E-learning

Vol. 13

E-learning
in the Time of COVID-19

University of Silesia in Katowice
Faculty of Arts and Sciences
of Education in Cieszyn

E-learning

Vol. 13

E-learning in the Time of COVID-19

Monograph

Scientific Editor
Eugenia Smyrnova-Trybulska

STUDIO NOA

Katowice–Cieszyn 2021

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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
9th vol., 10th vol. and 11th vol. indexed in Web of Science Core Collection
The E-learning series web-sites:
https://us.edu.pl/wydzial/wsne/nauka-i-badania/serie-wydawnicze/seria-e-learning
http://www.ig.studio-noa.pl/pubusc.html

ISSN 2451-3644 (print edition), **ISSN 2451-3652** (digital edition), **ISBN 978-83-66055-25-4**

Published by: STUDIO NOA for University of Silesia in Katowice
Faculty of Arts and Sciences of Education in Cieszyn

Printed in Poland

Scientific publication co-financed from the statutory research funds

Publication co-financed by the University of Silesia in Katowice

UNIVERSITY OF SILESIA
IN KATOWICE

https://doi.org/10.34916/el.2021.13

This Monograph contains the Authors' own original work, not printed before in any other sources.

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INTRODUCTION

The 13th volume of the Series on E-learning monograph is *"E-learning in the Time of COVID-19"* and includes articles of authors from twelve countries and from more than twenty universities – participants of the 13th annual international scientific conference "Theoretical and Practical Aspects of Distance Learning", subtitled: *"E-learning in the Time of COVID-19"*, held online on 11–12 October 2021, organized by the University of Silesia in Katowice, Poland – Faculty of Arts and Sciences of Education, Faculty of Social Sciences, Institute of Pedagogy, Faculty of Science and Technology, Institute of Computer Science. Co-organizers and Partners: University of Ostrava (UO), Czech Republic, Silesian University in Opava (SU), Czech Republic, Constantine the Philosopher University in Nitra (UKF) Slovakia, University of Extremadura (UEx), Spain, University of Twente (UT), The Netherlands, Lisbon Lucíada University (LU), Portugal, Curtin University in Perth (CU), Australia, Borys Grinchenko Kyiv University (BGKU), Ukraine, Herzen State Pedagogical University of Russia, St.Petersburg (HSPU), Russian Federation, Dniprovsk State Technical University (DSTU), Ukraine, IADIS – International Association for Development of the Information Society, a non-profit association, Polish Pedagogical Society, Branch in Cieszyn, Polish Scientific Society for Internet Education, Association of Academic E-learning, Poland.

Experts on e-learning from 12 countries, in particular Austria, Australia, Bulgaria, Czechia, Poland, Portugal, Slovakia, Spain, Sweden, Russia, Ukraine, Turkey, reflected on e-learning in the time of COVID-19, presented research results, contemporary trends and scientific an educational project devoted MOOCs, artificial intelligence (AI), augmented reality (AR), virtual reality (VR), selected Web 2.0 and Web 3.0 technology, LMS, CMS, STEM, mobile learning other topics.

The speakers representing the Comenius University in Bratislava (Slovakia), University of Silesia in Katowice (Poland), Plovdiv University "Paisii Hilendarski" (Bulgaria), Innsbruck University, (Austria), Ternopil Volodymyr Hnatiuk National Pedagogical University (Ukraine), RMIT University, Melbourne (Australia), Borys Grinchenko Kyiv University (Ukraine), Gdańsk University of Technology (Poland), Dniprovsk State Technical University (Ukraine), Pedagogical University of Krakow (Poland), Herzen State Pedagogical University of Russia, St. Petersburg (Russia), Zhytomyr Polytechnic State University (Ukraine), Lisbone Lusiada University, Lisbone (Portugal), K.D. Ushynskyi South Ukrainian National Pedagogical University (Ukraine), Abant Izzet Baysal University, Bolu, Turkey, Mykhailo Drahomanov National Pedagogical University, Kyiv, (Ukraine), Toki Eder Ikastola (Spain), Sumy State Pedagogical University (Ukraine), Izmail State University of Humanities

(Ukraine), and other educational institutions delivered lectures providing insights into interesting studies, presented their recent research results and discussed their further scientific work.

The authors include experts, 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 this monograph will be an interesting and valuable publication, describing the theoretical, methodological and practical issues in the field of e-learning in STEM education offering proposals of solutions to certain important problems and showing the road to further work in this field, allowing 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:

The conference topics include the following thematic sections:

1. **E-learning in COVID-19 Pandemic Time**

- Educational technologies for e-learning
- Modern ICT tools for e-learning – review, implementation, opportunities for effective learning and teaching
- Innovative methods for e-learning – theoretical and practical aspects
- MOOCs – methodology of design, conducting, implementation and evaluation
- Artificial intelligence (AI), augmented reality (AR), virtual reality (VR)
- Selected Web 2.0 and Web 3.0 technology
- LMS, CMS, VSCR, SSA, CSA
- Cloud computing environment, social media, multimedia resources, (video) tutorial design
- Simulations, models in e-learning and distance learning
- Networking, distance learning systems
- M-learning

2. **E-learning and internationalisation in higher education. E-environment and Cyberspace**

- Contemporary trends in world education – globalization, internationalization, mobility
- Legal, social, human, scientific, technical aspects of distance learning and e-learning in different countries
- European and national standards of e-learning quality evaluation
- Psychological and ethical aspects of distance learning and e-learning in different countries
- Collaborative learning in e-learning
- E-environment of the University
- SMART Universities. SMART technology in education
- E-learning in a sustainable society

- Comparative approach

3. **E-learning and STEM education**

- Robots and coding in education
- Immersive learning environments. Blockchain. Bots
- Internet of things. 3D printing
- STEM education contemporary trends and challenges
- Successful examples of e-learning
- Distance learning in humanities and science
- Quality of teaching, training
- Evaluation of synchronous and asynchronous teaching and learning, methodology and good examples

4. **Development of Key Competences and Soft Skills and E-learning**

- Effective development of teachers' digital skills
- Key competences and soft skills in the digital society
- Use of e-learning in improving the level of students' digital competences
- E-learning for humanities
- E-learning for science and technologies
- E-Learning and Lifelong Learning
- Self-learning based on Internet technology

Publishing this monograph is a good example of expanding and strengthening international cooperation. I am very grateful for all valuable remarks and suggestions which contributed to the quality of the publication. Here I especially want to thank Prof. Ryszard Kalamarz and Dr John Starnes for their assistance in editing and proofreading this publication. Also, I would like to say 'thank you' to the authors for the preparation and permission to publish their articles and the reviewers and experts who assessed and reviewed the manuscripts, which enhanced the value of the monograph. I wish all readers a pleasant read. Thank you.

Eugenia Smyrnova-Trybulska

E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 15–24
https://doi.org/10.34916/el.2021.13.02

A RETURN TO NORMALITY OR UNCERTAINTY AFTER COVID-19 FOR THE E-LEARNING ETHICAL ENVIRONMENT

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Abstract: *The coronavirus (COVID-19) pandemic global health crisis is having a profound impact, not only on people's lives – but how they learn, work and live. Educators were forced to shift to an online mode of teaching overnight and have adopted Emergency Remote Teaching through Online Learning (ERT-OL) using digital tools and online resources. Also educators had to deal with digital inequities by putting in extra work and shifting their mindsets. There are concerns that the impact of this health crisis will worsen inequities in learning outcomes for students from minority backgrounds. But learning had to continue. In these uncertain times, much had to be done so that students could learn, develop skills, and build on the knowledge they have acquired. The expected reopening of educational institutions will be another challenge, although still with many operating procedures put in place. There will be a need to define the resources that have been found beneficial, assess needs for the future, innovate and implement transparency in alternative educational systems and truthfulness in assessment strategies. This paper, following a systematic literature review aims to provide a comprehensive study on the COVID-19 pandemic emergency on the Portuguese educational system and analyse the way forward for a return to normality considering the uncertainty in a more equitable and ethical e-learning environment.*

Keywords: COVID-19; e-learning; ethics; equity; transparency; truthfulness.

INTRODUCTION

The unexpected COVID-19 pandemic spread worldwide in early 2020, affecting almost all countries and territories. Social distancing and restrictive movement policies have significantly affected traditional educational practices (Pokhrel & Chhetri, 2021). Like in other countries worldwide, the educational system in Portugal (elementary and secondary schools and universities) has been severely impacted due to the pandemic situation as it was built around physical schools (Muchacho et al., 2021). In elementary and secondary schools, the main constraints caused by the pandemic were during confinement in the last two school years – from 16th March 2020 up to the end of that school year and again between January and April 2021. When students could return to schools they were concentrated in "bubbles", delayed circuits and alternate timetables, with outsider study visits being cancelled. The majority of students in universities found no difficulty in adhering to online learning and gave good feed-back about the transition. However, they said that they missed social contact with their colleagues. Schools and universities also had to deal not only with online learning done in an emergency transition but also with all administrative activities being done remotely.

The online learning, done in such a quick way without any previous preparation became a panacea for this unprecedented global pandemic, despite the challenges and new opportunities posed to both educators and the students. They had to transit from traditional face-to-face to online learning from one week to the other with no other alternatives available (Pokhrel et al., 2021). The COVID-19 pandemic that was experienced demanded the solution of other problems experienced in schools – learning difficulties, failure, drop-out, special education – and has become a challenge for the political power, the leadership, teachers, students and parents. The transition of a teacher from face to face to online classes, is a process of building progressive (Alves & Cabral, 2021) trust and analysis towards learning. The uncertainties experienced towards the online emergent learning atmosphere produced insecurity. It is in the adaptive and innovative behaviour of the teacher wherein lies the strength of promoting quality in education.

If in developed countries, mainly in Europe and North America, this was a measure that allowed the introduction of technology in daily classes, for a large devastating number of students from developing countries it meant an abrupt interruption in learning. According to the United Nations, confinement has affected around 1.6 billion children and young adults in more than 190 countries (OECD report, 2020) and UNICEF estimates that there was not any remote learning for at least 463 million students (Unicef report, 2021).

This pandemic sheds a stark light on an emerging truth–education as we know it is over, and we must think of "school" in deeply different ways. However, we may question if an online classroom (Zoom, Teams. Google Meet, Cisco Webex or through any other platform) is a place where everyone is respected and transparent in their communication? Are we ensuring students privacy? This electronic approach to learning raises questions about trustworthiness and transparency (Castro-Gil & Correa, 2021). Transparency builds trust. The main need to be transparent and truthful is the commitment with all stakeholders and their compromise with international regulations (e.g. European General Data Protection Report- GDPR). By being truthful, it requires being honest and practicing transparency to all e-learning activities as honesty is the quality of being truthful and free from deceit, which is essential in human relations and should be rewarded.

RESEARCH METHODOLOGY

In order to conceive a better understanding on the unexpected COVID-19 worldwide pandemic effects on learning, a systematic literature review (Okoli, 2015) was carried out to identify, select and critically researched articles were considered more relevant to this subject.

1. THE COVID-19 PANDEMIC EMERGENCY

1.1. ERT – Emergency Remote Teaching

The educational systems, whether in elementary or secondary schools and universities have adopted "Emergency Remote Teaching" (ERT) – an unplanned and quick shift to a new form of teaching – as the main form of learning through the various online platforms (Seabra et al., 2021; Ezra et al., 2021) which have played an important role during this pandemic, helping the institutions to facilitate student learning during the quarantine periods that led to the closure of universities and schools (Subedi et al., 2020).

1.2. Rapid development and the offering of new tools

In Portugal, in the first year of the pandemic everyone was caught off-guard and the priority was to distribute computers to the student households where there was no equipment, and internet to the places without a network connection. The main concern was to keep all primary and secondary students with a minimum connection to the schools and teachers and rehearse a remote learning scenario, which had never been tested before within this dimension. Public and private organisations provided laptops and internet access to some students from disadvantaged backgrounds with little access to such tools and who required further attention and support. When this was not possible, in co-operation with the Post Office Services and the National Scouts Group, a mechanism was implemented allowing students who lived far from schools, and who had no computer or without access to the Internet, to receive hard copies of lessons and tasks from their teachers. Deliveries of homework/assignments on paper to students and their subsequent collection and return to the teachers were also organised (OCDE, 2020).
The virtual classroom platforms like videoconferencing (Google Hangouts Meet, Zoom, Microsoft Teams and Cisco WebEx) and customizable cloud-based learning management platforms such as Moodle and Classe365 were increasingly used.

2. AN E-LEARNING ETHICAL ENVIRONMENT

Accuracy, fairness, impartiality and respect are the main ethical principles applied to information processed by computers. It can also be considered that privacy, responsibility, copyrights and welfare may likewise be affected (Turilli et al., 2009). The use of computerised information needs to be regulated and the ethical principles of copyright, anonymity, freedom of expression and privacy are required.

2.1. The online environment

Accessibility, affordability, flexibility and educational policy are the most identified challenges in e-learning. However, many countries face huge issues without a reliable Internet connection and access to digital devices (Pokhrel & Chhetri, 2021).

Online learning requires different approaches to students of different age groups (Doucet et al., 2020). Online education depends on a suitable pedagogy and the expertise of information and communications technology (ICT) for both educators and learners (Petri, 2020).

School closures have a real impact on all students, but mainly on the most vulnerable ones who are likely to face additional barriers related to the current COVID-19 pandemic being more at risk of increased vulnerability and who are less likely to receive the support and extra services they need (OECD, 2020).

School closures and confinement measures mean more families have been relying on technology and digital solutions to keep children engaged in learning, entertained and connected to the outside world, but not all children have the necessary knowledge, skills and resources to keep themselves safe online. In Portugal, elementary and secondary students from rural villages may have illiterate parents. The majority of these students may not have access to computers or smartphones or TV at home in addition to poor Internet connectivity. Furthermore, as a result of the lockdowns, part of the population lost their jobs or their usual income. Continuous access to the internet is expensive and not affordable for poorer families and face-to-face online classes consume more data packages (OECD, 2020).

TPACK is probably the most referred proposal for technological adoption, due to the clarity with which it explains the need for three powerful dimensions: content, pedagogy and technology (Mishra & Koehler, 2006). Also, the potential use of games, simulators, the internet of things, learning robotics or artificial intelligence, all have the capacity of arousing strong and motivational student involvement.

2.2. Limited educational services for the most vulnerable

In Portugal, approximately 800 schools across the country hosted children from elementary schools whose parents worked in essential services, as well as provided food support to students from disadvantaged economic backgrounds, which meant that most of the time the only meal they had during the day was at school. Schools also reinforced their articulation with the Resource Centres for Inclusion, in order to ensure the continuity of their specialised support services for students (OECD, 2020).

Concerning the students with special needs, mainly from elementary schools, the role of parents is crucial in online learning (Ayda, 2020); to help on general or specific study questions, the special education teacher is online to clarify any concerns or questions from parents.

2.3. Equitable and inclusive access to digital resources

Educational equity means that all students, independently of their personal and social identifiers, have equal access to the educational resources and opportunities they need (Ezra et al., 2021). The shift of the Emergency Remote Teaching during the pandemic brought a decrease in educational equity. So, the implementation of e-learning technology must provide an equitable and inclusive environment with transparency and truthfulness (Silva et al., 2020).

In most of the cases during the pandemic, both parents were also at home teleworking. This brought the problem of the number of computers available for all the members of the family and the issues around physical workspaces.

The important thing is to guarantee that learners participate and learn in the actual context. But how can this be guaranteed? Some recent studies show a lack of readiness felt by the students, mainly those with greater socio-economic difficulties concerning their digital skills for an online model (Alipio, 2020; Basilaia & Kvavadze, 2020). The alternative is an ethics of care which directs our attention to the need for responsiveness in relationships (paying attention, listening and responding) (Prinsloo & Slade, 2017; Martel et al., 2021).

2.4. Assessment

Student assessments were carried out online, with a lot of trial and error, uncertainty and confusion among the teachers and students. The approach adopted to conduct online examinations varied, mainly depending on whether it was an elementary or secondary school or university and considering the expertise among the teachers. Appropriate measures to check plagiarism have yet to be investigated and put in practice in many institutions mainly due to the emergency of the moment (Pokhrel, 2021). Secure, remote testing can acquire better credibility if supported by systems that block the use of the computer which may or may not have an associated system that films the student and at the end, produces a report detailing the suspected cases for the teacher. In the same way, control of plagiarism may be incorporated in some LMSs.

3. RETURN TO NORMALITY

3.1. Traditional assessment methods

With this emergent and unexpected situation of online learning, the education institutions need to evaluate the impact of their remote teaching on the learning outcomes attained.

However, to do a secure and valid online assessment is a difficult task. There are several tools available that claim to avoid plagiarism and that do not violate privacy. An example of this is the software Proctorio – which is a Google Chrome extension that monitors students taking exams online (Kaup et al., 2020). However, these so called e-Proctoring systems lead to a range of potential ethical concerns, mainly if facial recognition or artificial systems to detect potential malfeasance are employed (Gordon et al., 2021).

3.2. Government policy to established procedures

The pandemic was a serious public health crisis and the economic and social problems associated with it, being primarily based on evidence that government interference is crucial, particularly to restrain or reduce growing social inequalities (Costa, A.F., 2020).

Probably the major test for the Portuguese government among the most important challenges created by COVID-19 was how to adapt the actual system of education built around physical schools (OECD 2020). The COVID-19 pandemic has provided all stakeholders with an opportunity to pave the way for introducing digital learning and it is generally recognized that there is a need to innovate and implement alternative educational and assessment strategies (Dhawan, 2020).

4. UNCERTAINTY AFTER COVID-19 – DISCUSSION

The purpose of this study is to explore the ethical issues concerning the transition from face-to-face to online learning. It is important to understand how this pandemic has reinforced and aggravated new and old social inequalities. The people most affected by this crisis are also the most vulnerable from the point of view of social inequalities, those with less social, economic, cultural and symbolic capital (Tavares & Cândido, 2020).

4.1. The Lawful and Political Approach

COVID-19 can bring threats to democracy in general – deterioration of the climate of confidence in governmental institutions, the rise of populism and xenophobic movements in Western Europe – and these risks are particularly high when it is thought that political leaders, whether national or international, "are not up to the job" as population surveys demonstrate (Magalhães, P. et al., 2020). In any case, for the welfare state to fulfil its functions and make a decisive contribution to reducing social inequalities, there are two priorities that have become salient with the current crisis: strengthening the public systems of the welfare state and emphasising their universal nature (Costa, A.F., 2020).

The General Data Protection Regulation of the European Union has merits, but is also very limited given the magnitude of the problem. One of its biggest shortcomings is, precisely, the failure to address some of the most worrying social inequalities involved in the new data concentration or the problems associated with online assessments, webcams, proctoring software, and learning analytics or trustworthiness (Costa, A.F., 2020). The government must also consider whether the several digital platform tools that serve as a substitute to traditional classes are a temporary condition or whether some components need to be adjusted permanently (Basilaia et al., 2020).

4.2. Beyond law – an ethical culture

Several questions arise regarding the ethical implications concerning online education. If problems are not solved by a law, then in what aspects can an ethical culture be created concerning quality and access and what is the role of transparency and trust? Is an online classroom through any platform like Zoom, MS Teams, Cisco Webex or Google Meet, a place where everyone is respected and transparent in communication? By using webcams, how can privacy be assured to students and teachers (Gordon et al, 2021)? In fact, this pandemic shines a stark light on an emerging truth–

education as we know it is over, and we must think of learning in different ways. Education must be reimagined concerning today's context and tomorrow's needs and needs to be rethought from the perspectives of the children and not of the curriculum. The existent technical problems must also be considered. The use of technology in online learning can be optimized, but some technologies are still difficult to access with errors in downloading, installation, login problems, audio and video problems, and so on. Frequently, students find online teaching boring and unattractive. Quality has to be improved with teachers needing to show their best efforts. E-learning courses have to be creative in design, centred on the learner, facilitate communication among students and work in groups (Partlow & Gibbs, 2003).

4.3. Awareness of Ethical Issues in new or updated e-Learning Systems

Which ethical reply can we expect from e-learning stakeholders (suppliers, government, etc.)? Will there be new applications appealing to the ethical awareness of promoting transparency and trust (Taddeo & Floridi, 2017)? Google's lack of transparency with schools became evident when districts demanded clarity from the company (Krutka et al., 2021). Ensuring digital equity is crucial in this difficult time. Not all teachers and students have access to the proper digital tools and steps must be taken to reduce the digital divide. It can be recognized that the best practices for online home-schooling are yet to be explored (Petrie, 2020). However, ethics and equity will always prevail in online education (Gallavan et al., 2017). According to Vermeulen et al. (2020), the capacity for self-questioning and innovative behaviour are necessary attributes to practice an education of the future, in developing a 'knowledge society'. Innovative capacity is the cornerstone of this process as it corresponds to a multidimensional process, associated with the dynamics of change, transformation, creation and novelty (Henriques et al., 2020, p. 144).

CONCLUSION

The coronavirus (COVID-19) pandemic global health crisis is having a profound impact, not only on people's lives but how they learn, work and live. Like in other countries worldwide, the educational system in Portugal (elementary and secondary schools and universities) has been severely impacted due to the pandemic situation as it was built around physical schools (Muchacho et al., 2021). Educators were forced to shift to an online mode of teaching overnight and have adopted Emergency Remote Teaching through Online Learning (ERT-OL) using digital tools and online resources. The shift to online learning, done in such a quick way without any previous preparation became a panacea for this unprecedented global pandemic, despite the challenges and new opportunities posed to both educators and students.

There are concerns that the impact of this health crisis will worsen inequities in learning outcomes for students from minority backgrounds. There are threats to democracy with the deterioration of the climate of confidence in governmental institutions, and the rise of populism and xenophobic movements in Western Europe. But e-learning had to continue in extremely democratic conditions. This pandemic sheds a stark light on an emerging truth–education as we know it is over, and we must think of “school” in deeply different ways. The expected reopening of educational institutions will be another challenge although there have been many operating procedures put in place. Government interference is crucial particularly to restrain or reduce growing social inequalities. The major test for the Portuguese government is how to adapt the actual system of education built around physical schools. There will be a need to define the resources that have been found beneficial, assess needs for the future, innovate and implement transparency in alternative educational systems and truthfulness in assessment strategies considering the uncertainty in a more equitable and ethical e-learning environment, to practice an ethics of care.

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"E-learning", 13, Katowice–Cieszyn 2021, pp. 25–39
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STUDYING TIMES OF STUDENTS IN ASYNCHRONOUS FORMS OF DISTANT EDUCATION: FACTS AND MYTHS

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Abstract: *The aim of the study was to identify studying times preferred by students participating in asynchronous forms of distant education. It was carried out using the instrumental, collective case study method, which allowed comparing cases and examining them in a context.*
At the beginning of the academic year, familiarising themselves with e-learning, students participated in online classes. Soon, they did not require further assistance. Initially, the majority of students did the tests shortly after the classes, but after a few sessions they did them before the classes. Students, for whom e-learning was new, usually took one test before the classes while experienced ones did several in one go. Students preferred to study in the evenings and at night. This means that distance education should incorporate the asynchronous delivery mode. University authorities need to regulate distance education which, in accordance with the Act and the ordinance of the Minister of Education, in addition to the dominant at Polish universities synchronous delivery mode, should allow also for asynchronous forms of distant education delivery mode. It is a myth that asynchronous mode of study weakens the bond between student, and between students and their lecturer. This common misconception myth disadvantages Polish universities, because corporations as well as the world highest-ranked universities offer MOOC and on-demand courses.

Keywords: students, study plan, instructions, test, post, evening, procrastination.

INTRODUCTION

Polish legislation on labour law in higher education allows delivering distance education courses in synchronous and asynchronous mode (Higher Education Labour Law, Art. 67, p. 4).
During the COVID-19 pandemic, the authorities of almost all Polish universities decided that classes were to be conducted in a synchronous mode using a videocon-

ference system, such as MS Teams. Lectures and tutorials were held at specified times according to the time table which had been developed for on-campus teaching. Following the schedule for distant education made it easier for decision-makers to control its delivery, for example the headmaster logged in at specified times to check whether the classes had started on time.

For both students and teachers synchronous distance education turned out to be psychologically and physically exhausting (Długosz, 2020a: 21; Długosz, 2020b: 4, 26, 42; Gruszczyńska, 2020: 27). The lecturers shared texts, books and other documents in pdf format, however disregarding students' time constraints. The students were expected to read the materials over the semester, and also participate in lectures, tutorials, workshops and on-line seminars.

On the other hand, Peter C. Herman aptly observed that "The major advantage of online learning is asynchronicity, or, «anytime, anywhere learning»." (2020). Asynchronicity, technology-mediated interaction and engagement are fundamentals of e-learning (Vrasidas, Zembylas, 26; Kędzierska, Ślósarz, Ratusiński, Skrzypek, 2014; Stowarzyszenie E-learningu Akademickiego, 2008). It requires the lecturer's immediate feedback (Alvarez, 2012) and personal reflections, collaboration, dialogic interactions, exchange information and ideas (Sparnon, 2004). They are more challenging to organise than a videoconference. Preparing not only study materials but also forms of self-assessment, tests, marking criteria and designing a course prior to its commencement requires competence and time investment on the part of the lecturer. On the other hand, asynchronous studies do not require any preparation of a detailed plan of studies or application of complicated technology (Anderson, 1997–1998). Such an approach is often used in medical field (White et al., 2021) as it gives students opportunity to study 24/7.

Therefore, it is worth to investigate at what time students are most inclined to study when they are given freedom of choice. The study presented in this paper is an attempt to answer the above question. It was conducted to examine to what extent synchronous distance education offered by a number of Polish universities is practical, whereas foreign universities for some time have been successfully offering asynchronous courses (Picciano, 2002; Blignaut & Trollip, 2003; Cheung & Hew, 2004; Dennen, 2005; Peterson et al., 2018), corporations offer more and more studies on-demand (SHRM, 2021), and the world's highest ranked universities offer MOOC courses allowing the students to work at their own pace (Coursera, EdX).

1. AIM, HYPOTHESIS AND METHODS

The aim of this study was to identify the time students typically undertook e-learning activities. As part of the netographic study, the daily practices and unique behaviours of students in specific groups were analysed in order to determine the scope of a wider phenomenon i.e. the rationale and effectiveness of on-line courses delivered in asynchronous mode.

The following hypothesis was formulated: *the majority of students undertakes e-learning activities as per schedule.*

The instrumental, collective case study method was used (Stake, 2009; Creswell, 2012), which allowed placing the cases within a larger context, understanding them better, and making comparisons, which provided a better *insight into an issue* (Cresswell, 2012, 465). The inductive and deductive stages of qualitative methods were used for data analysis (Patton, 2002, 18; Stake, 2011, 20).

Objective data was collected in the form of digital records of times at which students submitted individual tests. Data was entered into an Excel spreadsheet. Then, the frequency of specific values e.g. 9.00 a.m., 5.00 p.m. was calculated with the help of an internal search engine. The obtained results were presented as charts in order to establish trends, variabilities as well as the similarities and differences. Qualitative analysis included characteristics of the group and compared it with other groups. After analysing the data, assertions were formulated and grouped into categories *for* and *against* asynchronous education. Based on careful data analysis, all assertions supported by enough evidence were adopted. The results were also compared with those published by other researchers.

2. RESEARCH MATERIAL

The research material consisted of automatically registered times at which students enrolled in four different off-campus courses offered at the Institute of Polish Philology at Pedagogical University in Cracow in the summer semester of academic year 2019/2020 and 2020/2021 submitted their assignments. Classes were delivered on the MOODLE platform in asynchronous and synchronous modes, i.e. all or almost all study materials were made available to students before the first class so they were able to study at the time convenient to them. Additionally, students were able to meet the lecturer during scheduled online sessions. They were, therefore, able to study at their own pace and many completed particular modules or entire course well before the due date. The university courses were run in a synchronous mode, and online sessions were delivered according to the timetable set for on-campus education.

After each class, students were required to do an assignment. Three attempts were allowed. Students took second or third attempt if they failed the test or in order to get a higher score. Assignments had no weighting for the final mark. These were mandatory pass/fail tests. However, in the case of the first two courses the high mean test score improved the final mark.

The analysed modules were selected in such a way as to provide as much information as possible: two courses, courses delivered bachelor's and master's degrees level, modules from the 2019/2020 and 2020/2021 academic years, lectures, tutorials and workshops as well as on-campus and off-campus modes of study.

The lecturer had sessions with the students at set times. In academic year 2019/2020, the lecturer communicated with the students by exchanging posts on the forum, and in 2020/2021via BigBlueButton. At the beginning of each session, the lecturer discussed the main topics, provided information on how many students had already completed modules, and provided full names of students who scored 100% in the tests. Over time, the number of participants in these meetings decreased because they either did not need to continue mentorship, or had already completed the module or the entire course. Nonetheless, the synchronous contact with the lecturer was available over the entire course, according to the timetable. However, not many students participated in real-time meetings. That could have been due to the difficulties associated with the observance of real time meetings. Therefore, students usually posted their queries and requests to the lecturer outside of scheduled meetings.

Table 1. Analysed courses

Course	Class	Level, Semester	No. of participants
Course: *Cultural Studies and Media Knowledge*			
Contemporary Media Systems	Lectures, tutorials	Bachelor's first semester, 2019/2020	50
Basics of Social Communication	Lectures, tutorials	Bachelor's second semester, 2020/2021	13
Neurocognitive Analysis of Cultural Texts	Tutorials	Master's, first semester, 2019/2020	20
Course: *Polish Philology*			
Multimedia in Social Communication	Workshops	Bachelor's first semester, 2020/2021	14
Total			97

Source: Own work.

