of professors' IC'T-competence in the context of life-long learning.* New Pedagogical thought, 2015. №26, P. 204-206. [online] at http://www.nbuv.gov.ua/UJRN/Npd_ 2015_ 2_ 50. (accessed 5 June2016) [In Ukrainian]

Ovcharuk, O.V., 2013: *Information-communication competence* as *a subject of discussion: international approaches.* Computer in family and in school, 2013. .№7, P.3-6. [online] at http://nbuv.gov.ua/UJRN/komp_20l3_7_2, (accessed 22 May 2017) [In Ukrainian]

Shmyger G., Balyk N., 2016: *Formation of informational and social competencies of students for their professional training at the pedagogical university*, Scientific Review, 1(22), 2016, P.14-21. [In Ukrainian]

Smyrnova-Trybulska, E.N., 2007: *Fundamentals of Generating Information Competences of Teachers in the field of Distance Learning.* Monograph, Kherson: Ailant, 2007, 704 p. [In Russian]

Smyrnova-Trybulska, E.N., 2016: *E-learning and Open Education Quality – Some European and National Standards and Regulations* In: Monograph *E-learning Methodology — Implementation and Evaluation*, edited by Eugenia Smyrnova-Trybulska. Katowice-Cieszyn: Studio Noa for University of Silesia, Vol.8. P.51-72. ISSN 2451-3644 (print edition) ISSN 2451-3652 (digital edition). ISBN 978-83-60071-86-1

Tikhomirov V. *Smart education as the basic paradigm of information society development*, [online] at http://conf.it-edu.ru/sites/default/files/sbornik_2015_vypusk_1.pdf, (accessed 1 June 2017)

Williams, D., Coles, L., Wilson, K., Richardson, A., & Tuson, J.,2000: *Teachers and ICT: current use and future needs*, British Journal of Educational Technology, 31 (4), 2000, P.307-320.

Zablotska O., 2008: *The competence approach as an educational innovation: comparative analysis*, Journal of Zhytomyr State University, 40 (Pedagogical Sciences), 2008, P.63-68. [In Ukrainian]

Zeer E., 2000: *Psychology of Personally Oriented Vocational Education*, Ekaterinburg: Publishing House of the Ural State Professional Pedagogical University, 2000, 258 p.

Zhaldak M. I., 2009: *The model of social and professional competencies of teachers of computer science*, Naukovyj chasopys Nacional'noho pedahohichnoho universytetu imeni M. P. Drahomanova. Seriya 2: komp'yuterno-oriyentovani systemy navchannya, 7 (14), 2009, P.3–10. [In Ukrainian].