3. LIMITATIONS

The author of this study attempted to establish preferred studying times of students of a given university. The results cannot be generalised due to a small research sample, preparation and delivery of classes by one lecturer only, as well as only two academic terms and one Institute of the university. Moreover, attending tests prior to class could have been influenced by the student's hope to be praised by the lecturer by having their name revealed to other students had they achieved 100%. The way students studied might have also been influenced by the social context – the pandemic caused uncertainty as to the possibility of continuing studies. Thus, students might have been more inclined to study systematically. The case study presents behaviours of individual students only. Nonetheless, it allows for applying identified behaviours to a broader population i.e. all studied groups and the entire population of students.

4. RESULTS

4.1. Step One: Need for Mentorship

Cultural Studies and Media Knowledge students who were enrolled in the unit *Contemporary media systems* in the second semester, had not had any experience with the MOODLE platform. After the onset of the pandemic, most of the classes were delivered via the newly purpose-adapted videoconferencing services such as Microsoft Teams, ZOOM, or Google Meet.

However, students were prepared for classes being delivered on the MOODLE platform, because at the beginning of the second semester they had been provided with study materials and assignments the same as for the lectures delivered on-campus. The student’s main task was to post on the forum a Power Point presentation based on the readings which had already been presented to the students on campus. Students needed thorough instructions at the beginning of their e-learning experience, so they could master their platform navigation skills. Instructions were provided to the students face-to-face, and then via group and individual posts on the MOODLE platform.

Before the first online lecture, and the third in general, the lecturer posted detailed information on how distance learning would be delivered. The lecturer provided similar information prior to and during the following online sessions. Thanks to this, sessions ran smoothly. There were no organisational or technical issues. A hundred percent of students participated in the online lectures and tutorials. Such high attendance is uncommon in the case of on-campus classes. The lecturer provided students with further instructions during the first few online sessions. As scheduled, the lecture was delivered 11.30 a.m. – 1.00 p.m. on Thursdays, and tutorials 9.15 p.m. – 1.45 p.m. – on Mondays for group I, and on Fridays for group II.

Figure 1 below shows that students attending group sessions, rarely completed their assignments during sessions. Students studied hardest between 5.00 p.m. and 7.00 p.m. 36% of students studied after 8.00 p.m., at the time when on-campus sessions are hardly ever delivered. Therefore, it can be said that every third student preferred to study in the evening rather than during the day (including during scheduled sessions).

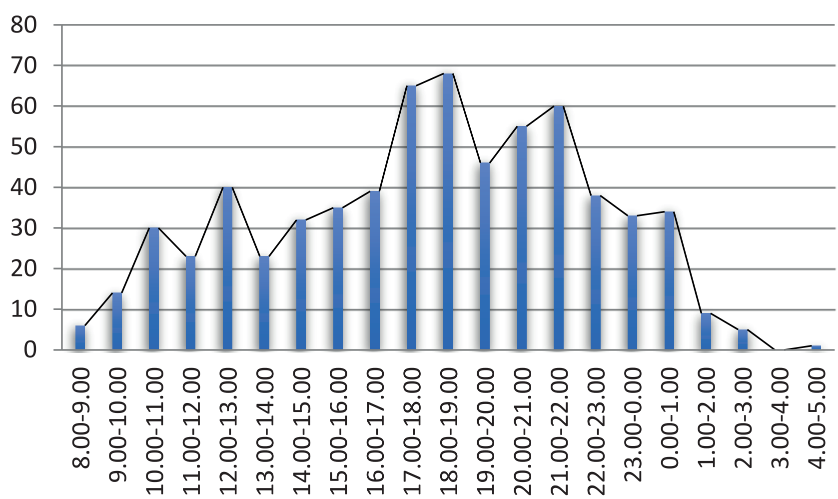


Figure 1. Studying times of first year BA students of *Cultural Studies and Media Knowledge*

Source: Own work.

It follows that asynchronous mode was useful. Classes for the second group had been scheduled to be delivered in May. Nonetheless, students logged in at the same time as the first group students and were completing modules ahead of the schedule. They studied systematically, so they were ready to take an exam before the scheduled exam session. Almost 100% of students completed their assignments and posted their presentations at the forum before the deadline. Preparation of a presentation was a challenging task. Therefore, it was decided that a student who did not prepare a presentation on time would be required to prepare an additional one. That might be one of the reasons why students posted their presentations ahead of the deadline in order to avoid the risk of e.g. difficulties with internet connection.
Figure 2 shows that almost all students completed the tests and assignments prior to the classes, rarely during and hardly ever after them.

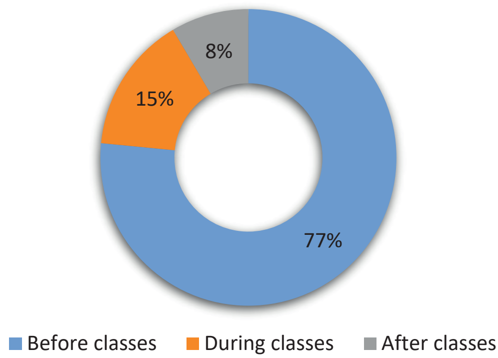


Figure 2. Studying times of first year BA students of *Cultural Studies and Media Knowledge*

Source: Own work.

It was found that the students in the group were committed and ambitious. Two lectures delivered on campus gave students and the lecturer the opportunity to establish a good rapport with each other, which in distant education is of significant importance. This hypothesis was confirmed by excellent exam results – the average was close to high distinction. 7 students (14%) dropped out, which is quite common in the first year.
The following year, students who studied in a similar system, did not achieve such a high exam mean result, one student failed the exam and twenty-nine students (31%) dropped out. It seems that reasons for the lower marks could be that it was impossible to meet on the campus that year. Additionally, the pandemic weakened the collegial bonds necessary for preparing group presentations. It also made it difficult for students to get to know the lecturer, and for the lecturer – to understand the needs of the students. However, earlier research suggested that *asynchronous learning actually fosters a very high degree of interaction among students and instructors* (Wilson & Weiser, 2001: 365). A number of researchers share this opinion (Mayadas, 1997; Miller & Webster, 1997; Koehler et al. 2020). Therefore, it can be said that *blended learning*, i.e. in this case the first two classes delivered face-to-face followed by

distant education in 2019/2020 because of the pandemic – triggered dedication in students and provided them with the opportunity to study asynchronously, which turned out to be highly effective.

4.2. Part-Time Students: Time Saving

Second-year BA students of *Cultural Studies and Media Knowledge* completed *Basics of Social Communication* unit delivered entirely in distant education mode. They had been familiar with e-learning, because in the first year they completed two units delivered in this way: *Contemporary Media Systems* and *Information and Communication Technologies for a Culture Expert*. The off campus mode of delivery meant that students frequently studied during scheduled hours due to their work commitments. The spike at 1.00 p.m. in Figure 3 was due to ten lectures and tutorials conducted between 1.00 p.m. and 2.00 p.m.

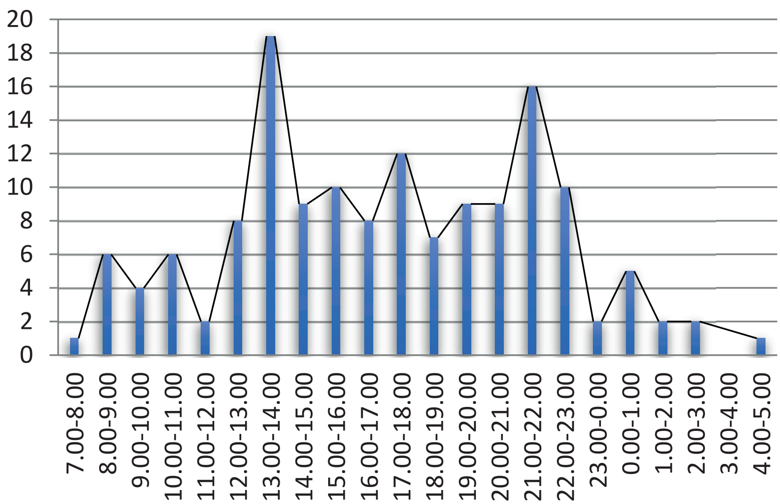
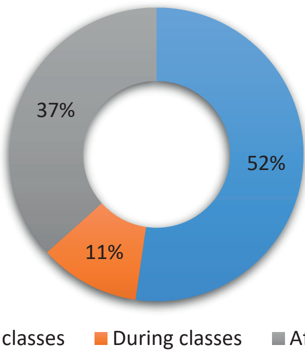


Figure 3. Studying times of second year BA students of *Cultural Studies and Media Knowledge* in distant education mode

Source: Own work.

The high position of 9.00 p.m. and the neighbouring hours in Figure 3 also deserves attention. Distant education students completed 32% of their units after 8.00 p.m., due to their other commitments.

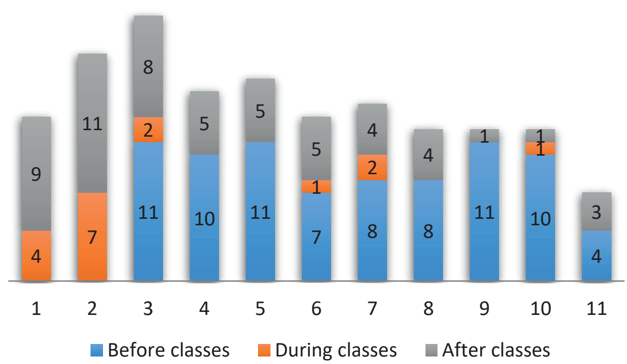
Students did not work systematically. They frequently completed assignments after the sessions, often after the next scheduled class. Inexperienced students procrastinated (Sanecka, 2019), which accounted for their falling behind. Nonetheless, they were able to make up on time. Figure 4 presents the scale of this phenomenon. It suggests that although students frequently completed their assignments before the class, the procrastination rate reached 37%, and it was the highest for all four studied groups.



F i g u r e 4. Test taking times of second year BA students of *Cultural Studies and Media Knowledge* in distant education mode

S o u r c e: Own work.

Students did not need any detailed instruction or arrangements at the beginning of the course. The majority participated in the first two sessions. Some students completed their assignments at the scheduled times, others – at a later date. Starting from the third session, most students completed their assignments prior to the scheduled sessions; tests were also less often attempted during session times. This is illustrated in Figure 5. The unequal numbers of students attempting tests during sessions resulted from the fact that some students attempted their assignments twice or three times in order to increase their score and final grade. Additionally, as one absence was allowed, some students completed tests at a later date, which accounts for the spike in figures.



F i g u r e 5. Assignment completion times of second year BA students of *Cultural Studies and Media Knowledge*

S o u r c e: Own work.

Despite being well behind with their studies, experienced students were able to make up by participating in unsupervised distance learning (Fernández-Aleman et al., 2016) and completing several modules at one sitting. All students – except for the one who dropped out – completed unit on time. All students passed the exam before the formal examination period. They had established a good relationship with the course coordinator and were familiar with the course program (Schroeder et al., 2016). Therefore, they were able to use e-resources proficiently. Nonetheless, work and other commitments posed a significant challenge for some of them.

4.3. Students Unfamiliar with MOODLE

The majority of second-year students of *Polish Philology* studied during the scheduled hours when completing the *Multimedia in Social Communication* unit. Sessions were held on Thursdays from: 3.15 p.m. – 4.45 p.m. Figure 6 shows that most students studied during the first hour of classes; they had also studied intensely prior to them. Some students participated in a group session with the intention of completing their assignments at a later date. Therefore, there was lower attendance in the second hour of the session.

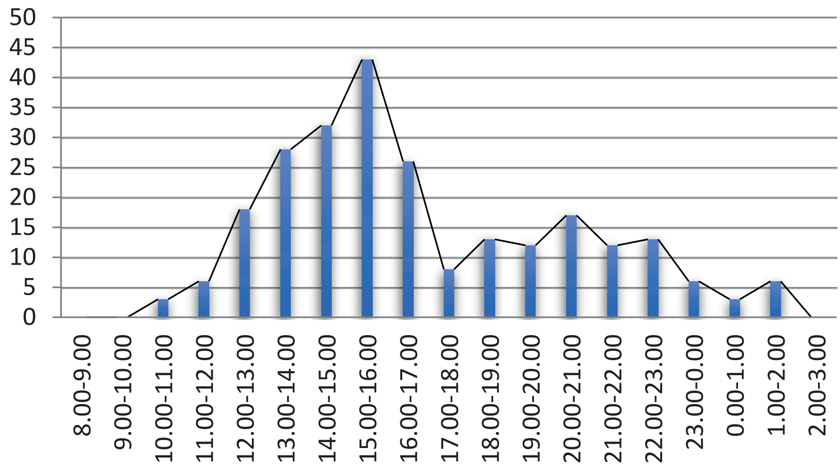


Figure 6. Assignment completion times of second year BA students of *Polish Philology*

Source: Own work.

Second-year students had previously completed a few sessions delivered on the MOODLE platform so they were familiar with it. However, these sessions mainly involved accessing study resources files (called *Resources for students*), i.e. the repositories. Therefore, students from this group were unfamiliar with e-learning. The student-representative of the group stated that that was their first Moodle unit to complete.

They studied systematically, hardly ever anyone fell behind. They aimed at completing the tests before the scheduled date. 23% of the assignments were completed after 8.00 p.m. Over time, fewer and fewer students studied during session times, preferring to study independently. The evening and night study times were preferred for posting presentations and commenting on their colleagues' posts. 36% of these were posted after 8.00 p.m. Preparing the posts required more attention and focus than ten-minute tests. Therefore, the students preferred to edit them when they had no time limits. It can be said that for these students their first distant education course became an opportunity for developing their independent-learning strategy. Figure 7 shows that 77% students worked before classes.

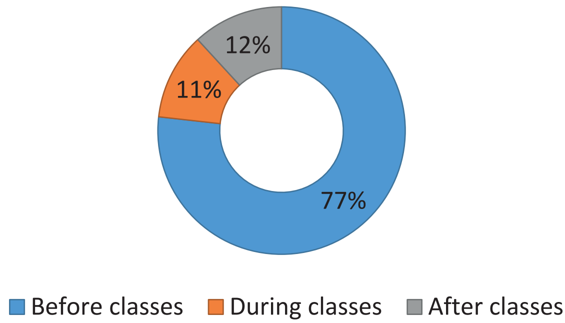


Figure 7. Test taking times of second year BA students of *Polish Philology*

Source: Own work.

This was the most committed group. The students diligently followed instructions. They studied systematically, on average completing one assignment, i.e. one module, a week. None of the students fell behind with their studies and all of them completed the unit on time.

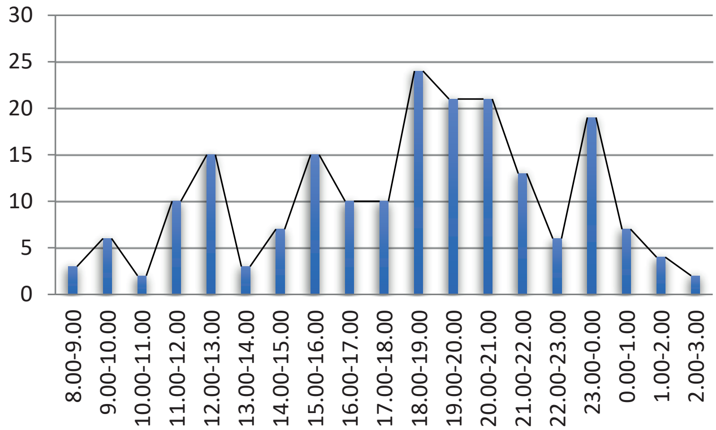
4.4. Experienced Students: Independent Studying

The *Neurocognitive Study of Cultural Texts* unit delivered in distance education mode was completed in the second semester of the 2019/2020 academic year by the first-year MA students of *Cultural Studies and Media Knowledge*. There were 20 students in the group. All students completed e-learning units during their bachelor degree course. Therefore, they were familiar with this mode of education and, indeed, utilised their skills freely and independently.

Most of the sessions were held between 3.30 p.m. and 5.00 p.m. However, as Figure 8 shows, students hardly ever studied at these times. They preferred to study in the evening hours, especially after 6 p.m. 36% of the quizzes were completed after 8 p.m. that is the highest percentage for all surveyed groups. This finding suggests that there is a high demand for asynchronous mode of learning, especially in the case of students with advanced skills in e-learning. It can be said, therefore, that every third student from this group studied in the evening, independently of the timetable.

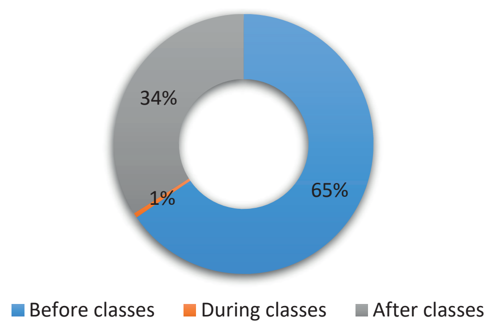
The joint meetings were rarely logged in because the instructions were clear, so no additional clues were needed.

Experienced students were comfortable in planning their study times independently. Therefore, they did not need to participate in sessions delivered in real time. They studied at their own pace, often completing several assignments at one sitting, before or after sessions. Hence, a relatively high percentage of the students who completed their assignments after the session, as illustrated in Figure 9. Only 1% of the students completed tests according to the timetable. Only a few joined online sessions because instructions were clear, and they did not require additional information.



F i g u r e 8. Studying times of first year MA students of *Cultural Studies and Media Knowledge*

S o u r c e: Own work.



F i g u r e 9. Study times of first year MA students of *Cultural Studies and Media Knowledge*

S o u r c e: Own work.

On the discussion forum, the students presented their reflections based on selected readings and their own experiences. Their posts were a mandatory requirement for successful completion of the unit. Alike their inexperienced colleagues enrolled in the *Multimedia in Social Communication* unit who completed 23% of their assignments after 8 p.m., they also preferred to study in the evening. Seven out of twenty comments were posted after 8 p.m., which amounts to 35%. This means that both extremely inexperienced and highly experienced students preferred to work asynchronously while completing the distant education course.

Figure 10 illustrates study patterns of experienced e-learning students. It shows that students preferred asynchronous contact with the lecturer, and that they required instructions only at the beginning of the course. Over time, they completed all assignments prior to sessions.

Thus, master's degree students were able to successfully organise their learning by taking advantage of the asynchronous study mode.

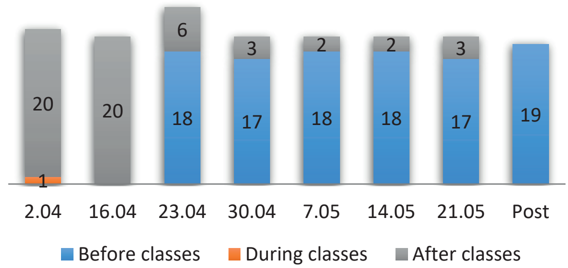


Figure 10. Assignment completion of first year MA students of *Cultural Studies and Media Knowledge*

Source: Own work.

CONCLUSION

The hypothesis that *the majority of students undertakes e-learning activities according to the timetable* has not been confirmed. Thus, it can be argued that enforcing synchronous mode of distant education by universities can be justified neither methodologically nor organisationally. As students gain experience in completing modules delivered on the MOODLE platform in asynchronous mode, they need less and less synchronous instructions. Moreover, experienced students do not need them at all. Students completed assignments asynchronously and in large blocks. They studied at times convenient to them and at their own pace.

The majority of students completed modules and entire units before the due date. Many students also studied after scheduled sessions times or did not participate in synchronous interactions at all. It seems that students were avoiding synchronous interactions preferring to study independently. They seemed to be least satisfied when required to follow the study regime imposed by the timetable.

The surveyed students needed one or two meetings with the course coordinator at the beginning of the course to familiarise themselves with the unit's rules and expectations. Therefore, for the future, it would seem reasonable to deliver the first two classes on campus, and the rest asynchronously. Those sessions should be audiovisual, and delivered in real-time so that the students could get to know the lecturer and the lecturer – the students. It is recommended that universities install the BigBlueButton application along with the commonly used Microsoft Teams. It is a myth that BigBlueButton slows down the system. It is successfully used on the MOODLE platform, for example by the University of Wrocław and by the Pedagogical University in Krakow from 2021/2022 academic year.

The argument that distant education negatively influences the students-lecturer and student-student relationship is a risky myth resulting from an inappropriate use of videoconferencing and negative attitudes the majority of university staff have towards distant education. That is the case because organising distant education requires huge time investment while academics seem to prefer to dedicate their time to research and publishing.

Study times of students of enrolled in asynchronously delivered courses require extensive research. The aim of research is to suggest improvements to practice (Cresswell, 2012: 4). In the 21st century, the coherent vision of quality education requires inclusion of distant education delivered in asynchronous mode.

ACKNOWLEDGEMENTS

The work presented in this paper has been supported by the funds obtained 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).

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 40–48
https://doi.org/10.34916/el.2021.13.04

EDUCATIONAL CHALLENGES DURING THE PANDEMIC

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Abstract: *The article summarizes one year of pandemic education. After presenting the calendar of events, the author describes his motivation to prepare this paper, presents the review of last year's literature. He refers to several basic educational terms and describes his experiences with Small Private Online Courses (SPOC) and an educational newsletter. Further, the author discusses simple ways of preparing multimedia objects of knowledge and proposes to use the paradigm of flipped education accomplished by formative assessment as well as making materials available in the framework of the Synchronous Online Flipped Learning Approach (SOFLA). Remote evaluation of learning outcomes is difficult and problematic mainly because of the e-cheating problem. The effectiveness of SOFLA during the pandemic was investigated in the same way as in China. Results of both surveys were compared. The article is supplemented by some comments regarding the future of education based on a comparative analysis of the situation of teachers in Poland and around the world.*

Keywords: pandemic education, flipped classroom, formative assessment, blended learning, learning objects.

INTRODUCTION

The article was created in three stages. Its first version was drafted in May 2020 for a conference, which was cancelled. The second version was created in September. The final version is of July 2021. The article has changed significantly over the last few months. During the pandemic, the government and ministries have reduced resolving pandemic education problems to issuing ineffective laws, regulations, and recommendations. If educators themselves do not do something constructive to save education, no one will do it for them. All lessons learned during the pandemic and described in the paper are of great importance for the future of education.

1. LITERATURE REVIEW

During the past year there were many papers published on pandemic education. Teräs et al. (2020) studied post-COVID-19 education and education technology solutionism. Dhawan (2020) raised an important question of whether online learning is a panacea in the time of the COVID-19 crisis. Nartiningrum & Nugroho (2020) investigated challenges, suggestions, and needed materials by students of English as a Foreign Language. Bailey et al. (2020) worked on finding intrinsic motivation for synchronous and asynchronous communication in the online language learning context. Lassoued et al. (2020) performed an exploratory study of the obstacles to achieving quality in distance learning during the COVID-19 pandemic. Colomo-Magaña et al. (2020) studied university students' perception of the usefulness of the flipped classroom methodology. Arora & Srinivasan (2020) investigated the impact of the COVID-19 pandemic on the teaching–learning process: a study of higher education teachers. In China during the pandemic there was a lot of research on different online learning and teaching models. Zhang et al. (2020) studied factors affecting Chinese university students' intention to continue using virtual and remote labs, which is crucial for technical studies. Wong (2020) tried to answer an important question – when no one can go to school, does online learning meet students' basic learning needs? Jiang et al. (2021) tried to measure online learning satisfaction in higher education during the COVID-19 pandemic and prepared a regional comparison between Eastern and Western Chinese universities.

2. SPOC AND NEWSLETTER

The concept of Small Private Online Courses (SPOC) was first introduced by Fox (2013). Ever since then such courses have been progressively implemented in higher education as a new approach to education (Ruiz-Palmero et al., 2020). To some extent SPOC replaced Massive Open Online Courses (MOOC), which have a very high drop-out rate (Eriksson et al., 2017). The course on Technology Enhanced Learning for faculty staff members was created on March 15, 2020, as a SPOC. This is an example of a course that was created without any funding but only within the framework of broadly understood educational volunteering. In the original version, this was primarily a place where questions could be answered in the discussion forum. Later, materials were added to the course showing how to prepare Learning Objects (Polsani, 2003) in multimedia and reusable form (Neto et al., 2017). Seven different types of multimedia recordings were recognized: whiteboard (simulation of a whiteboard in class), slides (classical slides with audio track and video), mixer (use of different sources), mixer plus (use of slides and whiteboard at the same time), paper (use of scanned paper notes), talking head and audio talk.

Later, in June 2020, the faculty educational newsletter was started. Lessons learned from the course were very simple. People do prefer to obtain a letter rather than to follow the course. Newsletters in the electronic version contained links to the course which was used more frequently as a result.

3. EDUCATIONAL SENECA EFFECT

In his book "The Seneca Effect" (Bardi, 2017) Ugo Bardi tried to explain why growth is slow, but collapse is rapid. This is an extension of a line written by a Roman Stoic philosopher Lucius Annaeus Seneca: "Fortune is of sluggish growth, but ruin is rapid". Thoughts from this book were expanded in a new one entitled "Before the Collapse" (Bardi, 2020) which is a kind of a guide to the other side of growth. The Seneca effect is also visible in education especially because of the pandemic COVID-19. The erosion of the educational system is caused by many factors. The first one is growing bureaucracy. The second element accelerating the collapse of the education system is negative selection for the teaching profession. Another element that enhances the journey towards the Seneca educational cliff is cyber diseases mentioned by Manfred Spitzer in his books about digital dementia (Spitzer, 2014), cyber diseases (Spitzer, 2017), and digital discomfort (Spitzer, 2020). The alpha generation is very seriously threatened by digital dementia, a disease caused by an uncontrolled use of digital media. This phenomenon can be especially dangerous for children and adolescents, whose brains are more malleable and absorb external stimuli like a sponge.

4. FLIPPED CLASSROOM AND FORMATIVE ASSESSMENT

Remote classes were conducted using a flipped education approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. One of the problems which arise in the case of remote classes is the assessment process and evaluation of learning outcomes. Classical exams and tests have limited value because of e-cheating. That is why formative assessment was used introducing a frequent, interactive assessment of a student's progress and understanding of the material so the teachers can determine how the students learn and how to teach them in the best way.

5. SOFLA MODEL

The Synchronous Online Flipped Learning Approach (SOFLA) model was presented for the first time by Marshal and published by Marshall & Kostka (2020). SOFLA was developed to align flipped learning principles with online instruction. In this approach flipped learning moves to asynchronous space. In-class work completes in synchronous class sessions when students and teachers are present. The key advantage of this approach is that by meeting synchronously regularly teachers and students can clearly distinguish between two contexts of the learning process: in-class synchronous and out-of-class asynchronous. The effectiveness of SOFLA during the COVID-19 pandemic was investigated by Ma (2020) from Xi'an International University. No other results concerning the investigation of SOFLA are available now. The survey participants were 60 second-year undergraduates in a pre-service

English teacher training program at a private university in China. An anonymous online survey was designed with the consideration of the Community of Inquiry framework (Garrison et al., 2001) and students' satisfaction questionnaire prepared by Wu et al. (2010). The survey covered five parts: social presence, teaching presence, cognitive presence, teaching evaluation, and learning effect, with 17 items in total. The survey was built on a five-point Likert scale (range from "strongly dissatisfy" to "strongly satisfy", 1–5). Table 1 presents the results of the survey. Results in grey columns are for Poland.

In January 2021 an identical survey took place at the Faculty of Civil Engineering of Warsaw University of Technology. 140 students were participating in this survey out of the total number 160. The surveys were conducted during the course described in (Gajewski et al., 2013). This course as described in (Gajewski & Jaczewski, 2014) is taught in a flipped format. Figure 1 presents results in graphical form. Black columns and lines are for Chinese results, grey are for Polish.

Table 1. Results of surveys (grey background – results for Poland)

Detailed description	M	SD	M	SD
Social presence				
1 Enhanced communication between T & Ss and Ss & Ss	4.30	0.71	2.93	1.07
2 Improved ways and forms of interaction between T and Ss	4.09	0.70	3.05	0.99
3 Maintained sustainable interest and attention	3.46	0.56	2.89	1.12
Teaching presence				
4 Clear objectives for learning tasks	4.01	0.53	3.63	1.08
5 Just-in-time teaching or peer instruction	4.28	0.58	3.42	0.97
6 Just-in-time supervision and reminder by the teacher	4.15	0.74	3.39	1.04
Cognitive presence				
7 Promoted autonomous learning and personalized learning	4.26	0.72	3.26	1.09
8 Upgraded learning motivation	3.96	0.67	2.68	1.26
9 Rich types of online learning resources	4.35	0.69	3.43	1.05
10 Various forms of in-class learning activities	4.23	0.73	3.00	0.96
11 Improved knowledge digestion and absorption	4.16	0.84	2.86	1.04
Teaching evaluation				
12 Beneficial to monitor, supervise, and feedback of learning	4.24	0.63	3.12	1.04
13 Helpful to examine learning effect in time	4.03	0.66	3.32	1.00
Learning effect				
14 Improved communication and expression sills	4.15	0.75	2.74	1.03
15 Promoted the ability to think critically and solve problems	3.87	0.79	3.20	1.04
16 Enhanced the ability to use information technology	4.17	0.68	3.69	0.98
17 Improved learning effect in general	4.20	0.62	3.10	1.06

Source: Own work based on (Ma, 2020).

It is easily visible that average values (M) are higher for China and standard deviation values (SD) are smaller for China. This means that Polish students are less satisfied with the SOFLA model but on the other hand, their opinions are more varied. It is a challenge to convince those who are not satisfied because education will change. The biggest differences in average values (M) are for the questions concerning enhanced communication (social presence) and improved communication and expression skill (learning effect). The smallest differences in averages are for questions concerning clear objectives for learning tasks (teaching presence) and enhanced ability to use information technology (learning effect).

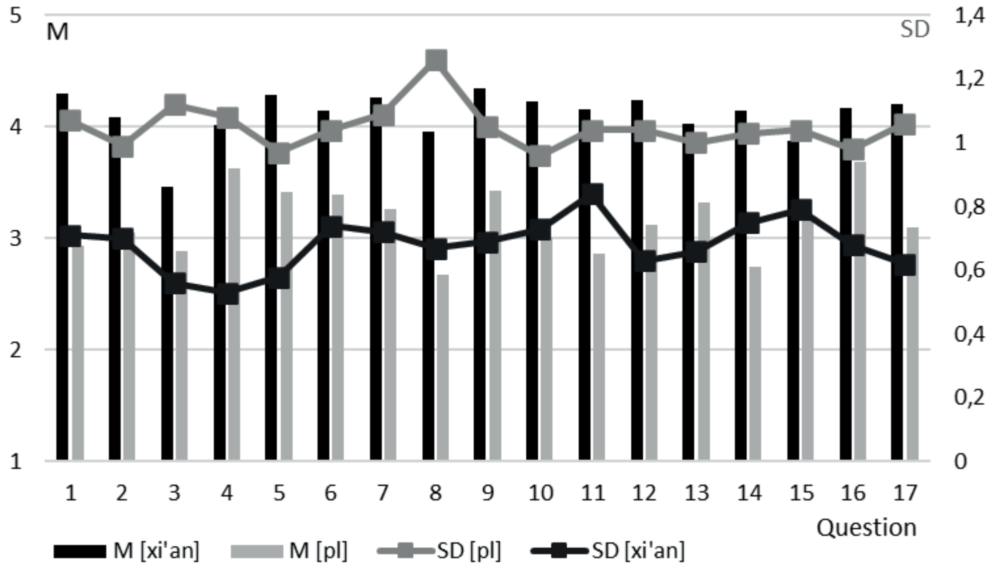


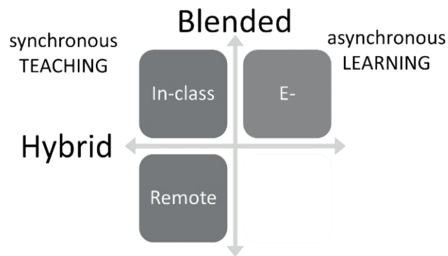
Figure 1. Comparison of results of surveys

Source: Own work.

6. HYBRID OR BLENDED?

For three semesters in principle, all of Poland's higher education institutions worked in a fully remote mode. In the last semester, elementary and secondary schools returned to classroom-based learning. Only when the epidemic threat increased were some of the classes moved to virtual space. This method is referred to in Poland as hybrid education, although a more correct term would probably be hybrid teaching. Hybrid teaching can therefore be defined as a mixture of synchronous teaching in the classroom and in virtual space. A completely different approach is blended learning. It is a combination of synchronous classroom teaching and asynchronous e-learning (see Figure 2).

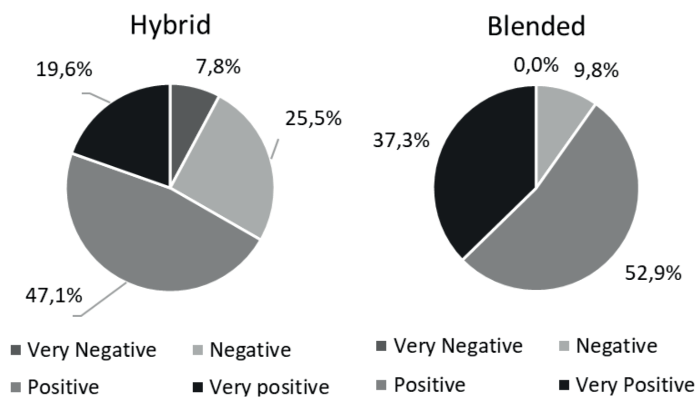
During a webinar at the Warsaw University of Technology in May 2021, which was devoted to education during the pandemic, after explaining the concepts of hybrid and blended learning, a survey was conducted among the participants. Fifty-one out of 110 registered participants of the meeting (academic teachers and students) completed the questionnaire, which is less than half. This does not necessarily mean a low interest in the survey. During webinars participants often only log in and do not actively participate in the event.



F i g u r e 2. Hybrid is not blended

S o u r c e: Own work.

The first two questions were about the respondent's opinion on hybrid and blended education – how do you rate the idea of hybrid (blended) classes. There were four possible answers: very negative, negative, positive, very positive – according to the four-point Likert scale. The results of the surveys are shown in Figure 3. Hybrid teaching was evaluated negatively and very negatively by exactly 33.3% of the respondents. In the case of blended learning, there was no very negative evaluation – only 9.8% of respondents evaluated this option negatively.



F i g u r e 3. Attitude to hybrid and blended education

S o u r c e: Own work.

The third question concerned the choice of the form of teaching if there was only an exclusionary alternative – hybrid or blended. The vast majority or 68.6% chose the blended form. This is shown in Figure 4. However, this does not translate into a decision made by the university authorities. The plan is to fully return to full-time classes and in the case of an increased pandemic threat, teaching in remote or hybrid mode. The reasons for the fact that although blended learning is rated higher, it is not the choice of the majority of teachers, and above all the university authorities should be sought in administrative and financial issues. Mastering remote teaching required a lot of work on the part of teachers and the financial resources of schools. Blended learning requires the preparation of e-learning courses which means additional expenses. Because of the approaching fourth wave, this step, although expensive, should be taken.

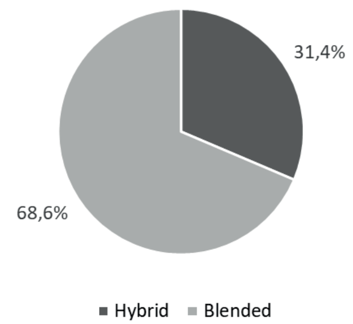


Figure 4. Hybrid or blended?

Source: Own work.

CONCLUSION

For the past thirty years education and higher education have never been a real priority for all Polish governments. Today, because of the pandemic situation, it is even worse. The OECD annual report shows in a chapter about indicator D3 – how much are teachers and schools heads paid. Salaries of Polish teachers are in terms of purchasing power of money several times lower than in Germany, Denmark, and Spain. The only chance to change this situation is a common reaction of all stakeholders of the educational process – pupils, their parents, students and, teachers.

A year and a half of the pandemic education has allowed you to learn a lot. The primary lessons learned are as follows. We must consider the generation gap between baby boomers and generation Z in the education process. The primary sources of information are completely different for these generations. And it is the baby boomers who need to adapt to the preferences of generation Z and not the other way around. We cannot focus only on teaching. We must focus our efforts on helping students learn. The SOFLA model seems very promising, but it should only be a temporary solution. The target educational model should be blended learning. Especially because, according to the Seneca effect, a full return to the pre-pandemic situation will not be possible.

The main educational challenge today is the need to focus more on pupils and students and their learning in isolation. This requires a change in the way teachers approach their tasks and responsibilities. A similar change should also occur at the level of policymakers who are most willing to hold teachers accountable simply for the number of hours they teach.

The greatest threat today seems to be the practical impossibility of reliably controlling the effects of the educational process. E-cheating is the scourge of pandemic education. Problems which were solved for traditional education (Gajewski, 2016) are insoluble in remote education. It is not possible to universally organize exams based on the open book exam model.

All lessons learned during the pandemic and described in the paper can be of great importance for all teachers working on different levels of education. Education after the pandemic will not be the same as before mainly due to different restrictions.

ACKNOWLEDGEMENTS

The author would like to express his gratitude to all students and teachers who participated in the survey. The final form of the paper was positively influenced by numerous conversations with companions in the misery of pandemic education.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 49–64
https://doi.org/10.34916/el.2021.13.05

HOW TO BALANCE SYNCHRONOUS AND ASYNCHRONOUS TEACHING AND LEARNING: A LOCAL STUDY

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Abstract: *The transition of higher education institutions to distance learning, caused by the spread of COVID-19, has highlighted the need to minimize the social distance of students and teachers, with the updated the use of blended learning; accordingly, studying synchronous and asynchronous e-learning modes to support them. This article discusses the balance of synchronous and asynchronous teaching and learning models and examines the attitude of teachers and students at higher education institutions to the choice of a particular learning mode. Based on the self-assessment of the educational process participants, the main factors influencing the choice of learning modes are presented, and the compliance of the obtained results with the developed theoretical model is analyzed. A comprehensive analysis of the survey results allowed us to assess the association between the adherence to a particular learning mode and gender, the status of the respondents, the type of educational activity, and the resource provision of the educational process. The proposed methodology and the obtained results can be used in the design of e-learning courses and the establishment of educational communication to ensure quality teaching and learning.*

Keywords: Synchronous and Asynchronous Learning Modes, Survey, Principal component analysis, Higher education institution, Distance learning.

INTRODUCTION

Prior to the COVID-19 pandemic, the concept of blended learning as a combination of in-person (or class-based) and online learning was implemented in many universities in the educational process (Morze, 2017; Su, 2019). The outbreak of the COVID-19 pandemic changed the situation drastically. The transition to universal distance learning was sudden, which caused many problems for students, teachers, university administration boards, related to ensuring the quality of education under the conditions of quarantine restrictions (Wahab, 2020). At the same time, educational institutions were given the opportunity to experimentally test previously developed theoretical models of distance learning and share successful practices (Alqahtani & Rajkhan, 2020; Tosun, 2021).

The study of students' attitudes to: e-learning during the COVID-19 pandemic process is the subject of research by Akcil and Bastas (Akcil & Bastas, 2021). Heng in his study of online learning during the COVID-19 pandemic (Heng, 2020), analyzes such terminology as: e-learning, online learning, distance learning, blended and hybrid learning. Each of these concepts is based on the use of educational and digital technologies, but differs depending on how students participate in the educational process and what forms of educational activities are used.

The purpose of the study is to investigate the attitude of teachers and students to the use of different forms of students' educational activities in synchronous and asynchronous learning models to ensure the quality of the educational process.

The objectives of the study are as follows:

1. Based on an analysis of scientific publications and empirical experience, the authors build a theoretical model of synchronous and asynchronous learning in accordance with certain types of educational activities.
2. To determine the attitude of teachers and students to the use of synchronous (asynchronous) distance learning and check the compliance with the theoretical model.

1. SYNCHRONOUS AND ASYNCHRONOUS LEARNING MODES: THEORETICAL BACKGROUND

There are two basic formats of learning in an online environment: synchronous and asynchronous. The researchers provide a comprehensive definition, which is unanimous, of synchronous e-learning that includes two components - interaction and time. Based on these components, Khan defines synchronous e-learning as, "The participants-instructor interaction via the Internet in real time" (Khan, 2006). Asynchronous learning means that the teacher and the students, taking the course, interact with the content of the course at different times (and from different places). The teacher provides students with a sequence of study units that they perform. Each unit can contain readable or downloaded media, online quizzes, discussion boards, and more. Asynchronous learning mode does not mean that participants in the educational process do not receive feedback from the teacher or grades for the activities performed. This happens constantly, but at a specific time or as needed.

The issue of the advantages and disadvantages of synchronous and asynchronous forms of organization of students' learning activities has been investigated in various aspects and conditions (Bower, 2015; Lynette, 2016). On the basis of the presented studies, it is possible to allocate comparison criteria (Table 1).

Table 1. A comparison of synchronous and asynchronous Learning Modes

Comparison criterion	Synchronous	Asynchronous
Place of study	Students can ask questions and receive answers in the **real-time** mode during the live-session.	Some students may not be able to attend at the **required time** due to technical or scheduling issues. They can be in different time zones.
Student engagement	**Only a small number** of students will be able to ask questions during the live session.	In the online discussion group, **all students** can ask questions or comment.
Interaction	Students experience an enhanced sense of teacher presence. Real-time chats or working hours allow you to interact **in real time**, such as a conversation. It is possible to conduct classes in different formats, e.g., master classes and **group classes**.	Students can access the course content and initiate or respond to interactions with the teacher and their peers when it best suits **their schedule**. But watching a recorded lesson, students may feel less connected to the teacher and **less connected to the learning group**.
Awareness	The teacher can assess students' understanding in real time and adjust the session accordingly. Students are **deprived of time to reflect** on the session and conduct additional research.	Students **can view recorded** sessions to deepen their learning, or to revise before the final exam. Students can also review topics in discussion groups long **after these discussions** have taken place.
Administration	Provides a **schedule** that helps those who have difficulty in self-organization.	Students can **postpone classes** because they can always „do it later." Requires a higher level of self-awareness and self-study skills.

Source: Own work based on sources Bower M. at al., 2015.

Synchronous and asynchronous online learning have common features. The model of such a combination is implemented in Ohio (Lawless, 2020). It stipulates that if asynchronous online classes are chosen, students do their work on a weekly schedule, receive immediate feedback on their performance, and plan group work when it is convenient for everyone. Synchronous online classes require attending classes almost every week together with teachers and classmates, participating in real-time discussions during classes, and improving their presentation skills. Both forms of learning require that all participants in the educational process attend classes from anywhere, students communicate regularly with teachers online and establish relationships with classmates. A survey (Hrastinski, 2008) on asynchronous and synchronous e-learning methods found that each of them supports different goals. The scientist discovered that personal participation refers to a more exciting type of participation, suitable for less complex information exchanges, including task planning and social support. Cognitive participation refers to a more reflexive type of participation, suitable for discussing complex issues. All other things being equal, synchronous e-learning better supports personal participation, and asynchronous e-learning better supports cognitive participation.

Synchronous and asynchronous learning can be combined for delivering one course. Such a combination is called blended learning in didactics and can be implemented using the technology of inverted learning (Bergland, 2020). In the literature, there is a review of different types of blending, which are based on the *content, scale, technology, learning space*, etc.

Irvine (Irvine, Code, & Richards, 2013) proposed a four-tiered model for 'multi-access learning' aimed at empowering students to customise the way in which they engage with their instructor and peers in a course. The core, underlying principle is one of promoting autonomy in terms of how each student accesses the learning environment through a mixture of F2F delivery, synchronous online learning, asynchronous online learning, and open learning. Blended synchronous learning corresponds to the second tier of Irvine's model, which entails overlaying onto the core of the traditional, F2F classroom synchronous online access for remote students, enabling those students to take part in activities in real-time along with their classmates who are located on campus.

Researchers have demonstrated the positive practices of using inverted learning technology. For example, they (Kuzminska, 2017) proposed scenarios and tools for students' practical collaborative activities, as well as examples of learning objects that provide resources for self-study and research.

A study of a blended learning model in the context of distance learning (Goksu, 2020) describes a mixing model based on a revised version of Bloom's taxonomy (Anderson, 2001): the authors suggest dividing learning into such stages as memorization and understanding, which should take place offline asynchronously, then application and analysis – online synchronously, and evaluation and creation – offline asynchronously after the lesson.

Based on the analysis of the described practices and university experience represented by the researchers, according to the stages of students' educational activity, we offer a generalized theoretical model of blending synchronous and asynchronous learning (Figure 1). Here, each of the activities in the overall structure of the educational process in the university is divided into five parts, i.e. each share in the blended synchronous and asynchronous learning mode is 20%. The five-stage cycle of mastering a training module from goal setting to evaluation / assessment contains

9 stages, which may differ in time, order and structure depending on the competencies that are mastered. But in our structure of activities, they have the same weight. We consider the model (Figure 1) of proportional blending in relation to the ratio of synchronous and asynchronous learning – the ratio is 22:23.

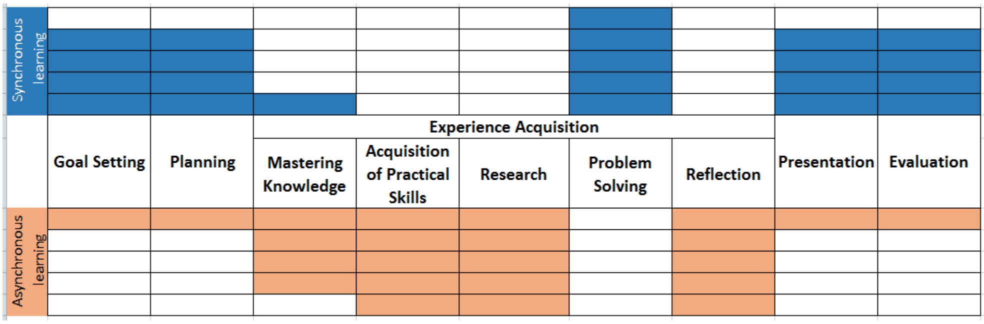


Figure 1. Model of proportional blending in relation to the ratio of synchronous and asynchronous learning

Source: Own work.

2. THE ATTITUDE OF TEACHING STAFF AND STUDENTS TO THE USE OF SYNCHRONOUS OR ASYNCHRONOUS LEARNING

2.1. Research Design

To study the attitude of teachers and students to the use of synchronous and/or asynchronous learning, we applied cross-section (cross-section) and single-sample (single) research schemes. We developed a statistical survey in Google Form (Statistical research survey in Google Form), which was distributed via social networks and messengers (Telegram, Viber, Facebook, Instagram) for online filling. Of course, this in some way limits the audience of respondents, but still allows us to draw certain conclusions about existing trends and patterns. In general, the sample corresponded to the structure of the general population of respondents with a representativeness error of no more than 5%. A total of 129 people from ten institutions of higher education in Ukraine took part in the survey. Of these: 28 (21.7%) are lecturers, 28 are undergraduates and 73 (56.6%) are postgraduates (taking Master courses). 41.1% of respondents are males, which corresponds to the general population. All respondents reported that higher education institutions where they were studying or working used different learning management systems to implement e-learning (mostly LMS Moodle is used as such a system – this answer was provided by 64.4% of respondents), and for synchronous online communications, the most often used platforms included Google Meet (30.9%), Zoom (29.1%), Cisco Webex (21.8%), and Discord (12.7%). 65.9% of respondents reported that they always had access to computers and mobile devices with Internet access, 29.7% – had certain but uncritical restrictions. It should also be noted that respondents demonstrated a high level of digital competence. According to the results of self-assessment, which correlate with the results of previous studies done by the authors of the article (Kuzminska, 2019), 49.6% of respondents evaluated their own level of digital competence as high, 31.8% – as expert, and only 1 participant – as basic. These data results indicate the readiness to the implementation of distance (blended) learning in higher education both at the level of institutional support and competence of the subjects of the educational process, so we can assume that the choice of Learning Modes depends on the personal characteristics of lecturers (as those who provide the educational process) and students (as customers of educational services).

To determine the attitude to synchronous and asynchronous learning of the subjects of the educational process, to identify links between groups of respondents who differ in status (undergraduates, postgraduates (master's degrees), faculty), as well as to determine the influencing factors and choice, the following hypotheses are formulated:

H1: The choice of Learning Modes does not depend on the status of the respondents, i.e. faculty and students equally determine the importance of synchronous or asynchronous learning.

H2: The choice of Learning Modes does not depend on the type of learning activity, but is determined only by personal characteristics.

H3. The choice of Learning Modes is influenced by the respondents' gender, their level of digital competence and resources (access to computer equipment and institutional learning management systems).

To confirm or refute the hypotheses in determining the adoption of a synchronous and (or) asynchronous learning regime, respondents were asked to:

- identify the type of Learning Modes, which is preferred (synchronous or asynchronous), in the implementation of the following activities: the actualization of (learning) goals, analysis of experience; the presentation and processing of theoretical information; study of the subject area; practicing skills (setting tasks for laboratory, seminar or practical work and their implementation); presentation and evaluation/assessment of educational results; problem-solving, reflection (group I questions, testing of hypotheses H1 and H2);
- indicate the availability of platforms and particular services to support asynchronous and synchronous learning in a particular higher education institution, assess the level of their own digital competence (according to DigComp 2.1), and provide certain personal data (gender, age, access to computers and the Internet) for determination of factors influencing the choice of Learning Modes (III group of questions, testing hypothesis H3);
- identify tools for the implementation of a particular type of educational activity, which is preferred by respondents (group II questions), in order to check the consistency of answers regarding the choice of Learning Mode in each case (group I questions). The consistency analysis of the answers will allow to find out how much the respondents understand the essence of the asynchronous and synchronous modes of learning, which is important for refuting or confirming the hypotheses.

During the data analysis, a set of methods and models was used to calculate all descriptive statistics. The choice of certain indices and criteria for evaluation was determined by the type of data, evaluation scale and limitations of the methods. The software tools for statistical data processing SPSS (Field, 2013; Levesque, 2005) were used for calculations.

At the first stage, most of the functions selected to determine the attitude of respondents to a particular mode of study in the survey process were evaluated by an ordinal two-point scale (1 – prefer synchronous mode, 0 – prefer asynchronous mode). To test the hypotheses, the method of analysis of two-dimensional frequency tables (conjugation tables) and the criterion χ^2 were used (Field, 2013). Cronbach's alpha was used to assess the internal consistency of individual questions of the questionnaire. The methods of analysis of the two-dimensional frequency tables were also used to study the connections between the main sections of the questionnaire and questions related to the use of tools for the implementation of a certain type of educational activity.

A significant number of features (respondents' characteristics) made it impossible to draw unambiguous conclusions about the general trends in the choice of a particular type of training regime by different groups of respondents. Therefore, data reduction methods were used for the processing. The first approach was based on an assessment of the total (aggregate) scores by groups in accordance with the selected types of educational activities. The method of a one-way analysis of variance (ANOVA) was further used to analyze the differences in the mean total scores (Kutner, 2004). The second approach was based on the Principal Component Analysis (Jolliffe, 2002), which allows for the conversion of data into such variables without a loss of information, the values of which determine the maximum value of the variance of the original features. A further analysis of the relationship between the factor values and groups of respondents was carried out on the basis of frequency tables using methods of a graphical data visualization.

When testing statistical hypotheses at all stages of the analysis, the decision was made on the basis of the p-value, which actually reflects the probability of error in rejecting the null hypothesis (errors of the first kind). The p-value for the rejection of the null hypothesis was taken equal to 0.05.

2.2. Findings

As a result of constructing frequency distributions of respondents' scores on each question of set I, where Learning Modes were determined according to each of the 8 defined types of learning activities (the analysis was performed using two-dimensional frequency tables), as well as according to summary values (a comparison of averages was carried out based on the method of a one-way analysis of variance), it was determined that students prefer the synchronous mode during the implementation of all these types of educational activities. Since the difference is not statistically significant for all groups of respondents, hypothesis H1 can be considered partially confirmed. Table 2 shows the average values of the sum of points for all types of educational activities for different groups of respondents, which shows that the average group value for teaching staff is less than for students.

Table 2. Mean of summa score for all types of activities for different groups of respondents with the confidence interval

Status	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Teacher	28	24.43	5.48	1.04	22.30	26.55
Master	72	25.32	8.47	1.00	23.33	27.31
Bachelor	28	25.93	7.20	1.36	23.14	28.72
Total	128	25.26	7.60	0.67	23.93	26.59

Source: Own work.

The analysis of the two-dimensional frequency tables (conjugation tables), as well as the criteria on the basis of which it is possible to assess the relationship between the distribution of answers for each question and other characteristics (gender, level of digital competence, etc.), showed that most features of communication observed at $p>0.05$. The Cramér's V and the contingency coefficient ranged from 0.086 to 0.366, indicating a weak association between traits. Therefore, the main analysis focused on the analysis of total scores by the type of educational activity according to different categories of respondents (Table 3). Table 3 also shows the values of Fisher's criterion and p-value calculated by the ANOVA method.

Table 3. Criteria for the significance of differences in total scores according to the main types of learning activities between groups of respondents

Types of learning activities	Gender		Status		Level of digital competence		Availability of technical and mobile means/ devices		Learning management systems used in HEI	
	F	p-value	F	p-value	F	p-value	F	p-value	F	p-value
Actualization of goals, experience	1.45	0.23	1.70	0.19	2.46	0.07	**0.03**	0.86	3.35	0.07
Presentation of the theoretical background	**0.00**	0.95	5.56	**0.00**	0.31	0.82	3.91	0.05	1.02	0.31
Setting tasks	**0.02**	0.88	2.36	0.10	1.82	0.15	2.81	0.10	1.08	0.30
Subject area study	5.57	**0.02**	5.23	**0.01**	0.44	0.73	2.01	0.16	6.89	**0.01**
Presentation of results	3.33	0.07	0.93	0.40	0.41	0.74	1.31	0.25	0.28	0.60
Evaluation of outcomes	5.80	**0.02**	3.29	**0.04**	0.78	0.51	0.70	0.40	2.94	0.09
Problem solving	1.91	0.17	5.48	**0.01**	0.19	0.90	0.15	0.70	2.50	0.12
Reflection	12.26	**0.00**	2.49	0.09	0.14	0.93	0.74	0.39	2.82	0.10

Source: Own work.

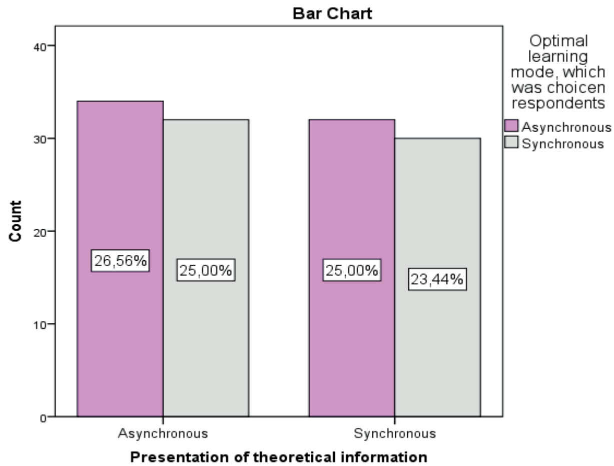
As a result, significant differences in the choice of a learning mode (synchronous or asynchronous) occur among teaching staff and students, and significant differences were found between undergraduates and postgraduates (masters). The difference between the groups of respondents according to their status was also tested by Tukey's test: the biggest differences were found between undergraduates and teaching staff, and undergraduates most need synchronous interaction in such areas as the presentation of the theoretical background, the subject area study, the evaluation of outcomes and problem solving. At the same time, the teaching staff prefer to use the asynchronous learning regime for the presentation and mastery of theoretical information, as well as research of the subject area (see Table 3), which confirms hypothesis H2 partially.

To confirm or refute hypothesis H3, the association between a Learning Mode, which respondents prefer, and the level of their digital competence (according to the results of self-assessment), gender, access to computers and the Internet, the availability of support to learning in HEI (both in synchronous and asynchronous modes). As a result, hypothesis H3 was rejected, because the choice of Learning Modes does not depend on the level of digital competence (assessment was performed on the chi-square criterion at p-value> 0.05) – respondents with different levels of digital competence equally assess the optimality of synchronous and asynchronous mode. Also, the commitment to a particular Learning Mode is not significantly affected by resource provision (an assessment was conducted according to Fisher's criterion at the level of p-value> 0.05) both at the level of free economic education (platforms and services to support e-learning) and the level of individual respondents (access to computer technology and the Internet). The respondents' gender does not affect the choice of a Learning Mode (an assessment was conducted according to Fisher's criterion at the level of p-value> 0.05) either.

Thus, the hypotheses about the association between the choice of a particular Learning Mode with the gender, status and level of digital competence of the subjects of the educational process, as well as the type of learning activities and resources were partially confirmed.

As part of the analysis of the consistency of the respondents' answers, we constructed tables of conjugation between the features that reflect the respondents' choice of Learning Modes according to the types of learning activities (group I questions) and the tools used by respondents to implement them (group II questions). The analysis of these tables showed that the respondents demonstrate the greatest consistency of answers about their attitude to the choice of a learning mode for the presentation and processing of theoretical information (Figure 2).

Significant differences were revealed in the implementation of other types of learning activities. In most cases, the degree of consistency of the answers depends on the status of the respondents – the higher the status, the greater the consistency. The latter is the basis for making assumptions about the feasibility of using a hybrid mode, which involves the use of synchronous and asynchronous learning, and the share of synchronous communications should increase in undergraduate education, including the formation of soft skills, in particular, critical thinking, time management, acceptance decisions, responsibilities and agility. However, this assumption needs further investigation. Indexes reflecting the internal consistency of the questionnaire were also evaluated, namely Cronbach's alpha was 0.7, Guttman's lambda-2 (Guttman's λ^2) was 0.75, and the intragroup correlation coefficient was 0.7. Such indeces indicate sufficient reliability of the questionnaire.



F i g u r e 2. Distribution of the respondents' answers to the choice of a learning mode

S o u r c e: Own work.

To identify learning modes that are preferred by teaching staff and students for different types of learning activities, it was decided to reduce the dimensionality of the data. To reduce the data, the principal component analysis (PCA) method was used, which was performed on the basis of 8 features using orthogonal rotation (varimax). The Kaiser-Meyer-Olkin (KMO) Measure confirmed the adequacy of the sample for factor analysis: KMO = 0.527, which is above the allowable limit of 0.5 (Field, 2013). The criterion of Bartlett's test of sphericity χ^2 (36) = 91.88, at p <0.0001, which indicates a fairly high correlation between the studied features. Table 4 shows the load factors after rotation. The features are referred to the main components by the absolute values of the coefficients of the inverse matrix (the corresponding cells are highlighted in color).

The elements grouped on the basis of the same components suggest that component 1 (PCA1), called Learning Experience Acquisition, combines the presentation and mastery of theoretical background, the subject area study, in particular through practical skills development, problem solving, and reflections; component 2 (PCA2, Goal Setting) unites goal updating, experience analysis and task setting; component 3 (PCA3, Presentation of experience) – presentation and evaluation of learning activity outcomes.

The graphical representation of the results of the application of the principal component analysis method (Figure 3) provides the grounds to assert that the initial correlation of features divides the initial data in no more than three directions, which led to the selection of the three main components.

Table 4. The results of factor analysis of the determination of Learning Modes (based on respondents' answers) (N = 129)

Types of learning activities	Component		
	PCA1	PCA2	PCA3
Goal updating and experience analysis (VAR1)	0.26	**0.79**	–0.01
Presentation of the theoretical background (VAR2)	**0.52**	0.03	0.10
Task setting (VAR3)	–0.05	**0.74**	0.07
Subject area study (VAR4)	**0.63**	–0.34	0.04
Tasks implementation (VAR5)	**0.39**	–0.28	0..29
Presentation of outcomes (VAR6)	–0.04	0.09	**0.80**
Evaluation (VAR7)	0.13	–0.02	**0.79**
Problem solving (VAR8)	**0.66**	0.19	–0.13
Reflection (VAR9)	**0.57**	0.20	0.07

Source: Own work.

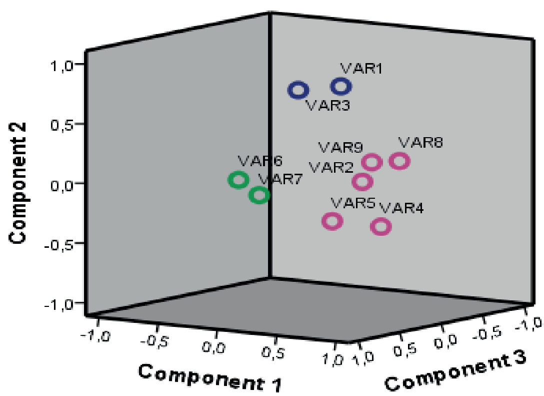


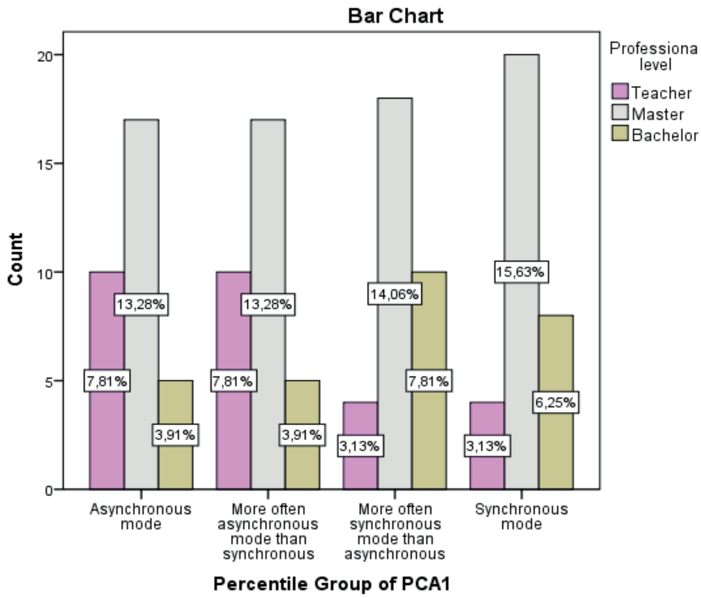
Figure 3. The diagram of the main component selection according to the distribution of the selected features values (Component Plot in the Rotated Space)

Source: Own work.

Further analysis of the obtained factor values based on the principal component analysis method in terms of respondents' groups did not show significant differences on the basis of gender, status, a level of digital competence and access to technical means.

According to the developed theoretical model of Balance Synchronous and Asynchronous teaching and learning, for the implementation of PCA2 and PCA3 components, synchronous Learning Mode is preferred, i.e. the share of synchronous interactions prevails, and for PCA1 – asynchronous. To check the degree of conformity of the factor analysis results to the theoretical model, additional ordering of respondents' answers was performed according to the calculated factor values of the main components, which were ranked by the percentile method and divided into four groups: 1 – respondents who prefer an asynchronous Learning Mode; 2 – respondents who more often prefer an asynchronous mode than synchronous; 3 – respondents who more often prefer a synchronous mode than asynchronous; 4 – respondents who prefer a synchronous Learning Mode.

Analyzing the obtained frequency distributions for different respondent groups, we can assume that faculty use (a clear relationship is found) an asynchronous Learning Mode (Figure 4), which corresponds to the theoretical model, to gain learning experience (PCA1).

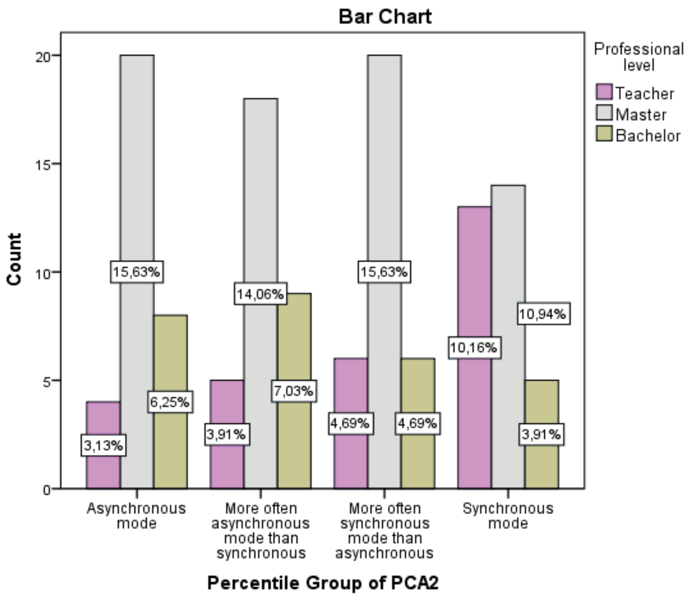


F i g u r e 4. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Learning Experience Acquisition" and the status of respondents

S o u r c e: Own work.

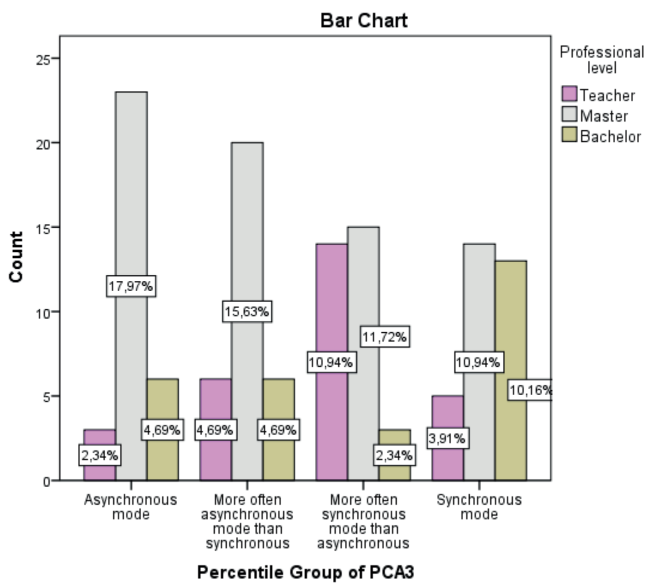
Instead, students do not have a clear distribution, although on average (we analyze the average factor values of the first component), undergraduates are more likely to implement a synchronous Learning Mode. Such data can be interpreted as students' lack of experience of independent learning, self-doubt or unwillingness to take responsibility for the course and outcomes of their own learning activities.

As for the *Goal Setting* (Figure 5), as in the previous case, teaching staff demonstrates a clear dependence – they prefer a synchronous Learning Mode. The situation with undergraduates is similar, but on average they prefer an asynchronous interaction. It should be noted that the possible reasons for such an attitude may include a lack of experience in goal setting or the assumption that undergraduates do not consider this type of activity important, as they need synchronous interaction for "important activities". Another reason may be the lack of a systematic approach to learning goal-setting in the process of pedagogical design of individual disciplines or modules, as well as the training system as a whole, and students' engagement in this process.



F i g u r e 5. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Goal Setting" and respondents' status

S o u r c e: Own work.



F i g u r e 6. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Experience Presentation" and respondents' status

S o u r c e: Own work.

In the *Experience Presentation* (Figure 6), no clear intergroup dependence was found. However, the analysis of average values is a reason to assume that postgraduates prefer an asynchronous Learning Mode, and undergraduates – synchronous. The choice of synchronous interaction by undergraduates in this case is considered expedient (corresponds to the theoretical model). The choice of asynchronous way of presenting the learning activities outcomes and their evaluation by postgraduates can be interpreted as a result of their high level of independence and formed soft skills. Since the vast majority of postgraduates combine studying with working in the specialty, in this case, asynchronous interaction can save time and other resources, which is also justified. The lack of a clear division among teaching staff can be interpreted as the implementation of a student-centered approach, provided that when designing courses or modules, teachers will "offer" tools and strategies for implementing both Learning Modes at the choice of students.

CONCLUSION

The study of asynchronous and synchronous e-learning methods discovered that each supports different purposes, which should be taken into account while designing e-learning courses and educational communication of faculty and students.

According to the results of the theoretical models analysis and methodologies of synchronous and asynchronous Learning Modes application, it was established that in the process of actualization of students' learning experience, formation and coordination of learning goals, as well as presentation and evaluation of learning outcomes, it is advisable to prefer the use of synchronous Learning Mode, that is, the share of synchronous interactions predominates, and in the process of students' learning experience acquisition, the use of the asynchronous one is preferable.

The results of an empirical study to determine the attitude to the choice of Learning Modes, which involved 129 teachers and students of higher education institutions in Ukraine, did not reveal the dependence of choice on gender, the respondents' level of digital competence and resources at both an institutional and personal level. However, the dependence of the choice on the status of the subjects of the educational process and the type of learning activity was revealed. Undergraduates most need synchronous interaction in such areas of activity as: presentation of theoretical background, the subject area study, an evaluation of learning outcomes and problem solving. Faculty prefer to use the asynchronous learning mode in the presentation and mastery of theoretical background and research of the subject area.

Since the reliability of the questionnaire developed by the authors was confirmed by statistical methods, it is possible to state with a high degree of probability that:

- the greatest compliance with the theoretical model was shown by faculty in their attitude to the choice of Learning Modes for the organization of teaching;
- undergraduates, regardless of the type of activity, prefer the synchronous Learning Mode;
- non-detection of a clear dependence among postgraduates can be interpreted as the presence of learning experience, in particular in the choice of tools and

Learning Modes, i.e., postgraduates are not dependent (the dependence is not strong) on the proposal for the organization of learning activities.

Although these assumptions require further investigation, they can be taken into account (at the level of educational needs) in the process of pedagogical design of e-learning courses. The implementation of a student-centered approach in education also needs additional research. In this context, the design of digital learning networks and personal learning environments is promising.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 65–75
https://doi.org/10.34916/el.2021.13.06

THE DIDACTIC ASPECTS OF BLENDED LEARNING IN HIGHER EDUCATIONAL INSTITUTIONS DURING THE PANDEMIC

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Abstract: *The article considers the didactic aspects of the implementation problem of blended learning in higher education in the context of the COVID-19 pandemic. The concept of "blended learning" is studied. It turns out that there is no single vision for the essence of blended learning. Different scientists consider this concept as a model, method, teaching system, a set of teaching methods and strategies, form of learning, program. The tasks and advantages of blended learning, didactic aspects of its introduction into the educational process of the university are determined. The model of the environment of blended learning and didactic aspects of two-level implementation in the university of blended learning for the purpose of training improvement are offered, the choice of methods of its realization is substantiated. It is established that the use of blended learning in the process of studying the courses "Technology of e-learning", "Computer information technologies in education and science" in master's programs in a pedagogical institution of higher education creates conditions for the implementation of effective student-centred learning. It has been proven in practice that blended learning is more effective than pure distance learning and offers many benefits for students, such as accessibility, better design of methodological instructions, consideration of individual opportunities, increasing student involvement level due to social interaction, time monitoring.*

Keywords: blended learning; didactics; implementation; pandemic time; higher education; masters.

INTRODUCTION

In the 21st century, it has become clear that online learning is entering the mainstream and is becoming a growing market as it expands access to learning for a significant number of people. It has evolved from part-time programs of the last century into professional and well-designed institutional online offerings for modern learning. It can be predicted that online education will continue to expand its presence and influence higher education through an effective process of improvement and restructuring (Smyrnova-Trybulska & Morze, 2019).

In connection with the global pandemic, the role of blended learning has increased significantly. It is no coincidence that after the first wave of the pandemic, the vast majority of the world's leading universities have announced plans to introduce blended learning, when classic face-to-face classes are complemented by work on online platforms.

Well-designed blended learning enables effective mixing of educational audience's boundaries, combining formal and informal learning with a wide range of professional online communities.

Blended learning originated as a mix of online and offline learning. Now they are often compared. Both formats have their undeniable advantages, but the effectiveness is different for each case. The result depends on the context, subject, learning objectives, personal characteristics of the student, the quality of the educational product and the effective training of teachers.

Analysts of the National Agency for Quality Assurance in Higher Education gave the profession of online teacher the fourth place among the professions of the future, which will be the most popular in the next ten years (Kvit & Yeremenko, 2021).

In this article we will consider the didactic aspects of the introduction of blended learning in higher education institutions.

1. ANALYSIS OF RESEARCH PUBLICATIONS IN THE FIELD OF BLENDED LEARNING

The term "blended learning" is used alongside the terms "hybrid learning", "combined learning", "flexible learning", which are considered synonymous. All concepts are often used in research because they refer to the same technology.

The Recommendations for the introduction of blended learning in Ukrainian institutions of professional before higher and higher education determine that blended learning is an approach, pedagogical and technological model, methodology that, along with online technologies, relies on direct interaction between students and teachers in the classroom (Stadny & Nikolaev, 2021).

According to the Christensen Institute, blended learning is a formal educational program that involves learning within an educational institution, distance learning, and the methods that combine these forms of learning (Christensen et al., 2013).

According to scientists (Painter, 2006; Bates, 2021) blended learning is a combination of rigorous formal teaching methods (working in classrooms, studying theoretical material) with non-formal (discussion via e-mail and Internet conferences, consolidation of learning material using multimedia teaching aids), organic integration of carefully selected traditional and online approaches.

From C. Maxwell's point of view, a formal educational program in which a student learns partially online with some element of control over the time, place, route, or pace of study may be called mixed (Maxwell, 2016).

According to most Ukrainian scientists, blended learning is a process of acquiring knowledge, skills and abilities, which is accompanied by a combination of different learning technologies: full-time, electronic, distance, mobile.

V. Kukharenko summarizes blended learning as a form of learning with determined boundaries of an online course, which uses synchronous meetings and network technologies, with asynchronous activities and possible face-to-face meetings (Kukharenko, 2016).

We adhere to the definition of Ukrainian scientist O. Korotun, who understands blended learning as a system of learning, in which takes place a purposeful process of interaction of learning subjects based on a combination of traditional and online learning models. This process takes place in the classroom and beyond, in synchronous and asynchronous modes and is based on a widespread use of information computer technologies (Korotun, 2016).

Thus, analysing the approaches to the definition of "blended learning", we see that it is considered to be a teaching system, model, method, technology, form of education, educational program. But the common denominator is that the interaction of subjects in the educational process is based on a combination of different types of learning, such as distance (online) and traditional (offline), because most scholars adhere to the definition that indicates that blended learning is a process of acquiring knowledge, skills and abilities, accompanied by a combination of different learning technologies. We fully agree that no training can exist in its pure form, but must be an effective combination of different technologies, which will significantly increase the effectiveness of training. When choosing forms of education, it is necessary to take into account the specifics of the discipline, material and technical equipment and support, the level of digital competence of teachers and training schedule.

2. RESULTS AND DISCUSSION

2.1. Research methods

The following methods were used during the research: analysis of research and publications in the field of e-learning and blended learning, official documents of the Ministry of Education and Science of Ukraine, the National Agency for Higher Education Quality Assurance (Ukraine) and state standards of higher education. Observational and interview methods were used in the experimental study. These methods determined whether masters know the basic principles of blended learning; do they have an idea of its advantages and disadvantages; whether they would like to master the technology of blended learning in practice with the aim of possible further use in professional activities.

2.2. Didactic aspects of blended learning in higher education institutions

Researchers Charles Graham and Jared Stein in the education field highlight the following benefits of a blended learning system: accessibility, improving of learning process, and reduced costs (Stein & Graham, 2013).

1. Availability.
2. Improving the efficiency of the educational process:
    - the detail designing of methodical instructions;
    - taking into account individual capabilities;
    - increasing the level of involvement due to social interaction;
    - monitoring time for tasks.
3. Reduced costs.

Based on the analysis of scientific publications (Al-Busaidi, 2012; Spring et al., 2016; Ghazal et al., 2018; Smyrnova-Trybulska & Zegzuła, 2020; Bokolo et al., 2020; Szulc, 2020; Morze & Smyrnova-Trybulska, 2021) and our own experience (Balyk & Shmyger, 2018) of blended learning implementation in Ternopil Volodymyr Hnatiuk National Pedagogical University (TNPU), we highlight the following didactic aspects of blended learning in higher education institutions:

- increasing the motivation of applicants to educational and cognitive activities, independence, social activity, reflection and introspection, the formation of responsibility;
- expanding the educational opportunities of students through accessibility and flexibility;
- personalization of the educational process, taking into account the individual educational needs of students;
- the ability to control their own educational activities;
- development of digital infrastructure of the institution and formation of digital competence of students;
- pedagogical autonomy of the teacher in the choice of presentation of material, educational services and platforms;
- changing the role of the teacher (transition from knowledge transfer to interactive interaction with the student).

In our opinion, blended learning provides the student with the following didactic opportunities: obtaining complete information about the learning process, including grades during the semester; receiving all educational and methodical materials in electronic form through web resources; work with educational web resources in an individual, convenient for the master mode; communication through participation in webinars, forums; receiving remote consultations from teachers; exchange of messages with teachers; sending works for inspection; control of knowledge through testing, passing exams and tests in a remote session.

Thus, blended learning makes it possible to solve the most relevant didactic tasks.

2.3. Introduction of blended learning at the university in the context of the COVID-19 pandemic

The challenges posed by the Covid pandemic have forced teachers at TNPU to face new challenges in organizing the educational process, and pushed them to improve educational technologies that were not so relevant before – blended learning. We have a lot of experience in using blended learning technology and it started long before the pandemic (Balyk & Shmyger, 2017).

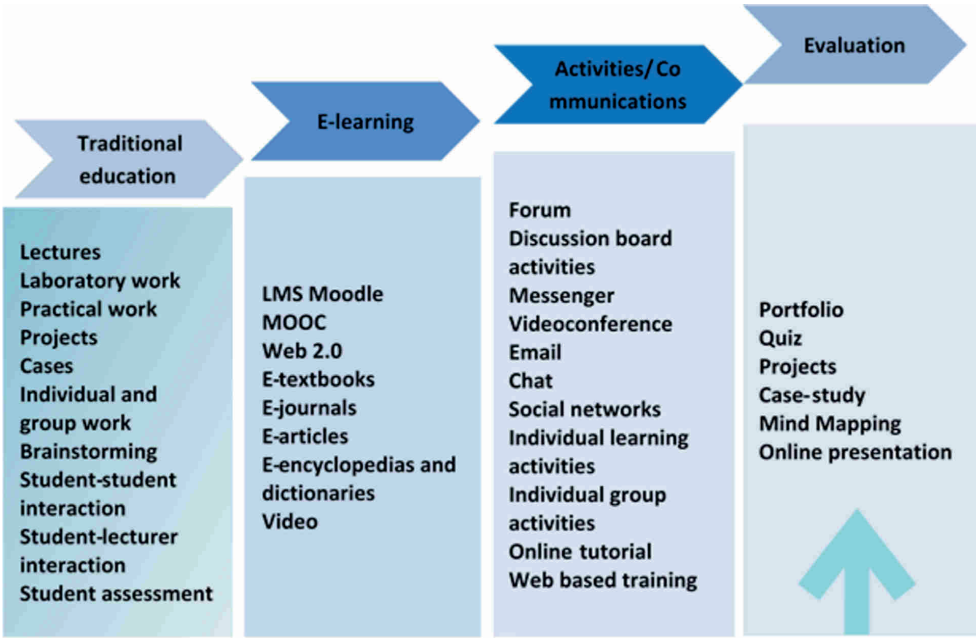
At TNPU blended learning is convenient for those who, due to the circumstances, cannot traditionally attend lectures and seminars at the university, but at the same time want to get a quality education. These are usually masters who work and study in a dual form of education. This type of study does not require you to attend classes every day, the main work is done by masters themselves. Communication with teachers and classmates face to face takes place at a predetermined time.

During blended learning, masters participate in video conferences, listen to lectures and reports of classmates, undergo training, work in groups with the support of a teacher, receive consultations from teachers remotely. In blended learning, classrooms are combined with distance learning using a variety of online tools. Such tools include Internet forums, video conferencing tools, such as Zoom, BigBlueButton, GoogleMeet.

The uniqueness of the master's educational programs developed by TNPU is that we offer future teachers not only an opportunity to study the technology of blended learning, but also to master the technology in theory and practice, in particular in courses such as "E-learning technologies", "Computer and information technologies in education and science", during the pedagogical practice. This, in our opinion, is extremely relevant for the effective organization of the educational process in a COVID-19 pandemic.

The tasks are built to harmoniously combine theory and practice. Our practice of blended learning implementation includes traditional (classical) teaching methods, online activities, electronic resources, assessment, which are used by teachers of our university to develop appropriate curricula to support students in improving learning (Figure 1).

The formation of skills in the implementation of educational activities on the technology of blended learning takes place in two levels: students study this technology on the principles of blended learning and perform practical tasks related to this technology in the classroom and during teaching practice. Thus, masters gain theoretical knowledge and practical experience in this technology. In particular, the concept of blended learning and its basic principles, examples of implementation, models of construction of the educational process, etc., masters study on the materials offered on the server of distance learning TNPU in the course "E-learning technologies". And not only a discussion of problematic issues, but also a presentation (a step-by-step description of this technology) is carried out during the practical lesson on the topic "Blended Learning" of this course.



F i g u r e 1. Didactic aspects of blended learning in TNPU

S o u r c e: Own work.

In the course “E-learning technologies”, in particular, we pay attention to the most important **aspects of the didactics of blended learning** in school:

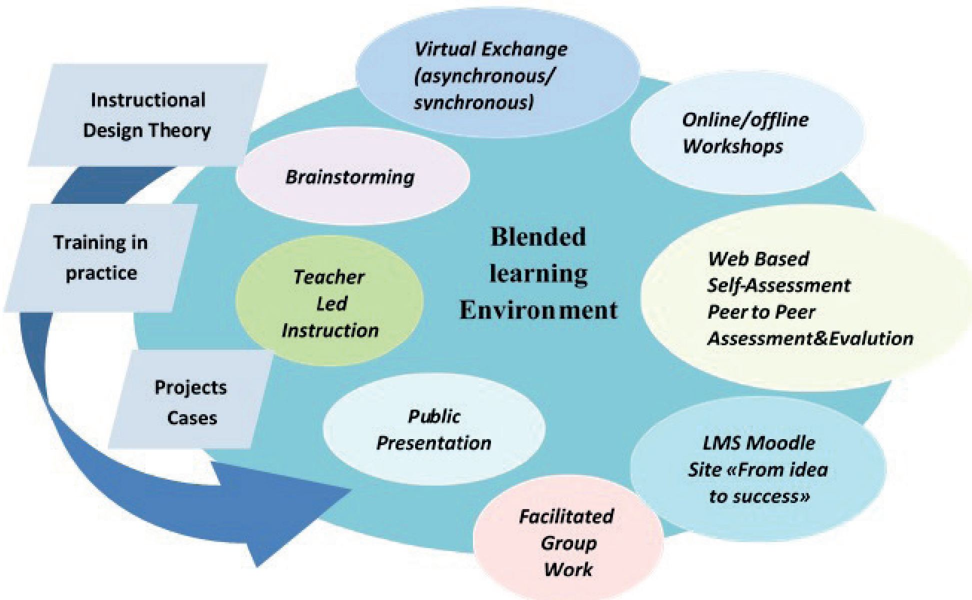
1. Expanding the concept of “lesson”.
2. Expansion of the concept of “school premises”.
3. A new approach to the schedule.
4. Access to digital technologies and reliable Internet.
5. Autonomy of teachers.
6. Flipped classroom.
7. Allocating time for live dialogue.
8. Transparency of planning and learning expectations.
9. A clear system for assessing student achievement.
10. Cooperation with parents.

The practical aspect of mastering blended learning technology by masters is based on acquaintance with the best practices and models of blended learning.

For example, in the course “ Computer and information technologies in education and science” we discuss the design of educational mixed courses, which will help change the teaching style:

1. Improved communication.
2. More personalized instructions.
3. Learning and motivation of students.
4. Improving self-organization skills.

Transferring part of the learning process in online mode distinguishes blended learning from the classical system and requires the creation of a blended learning environment (Figure 2). For example, masters study the theoretical part at home, watching videos and studying accompanying materials. After that, in class, they perform practical exercises with teachers and classmates or work in groups on the project. Under this model, teachers become moderators of the educational process. During the work, they determine how well individual masters understand the topic.



F i g u r e 2. Model of blended learning environment of the course "Computer and information technologies in education and science"

S o u r c e: Own work.

With blended learning at the university, masters in practice are convinced of the changing role of teachers. Here they are facilitators of the educational process. That is, people who organize a collective discussion so that all students are involved as much as possible and problems are solved quickly and efficiently. Therefore, the main goal of teachers is not to assess students in the exam, but to actively interact with them, monitor progress and help if necessary. So teachers stop being just observers and take on the role of mentors.

We would like to note the techniques of pedagogical design of the considered courses, which proved to be effective in practice: the development of relations; participation; timeliness; communication; organization; flexibility. In our opinion, the establishment of good relations and communication between teachers and masters is crucial and can be achieved through teachers' empathy for masters, willingness to help masters achieve success. Understanding the nature of communication in the online environment, we suggested that in the future in their professional activities, online teachers respond in a timely manner to emails and text messages. To do this, practical strategies should include instructions for the tasks, information about the evaluation criteria, timely feedback on the tasks performed, answers to written questions.

In the practical cases of these courses, we implement learning scenarios taking into account the characteristics of the main components of our proposed environment of blended learning:

1. Class activities. Provides part of the usual work "in the classroom" with teachers and other students. Depending on the blended learning system, the number and type of offline activities will be different in a particular case.
2. Online content (independent learning). During this type of work, students independently work on materials at a pace and place convenient for them. It is important that teachers provide complete and clear instructions on the work they need to do on their own.
3. Cooperation. Combines two key elements: working with peers and working with teachers. Through working with peers, students can find new solutions and share experiences and knowledge. Through personal work with the teacher, the student can get answers to individual questions and clarify unclear points. Such a model should be created for a specific type of training and course. It is important that such cooperation can take place both in the classroom during group tasks and through e-mail or social networks.
4. Assessment. Assessment is important for both students and teachers. Students can monitor their progress, while teachers can assess their knowledge and adjust the learning process through individual instruction. Students are given explanations about taking a certain course. Such a model should be created for a specific type of training and course. Teachers can also use testing to understand how students perceive the material and how to improve the process.

Along the way, we are also exploring how better Moodle platform can be used to implement a blended learning model in an educational institution.

We believe that a successful blended learning program is the deliberate integration of educational and digital technologies to improve the learning process. Students interact with content through a variety of methods and digital tools.

The educational results of masters at the completion of the courses "E-learning technologies", "Computer and information technologies in education and science" indicate the effectiveness of the proposed technology of blended learning, development of skills of independent planning and organization of their own activities, deepening skills to independently obtain and analyse their own knowledge, select the necessary information and data, make decisions, engage in self-education.

The effectiveness of these courses is evidenced by high marks for modular and semester control. As the practice and results of the intermediate and final assessment show, 16 study weeks, during which masters master blended learning, is a sufficient period during which they form stable skills of teaching methods by the specified technology.

Masters who worked on blended learning technology after completing the courses used elements of blended learning technology during training sessions based on pedagogical practice.

In general, these courses aim to provide masters and practicing teachers with a better understanding of how to implement blended curricula.

Blended learning has become the main technology for presenting the content of our courses at TNPU. We found that course design, motivation, and communication are factors that contribute to the overall success of blended learning courses and the satisfaction of masters with blended courses.

Blended learning, as a symbiosis of classical and online learning, combines the best of both forms of teaching. If in standard teaching in the lecture hall all masters are expected to have a general level of preparation and classes are held according to the standard scheme, where individual abilities and skills are not taken into account, then classes with blended learning technology allow each master to choose the pace and priorities. Blended learning is maximally focused on the educational and professional needs of each of the participants of the master's program.

CONCLUSION

The development of the modern information society and the permanent course of the pandemic requires the transfer of part of the educational process from classrooms to the Internet. Blended learning has become the best for us in a pandemic. Therefore, we believe that its implementation is an important direction of modernization of modern higher education.

Analysis of the scientific literature shows that despite the large number of different interpretations and definitions, scientists agree on a combination of different learning technologies, such as traditional and electronic (computer, distance, mobile, etc.), the use of which is an important condition for effective implementation of mixed teaching. Thus, blended learning is a modern system of education in which there is an approach to the organization of the educational process in higher education institutions, which transforms the structure and methods of teaching, changes the roles of teacher and student.

Didactic aspects of blended learning in higher education include: elements of traditional learning (Lectures, Laboratory work, Practical work, Projects, Cases, Individual and group work, Brainstorming, Student-student interaction, Student-lecturer interaction, Student assessment), elements of E-training (LMS Moodle, MOOC, Web 2.0, E-textbooks, E-journals, E-articles, E-encyclopaedias and dictionaries, Video), activities / communications (Forum, Discussion board activities, Messenger, Videoconference, Email, Chat, Social networks, Individual learning activities, Individual group activities, Online tutorial, Web based training), assessment (Portfolio, Quiz, Projects, Case-study, Mind Mapping, Online presentation).

The master's educational programs developed by us are two-level, as we offer future teachers not only an opportunity to study the technology of blended learning, but also to master the technology itself in theory and practice.

Our proposed model of a blended learning environment and didactic aspects of the implementation of blended learning technology in the courses "E-learning technologies", "Computer and information technologies in education and science" in master's programs in a pedagogical institution of higher education are effective. This is evidenced by the results of masters at the end of these courses.

Given the advantages of blended learning listed in the article, we conclude that the effectiveness of this form of learning in the educational process of higher education institutions in general and in the study of computer science disciplines in particular. However, the introduction of this form still requires a lot of effort from teachers.

We see the prospect of further research in the development of didactics of teaching masters on the basis of a model of blended learning, highlighting modern digital tools aimed at its effective implementation.

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"E-learning", 13, Katowice–Cieszyn 2021, pp. 76–88
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BUILDING SOCIAL AND EMOTIONAL SKILLS IN STUDENTS IN THE CONTEXT OF DISTANCE LEARNING

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Abstract: *The paper discusses the essence of social and emotional learning, highlighting the need to develop students' soft skills in the ever-shifting world, as well as during the time of pandemic. Social and Emotional Learning is a vehicle for shaping soft skills as it focuses on the development of such capacities as self-awareness; social awareness; self-management; relationship skills; and responsible decision making. The paper presents some findings from the 2021 representative survey of teachers and school principals across Ukraine (involving 3,237 teaching staff and 420 school principals) that was aimed at determining the level of educators' acceptance and readiness to implement Social and Emotional Learning as part of the New Ukrainian School Reform. It takes stock of teachers' capacity in building the skills to proceed with the implementation of Social and Emotional Learning, in particular regarding in-service training, knowledge of methodologies for soft skills development, access to electronic resources, methodological and training materials, individual education programmes on Social and Emotional Learning, and allocation of school time for their implementation. The paper underlines the increasing role of building social and emotional skills in distance-learning settings and describes various ways in which teachers can employ digital tools to facilitate effective transition to electronic learning while taking into consideration students' learning styles and the need to build social and emotional skills.*

Keywords: social and emotional learning (SEL), soft skills, social and emotional skills (SES), digital tools, distance learning.

INTRODUCTION

The concurrent processes of globalization and digitalization have generally broadened horizons, expanding possibilities to access information in the world. At the same time, these very processes have contributed to greater confusion, unpredictability, and ambiguity in the modern world.

In the era of major global transformations, contemporary educational systems cannot simply strive to transfer academic knowledge to students, since children need to acquire a balanced set of cognitive, social and emotional skills for their successful self-fulfilment in life. Schools are to prepare children for present and future challenges, boost their confidence and self-efficacy.

How can we achieve this goal? By building and developing in children the social and emotional skills that are relevant for the 21st century and that have proven instrumental for coping with life changes in today's highly globalized and dynamic world. Social and emotional skills are also defined through such concepts as 'soft skills', 'transversal skills', interpersonal skills', 'skills of the 21st century', etc.

Chernyshenko, Kankaraš and Drasgow point out that the development of social and emotional skills is important not only for individuals, but also for communities and societies at large. The abilities of citizens to flexibly adapt to changes in the world, to respect their own dignity and the dignity of others, to maintain healthy relationships in their communities, to show ingenuity, responsible and ethical decision-making – all these and other important soft skills have become the essential attributes of a successful country (Chernyshenko, Kankaraš, & Drasgow, 2018).

Authors of the "Handbook of Social and Emotional Learning: Research and Practice" point out that numerous definitions of social skills are exist but according to the Greshman (2002) they describe social and emotional skills as, "a set of behaviours that facilitates the initiation and maintenance of positive social relationships, contributes to peer acceptance, allows individuals to cope with and adapt to the demands of the social environment, and results in satisfactory school adjustment" (Durlak, Domitrovich, Weissberg, & Gullotta, 2017: 301).

According to the Greshman and Elliott (1984, 1990, 2008), social skills are defined as "socially acceptable, learned behaviors that enable an individual to interact effectively with others and to avoid or escape unacceptable behaviors that result in negative social interactions with others" (Durlak, Domitrovich, Weissberg, & Gullotta, 2017: 302).

Social and Emotional Learning (SEL) is a tool for building and developing social and emotional skills. SEL is a foundation for the enhanced academic performance of students and, most importantly, for their successful and happy life.

The authors of the work "Promoting social and emotional learning: Guidelines for educators" understand Social and Emotional Learning as, "the process of acquiring core competences to recognize and manage emotions, set and achieve positive goals, appreciate the perspectives of others, establish and maintain positive relationships, make responsible decisions, and handle interpersonal situations constructively" (Elias, Zins, Weissberg et al., 1997: 5).

The Collaborative for Academic, Social, and Emotional Learning (CASEL) identifies five key competences developed through SEL:

- **Self-awareness** – abilities to identify and recognize one's own emotions, their influence on behaviours and actions, to recognize one's strengths and

limitations, as well as self-esteem and self-efficacy, optimism and confidence in oneself;
- **Social awareness** – abilities to feel compassion for others, empathy, respect for oneself and others;
- **Self-management** – abilities to effectively manage one's behaviour, thoughts, and emotions, to focus, to solve problems, to relax, as well as positive thinking and the ability to listen;
- **Relationship skills** – abilities to establish and maintain healthy relationships in society, to ask for and provide help, to communicate and collaborate;
- **Responsible decision-making** – abilities to make constructive, responsible, and ethical decisions that promote personal and community well-being, to effectively manage goals and resources (www.casel.org).

Well-developed social and emotional skills are important drivers of academic performance in typical learning settings. This has been confirmed by results of the international study conducted by the Organization for Economic Co-operation and Development (OECD).

Beyond Academic Learning has been the first international comparative survey to examine and evaluate the conditions and factors contributing or inhibiting to the development of social and emotional skills in children aged 10 and 15.

The survey found that the development of social and emotional skills in children, unlike academic knowledge, does not follow a steady growing pattern (OECD, 2021). The findings revealed that all 15-year-olds, regardless of gender and social background, reported lower social and emotional skills than 10-year-olds. Assessments given by parents and teachers also confirmed a decline of social and emotional skills as children grow. Furthermore, it was established that levels of creativity and natural curiosity were also lower among 15-year-olds as compared to 10-year-olds. Although the decline in soft skills could be partially attributed to individual development factors, it is indisputable that the educational system plays a significant role in stamping out intellectual curiosity, imagination, and creativity as children grow.

An important finding of the Beyond Academic Learning survey shows that social and emotional skills are indeed strongly related to school performance, notably in reading, mathematics, and arts. There is a general misconception that social and emotional learning squeezes out academic learning, whereas in reality, the former enhances the latter, thus strengthening students' learning outcomes.

It is a child's natural curiosity towards diverse topics that underlies the powerful intrinsic motivation for learning and the acquisition of new academic knowledge. According to the survey findings, the key social and emotional skills contributing to better academic performance in mathematics among 10- and 15- year-olds are persistence, trust, and curiosity (OECD, 2021).

Today, all advanced educational systems around the world place strong emphasis on the introduction and development of soft skills, with progressive educators, non-governmental, parents' and employers' organizations joining efforts towards this goal.

Thus, in 2018 the EU Council Recommendation introduced the Personal, Social and Learning to Learn Competence, or LifeComp, to the set of key competencies for lifelong learning. The LifeComp Framework regards a set of competences important for any person in the 21st century for a happy and successful life. The Forward section identifies three groups of cross-cutting skills, each comprising three competencies:

1. Personal Competence:
   - P1 Self-regulation;
   - P2 Flexibility;
   - P3 Wellbeing.
2. Social Key Competence:
   - S1 Empathy;
   - S2 Communication;
   - S3 Collaboration.
3. Learning to Learn Key Competence:
   - L1 Growth mindset;
   - L2 Critical thinking;
   - L3 Managing learning.

(Sala, Punie, Garkov, & Cabrera, 2020).

In 2017, Ukraine launched the New Ukrainian School Reform that specifically emphasized a shift from 'knowledge-centred' to 'competence-centred' schooling, meaning that teaching should focus not only on academic knowledge but also on social and emotional learning and ethics.

A cornerstone of the New Ukrainian School Reform is education based on values and the transversal shaping of values in the educational process, development of attitudes and soft skills. Thus, the key competencies of the New Ukrainian School include:

- Fluent proficiency in the official language of the state
- Ability to communicate in a native language (if different from the official language) and foreign languages
- Mathematical competence
- Competence in science and technology
- Information and communication competence
- Environmental competence
- Innovation
- Lifelong learning
- Civic and social competences
- Cultural competence
- Entrepreneurship and financial literacy

The Ukrainian Law on Education (2017) lists the following skills common for all key competencies:

reading comprehension,

- ability to express one's thoughts orally and in writing,
- critical and systemic thinking,
- ability to logically argue for one's position,
- ability to cope with one's emotions in a constructive way,
- ability to assess risk,
- ability to make decisions,
- ability to solve problems,
- ability to collaborate,

- creativity,
- initiative.

To assess the level of acceptance and preparedness of the educational community as to the introduction of social and emotional learning within the New Ukrainian School Reform, a nationwide survey was carried out from January through July 2021 among teachers and school principals, with findings presented in the analytical report, the "Feasibility Study on Opportunities for SEL within New Ukrainian School Reform" (Hrynevych, Drozhzhyna, Hloba et al. 2021).

The survey included a representative sample of 3,657 respondents (3,237 members of teaching staff and 420 school principals), covering:

- a core group of schools,
- 20 schools with close proximity to the contact line, and
- 26 schools participating in the nationwide experiment "Organizational and pedagogical conditions for building soft skills in students through teaching social and emotional skills and ethics" and therefore, having experience with the implementation of one of the advanced areas of SEL.

The survey has found that SEL is generally perceived in a positive way (61.7% of teachers and 69.2% of school principals recognized SEL as 'definitely positive'), especially in schools that already had some experience with SEL (Figure 1).

Teachers who practice SEL should possess certain skills, which is recognized by 85.1% of surveyed teachers and 90.2% surveyed school principals. 78.5% of teachers believe that social and socio-ethical competencies are needed by all teaching staff in schools.

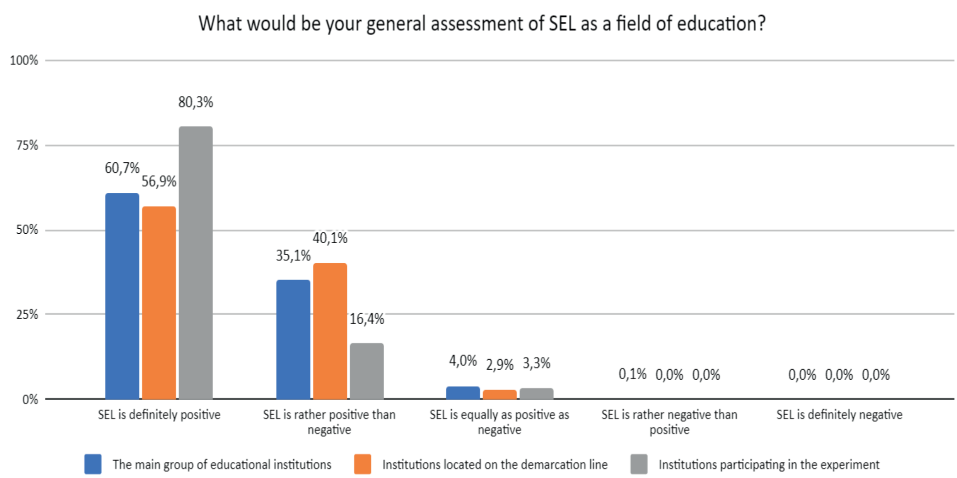


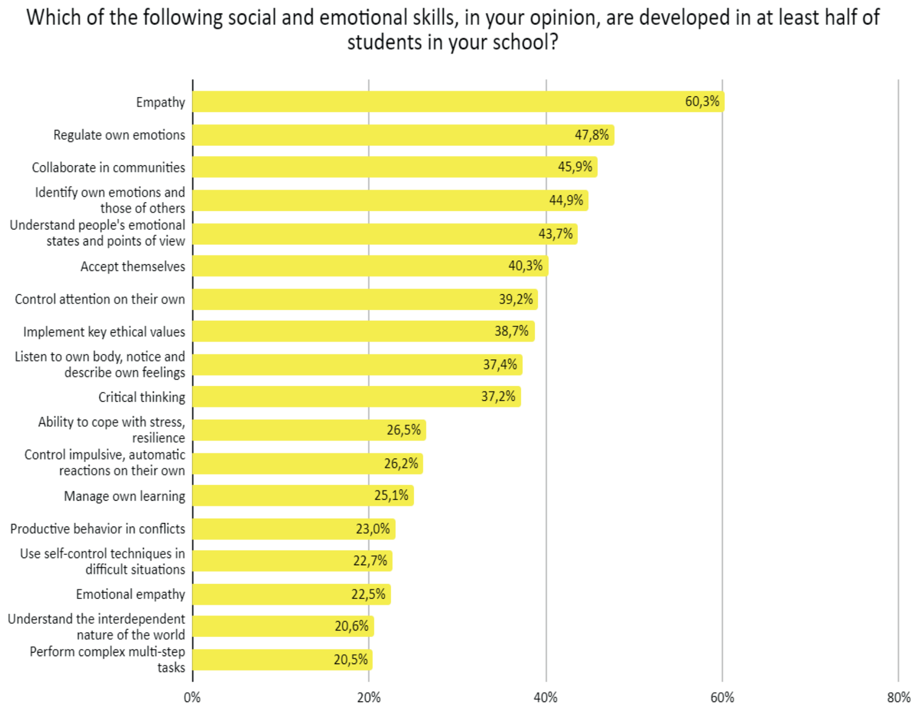
Figure 1. Distribution of respondents' answers to the question "What would be your general assessment of SEL as a field of education?"

According to teachers participating in the survey, the least developed social and emotional skills in students are:

- ability to perform multi-step assignments (only 20.5% of respondents stated that this ability was developed in at least half of students in a school),

- ability to understand the interdependent nature of our world (20.6%), and
- emotional empathy (22.5%).

Compassion was reported to be the most-developed skill (60.3%), despite the fact that compassion and emotional empathy are inter-connected, and the former is impossible without the latter (Figure 2).



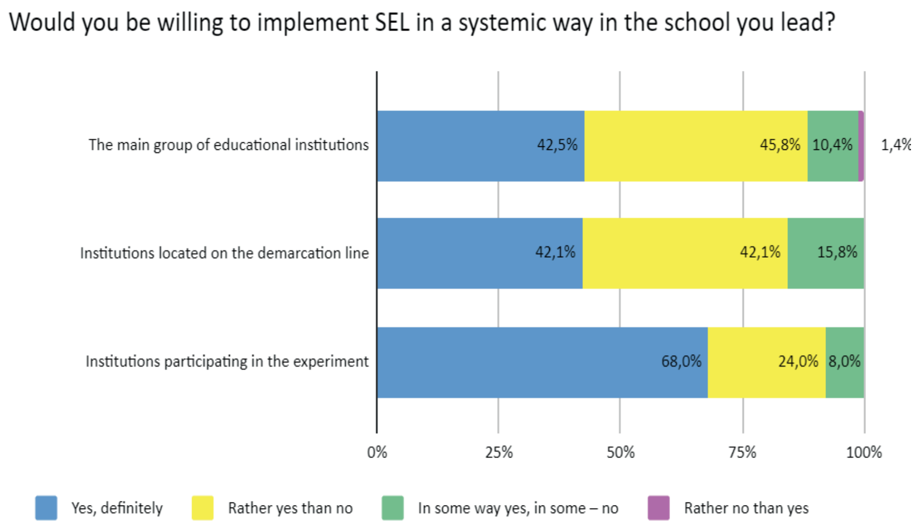
F i g u r e 2. Distribution of respondents' answers to the question "Which of the following social and emotional skills, in your opinion, are developed in at least half of students in your school?"

When asked, "To what extent are the following social and emotional skills developed in you personally?", in both groups the 'outsiders' appeared to be:

- the ability to use self-regulation techniques in challenging situations (33.2% of teachers and 34.6% of school principals), and
- the ability to cope with stress, resilience (35% of teachers and 38.9% of school principals).

Therefore, the development of soft skills is needed not only by students, but also by teachers themselves. 59.6% of respondents among teachers stated they were definitely willing to engage in in-service training on SEL (with an additional 31.9% who chose the "more likely than not" response). However, they also pointed out a lack of opportunities: 55% of respondents among teachers reported that they had not participated during the last 12 months in any in-service training programme that would at least include some SEL topics.

At the same time, the findings suggest that school principals are prepared to implement SEL in a systematic way: 44% of school principals would definitely want it, and a further 44.3% chose the “more likely than not” response (Figure 3).



F i g u r e 3. Distribution of respondents’ answers to the question “Would you be willing to implement SEL in a systematic way in the school you lead?”

When asked, “What kind of support do you personally need to implement SEL in the most effective way?” teachers most frequently selected the following answer options:

- creating a basic online course with supportive information and methodological materials (66.7%);
- availability of information and methodological materials on how to communicate this topic to parents (43.2%);
- introducing a model SEL curriculum (29.9%);
- participation in professional networks of colleagues who implement SEL (26.4%);
- systemic public policy backed up by the Ministry of Education and Science (26.2%);
- support from parents (22.9%);
- including SEL in the variable part of the curriculum (22.8%);
- presence of SEL elements in model subject-specific programmes (22.3%). (Hrynevych et al., 2021: 228–229).

Thus, both teachers and school principals recognize the importance of developing social and emotional skills in the educational process and are prepared to implement SEL in their schools. However, they lack the respective capacity building, knowledge of methodologies and necessary methodological and learning materials.

1. CHALLENGES RELATING TO DISTANCE LEARNING AND SEL

In situations of crisis, the role of soft skills tends to become even more prominent, compared to normal, mundane settings. The OECD researchers highlight that lack of proper socialization with peers and teachers due to the forced restrictions during the COVID-19 pandemic and missed school time affect not only children's academic performance but also their mental state and social skills (an ability to build and maintain positive, healthy relationships in the community after the crisis subsides) (OECD, 2021).

The authors of the Beyond Academic Learning survey point out that the pandemic-induced transition to distance learning has underscored the importance for children to develop such skills and abilities as an intrinsic motivation to learn, time management, and emotional self-regulation. The development of strong social and emotional skills is central for students to remain focused and motivated in challenging learning environments and various situations of crisis.

The COVID-19 pandemic has affected multiple areas of our life – from economy to education. The pandemic-related crisis has highlighted the importance that should be attached not only to building cognitive skills but also social and emotional skills as well as ethical skills, to be able to effectively respond to the challenges of the modern world. We cannot insulate and shield children from all difficulties and challenges in life, and there will always be things beyond our control. However, we are to use such difficulties as a teachable moment and be able to adapt to the requirements of the time (OECD, 2021).

The pandemic has also underscored the importance of transformations in the school system to enable the fostering of emotional, social, and ethical skills in children. Teachers should be presented with opportunities to learn and use SEL tools as a valuable component of the education process in its own right, so that each and every child in Ukraine could acquire the soft skills necessary in the 21st century as part of mandatory schooling.

SEL implementation in the current curricula may only be possible through the respective capacity building of teachers and equipping them with methodologies and support materials suited for students of different ages.

2. SEL DEVELOPMENT IN THE CONTEXT OF DISTANCE LEARNING

Faced with digital transformations in education and reliance on distance and mixed learning formats, teachers should have sufficient levels of information and communication competence to be able to manage the development of social and emotional skills in children using digital technologies, especially considering the fact that the modern-day Gen Alfa students are firmly immersed in and embrace technology.

According to Professor Diana Laurillard, teachers should know and be able to make the transition from traditional to innovative pedagogical methods in the organization of classroom learning using digital technologies (Hrynevych, Iliich, Lyniov et al., 2020) (Table 2).

Table 2. Transition from traditional to innovative pedagogical methods in the organization of classroom learning using digital technologies

Learning style	Description of student activity	Use of digital tools
Studying	Students learn when they listen to a teacher or podcast, read books or websites, watch demonstration video-clips.	Reading from multimedia, websites, digital documents and resources, listening to podcasts, web-broadcasts, watching animation films, video-clips.
Collaboration	Includes discussion, practice, and production (presentation of a product). Based on research and acquired knowledge. Participation in fostering one's knowledge.	Small group projects using online tools, forums, chats, etc. to discuss other participants' results, creation of joint digital products.
Discussion	Learning through discussion requires students to formulate their ideas and questions, solicit ideas from others, answer questions from a teacher and other students.	Online learning materials/ textbooks, discussion via email and messengers, discussion groups, discussion forums, whiteboards, video conferencing tools (synchronous and asynchronous).
Exploration	Learning through exploration allows students to examine, compare and critique texts, documents and resources reflecting education concepts and ideas.	Using online tips (information) and recommendations, analysing ideas and information from multiple digital sources, using digital tools to collect and analyse data, comparing digital texts, using digital tools to look for and evaluate information and ideas.
Task performance	Learning through practice allows students to tailor their actions according to their goal / task and use feedback for improvement. Feedback can come from self-reflection, from peers, teachers, or activity itself if it shows students how to improve the result according to their goal.	Using simulation models, micro-education, online simulators, virtual labs and tours, online role play.
Production (product creation)	Learning through production (product creation) is a way for a teacher to encourage students to put together all they have learnt through conceptual understanding and understanding of how it can be applied in practice.	Creating and storing digital documents, presenting projects, shows, artefacts, animation films, models, resources, slideshows, photos, videos, blogs, electronic portfolios.

Source: Own work based on Hrynevych, Iliich, Lyniov et al., 2020.

Digital tools and services that help teachers manage learning objectives and assignments while organizing distance learning include (Dziabenko, Morze, Boiko et al., 2021) (Table 3):

- the creation of electronic content;
- the organization of webinars (video conferencing services);
- communication via messengers (messengers, groups in social networks);
- group work management (services to organize group work and interaction);
- the engagement and delivery of surveys (tools for online surveys, polls and quizzes);
- the organization of joint work on documents (shared documents (presentations) and cloud storages, virtual boards).

Table 3. Digital tools for organizing distance learning

Purpose of digital tools	Examples of digital tools
Tools enabling design of electronic content	
Long read	Atavist, Medium, Ready Mag, ShortHand
Tools to design and edit images	Canva, GIMP, Awesome Screenshot
Tools for visualization	Visme, Easel.ly, Google Charts, Piktochart, Venngage, Canva
Tools to create presentations	Prezi, Moovly, Emaze, Beautiful.ai
Tools to create interactive content	LearningApps, Ceros , Mapme, Apester, Playbuzz, Biteable, Playbuzz
Screen capture tools	Snagit, Greenshot, Fireshot, Lightscreen
Tools to create video	Mozilla Popcorn Maker, Meograph, Windows Live Movie Maker, Avidemux, DaVinci Resolve, iMovie
Tools to create collages	Canva, Pro-photos, Mycollages
Tools to create comic books	Paint, Power Point, Tux Paint, Pixton, Storybird, Animatron
Tools to create animation films	Powtoon, Animaker
Tools to create word clouds	Tagul, Tagxedo, Wordle i Word Clouds
Interactive books and interactive sheets	Smilebox, Storyjumper, Live Worksheets
Tools for a variety of purposes	
Organization of webinars	Zoom, Google Meet, Skype, Cisco Webex Meetings, Microsoft Teams
Organization of communication via messengers	Viber, WhatsApp, Telegram, Slack
Group Work management	Microsoft Teams, Granatum, Space Training
Engagement and delivery of surveys	Kahoot!, Socrative, Plickers, Quizizz, Quizalize, Mentimeter, Classtime, Mentimeter, Poll Everywhere, Google Forms, EDpuzzle, ClassMaker

Organization of joint work on documents	Notion, G Suite
Tools to create mind maps	XMind, Mindmeister, Mindjet Coggle, WiseMapping, Mind42, FreeMind, Spider Scribe, Mindomo
Virtual digital boards	WikiWall, Tutorsbox, Glogster, Dabbleboard, Twiddla, Scribblar, Padlet, Educreations, Popplet, Realtimeboard (Miro), Twiddla
Digital tools to organize exploratory learning	GoLab System Go-Lab
Learning management system	
Moodle, Google Classroom, Go-Lab ecosystem	

Source: Dziabenko, Morze, Boiko et al., 2021.

In the system of the purposeful building of teachers' capacities to develop social and emotional skills in children in the context of distance and mixed learning, it is important not only to focus on the development of teachers' information and digital competence and digital skills but also to provide examples of the comprehensive use of digital technologies for the development of soft skills. These examples include tools designed by Microsoft that proposes 5 steps for SEL integration in teaching and learning through various technologies used at each step (OECD, 2021):

1. Develop an emotional vocabulary with SEL chatbot, Reflect app, Teams whiteboard.
2. Help students build strategies and practice with Minecraft's Mindful Knight, Teams breakout rooms to develop listening, communication, cooperation and conflict resolution skills, the Flipgrid app for video discussions.
3. Observe and provide feedback using Education Insights, surveys.
4. Recognise milestones and build self-worth by sending praise badges with video or chat, coach app, icebreaker bot, using Teams video, emojis, OneNote video.
5. Enjoy using Teams and make it personal, make learning enjoyable for all with assistive technologies and learning tools.

In addition, scientists and educators involved in the implementation of SEL during the pandemic support members of their national communities, which are created specifically to discuss emerging issues in such areas as (Yoder, Posamentier, Godek, Seibel, & Dusenbury, 2020):

- exchange of experience in introducing distance and blended learning through webinars;
- preparation of methodological and didactic materials for teachers on the use of digital tools for communication between students, students and teachers and posting them on special sites on the Internet;
- involvement of parents in the use of digital tools in teaching children in distance learning;
- the organization of individual assistance to students by the community and teachers;

- conducting consultations to support students in learning during the implementation of distance learning from community professionals for teachers, parents and students.

CONCLUSION

To be successful in the 21st century, it is essential that children acquire social and emotional skills, related to such concepts as ‘soft skills’, ‘transversal skills’, interpersonal skills’, ‘skills of the 21st century’, all of which are instrumental for coping with life changes in today’s highly globalized and dynamic world. Research findings show that social and emotional skills have a positive impact on academic performance.

Moreover, the role of soft skills becomes even more important in a crisis. OECD researchers highlight that lack of proper socialization with peers and teachers due to the forced restrictions during the COVID-19 pandemic and missed school time affect not only children’s academic performance but also their mental state, adaptability, and interpersonal communication.

The survey conducted in Ukraine has demonstrated that both teachers and school principals recognize the importance of building social and emotional skills in the course of education and are prepared to implement SEL in their schools. However, they lack relevant in-service training, knowledge of methodologies, model curricula and the necessary methodological and learning materials.

The transition to distance-learning has highlighted the need to build strong social and emotional skills for students to remain focused and motivated in challenging learning environments and other situations of crisis. Therefore, current and future teachers should be provided with opportunities to master and use SEL tools, be aware of relevant methodologies and didactic materials suitable for different age groups, and also should show competence in using digital tools in the transition from more traditional forms of learning to distance or mixed learning.

All of the above aspects require targeted efforts to strengthen information and communication competence in teachers and school principals to facilitate the development of social and emotional skills in children using digital technologies.

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"E-learning", 13, Katowice–Cieszyn 2021, pp. 89–99
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THE MANAGEMENT OF E-LEARNING PLATFORMS AND ONLINE ASSESSMENT IN PRIMARY EDUCATION THROUGH THE PRISM OF SCHOOL ENGAGEMENT AND SCHOOL CULTURE

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Abstract: *In recent years, e-learning has been a very relevant and interesting object of research for the educational community. However, it has been mainly focused on its pedagogical side, leaving aside the more technical aspect. In this paper, virtual learning environments will be approached from a more technical point of view, focusing on their implementation, management and maintenance. In addition, in a context in which the real value of exams has been questioned, alternatives to them will be offered and an approach to online test supervision tools (e-proctoring) will be made. All this will be discussed within the framework of primary education where e-learning and the management of Virtual Learning Environments will also be addressed through the concepts of school engagement and school culture.*

Keywords: e-learning, management, online assessment, primary education, school engagement, school culture.

INTRODUCTION

E-learning has become not only a tool to improve the quality of education, but also the axis of many learning environments. It could be thought that the huge growth of educational technologies happened in the last year due to the coronavirus (SARS-CoV-2) pandemic, but this is not completely true. While the pandemic made all the learning turn virtual, the educational technologies existed many years before 2020. In Spain, for example, in 1999, the University of La Rioja started an online teaching program; and the University of the Basque Country made Moodle their learning platform by 2010 (Moreno & Santiago, 2003; Ros, 2008).
These two cases are just small examples that symbolize the technological revolution that our world witnessed in the late '90s. By 2020, e-learning was just part of our culture, giving rise some years before among other elements related to the e-learning culture, to the so-called "online universities". These colleges were born with the

objective of fully online teaching university degrees and master's degrees, but the real origins of distance learning dates back to 1969 with the creation of the Open University in the UK (Szulc, 2020).

Online universities have a great deal of students from all around the world. In Spain, for example, there are two big universities that are fully dedicated to online teaching: the International University of La Rioja (also known as the "University on [the] Internet") and the Valencian International University. As the main goal is online teaching, there are some differences between them; while the Valencian International University assesses their students online using a program based on artificial intelligence, the International University of La Rioja calls for on-site exams (Periódico La Rioja, 2019; Universidad Internacional de Valencia, 2020; Universidad Internacional de La Rioja, 2015).

This 'the online teaching being a revolutionary method in the late '90s, the online Universities and the e-learning platforms as an essential part of the face-to-face learning for more than a decade' is just evidence that proves that the means to teach and assess online were in our schools and universities long before the pandemic. Even so, it is considered that the forced transition to online teaching was difficult and laborious and yet not as successful as expected (Abreu, 2020).

There are two reasons that can help explain why the e-learning environments did not work as expected. First, it is very important not to focus only on universities, and understand the special characteristics of the learning and teaching processes in early ages where e-learning is not an option (0–6 years). Second, elearning needs to be understood as the tool it is and the new opportunities it brings, and not as a tool only used to reproduce traditional teaching and assessment methods (Ananga, 2020).

In Primary Education, e-learning platforms were not as used as in universities or high schools, resulting in teachers not having enough technical knowledge to set up (and in some cases create) virtual learning environments. While universities and big corporations had experience and specialized people creating, maintaining and supervising the technical aspects of Learning Management Systems (LMS), primary education teachers had to do everything by themselves and take care of not only the pedagogical aspects but also of the technical ones.

Then, the traditional assessment methods were once again questioned (López-Alvarez, 2013; Jiménez et al., 2017; Kharbat & Daabes, 2021). The real value of a final test, especially in situation where 'in primary education' there were no means to supervise online exams (e.g. e-proctoring programs). Alternatives to these types of tests were being proposed, as well as e-learning methodologies, such as gamification were on the rise.

In this paper, the major two concerns raised in the previous lines (management of LMS platforms) and online assessment are going to be addressed, always in the context of primary education. In addition, the relevance of e-learning in school culture and school engagement are going to be taken into account.

For this purpose, a theoreticaldescriptive review study will be carried in which the existing theory will be reviewed, in order to know how LMS Management aspects were approached in the educational-scientific literature.

In the review of scientific literature, it was found that there are very few studies that analyze e-learning from a technical point of view. Studies on the validity and effectiveness of e-learning in university contexts predominate, with hardly any research conducted in primary education. It is precisely in primary education where it is most important to carry out investigations and case studies on the application of e-learning platforms from a technical point of view. This is because primary schools, which are the ones who create their own VLEs, do not have a team of computer scientists and IT experts, unlike universities.
Therefore, the main objective of this paper provides the educational community with a technicalpedagogical reference framework that allows the installation and management of LMS in primary education centers, as well as their pedagogical integration in the teaching-learning processes and school culture. This chapter carries out a qualitative observational study, analyzing the data obtained in a theoreticaldescriptive method, in order to systematize them and elaborate a multidisciplinary approach that brings together various technical and pedagogical aspects.

1. THE MANAGEMENT OF E-LEARNING PLATFORMS (LMS)

In the introduction, management of e-learning platforms was considered one of the major topics to address. Many primary education schools have no specialised teachers that have the technical knowledge to manage a LMS site such as Moodle. What is more, they cannot choose the most suitable LMS for the school due to the poor information that schools have regarding this issue.

1.1. The need to choose a good LMS: Moodle, Google Classroom and BlackBoard Learn

Nowadays, there are three big e-learning platforms: Moodle ‘free’, Google Classroom ‘free for schools using Google Workspace for Education’ and BlackBoard Collaborate ‘pay’ (Basogain-Urrutia, 2021). All of them have pros and cons, and it is essential for schools to know them, so they can freely choose their ideal LMS. A big problem nowadays is that many schools are using Google Classroom just because it is part of their Google Workspace for Education, resulting in a disadvantage for Moodle and BlackBoard Learn. Google Workspace for Education provides an institution with a mailing system for unlimited users, which is the main reason that schools find Google and then they end up using their virtual classrooms because there is no need to register the users (the login is the same as in the corporate email).
The ideal situation, however, would be that a school depends on no company to set up its own Virtual Learning Environment (VLE). This is only the case with Moodle (Modular Object-Oriented Dynamic Learning Environment), which, as a public domain software or shareware, makes it possible for a school to install it and freely use it. A possible issue could be that Moodle needs to be installed in the main server of the school, and, as it needs to be accessed from outside the school, this could bring some security issues, because school servers do not have as much security as big corporate servers have.

Even so, Moodle is such an excellent LMS platform and the security problem could be solved just by using a hosting server and not installing the program in the school server. Hosting a website is not free, but some governments such as the Basque government (Eusko Jaurlaritza) offers an e-learning hosting platform with secured servers to provide Moodle to the schools in the Basque Autonomous Country. BlackBoard Learn is a very similar to Moodle, but it requires an institution to pay a fee, so it is not considered an ideal option for a school, so, there is no other but Moodle and it is the ideal LMS for a school. In table 1 is displayed a brief comparison of the VLEs mentioned in this chapter.

Table 1. Comparative of Google Classroom, Moodle and BlackBoard Learn

<table>
<tr><th></th><th>Google Classroom</th><th>Moodle</th><th>BlackBoard Learn</th></tr>
<tr><td>Zero cost</td><td>Yes, but when using Google Workspace for Education.</td><td>Yes.</td><td>No.</td></tr>
<tr><td>Set up and maintenance</td><td>Software as a Service. Installed in Google's servers. No maintenance.</td><td>Needs to be installed in an own server. Needs to be updated. Hosting is possible.</td><td>Software as a Service. No maintenance.</td></tr>
<tr><td>Site admin privileges</td><td>Admin needs to be invited to classroom to see its content. Only can see number of active classrooms and can choose what users can create classrooms.</td><td colspan="2">Admin can see and edit all the classrooms. Only admins can create classrooms (can connect with a database and create them automatically).
Can see and edit all classrooms.</td></tr>
<tr><td>Appearance</td><td>Pre-determined by Google. Can only change the heading picture of a classroom.</td><td colspan="2">The whole site can be personalized (colours, fonts, shapes, institutional logotypes, course descriptions, display the names of the teachers)…</td></tr>
<tr><td>Tools and plugins</td><td>Connected to all the Google services such as Drive and can create templates for assignments and each student's work is automatically saved in the classroom's Drive folder.</td><td>Can add plugins to use determinate software compatible with Moodle (text editors, voice recorders, videoconference tools such BlackBoard Collaborate Ultra).</td><td>Need to use its resources but can connect with other software when using LTI (Learning Tools Interoperability) which allows services to integrate in the LMS.</td></tr>
<tr><td>Videoconference tools</td><td>Google Meet integrated in Classroom.</td><td>Can add plugins or LTI to use them (license may be required).</td><td>BlackBoard Collaborate Ultra integrated.</td></tr>
</table>

Source: Own work.

1.2. The Management of Moodle in Primary Education

As important as a good choice of a good LMS platform for the school is its management. In the previous section, Moodle was chosen as the best LMS for a school as it is shareware and offers multiple customizable options, all of it at no cost and it depends on no private companies. One of the problems that schools have regarding the installation of a LMS is that teachers and ICT coordinators have no specific training in the installation, management and maintenance of an LMS. Therefore, the management of these sites is usually poor, follows no order and depends on each teachers' criteria. This sub-chapter is going to address this issue as it may recommend some basic steps to use and manage Moodle as a site administrator.

A big difference that Moodle and Google Classroom have is that Moodle requires each course to have a minimum set of information that works not only as a tool to arrange the courses, but also as an ID. Courses can be also arranged in categories (e.g., grades, stages, topics, etc.) while in Google Classroom courses have no ID nor categories, these two items will make easier to manage e-learning sites.

1.1.2. Basic setup: users, courses and categories.

Users need to have login credentials in Moodle. Those login credentials can be given by the site admin or an auto-login form can be added to the login site so each user can create a profile. Also, there is the option of "guest" user, requiring no login credentials, but the site admin can disable this option.

Courses are the axis of every LMS, in the case of Moodle, only the site admin or the persons designated by the admin can create courses. There is an option that allows other users to request new courses. This option is displayed as a form where the person requesting the course needs to introduce all the information regarding the course. The form is customizable by the site admin and can add additional fields regarding other aspects (e.g., questions like, "What do you need this course for?").

When creating a course, the course must be given a full and a short name. The full name is displayed on the home page and in the heading of the course; while the short name is shown only when navigating in the left bar and it is used as an ID of the course because the real ID is never visible to the users. Courses can be arranged in categories and when creating a course, needs to be nested in a category.

1.1.2. Management: users, courses and categories

Everything in Moodle can be done manually, but it is not useful when it comes to big schools when up to 200 students and teachers need to be enrolled in courses, and more than 20 courses and categories need to be created. Moodle provides easier ways to substitute all these manual methods with massive operations. An ideal situation would be that schools had databases such as Oracle with Lightweight Directory Access Protocol (LDAP) authentication. In this ideal situation, it would even be possible to have a virtual classroom management program that reads the data relating to students, teachers and their subjects and automatically creates virtual classrooms for each school year. This would allow immediate changes in Moodle at the same time they happen in the database (e.g., a student changes groups, there is a new substitute teacher…).

As long as this option is not a real option, there are other ways to manage Moodle and enact massive changes easily. Thanks to Microsoft Excel, a list of users, courses, and categories can be created and with Moodle's option to use this type of upload option – massive users, courses and categories, everything can be set on a file and Moodle will to the job. But before doing so, each school needs to set its own rules and formats, as the example shows in table 2:

Table 2. Setting users, courses and categories in Moodle: examples of formats

	Rule	Format	Example
Name	Name and surnames (both) need to be registered in Moodle. No short names, nor only one last name are going to be accepted.	Name Surname1 Surname2	Jon Xabier Basogain Urrutia
Full name of a course	The name subject, it includes no other information (grade or group).	Full name of the subject	Basque Language and Literature
Short name	Includes a short name of the subject, the school year, grade and group.	2021-22_ Shortname_ Grade-Course	2021-22_Basque_ LH5-A
Category	Must make reference to a big group of courses (e.g., all the courses of fifth grade).	Main category/Sub-category	Primary Education/ Grade 5/Group A

Source: Own work.

It is important that when creating the .cvs or .xls file to upload the users and courses, these format-rules are followed. In addition to the options mentioned before, there is also the option to specify the role of the user on each course, a group (if groups are being used on each course) and many more options. It is important to remember that if one user already exists in the Moodle site, when uploading the file with users and courses, that user's profile is going to be updated, which makes this option an excellent substitute for more complex systems.

2. ONLINE ASSESSMENT

Moodle and similar LMS sites offer many different ways to assess students online. In fact, in Moodle not only "quiz", which the tool to create online exams, and "assignment" are used to assess students. Other tools such as "forum" or "lesson" are used to assess as well because they can be graded. When classes were suspended due to COVID-19 pandemic, the real value of the exams and traditional assessments was questioned. In this chapter, alternatives to traditional exams and assignments will be analysed (both in and out of Moodle). Yet, traditional exams and other types of tests such as practical exams need to be proctored, so e-proctoring techniques will be analysed as well.

2.1. Alternatives to traditional assessment methods

Inside Moodle there are three resources that can be used to assess students as alternatives to traditional evaluation resources:

1. Forum. The forum activity module enables participants to have asynchronous discussions (Soliman, 2014). A teacher can set different topics and students can discuss them.
2. Lesson. The lesson module includes theoretical explanations of a teacher and multimedia content (texts, videos, pictures…) and questions regarding the theory.
3. Peer to peer assignments. When using this module, assignments sent by the students are going to be graded not only by the teacher but also by another classmate. The weight that a peer's grade has on the final grade of the assignment varies as established by the teacher and can range from zero to 100 percent.

As demonstrated, tools that do not seem oriented to assessment can be useful in Moodle, but when it comes to more pedagogical aspects and changes related to the teaching approach, there are some alternatives that are very useful too.

1. Portfolio of activities. The aim is to highlight the work done in the subject during the course, seeking to develop tests that put the students' knowledge to the test, making them find solutions and acquire disciplinary and interdisciplinary competencies (Gregori & Martín-Rojo, 2011).
2. In-class activities. It is equally useful, as well as enriching, to create debates in class where students must present their arguments for or against a question or problem proposed by the teacher. Thus, the student will have to position himself, argue and give his opinion based on facts and theoretical knowledge. These activities can be both formal (previously planned) and informal (arising in class).
3. Final project. As a culmination of the course, the final project is a good choice. This project can be a research paper (e.g., exposing the most relevant discoveries of Fleming) or a more creative activity such as sending letters to the characters of a book read in class from the point of view of a friend of the character, commenting on something that happened in the story. It can also be a project where there is a final product (such as telling a story using Scratch, for example) or a STEAM (Science, Technology, Engineering, Art and Mathematics) initiative. This type of initiative is close to what is known as Project Based Learning (PBL) where students follow a learning path, culminating in the presentation of a project (Trujillo, 2015; Jiménez et al., 2017).

2.2. e-Proctoring

Final tests or exams, whether they consist of applying theoretical content or solving practical cases, need to be supervised. When it comes to online assessment and, therefore, to supervising online tests, we speak of e-proctoring, and schools have few resources in this regard. It is true that in the framework of primary education, the framework in which this chapter is developed, e-proctoring techniques should

not be very complex. Due to the characteristics of the students, it is not advisable to use very invasive techniques.
There are e-proctoring programs, such as *Smowl*, which is based on artificial intelligence and recognizes the student through biometric control while monitoring desktop activity. Other programs, such as *Respondus Lockdown Browser*, lock the computer screen, and while it is running, only the institution's e-learning portal can be accessed.
As numerous studies suggest, in primary education, the characteristics of the students and their digital competence is not conducive to use sophisticated techniques (Basogain-Urrutia, 2021). The ideal is to supervise the final tests using videoconferencing, since this allows the student to communicate with the teacher in case there are doubts and there is an open communication channel. Even so, this cannot be done with all students in primary education, since the youngest students cannot develop an evaluation of this style on their own, however, this is appropriate from the age of 8–9 years.

3. SCHOOL ENGAGEMENT, SCHOOL CULTURE AND E-LEARNING

School Engagement refers to the way students relate to and become involved in their school. Fredricks et al. (2005) offers a definition of this concept, but many authors have described it and its definition has changed over the years. Yet, this definition (Fredricks et al., 2005) is most accepted by the educational-scientific community, where three types of involvement are distinguished as Ramos-Díaz et al. (2017) and Basogain-Urrutia (2020) explain:

1. Emotional engagement: characterized by collecting all emotional reactions, whether positive or negative, as well as the feeling of belonging to the centre.
2. Behavioural engagement: focuses on the student's participation in school activities; it is also considered essential to achieve good academic results.
3. Cognitive engagement: refers to the effort a learner is willing to make to understand complex ideas and skills. It also refers to the effort to go beyond the minimum required.

School Culture, on the other hand, defines the reality that takes place within the school. Innumerable authors have tried to define it, however, one of the definitions that makes its meaning clearer is the one offered by Deal and Kennedy "the way we do things around here" (Deal & Kennedy, 1983: 501). It is conceived as a static and at the same time, dynamic entity that concerns the bases of the rules, beliefs and assumptions that govern an institution. It is emphasized that it has a dimension that is not so evident, suggesting that the only way to learn the culture of a school is to be in it. The elements to which school culture concerns are many, since they cover a wide spectrum; thus, Schein (2018), tries to collect some of the elements that compose it, in order to try to understand it better. These are:

- Observable attitudes (includes language and rituals).
- Rules –written and not written– that evolve in work teams.

- Dominant values, especially those established by the organization.
- The policies of the center.
- The rules.
- The philosophy guiding the policies and standards.
- The school climate.

The inclusion of e-learning as part of the teaching and learning processes is part of the school culture and could affect school engagement levels. It is part of the school culture because in order to move towards a successful e-learning model in schools, it is essential to make it part of the school culture. Teachers and students must conceive of it as a natural element of the school, while acknowledging this is more difficult at the early ages. It is important that the elements of VLE management become cultural elements, since LMS environments are but an extension of the school and not a parallel reality to it.

As an element that can affect the school environment, it is important to consider the pedagogical aspect of e-learning, as well as its management system. Creating elearning environments that are easy to use, efficiently managed and based on the school's pedagogical and curricular models, will move society towards an ideal goal. Since school engagement is concerned with how it relates to its school, it is important that this dimension is considered during the creation and management of the LMS site, but it is also vital to adapt the pedagogical model to the learning environment, virtual in this case, to which it is applied.

That is, if a high cognitive engagement (trying to go beyond what is required) or a high behavioral engagement (participation) is sought, the academic activities developed in the VLE must have been developed taking into account that they will take place in a virtual context. In this aspect, the motivation to learn more and make a greater effort may be related to the instructional design of the virtual classroom. On the other hand, emotional engagement may also be related to the management and appearance of the e-learning site, especially the usability and user experience for younger learners.

CONCLUSION

The management of an e-learning environment has more dimensions than it seems at first glance. First of all, the more technical part requires certain knowledge and specific management aspects. In addition, it is very important to know the processes that make up the implementation of an e-learning site and its maintenance (enrolling users, creating courses, establishing patterns and rules for its use). Besides that, it is extremely important to master the pedagogical part of e-learning. This is the task of the teacher and not of the site administrator (as opposed to the more technical aspects), and it is important to train teachers in aspects of the use of their LMS sites. To continue with, it is relatively important to delve into all the resources offered by VLEs in order to develop complete, innovative and appropriate activities and assessments for the virtual environment. In this regard, it is not enough to master basic assessment tools such as homework or the online form. It is recommended to try new tools and resources, even testing alternative methods such as discussions or projects.

Finally, as in most educational processes, it is necessary to expand the focus of attention and look at the school reality from a broader point of view. Although the management of e-learning sites such as Moodle has many technical and precise aspects that require careful study and online assessment offers many tools and methodological alternatives, the school is still an accumulation of interconnected processes, as defined by the school culture.

In this regard, the implementation and management of the VLE should be understood as a cultural element of the school and it is important not to ignore how its use, management and design affect school engagement. Since online learning remains part of the school and pursues specific objectives, it should be understood not only as a means but also as a part of learning itself.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 100–113
https://doi.org/10.34916/el.2021.13.09

PROGRAMME COMPETENCES FOR MANAGEMENT STUDENTS IN THE COVID-19 PANDEMIC

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Abstract: *The paper discusses programme competences of students majoring in the specialty 073 – Management in conditions of distance learning caused by the pandemic COVID-19. It analyses the influence of distance learning methods and techniques on the programme competences of managers. The paper studies the curriculum design of the first (bachelor's) degree course 073 – Management within the field of knowledge "Management and Administration" (07) at one of the typical higher education institutions in Ukraine in conditions of distance learning. The authors consider relevant components of the curriculum design. The analysis allowed the authors to identify which of the programme competences in the course design were made easier for the students to acquire due to pandemic-induced distance learning mode. The authors suggest a way to improve the curriculum design for the next year of study.*

Keywords: distance learning; competences; higher education; students; management.

INTRODUCTION

The research problem

The COVID-19 pandemic has dramatically affected all spheres of society, including education. During the forced distance learning period a number of technical, psychological and methodological problems emerged.

Due to observed changes in the modern academic environment we are witnessing the enrichment of educational terminology reflecting the specific work mode we are forced to experience. Experts stress that it can not be labeled 'online learning', but rather emergency remote teaching (Iglesias et al., 2021) or emergency online teaching (Lorenza & Carter, 2021), reflecting the unprecedented speed of change the COVID-19 pandemic caused in the teaching community. The terms represent both the urgent move from presence classes to an online blended mode and a sense of disruption among the teaching community and the learners (Lorenza & Carter, 2021). Evidently, this partially unprepared mode of work presents feasible advantages for both participant groups of the learning process, saving travel time to the auditoria, opening up new opportunities for collaboration and production of ideas. However, the opportunities are somewhat balanced by new challenges for the academic community and the educational management, namely elaborating digital environments to serve online teaching and learning. Another challenge is to develop adequate attitude among faculty members towards distance teaching in order to ensure equal levels of knowledge and competences provided in both mode of study (Szopinski & Bachnik, 2022).

The unprecedented speed of change leading to a shift in mode of work evidently increases the instructor's workload, demanding extra effort to present the learning content equal to the one developed in traditional classrooms (Iglesias-Pradas et al., 2021). The experts argue that for the students' learning effectiveness largely depends on their ICT competence, motivational factors and virtual competency factors, since all these factors combined positively impacts their learning and involvement (Amin et al., 2021).

There is a growing body of research confirming overall high academic performance of students in forced remote teaching mode (Iglesias-Pradas et al., 2021), with particular subject-specific cases where the learners benefited from the new challenges presented by the COVID-19 changed living environment. Namely, an interesting case in Poland demonstrates students of management and production management and engineering learning a new skill of creating complex websites based on CMS WordPress. Consequently, the change in the syllabus was found beneficial for the students and for the university program as well, as it allowed the faculty management to adapt curriculum to market needs and better equip modern graduates for competition on the job market (Krupcała, 2021).

Competence-wise, the main normative document regulating distance learning is the "Regulations on distance learning", approved by the order No. 466 of the Ministry of Education and Science of Ukraine of 25 April 2013. The document highlights a significant use of information and communication technologies (Polozhennya pro distancijne navchannya, 2015). All this calls for paying special attention to the issue of obtaining programme competences and relevant programme learning outcomes for university students at all levels. Thus, the problem of research is to identify in what ways the competence components of the curriculum for the Management course changed during the pandemic-induced learning period and to see the ways to improve the curriculum design.

1. PROGRAMME COMPETENCES IN DISTANCE LEARNING

1.1. Research methodology

The theoretical basis of the study is formed by basic principles and provisions in the field of higher education of Ukraine. In the process of solving the tasks there were used historical-logical and systematic approaches, general and special methods, in particular: monographic and abstract-logical methods (in analysing the impact of distance learning on the programme competences of managers); methods of observation and generalization (in the analysis of the use of elements of distance learning); methods of system analysis and synthesis.

1.2. Theoretical background

Reference to modern psychological and pedagogical technologies strongly highlights the essence of distance learning and urges the educational management to take into account its special features (Karimov, Kuzmenko, & Radchenko, 2020). The solution of these problems has forced to intensify certain programme competences of students, which are related to the use of information and communication technologies and skills of independent and team work. The acquisition of such competences is the result of achieving the following learning outcomes (learning objectives), according to the classification that is generally accepted in the international educational environment:

- in the ***cognitive*** (gnostic) area, according to B.S. Bloom (Bloom 1984)

Applying – the ability to use the studied material in new situations.

Evaluation – the ability to assess the importance of the material for a specific purpose.

- in the ***emotional*** (affective) sphere, according to W. Krathwohl (Krathwohl; Bloom, Masia 1964)

Perception. Characterizes the desire (motivation) of the student to receive the necessary information.

Responding. Concerns the active participation of the student in the educational process.

Organization and Conceptualization. It refers to the processes that individuals face, when it is necessary to combine different values, resolve conflicts between them and assimilate a specific system of values.

Characterization by a Value or Value Set. At this level, a person has developed a system of values that determines their consistent and predictable behaviour.

- in the ***psychomotor*** (activity) area (Krathwohl; Bloom, Masia 1964)

Reproduction of manipulations. Performing certain actions with instructions and practical skills.

Develop Precision. The ability to perform tasks with a small number of errors and do it more accurately without professional help.

As one can see, most of the points belong to the emotional (affective) or value-motivational aspect of educational goals, i.e. the perception of specifics and features of distance learning by the students.

When it comes to educational goals and forecasted competences, it is worth addressing the documents developed within the TUNING project, defined by the working group itself as a "university driven project which aims to offer a concrete approach to implement the Bologna process at the level of higher education institutions and subject areas". Distinguishing between subject specific and generic competence, the Tuning team lists the following generic competences:

- **instrumental competences**: cognitive abilities, methodological abilities, technological abilities and linguistic abilities;
- **interpersonal competences**: individual abilities like social skills (social interaction and cooperation);
- **systemic competences**: abilities and skills concerning whole systems (combination of understanding, sensibility and knowledge; prior acquisition of instrumental and interpersonal competence required) (Tuning Educational Structures, 2007).

At present, the main proportion of university graduates students of the first (bachelor's) level of education. The bachelor's degree or its equivalent according to UNESCO (International Standard Classification of Education, 2013) corresponds to the sixth level of education to which the National Qualifications Framework puts forward a list of descriptors in four areas: Knowledge, Skills, Communication, Responsibility and Autonomy (Kabinet Ministriv Ukraïni, 2012). From the list of descriptors of the National Qualifications Framework, in our opinion, it is advisable to pay attention to the following:

Communication

- Communicating information, ideas, problems, solutions, personal experience and arguments to specialists and non-specialists
- Data collection, interpretation and application

Responsibility and autonomy

- Ability to take responsibility for developing and making decisions in unpredictable work and / or learning contexts
- Forming judgments that take into account social, scientific and ethical aspects
- Organization and management of professional development of individuals and groups
- Ability to continue learning with a significant degree of autonomy.

That is, the specifics of distance education activates, first of all, the communicative abilities, independence of decisions and responsibilities of students.

Taking into account the general list of descriptors of the National Qualifications Framework, which receive an additional positive impetus in the situation of distance learning, the following skills are highlighted for future managers according to the Standard of higher education for the first (bachelor's) level, specialty 073 – Management (Standart vishchoï osviti, 2018):

Communication

- Ability to effectively formulate a communication strategy.

Autonomy and responsibility

- Management of complex actions or projects, responsibility for decision-making in unpredictable conditions.
- Responsibility for professional development of individuals and/or groups of individuals, ability to continue studying with a high level of autonomy.

2. PROGRAMME COMPETENCES OF FUTURE MANAGERS

From the list above in the conditions of distance learning we consider the following categories as key indicators for managers:
1 – developing communication strategy (Communication)
2 – responsibility for decisions in unpredictable conditions (Responsibility)
3 – the ability to learn with a high level of autonomy (Autonomy).
Tables 1 and 2 present the correspondence of these categories to the competences defined by the curriculum design for the course 073 – Management in the field of knowledge 07 – Management and Administration for the first (bachelor's) level of higher education (Kucher, Voronina & Tarasenko, 2019) of Dniprovsky State Technical University. The correspondences defined by the National Standard (Standart vishchoï osviti, 2018) are marked as " + ". The correspondences not defined by the Standard, but in our opinion present, are marked as " * ". Table 1 discusses aspects of generic competences of future managers:

Table 1. Correspondence of categories to the generic competences of future managers

Competences	Categories		
	Communication	Responsibility	Autonomy
1. the ability to exercise their rights and responsibilities as a member of society, to be aware of the values of civil (democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine;	+	+	
2. the ability to preserve and promote moral, cultural, scientific values and build upon the achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society as well as in the development of society, machinery and technology; use various kinds and forms of movement for active recreation and healthy living;			
3. capacity for abstract thought, analysis, synthesis;			
4. ability to apply knowledge in practical situations			
5. domain knowledge and professional expertise			

6. the ability to communicate in the national language both orally and in written form;	+		
7. the ability to communicate in the foreign language;	+		
8. skills of using ICT-technologies;	*		+
9. the ability to learn and acquire modern knowledge;		+	+
10. aptitude to hold research at the appropriate level;			
11. ability to adapt and act in a new situation;	+		*
12. potential to generate new ideas (creativity);	+	*	
13. appreciating and respecting diversity and multiculturality;	+	+	
14. ability to work in an international context;	+	+	
15. ability to act out of ethical considerations (motives);	+	+	
16. ability to take initiative, responsibility and skills for safe activities in accordance with the future profile of work, industry norms and rules, as well as the required level of individual and collective safety in emergencies (defined by educational institution).		*	

S o u r c e: own work based on (Standart vishchoï osviti, 2018; Kucher, Voronina, & Tarasenko, 2019).

Table 2 discusses precisely aspects of specific competences of future managers:

T a b l e 2. Correspondence of categories to the specific competences of future managers

Competences	Categories		
	Communication	Responsibility	Autonomy
1. ability to identify and describe the characteristics of the organization;			
2. the ability to assess the results of the organization and correlate them with factors of external and internal environment;	+		
3. ability to determine the prospects for the development of the organization;	+		
4. ability to determine the functional areas of the organization and the relationships between them;			
5. ability to manage the organization and its departments through the implementation of managerial functions;	+		
6. the ability to act in a socially responsible conscious way;		*	
7. ability to choose and use modern management tools;			*
8. ability to plan the activities of the organization and manage time;			

9. the ability to work in a team and establish interpersonal interaction in solving professional problems;	*		
10. the ability to assess the work performed to ensure its quality and motivate the staff of the organization;		+	
11. ability to create and organize effective communication in the managerial process;	*	+	
12. ability to analyse and structure the problems of the organization to develop efficient solutions;			
13. understand the principles and norms of law and use them in professional activities;		+	
14. understand the principles of psychology and apply them in professional activities;			*
15. ability to form and demonstrate leadership qualities and behavioural skills.	*		+

Source: own work based on (Standart vishchoï osviti, 2018; Kucher, Voronina, & Tarasenko, 2019).

The competences that did not receive any mark of compliance with the key categories of successful distance learning are considered to have been negatively affected by distance learning tools and methods. These competences are not discussed further. Correspondence of other competences to learning outcomes of future managers majoring in Management is given in Table 3.

Table 3. Compliance of future managers' competences to learning outcomes

Learning outcomes	Competences	
	general	**specific**
1. know one's rights and responsibilities as a member of society, be aware of the values of civil society, the rule of law, human and civil rights and freedoms in Ukraine;	1	
2. preserve moral, cultural, scientific values and promote the achievements of society, use different types and forms of physical activity in order to lead a healthy lifestyle;		
3. demonstrate knowledge of the theory, methods and functions of management, modern leadership concepts;	9	3,5
4. demonstrate skills of problem identification and justifying managerial decisions;	11,12	10
5. describe the content of the functional areas of the organization;		3,11
6. to show skills of search, storage and the analysis of information, calculation of indicators in order to justify administrative decisions;	8	2,10
7. identify organizational design skills;		2,3

8. apply management techniques to ensure the effective operation of the organization;	13	2,5,6,7,11
9. demonstrate collaboration, leadership, teamwork skills;		5,13,15
10. have the skills to justify effective tools to motivate the organization's staff;	11	7
11. demonstrate skills of situation analysis and communication in various areas of the organization;	8	11
12. assess the legal, social and economic consequences of the organization's activity;	15	6,7,14,15
13. the ability to communicate in the national and foreign language both orally and in written form;	6,7,14	11
14. identify the causes of stress, adapt themselves and team members to the stressful situation, find ways to neutralize it;	15	13,15
15. demonstrate the ability to act in a socially responsible and civic-aware way on the basis of ethical considerations (motives), respect for diversity and multiculturalism;		6,14,15
16. demonstrate skills of independent work, flexible thinking, openness to new knowledge, critical thinking skills and self-criticism;	9,11	
17. perform research individually and / or in a group under the guidance of a leader;		9
18. demonstrate skills for safe activity in accordance with the future profile of work, industry norms and rules, as well as the required level of individual and collective level of safety in emergencies (defined by the educational institution).	16	

Source: own work based on (Standart vishchoï osviti, 2018; Kucher, Voronina, & Tarasenko, 2019).

Given the predicted learning outcomes, we believe that generic programme competences No. 1, 6, 7, 12, 13, 14, 16 (see Table 1) and special programme competences No. 2, 3, 5, 7, 13, 14, 15 (see Table 2) are acquired by student managers regardless of the form of training. In other words, the introduction of distance learning did not affect the acquisition of these competences. The remainder of the list of competences for student managers during the forced distance learning period has strengthened its applied component. Thus, it is possible to distinguish three groups of competences according to the amount of influence they experienced during forced distance learning period:

- Negative influence
- Lack of significant impact
- Positive impact

Accordingly, the third group of competences presents the biggest interest for further consideration.

3. COMPONENTS OF THE CURRICULUM FOR STUDENT MANAGERS

Consequently, the group of programme competences that have been positively affected by the intensification of distance learning includes four competences from the list of generic competences and four from the list of specific programme competences of the curriculum for the course 073 "Management" for the first (bachelor's) level. The correspondence of programme competences and learning outcomes to the components of the curriculum is presented in Table 4. It enumerates those specific learning outcomes, which, in our opinion, have had a positive impact from distance learning.

Table 4. Compliance of future managers' programme competences and learning outcomes to the components of the curriculum

Competences	Components of the curriculum	Learning outcomes	Components of the curriculum
		Generic competences	
8. Skills of using information and communication technologies;	GS 1.6, PS 2.16, PS 2.17, ES 1.8	6. to show skills of search, storage and the analysis of information, calculation of indicators;	GS 1.5, GS 1.6, GS 1.7, PS 2.2, PS 2.2.1, PS 2.5, PS 2.5.1, PS 2.6, PS 2.7, PS 2.8, PS 2.12, PS 2.15, PS 2.17, ES 1.5, ES 1.6, ES 1.8, ES 1.10
		11. demonstrate skills of situation analysis and communication in various areas of the organization;	GS 1.6, PS 2.5.4, PS 2.8, PS 2.11, PS 2.16, PS 2.17
9. ability to learn and acquire modern knowledge;	GS 1.7, PS 2.5, PS 2.5.1	15. demonstrate skills of independent work, flexible thinking, openness to new knowledge, critical thinking skills and self-criticism;	PS 2.5, PS 2.5.3, PS 2.15, PS 2.16, PS 2.17, ES 1.5, ES 1.6
11. ability to adapt and act in a new situation;	PS 2.5, PS 2.5.5, PS 2.5.7, ES 1.2	4. demonstrate skills of problem identification and justifying managerial decisions;	PS 2.3, PS 2.5, PS 2.5.4, PS 2.5.6, PS 2.5.8, PS 2.7, PS 2.10, PS 2.15, PS 2.17, ES 1.5, ES 1.7, ES 1.10
		16. demonstrate skills of independent work, flexible thinking, openness to new knowledge, critical thinking skills and self-criticism;	PS 2.5, PS 2.5.3, PS 2.15, PS 2.16, PS 2.17, ES 1.5, ES 1.6

15. ability to act on the basis of ethical considerations (motives);	GS 1.1, GS 1.3, PS 2.1, ES 1.3, ES 1.4	14. identify the causes of stress, adapt themselves and team members to the stressful situation, find ways to neutralize it;	GS 1.8, PS 2.5, PS 2.5.3, PS 2.5.5, PS 2.17, ES 1.2
Specific competences			
6. the ability to act in a socially responsible conscious way;	ES 1.3, ES 1.4	15. demonstrate the ability to act in a socially responsible and civic-aware way on the basis of ethical considerations (motives);	GS 1.1, GS 1.3, PS 2.1, PS 2.17, ES 1.3, ES 1.4, ES 1.9
9. ability to work in a team and establish interpersonal interaction while solving professional problems;	PS 2.5, PS 2.5.5, ES 1.4	16. perform research individually and/or in a group;	PS 2.5, PS 2.5.5, PS 2.7, PS 2.15, PS 2.16, PS 2.17, ES 1.5, ES 1.6, ES 1.8, ES 1.10
10. the ability to evaluate the work performed;	PS 2.5, PS 2.5.4, PS 2.5.6, PS 2.12, PS 2.15, PS 2.17, ES 1.9	4. demonstrate skills of problem identification and justifying managerial decisions;	PS 2.3, PS 2.5, PS 2.5.4, PS 2.5.6, PS 2.5.8, PS 2.7, PS 2.10, PS 2.15, PS 2.17, ES 1.5, ES 1.7, ES 1.10
11. ability to create and organize effective communication in the managerial process.	PS 2.5, PS 2.5.5, PS 2.5.6, PS 2.11, PS 2.17	11. demonstrate skills of situation analysis and communication in various areas of the organization.	GS 1.6, PS 2.5, PS 2.5.4, PS 2.8, PS 2.11, PS 2.16, PS 2.17

Notes: GS – general subjects, PS – professional subjects, ES – elective subjects

Source: own work based on (Kucher, Voronina, & Tarasenko, 2019).

Analysing the coincidences of disciplines that provide the acquisition of programme competences and relevant learning outcomes, as well as syllabi of relevant disciplines (Information portal of Dniprovsky State Technical University) we compiled a list of disciplines that demonstrated an increased applied component of competences for students majoring in Management during the distance learning period. The final list is presented in Table 5.

Table 5. The disciplines, promoting the acquisition of programme competences by future managers

Programme competences	Disciplines
Skills of using information and communication technologies	Information systems and technologies Models and methods of optimization
Ability to learn and acquire modern knowledge	Management and administration
Ability to adapt and act in a new situation	Management and administration Psychology
Ability to act on the basis of ethical considerations (motives)	Management and administration Psychology Sociology
The ability to act in a socially responsible conscious way	Philosophy Sociology
Ability to work in a team and establish interpersonal interaction in solving professional problems	Management and administration Sociology Introduction to scientific research
Ability to evaluate the work performed	Management and administration Introduction to scientific research
Ability to support the managerial process with effective communicative situations	Management and administration Information systems and technologies

Source: Own work.

Thus, the selected disciplines enrich the curriculum of the Management course by including the methods and techniques of distance learning. It should be noted that the course Management and Administration, primarily takes into account the studying module Self-Management.

Since the Law of Ukraine "On Higher Education" defines the distance form of education as "individualized process of education" (Zakon Ukraïni „Pro viŝu osvitu", 2021), it is advisable to consider a wider implementation of the asynchronous mode in the educational process. In particular, the Regulation on distance learning (Polozhennya pro distancijne navchannya, 2015) provides for the use of asynchronous mode for obtaining training materials, communication between subjects, lectures, consultations, seminars, practical classes, which include practical (assessment) work, business games, project implementation in groups, etc. In our opinion, when using distance learning technologies in training future managers attention should be focused on the following main elements recommended by the Ministry of Education and Science of Ukraine:

- digital tools for multilevel individual and group tasks (to compile a report, a multimedia presentation, a project, a video, etc.) on the material being studied;
- testing tools for formative and summative assessment with questions selected randomly from the test database for each student, as well as mixed answer options;
- tools for the teacher to assess the interaction and communication between students through a chat, forum, survey, questionnaire, etc.;

- the tools for tasks that require detailed, creative solutions (for example, cases) (Rekomendaciï ŝodo organizaciï, 2020).

However, the practical mechanism for introducing such elements into the work programmes of full-time education needs further elaboration.

CONCLUSION

Consequently, it is advisable for the educational management of the university to reconsider the structure of the curriculum and to enrich the specific curriculum of the course Management by instruments and tools of distance and online learning, since they have proved efficient for the disciplines mentioned in Table 5 and help shape future managers' competences. This process will go in stages in accordance with the Regulations on the organization of the educational process at the Dniprovsky State Technical University (Gulayev, Peremitko, & Hlushchenko et al., 2017):

- the Scientific and Methodological Council of the university receives from the Scientific and Methodological Commission of the Faculty of Management, Economics, Sociology and Philology the list of disciplines, enriched by distance learning instruments and tools, and grants the right to introduce them on a regular or more flexible basis;
- the scientific and methodological commission of the Faculty delegates to the relevant departments to adjust the syllabi of specific academic disciplines for the next academic year.

We support the view that COVID-19 should be seen not so much as a temporary solution before the academic community switches back to presence teaching mode, but more so a feasible move towards the improvement of digital teaching skills among professors and educational management (Iglesias-Pradas, 2021).

Thus, the university as a whole and individual professors thrive from ample opportunities to develop and balance teaching methods that enhance the practical acquisition of programme competences by the students.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 114–124
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THE IMPACT OF ONLINE EDUCATION ON THE STUDENT'S SUCCESS IN THE COURSE "TEACHING GEOMETRY IN PRIMARY EDUCATION"

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Abstract: *During the COVID-19 pandemic (since March 2020) the Faculty of Education at Comenius University in Bratislava immediately switched to distance learning. A part of the university online education was e-testing using the Moodle system. Lecturers had to change their standard approaches, including the introduction of online testing to their teaching. We were interested in the effect of online learning and e-testing on the level of students' knowledge gained in the course "Teaching geometry in primary education". The goal of the study was to investigate the impact of e-learning on knowledge of students of preprimary and primary education. We analyzed the students' results between 2018 and 2021 to compare the traditional teaching and testing in the paper-pencil-compass and ruler form (standard group of students) with the online form of teaching and testing (COVID group of students). Statistical methods of quantitative research were used to analyze the data separately for full-time and part-time students. The statistical analysis showed that there are no differences between the distributions of the percentage scores of standard and COVID group of full-time students. The same result was obtained for the distributions of percentage scores for standard and COVID group of part-time students. Hence, the online form of teaching and testing was equivalent to the in-person form. In addition to the percentage score of students, it is also necessary to investigate other determinants of online education and their impact on the preparation of future primary education teachers.*

Keywords: online education, distance learning, online testing, preservice primary teachers.

INTRODUCTION

The pandemic caused by the spread of the COVID-19 resulted in rapid transitions from in-person to remote learning across the world. In Slovakia, universities immediately reacted to the novel situation and transitioned from in-person to online learning within few weeks. However, over time it turned out, that the universities were not well prepared for such a prompt transition. Therefore, the lecturers had to make great effort to be able to teach online and to create electronic study materials of different types, including online tests, in a short amount of time (e.g. evaluation of the survey on distance teaching in WS 2020/2021 – teachers; evaluation of the survey on distance teaching in WS 2020/2021 – students, CIT UK, 2021). However, the real impact of these transitions from in-person to online learning on students’ remains unclear.

Overall, there are two contrasting views prevailing within literature on the impact of online learning on the students. While some authors believe students can greatly benefit from e-learning, others suggest it can have an adverse impact on students’ wellbeing. Although, online education can be as effective as in-person education (Pokorný, 2021a, 2021b). Yadav (2021) found that the pandemic had a significant impact on students’ mental and physical wellbeing. More specifically, Yadav (2021) revealed that the screen time during remote learning had an adverse impact on physical health of the students as many of them developed eye problems due to prolonged screen time. Moreover, an increased number of students were found to have mental issues during pandemic in comparison to the pre-pandemic time. Expanding previous findings, Chakraborty, Mittal, Gupta, Yadav, & Arora (2020) revealed that university students found the online education extremely stressful, and they felt that it had a considerable impact on their overall health and social life. Furthermore, Žilková, & Žilková (2021) found that university students perceived online education and e-testing to be more stressful than in-person learning. Overall, this suggests that the pandemic had a great impact on students’ overall wellbeing.

However, some authors (e.g. Spitzer & Musslick, 2021) believe that students can greatly benefit from online learning. More specifically, Spitzer & Musslick (2021) found, that the gap in performance between low- and high- achieving students narrowed during the pandemic. In other words, the authors found that low-achieving students showed greater improvement in performance in comparison to the high-achieving students. They concluded that “online learning environments may be effective in preventing educational losses associated with current and future shutdowns of schools” (Spitzer & Musslick, 2021). For example, Oproiu (2015) suggested that online education contributes to students’ development of autonomy. In fact, Oproiu (2015) claimed that learning autonomy in online learning can be achieved by using blended learning via Moodle. This is essential as recent studies found that increased autonomy in students leads to lower mathematical anxiety (Kuruc et al., 2020). Chiu (2021) revealed that providing students with digital support for remote learning supports their autonomy, competence, and relatedness. Based on self-determination theory, satisfying students’ psychological needs further increases students’ motivation to engage in online learning. On the whole, it appears that while e-learning can potentially have an adverse effect on students' overall wellbeing, this effect can be reduced by using sufficient support.

1. ONLINE LEARNING IN THE COURSE "TEACHING GEOMETRY IN PRIMARY EDUCATION"

Overall, lecturers at the Comenius University (CU) in Bratislava were aware of the potential limitations of online learning. Thus, a great effort was made to reduce the potential negative effects of online learning on the students when implementing online learning. At the Comenius university we generally used LMS Moodle and Office 365 (especially MS Teams) as base tools for education throughout the pandemic. More specifically, MS Teams was the platform for online education (e.g. lectures, consultations), LMS Moodle was the platform for sharing educational materials (e.g. texts, audio and videos, assignments, and e-testing) for students. Before the pandemic, we used Moodle mainly as a supporting environment, thus it served as an environment to blended learning.

The course "Teaching geometry in primary education" at the Faculty of Education is intended for future teachers of mathematics in primary education. The course has two main goals: to develop students' geometric thinking and to prepare students for teaching elementary geometry. Teaching geometry requires gaining theoretical knowledge as well as practical skills to solve geometrical problems and tasks. During our online education, we used various geometrical manipulatives (e.g. physical cubes or mirrors or paper folding – we used them via video camera and MS Teams) and software products (e. g. dynamic geometry system GeoGebra or our own geometrical applets retrieved from www.delmat.info). Another manipulative activities and geometric algorithms were replaced using of different software tools (e.g. e-whiteboard). Although, traditional geometry teaching significantly differs from the online teaching we believe that students can greatly benefit from both approaches to teaching.

We developed an e-course for future primary teachers named 'Teaching geometry in primary education'. The aim of this course was to aid the development of theoretical knowledge and practical skills in future primary teachers. It was important that the future primary teachers learned that they could teach geometry in-person as well as remotely. We were interested to see how the online development of the theoretical knowledge and practical skills in future primary teachers impacted their academic results. Thus, we compared the results of the students who were taught remotely with the results of the students from previous years who were taught and tested in a standard manner. Because it was not possible to use the standard approach to testing (i.e., paper-pencil-compass-ruler tests) during the pandemic, we created Moodle tests to examine students' knowledge.

2. RESEARCH

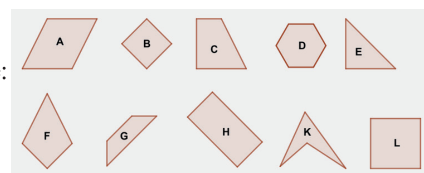
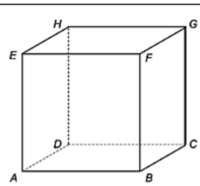
2.1. Methods of data collection, research tools

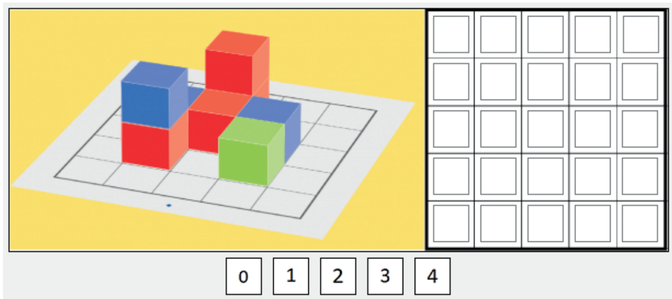
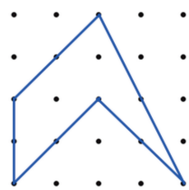
The Faculty of Education at Comenius University in Bratislava shifted to distance learning in March 2020. Therefore, the mathematical courses focusing on teaching geometry in primary education were delivered remotely. For online teaching we used the MS Teams platform which enabled the geometry lecturer to share their screen with the students. As we mentioned above, we used GeoGebra and other interactive geometry environments, for example applets. Such teaching was supported by self-study materials that were uploaded on Moodle.

During semester we examined students' knowledge by giving them two specific tests. While one test was focused on plane geometry the other one was focused on spatial geometry. Although, students usually take the paper-pencil test in which they are allowed to use compass and ruler, this was not possible due to the pandemic. Thus, it was necessary to create e-tests. We decided to perform student examination via Moodle. The content of the online test resembled the content of the traditional paper-pencil tests.

To simplify the test evaluation on Moodle, we decided to reformulate some test tasks. We used single or multiple-choice questions, dropdown questions or dichotomous (yes/no; true/false) questions, etc., to a great extent. We based formulations of distractors on our experience from previous years and presented the most common incorrect student answers. Some examples of test tasks are shown in Table 1.

Table 1. Sample tasks in a Moodle e-test

Topic/task type	Task in Moodle
Sorting of polygons task type: dropdown questions	Decide as precisely as possible: Shape A is ... Shape B is ... Shape C is ... 
Basic and derived geometric terms task type: dichotomous questions (true/false)	Let there be line segment KL. Point P belongs to line segment KL. Point M belongs to line KL and does not belong to segment KL. Point N lies behind M, so that point M lies on the ray PL. Find the truth value of statements: • Point L lies between points PN and L does not lie between MN. • Point L lies on the line PM and on ray PK • Point P lies on half-line KL or on ray LK
Mutual position of lines in space task type: dropdown questions	 Line HD is skew to line Line LF is parallel to line Line GH is intersecting to line 

Basic and derived geometric terms task type: multiple-choice question	Let there be line p. Points A, B, C, D lie on the line so that point B lies between points A and C and point A lies between points B and D. Choose which statements are false: Choose one or more answers: a) Half-line BD and half-line BA are identical half-lines b) The intersection of AD and AC is point A c) The union of half-lines BC and AD is line p d) Half-lines BC and BD are opposite
Spatial imagination – building from cubes Task type: fill by dragging to the image	Create the plan of building 
3D shapes and their attributes task type: short number answer	How many? a) regular polyhedrons b) prisms c) cuboids 
polygons and their measuring task type: short number answer	Calculate a) the area of the polygon b) perimeter of the polygon 

Source: Own work.

2.2. Objectives of the research

Overall, we attempted to create an e-test that would be an equivalent to a traditional test with regard to its content and difficulty level. Thus, the purpose of this study was to investigate whether there were any differences in student scores on the traditional testing compared to the e-testing. We were also interested in whether the results were influenced by the distance learning mode.

Q1: What effect has online education and e-testing on the results of students of the course "Teaching geometry in primary education" in comparison to the traditional education and traditional paper-pencil-ruler tests?

2.3. Research design

The research sample consisted of the students who took the course "Teaching geometry in primary education" between 2018 and 2021. Each student was taught by the same lecturer. Both full-time students and part-time students were included in the study, however, they were analysed separately as we believe that different form of the study may play a role in the ability to adapt to online teaching and testing. Full-time and part-time students were further split into two groups based on the way of teaching and testing in the semester when they attended the course. Hence, the students from summer semesters 2018 and 2019, when there was no pandemic and the standard way of teaching and testing took place, formed control (standard) group. Students from summer semesters 2020, 2021 and winter semester 2020 formed the COVID group when the teaching and testing was done online. We collected students' scores from two compulsory tests written during the semester which contributed to their final grade. We calculated percentage scores of students obtained as the sum of their total scores divided by the sum of maximum possible score. The analysis was performed on the percentage scores rather than the total scores as the total scores differed in standard and COVID semesters due to different formulation of the tasks in the online space. We assume the independence between the control groups and COVID groups as the results of the students are independent. Although, we are not able to find out the differences between the baseline knowledge of students enrolled in the course in standard or COVID semesters, we may assume it is the same. This assumption is based on our teaching experience and the fact that there were no changes in accreditation of the study programme, conditions of admission to the faculty or enrollment in the course. For all tests we use the significance level $\alpha = 0.05$.

2.4. Results and discussion

2.4.1. Full-time students

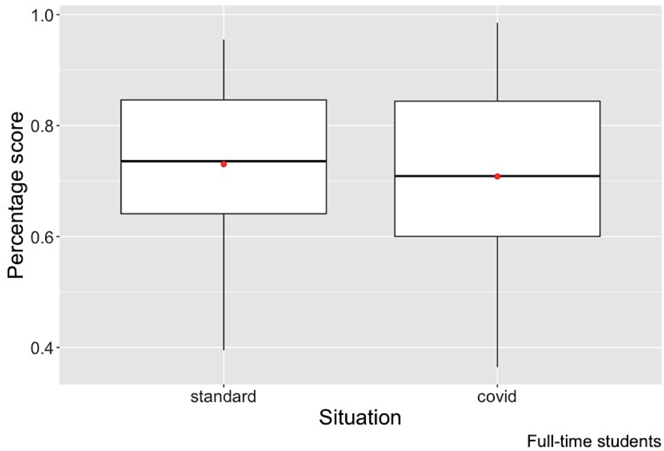
At first, the analysis was performed on the percentage scores of the full-time students. The basic characteristics of the data is displayed in Table 2, where n denotes the number of full-time students in given groups. We see that the sample size (n) for the COVID group is higher than for the standard group. The mean percentage scores and the medians are very similar in both groups indicating symmetric distributions within the groups. The standard deviations are relatively alike in both groups.

Table 2. Characteristics of the data for full-time students

Pandemic situation	n	Mean	Median	Standard deviation
standard	*91*	0.731	0.736	0.134
COVID	129	0.708	0.709	0.146

Source: Own work.

The observations made about the distributions of the data from Table 2 are also supported by a boxplot (Figure 1). The box is constructed from the 25% and 75% quartiles, the middle line shows the median percentage score, the mean is illustrated with the red dot. There are no outlying values in the percentage scores of full-time students. The same lengths of the whiskers at both ends of both boxes suggest again symmetrical distributions of percentage scores in both groups.



F i g u r e 1. The boxplots of the percentage score of full-time students

S o u r c e: Own work.

In Table 2 we observed that both the mean and the median are slightly higher for the standard group. The aim of the analysis is to use hypotheses testing to find out whether the observed difference between the groups is statistically significant. First, we tested for normality in the groups as the boxplots indicate symmetrical distribution. We test for normality using Shapiro-Wilk test, which is chosen from the tests of normality because of relatively small sample sizes in the groups. The null hypothesis about the normality of the percentage scores was rejected at the significance level 0.05 in both groups (p-value for standard group 0.017, p-value for COVID group 0.030). Hence, the percentage scores of students are not normally distributed on the significance level 0.05 and we have to use non-parametric test instead of parametric test. Based on the literature review we were not able to assume anything about the underlying distributions, thus, we chose the two-sample Kolmogorov-Smirnov test in order to test for any differences in the distributions. Because there are contrasting views in the literature regarding the effect of online learning on students' performances, we used the two-sided alternative. We test the null hypothesis that there is no difference between the standard and COVID group against the alternative that there is a difference. The value of the test statistics is $D = 0.150$ and the corresponding p-value 0.180, thus the null hypothesis about the equality of the distributions of standard and COVID group was not rejected at the significance level 0.05. Therefore, there is not a significant difference between the distribution of percentage scores of the group of full-time students who were taught and tested face-to-face and the group of full-time students who were taught and tested online.

2.4.2. Part-time students

The same analysis was performed on the percentage scores of part-time students. The basic characteristics of the two groups of part-time students is displayed in Table 3. The number of students in both groups is this time approximately the same. The median values and the mean values were a bit different, mainly in the standard group. The mean value was greater for the COVID group, and the median was also slightly higher for the COVID group. The standard deviation was slightly higher for the standard group. These characteristics suggest that the distribution of the percentage scores for the standard group of part-time students is left-skewed.

Table 3. Characteristics of the data for part-time students

Pandemic situation	n	Mean	Median	Standard deviation
standard	*50*	0.635	0.700	0.194
COVID	46	0.717	0.732	0.161

Source: Own work.

We used a boxplot (see Figure 2) to illustrate the distributions of the percentage scores for both groups of part-time students. In both groups there was a low percentage score marked as an outlier from the distribution. The distribution in the standard group might be also heavy-tailed and it seemed to differ from the distribution of the percentage scores in COVID group.

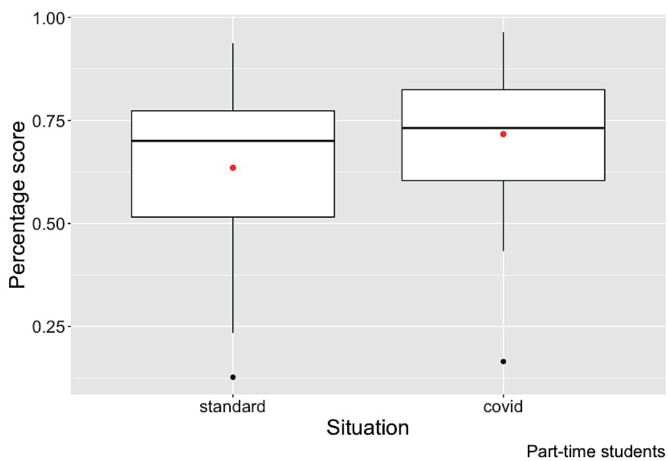


Figure 2. The boxplots of the percentage score of part-time students

Source: Own work.

The observations about distributions are confirmed by the Shapiro-Wilk test of normality. This test rejects the null hypothesis about the normality of the data in both groups (p-value for standard group 0.006, p-value for COVID group 0.032). The underlying distributions are unknown. Hence, we again used the non-parametric two-sample Kolmogorov-Smirnov test with two-sided alternative to find out whether the differences in the distributions suspected in the characteristics of the groups in Table 3 and visible in the boxplots in Figure 2 are statistically significant. We test the null hypothesis that the distributions of data are equal in the standard and COVID group against the alternative that there is a difference between the distributions. The value of the test statistics was $D = 0.255$ and the corresponding p-value was 0.09. Thus, the null hypothesis about the equality of the distributions of percentage scores of part-time students in the standard and COVID groups was not rejected at the significance level 0.05. Thus, the differences in the distributions of the data were not statistically significant.

In general, we found that the percentage scores of both full-time and part-time students in standard and COVID groups were not normally distributed and that the distribution of the percentage score might be considered equal for those two groups at the significance level 0.05. These results suggest that both the online form of teaching and the online form of testing do not have any impact on the students' performance in the course "Teaching geometry in primary education". Thus, we may conclude that the online version of the test is a good alternative to the paper test and the teaching form was well adjusted to the online environment. At the same time, we realise the limitations of our research which was conducted on a small sample size and some of the assumptions had to be made without testing them. First of all, the independence of the percentage scores of students might be violated as we included students from several years and they could share the tasks from the tests. Also, we assumed the same baseline knowledge of the students which should be formally tested and further research needs to be done taking this into consideration. The biggest limitation is the online form of testing itself. There is no possibility of guaranteeing the same conditions of writing the test online as in the class. We are not able to fully ensure that the students do not help each other or have any other means of help during the test although they are fully monitored via MS Teams. Also, the tests themselves needed to be modified in order to be used online and provided more possibilities of guessing the correct answer (multiple choice and dichotomous questions, drop-down selection).

CONCLUSION

E-learning and e-testing became a key part of the distance learning at universities during the COVID-19 pandemic, thus also at the Comenius University in Bratislava. Distance learning of the course "Teaching geometry in primary education" at the Faculty of Pedagogics was conducted via MS Teams and students could also use study materials on Moodle. While teaching online, we presented activities with real manipulatives using video camera in MS Teams environment and also virtual manipulatives in the interactive applet environment (www.delmat.info). Additional geometric situations were modelled with the help of the dynamic geometry software GeoGebra. E-testing was done in Moodle. We investigated the impact of the e-learning and e-testing forms on the students' results in the course "Teaching geometry in primary education" and compared them with the results (percentage scores) of students from previous years. We found no statistically significant differences between

the distributions of the percentage scores of groups of students enrolled in the course before the pandemic situation and the group of students taught and tested online due to COVID situation. These results were obtained for the full-time students as well as for the part-time students. Therefore, we showed that the online version of the test was a good alternative to the paper test and the teaching form was well adjusted to the online environment, so the e-learning and e-testing were equivalent to the standard form of education. Thus, the present results are in line with previous findings (e.g. Pokorný, 2021a, 2021b) suggesting that online education is an appropriate alternative to traditional education. At the same time, we have to take into consideration the limits of the research which was performed at only one university and in only one course. For the objectivity, we need to state that according to the students' opinions they prefer contact teaching to online teaching. Žilková & Žilková (2021) identified students' anxiety connected with e-testing in the same course. We consider the stress and anxiety to be a subject of further investigation. That is because the aim of mathematical and geometrical preparation for future teachers is not only to help them succeed in their course work but also to increase their levels of satisfaction.
Moawad (2020) also found that the most frequent stressor reported by students is the uncertainty regarding the end of semester, the fairness of online exams and assignments as well as their own ability to understand and comprehend the lectures. Another stress factor identified by students was related to the online submission of the exams and assignments. Moawad (2020) suggests that it is because successful course work submission is determined by the speed and strength of internet connection. Thus, when submitting online, students have to rely on external factors which elevates their stress levels. Therefore, we seek to investigate the relationship between the students' test performances and stress levels in the next stage of our research. Gopal, Singh, & Aggarwal (2021) observed the effect of online teaching on students' performance during the COVID-19 pandemic. The results revealed four factors that had an impact on students' satisfaction: quality of lecturer, course design, prompt feedback, and student's expectations. Subsequently, students' satisfaction had a positive impact on their overall performance (Gopal, Singh, & Aggarwal, 2021). However, in our course, we attempted to reduce the differences between in-person and remote approaches to teaching (the lecturer and the course content remained the same, students received feedback on regular basis). Thus, we believe that the students' results were comparable, and no significant differences were found between the pre-pandemic time and during the pandemic.

ACKNOWLEDGEMENTS

The study was supported by the grant VEGA 1/0592/20 Gender aspect mathematical anxiety of young school children.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 125–136
https://doi.org/10.34916/el.2021.13.11

PEDAGOGICAL GOAL-SETTING IN A DIGITAL ENVIRONMENT: PROBLEM ACTUALIZATION

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Abstract: *The pedagogical activity strategic goals are associated with current trends in social development and society digitization. The goal-setting aspect of pedagogical competence is of particular importance in terms of changing demands for education and the increasing diversity of the digital educational environment. The "second digital divide" is clearly manifested in pedagogical activity by significant differences in the goal-setting of teachers who effectively, creatively apply digital technologies, and activities in a traditional paradigm. Constant updating of pedagogical priorities requires further multifaceted research.*
The purpose of the study is to review goal-setting perceptions by school teachers and academic teachers. Research methods: theoretical methods of studying psychological and pedagogical scientific publications associated with the problem of pedagogical goal-setting, as well as quantitative research methods, particularly anonymous surveys. The study supports the conclusion that significant pedagogical goal-setting transformation in the modern educational environment is crucial. The detected problem: the overwhelming majority of teachers do not perceive the importance of digital skills, soft skills and lifelong learning goals. It is required to adjust the advanced professional programs content for future teachers and for academic teachers in sections that contribute to shaping goal-setting skills to reflect the multifaceted capabilities of the digital environment.

Keywords: pedagogical goal-setting; digital educational environment; pedagogical competence; advanced professional programs.

INTRODUCTION

According to Leontiev (Leontiev, 1978) activity theory, goal-setting is a basis for any human activity. The professional activity goals have multiple relationships with the socio-cultural conditions, society demands, professional values, etc. Goal-setting is always associated with understanding and anticipation of an activity result. The general strategic pedagogical activity goals are of particular importance, predetermining particular goals in professional practice and continuous professional development. The strategic modern teacher goal-setting rests on the current and long-term society and education development trends, in particular "digital transformation of education aimed at the availability of quality education and conditions for personal comprehensive development in changing world" (Global Education Futures, 2014; Future Skills for the 2020s, 2021). Strategic goals specification stressing aspiration to enrich and transform learning outcomes can be detected in official documents, predictive scientific publications and manifestos related to the development of the digital educational environment. Long-range goals have significant differences in comparison with traditional ones and require teacher's decisions to make changes in professional activity.

The official Ministry of Education of Russia guidelines for digital technologies adoption in the main general education programs highlighted the importance of "attunement among all members of the teaching staff regarding the goals, desired actions for effective response and management of changes in an uncertain and dynamic environment, overcoming the traditional educational problems of the industrial paradigm of education" (Ministry of Education of Russia, 2020).

E-learning and distance learning technologies have continued to expand at different education stages, and the availability of open educational content has significantly increased. If during the period of forced distance learning, all efforts were aimed at ensuring learning continuity, then after returning to classrooms and auditoriums, teachers clearly had felt the need for a new comprehension of digital technologies purpose based on the learner's and teacher's new experience. To what extent do teachers perceive the problem of changing professional goal-setting in a digital educational environment as relevant? A basic assumption of the study is that an insufficiently shaped perspective of pedagogical activity objectives in a digital environment prevents goal-setting in specific pedagogical situations adequate to the rich open networked information space facilities, changing demands for education, and student's requirements. In all current instructional programs for future teachers, professional ICT competencies are shaped, and in continuous professional development, teachers learn how to use various digital tools. But this is clearly not enough to produce innovative educational outcomes. The study focuses on the need for a significant transformation of pedagogical goals and objectives.

Therefore, following the identified problems, the purpose of the study is to review the understanding of core changing issues in pedagogical goal-setting in a digital educational environment for school teachers and academic teachers.

1. LITERATURE REVIEW

The pedagogical goal-setting issues have been studied in various contexts, and a fundamental role in professional activities and educational interaction has been identified (Kuzmina, 1970; Markova, 1993; Louws et al., 2017; Bakkenes et al., 2010; Laurillard, 2002, etc.). Gumerova distinguishes the following functions of pedagogical goal-setting: “orientation-motivational, design-executive, organization-stimulating, analytical and diagnostic” (Gumerova, 2007). The system of functions substantiated by the author demonstrates that professional activity meaningful goals and priorities predetermine the solution of all teachers’ professional tasks.

The importance of focusing pedagogical goal setting on 21st century skills and technology integration stressed in numerous publications (Teo et al., 2021; Kennedy & Sundberg, 2020; Desimone & Garet, 2015). Authors identify such important new learning objectives as «to prepare students for handling the complexity of modern societies with the globe call for 21st century skills» (Kennedy & Sundberg, 2020). In the modern sense, teaching involves a close integration of substantive objectives and «involving students in reflection and discussions in line with 21st century skills» (Desimone & Garet, 2015), including teachers’ capacity to develop students’ digital information and communication skills (Claro et al., 2018).

The new educational results framework associated with the need to change the nature of educational interaction substantially and to apply “sophisticated forms of teaching to develop 21st century student competencies” (Darling-Hammond et al., 2017). The peculiarity of the modern educational situation presented by focusing pedagogical activity not only on more effective ways to achieve traditional educational results but also ahead of time, on building together with learners an image of near-future society demanded outcomes. It is becoming increasingly important to address 21st-Century Skills and 21st-Century Digital Skills (Berit et al., 2021; Sberbank, 2018), soft skills (Wats & Wats, 2009), student’s involvement in the implementation of “lifelong learning” strategy (Aspin & Chapman, 2007). Meaningful skills named “new technical skills to prepare for a new wave of the Fourth Industrial Revolution in the ‘20s”, “basic skills that increase human adaptability, future-readiness, and proactive behavior” were suggested to move “from elite/top tier education into mass-scale education, and become part of the fundamental skill set that makes professionals employable and successful in the 2020s” (Future Skills for the 2020s. A New Hope. Fall 2020).

The level of professional ability to use digital teaching technologies is reflected not only in the ability to use certain tools, but also in the capabilities to set adequate goals for students’ learning and development, which requires a deep understanding of transformative role of digital technology in education. Researchers assign categories of teachers depending on how they “perceive their own place and role vis-à-vis the digital revolution: 1) outside observers; 2) circumspect participants; 3) conscientious participants” (Tsybulsky & Levin, 2019). Louws et al. explored “the relationships between teachers’ self-articulated professional learning goals and their current professional concerns” (Louws et al., 2017) and indicated that current professional concerns are largely attributable to the need to change their professional activities in the process of society and education digitization. Researchers of modern transformational processes in education emphasize that “On the one hand, teachers are supposed to use technology in their instruction in a way that is conducive to achieving meaningful pedagogical goals; on the other, teachers may be supposed to integrate new content into their instruction or change the instructional focus due to the digital transformation” (Guggemos et al., 2021).

Naturally, many teachers do not immediately perceive the need to enrich and change the range of educational goals. Webster-Wright (2009) remarks that teachers detect some professional development directions "next to useless" if they do not feel alignment with personally conscious goals.

The importance of identifying new pedagogical priorities in the process of dynamic digitization of society and education is emphasized in many studies, and these priorities should be manifested at all interrelated levels of pedagogical goal-setting. N. Gumerova states that "the process of pedagogical goal-setting is creative in nature since all its functions are associated with the search for the most effective, flexible operational and technological ways of teaching and professional upbringing" (Gumerova, 2008). In conditions of multidimensional pedagogical goal-setting, and the impossibility to identify uniform learning outcomes, the need to improve pedagogical goal-setting competences increases dramatically. Researchers have different perspectives on the problem of pedagogical goal-setting in the digitization of the education context. For example, Blinov et al. (2019) argue that in the didactic triad "expected results – content – forms and methods", digitization shifts the emphasis to forms and teaching methods. Authors affirm that "the primacy of forms and teaching methods over goals and expected results means a certain liberalization of learning aimed at individualization and personalization" (Blinov et al., 2019). Noskova (2020) reveals the influence of new digital tools on changing personal activities (goals, motives, operations and results), highlighting the importance of new goals setting and striving for new facets of the education quality that are inaccessible with previous teaching and learning practices.

Changing demands for education and increasing the variety of learning opportunities in an open information environment can be interpreted as a problematic situation in the educational process that requires significant changes in the teacher's activities. Interpreting problems directly related to the competence of pedagogical goal-setting in the digital environment, researchers note the "second digital divide" (Warschauer, 2003; Fishman et al., 2016), caused by significant differences in the activities of persons who productively, creatively apply multifunctional digital technologies, focusing on innovative results, and digital activities in the traditional paradigm. The greatest contribution to this gap is made precisely by the differences in pedagogical goal-setting in the changing educational environment.

2. METHODOLOGY

The study was carried out using theoretical methods of reviewing scientific publications on the problem of pedagogical goal-setting, as well as quantitative research methods, in particular, anonymous surveys.

The survey as a part of advanced training was conducted when trainees had already studied modules contributing to an innovative pedagogical perspective in the digital environment. But at the same time, it was taken into account that a significant change in teacher's professional position cannot be provided by even the most informative classes. It required personal experience, confirming the feasibility of innovative goals and ways to achieve them.

It has been hypothesized that an adequate change in pedagogical goal-setting ensures the functioning of the digital educational environment not as supplementary means in the learning process, but as a complex of innovative conditions for student's learning, development and socialisation.

The features of pedagogical goal-setting in a digital environment were tested using a questionnaire, divided into 5 blocks.

The questions of block 1 were designed to identify the survey participants' perception of general differences in pedagogical goal-setting in a traditional and digital educational environment.

The questions of block 2 were focused on identifying the respondents' ideas about the relationship between pedagogical goal-setting and educational facilities of the digital environment.

Block 3 aimed at identifying the participants' awareness of changes in pedagogical goal-setting, taking into account the information society and the digital economy demands.

Block 4 is focused on identifying the importance of pedagogical goal-setting in the soft skills area.

Block 5 is associated with identifying the importance of pedagogical goal-setting in a digital environment, taking into account the adoption of the long-life learning strategy.

Block 6 allows identifying the aspirations to improve the competence of pedagogical goal-setting in a digital environment.

The answers structure in each questionnaire block was set by the SAMR model (Substitution, Augmentation, Modification, Redefinition) of the ICT influence on the educational process (Puentedura, 2013).

The answers in all questionnaire blocks corresponded to 4 levels (L1–L4), where L1 matches the absence of changes in pedagogical goal-setting in the digital environment, L2 reflects functional improvement in traditional goals realising, L3 confirms the need to redesign pedagogical goals, and L4 is the level of significant goal-setting transformation in line with the innovative digital environment capacity considering new society demands for education.

Experimental work was carried out with the group of teachers in frame of the professional improvement program "Teacher of the Future" and with the group of pedagogical university academic teachers participating in an in-service training program related to the learning design in a digital environment. The selection of pilot groups was determined by the importance to assess and correlate the situation with goal-setting and priorities in a digital environment for current teachers, and for academic teachers providing professional training for future education specialists. The survey received responses from 148 teachers (49 academic teachers and 99 school teachers).

3. RESULTS

For each questionnaire block, obtained data were analysed for two groups of survey participants, school teachers and pedagogical university academic teachers. Before the survey started, the discussion aimed at systematizing the digital environment educational facilities had been carried out. But as expected, the discussion did not have a decisive influence on the survey results, since its participants relied mainly on their own experience and an established system of pedagogical views. The survey results clearly demonstrate the teachers' cautious attitude to significant changes in pedagogical goal-setting in changing educational environment (Table 1). Since the school teachers and academic teachers answers did not show significant differences, the averaged values were analysed. Some differences by groups will be noted in the text.

Table 1. Results of anonymous school teachers and pedagogical university academic teachers survey on the problem of pedagogical goal-setting in a digital environment

Question Blocks	Groups of respondents	Answers by levels			
QB1. General differences in pedagogical goal-setting in a traditional and digital educational environment		L1	L2	L3	L4
		No difference	A digital educational environment expand the scope to achieve traditional goals	A digital educational environment supports to expand the range of pedagogical goals	A digital educational environment significant transformation of pedagogical goals
	School teachers (%)	54	20	22	4
	Academic teachers (%)	50	24	14	12
QB2. Ideas on the relationship between pedagogical goal-setting and educational facilities of the digital environment		The educational facilities of a digital environment contribute to the achievement of the traditional goals	The educational facilities of a digital environment enrich opportunities to achieve traditional goals	The educational facilities of a digital environment should support the goals of developing digital skills	In a digital environment should be substantially transformed interconnected pedagogical goal-setting and educational conditions
	School teachers (%)	46	29	23	2
	Academic teachers (%)	42	35	17	6

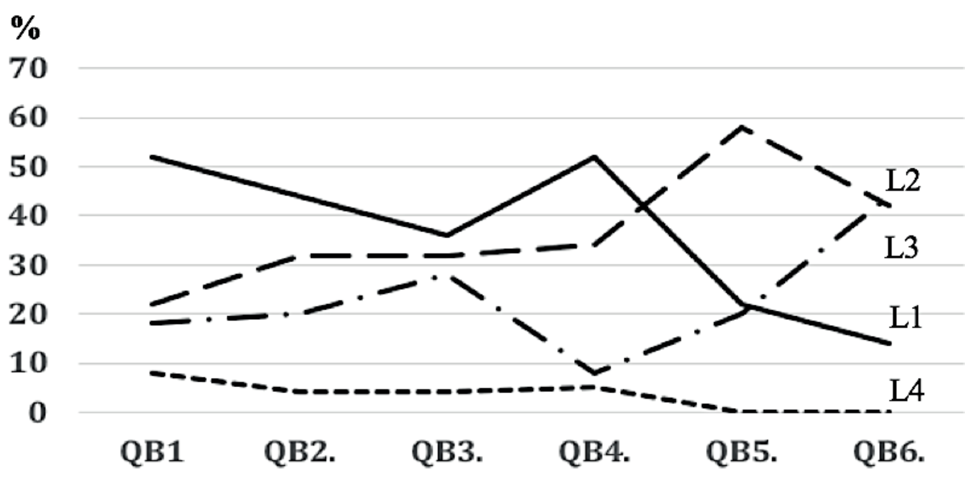
QB3. Revealing awareness of changes in pedagogical goal-setting, considering information society and the digital economy demands		Do not see significant changes	The goals do not change significantly, but the possibilities to achieve them change. Incidentally new demanded skills are shaping	The goals of shaping digital skills and information culture are attached to the traditional educational goals	A significant transformation of educational goals is required in line with changing demands of the information society and the digital economy
	School teachers (%)	34	36	26	4
	Academic teachers (%)	38	28	30	4
QB4. Revealing the importance of goal-setting considering soft skills shaping in a digital environment		Do not see significant changes	Digital environment supports new opportunities for soft skills shaping	Digital environment enables to expand the range of goal-setting considering soft skills shaping	Digital environment provides a significant transformation of goal-setting considering soft skills shaping
	School teachers (%)	48	34	10	8
	Academic teachers (%)	56	34	6	4
QB5. Identifying the importance of pedagogical goal-setting in a digital environment considering lifelong learning		Do not see significant changes	Digital environment allows teachers to demonstrate 'lifelong learning' potential	Digital environment permits to expand the range of goals, encouraging learners to adopt a lifelong learning strategy	Digital environment requires a significant educational goals transformation to ensure students inclusion in implementation of «lifelong learning» strategy
	School teachers (%)	23	61	16	0
	Academic teachers (%)	21	55	24	0

QB6. Revealing the desire to improve the competence of pedagogical goal-setting in a digital environment		Currently, I don't feel such a desire	I should comprehend this problem	I strive to master new competencies of pedagogical goal-setting в in a digital environment	A significant transformation of pedagogical goal-setting in a digital environment required
	School teachers (%)	16	40	42	2
	Academic teachers (%)	12	43	45	0

Student's t-test detected no statistically significant difference between groups of school and academic teachers. The survey results clearly demonstrate the unwillingness of the majority of teachers and instructors to change significantly their professional position on pedagogical goal-setting in a digital environment. Analysis of the answers distribution by levels will reveal the most problematic areas of goal-setting (Figure 1).

The answers related to the significant transformation level of pedagogical goal-setting in a digital environment L4 are consistently at a low level, tending to zero. This testifies to the seriousness of the discrepancy between the available modern digital educational environment facilities and pedagogical goal-setting.

The answers related to the modification level of pedagogical goal-setting in a digital environment L3 demonstrate an unstable tendency.



F i g u r e 1. Distribution of anonymous survey results on the problem of pedagogical goal-setting in a digital educational environment by levels

S o u r c e: Own work.

Survey respondents attributed more significance in pedagogical goal-setting to information society demands and the strategy of "lifelong learning" than goal-setting in the soft skills area. At the same time, it should be noted that 44% of respondents noted their own desire to master a new goal-setting competence in a digital environment. But since clear goals vision in changing information and socio-cultural conditions has not been shaped for the majority of survey participants, only 2% confirmed that they are currently aware of the need for a significant transformation of pedagogical goal-setting. Therefore, the overwhelming majority of teachers are still perceiving new information, communication and regulatory learning conditions as an expansion of opportunities to achieve traditional educational goals.

Both school and academic teachers do not yet attach sufficient importance to the purposeful development of students' soft skills. To a greater extent, university teachers are aware they need to purposefully undertake focused actions that improve students' longlife learning activity. Apparently, such results reflect the international educational platforms progress, and the implementation of the Open Education project, enhancing opportunities for active, motivated students not to limit their learning route by educational program disciplines.

The most positive and encouraging survey result is the overlapping of L1 and L3 graphs in QB6 section. Only 14% of teachers answered that they did not see the need to improve the goal-setting competence in a digital environment. Almost 42% of the respondents chose the answer "I need to comprehend this problem".

4. DISCUSSION

Undoubtedly, learning interaction in a digital environment empowers students with learning actions freedom with various digital resources, tools and communication methods. Free action choice reflecting personal capacities and preferences is the basis for the personal learning route. At the same time, we understand that the variability of the learner's actions will be in demand only in case of sufficient variability of learning goals. The main purpose of the pedagogical activity is to convey the idea of a multicomponent composition of perspective educational goals and results, which also generate a demand for the enrichment of the assessment system in a digital educational environment. In most examples of pedagogical practice, even the digital tools are actively applied in the learning process, the final assessment is carried out according to traditional principles.

Changing pedagogical goal-setting in the digital environment is a factor in significant changes in all professional functions. In this regard, a special role is played by the prognostic function, which ensures the construction of complex criterion-prognostic scenarios, reflecting the teacher's understanding of promising requests for educational results. Taking into account the general complication of educational results, the skills of decomposing pedagogical goals and creating conditions for their understanding and acceptance by students acquire special importance. Therefore, a key direction in improving educational programs is to stimulate teachers perception of a digital environment as a new educational reality that requires innovative goal-setting. The "mobility" of goal-setting in a digital environment becomes an integral attribute of the pedagogical activity, aimed at equipping students for success in their future professional activities.

The study confirms that in mass pedagogical practice, there has not been sufficient focus on the idea of a close connection between encouraging demands for education and the digital educational environment, reflecting society current development trends. Consequently, the problem of pedagogical goal-setting in the changing sociocultural and informational conditions is significantly actualized.

CONCLUSION

The obtained survey results lead to the conclusion that the pedagogical goal-setting issue appeared to require further research and study. The modern educational environment contains two parts: the traditional classroom interactions and the digital environment as an innovative educational activities complex. They are not always perceived by teachers as interrelated and mutually influencing. This is evidenced by a survey conducted among school and university teachers on the possibilities of enhanced pedagogical goal-setting in the digital environment. Unfortunately, more than 70% of teachers do not see significant differences nor attribute the potential of the digital environment to the expansion of traditional educational goals. But while answering questions about matching the possibilities of the digital environment to the new challenges of education, more than 50% of teachers chose options that a digital environment supports new opportunities and permits to expand the range of learning goals. More than 40% of teachers perceive the problem to improve the competence of pedagogical goal-setting in a digital environment as relevant. About 40% of teachers are willing to comprehend this problem in the future. The study results revealed a clear revision trend of the teacher's professional priorities in the progressive digital environment.

This unavoidably increases the value of further research of the pedagogical goal-setting, and consequently, the problems of disclosing the innovative pedagogical potential of a digital environment. The results of such research are urgently needed to strengthen the advanced professional programs content for future teachers and for academic teachers in sections that contribute to shaping skills in order to realize and set specific, controlled educational goals reflecting the multifaceted digital environment potential.

ACKNOWLEDGEMENTS

The research was supported by the Ministry of Science and Higher Education of the Russian Federation (project No. FSZN-2020-0027).

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 137–150
https://doi.org/10.34916/el.2021.13.12

PRELIMINARY ANALYSIS OF THE DEVELOPMENT AND IMPLEMENTATION OF THE MOOC PROJECT: A CASE STUDY

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Abstract: *This study describes the aims, structure and content of MOOCs "Contemporary ICT tools and innovative methods of creative education", developed by the international research group within the project "Direction to the MOOCs". It sheds light on the pedagogy of its development and the content of the MOOCs modules. The study also analyses the students' feedback after their participation in MOOCs, concerning their satisfaction with the MOOCs content, volume, the course difficulty, and its technical operation. The obtained and analysed data allowed us to trace the positive dynamics between the 1st and 2nd editions of MOOCs implemented in 2020 and 2021 in Polish in terms of their quality and student satisfaction.*

Keywords: MOOCs, Navoica, evaluation, online learning, survey.

INTRODUCTION

Recently, MOOC has been in the centre of all education stakeholders but it must be stressed 'all MOOCs are not created equal' and there are lots of species of MOOCs. This is good and we must learn from these experiments to move forward and not get bogged down in old traditionalist and modernist arguments. MOOCs will inform and shape what we do within and without institutions. What is important is to focus on the real needs of real learners (Clark, 2013).

BACKGROUND RESEARCH

Before the global transfer to online learning in 2019, MOOCs had been actively discussed in the mass media and academic research from the point of view of their credibility, quality of their content and teaching methods, interactivity, theoretical and practical applicability, economic aspects, market strategies, universities' competitions and so on (Jansen & Goes-Daniels, 2016; Sekret et al., 2019a, 2019b).

After returning to the predominantly traditional education, the question of MOOC can be already speculated upon from a position that has been enriched with the abundant experience of online learning synchronously and asynchronously in different learning groups, together with the experience of developing MOOCs and their delivery to students.

In the most common sense, MOOCs are defined as a free web-based distance learning program that is designed for large numbers of geographically dispersed students. Bali (2014), discussing the pedagogy of MOOCs, draws attention to different formats of MOOCs, namely cMOOCs, driven by connectivism and xMOOCs, which were developed as regular university courses converted to a MOOC format (Bali, 2014).

According to the connectivist approach, learning should be viewed as a network phenomenon, influenced by socialization and technology. cMOOCs, driven by a connectivist pedagogy, rely extensively on the usage of social media as a means of constructing knowledge through social connections and evolve in most cases as professional development activities (Bali, 2014; Sekret, 2016). Learners with a high degree of autonomy, flexibility, and technological skill can benefit from cMOOCs, as they can connect with other participants. xMOOCs are influenced mostly by cognitive-behaviorism and some social constructivism (Rodriguez, 2012), are more structured and follow the more traditional pedagogy of face-to-face learning. Finally, they have been modified for an online learning environment.

Among the benefits of MOOCs, regardless of the pedagogy they are based on, these benefits are as follows (Sekret et al., 2019b):

1. Courses are offered free-of-charge to any number of people from anywhere and anytime, enabling access to higher education and beyond for people who cannot afford a formal education and belong to disadvantaged groups.
2. MOOCs can reduce the gap between the skills and aptitudes of university graduates and the needs of the global market by targeting the skills and knowledge which are in a requirement to gain employment.
3. MOOCs can focus on job-oriented training for students of any age and at any stage of their career to adjust to the changing needs of the society and market.
4. MOOCs emerged from the open education movement and are supposed to enable free access to high-quality content and resources, which might be too costly to be produced by one educational establishment or inaccessible for students from different countries, as well as experiencing different kinds of limitations to take up a full education program.

According to the present evidence, the provision of MOOCs in Europe and other continents tends to grow, though the implementation of MOOCs may be hindered because of diverse languages, cultures, settings, pedagogies, technologies and other reasons (Jansen & Goes-Daniels, 2016; Sekret, 2016, 2019a, 2019b).

Hollands & Kazi (2019), in their discussion of MOOCs, mention that most of the institutions which developed and implemented MOOCs reported that

1. the implementation of MOOCs helped them extend their reach and improve access to their educational services;
2. they managed to succeed in enhancing their institution brand in their country and abroad; and
3. the MOOCs experience inspired many instructors to reconsider their teaching methods and experiment with innovative strategies (Hollands & Kazi, 2019).

The theoretical and practical aspects of developing MOOCs were also widely discussed in multinational contexts (Smyrnova-Trybulska et al., 2016, 2019).

In this study we are going to:

1. describe the structure and the content of MOOCs "Contemporary ICT tools and innovative methods of creative education", which have been developed by the international research group within the project "Direction to the MOOCs", focussing on the content of the modules, their technological accomplishment on the platform "Navoica" and evaluation criteria;
2. analyze the data received as the students' feedback after they participated in the course concerning their satisfaction with the MOOCs content, volume, the course difficulty, as well as its technical operation.

1. ABOUT THE PROJECT "DIRECTION TO THE MOOCS" AND "MOOCS FOR SCIENCES OF EDUCATION"

The project "Direction to the MOOCs" (Project POWER 3.1) includes the creation and implementation of one of the following two types of courses in the form of e-learning. That is an educational course for students as an additional element of the education process at its first or second cycles. Massive Open Educational Course (MOOC) was designed to be available for all attendees.

As is known, MOOCs must be free and available to the public. The courses selected for funding were placed on a specially created platform, and administered by the Ministry of Science and Higher Education.

The platform, based on the Polish Open EdX platform hosts all e-learning / MOOC courses. The Open edX platform is released as Open-Source software under the AGPL license.

The project lasts no more than 24 months.

The minimum number of participants in educational courses is 35, and in the case of Massive Open Educational Courses is 40.

Additional bonus criteria of online courses are as follows:

- Preparation and implementation of the course in a foreign language simultaneously with;
- Prepared courses must be available and conducted for at least 24 months from the project completion date. The MOOC audience includes several categories of users and learners (Figure 1).

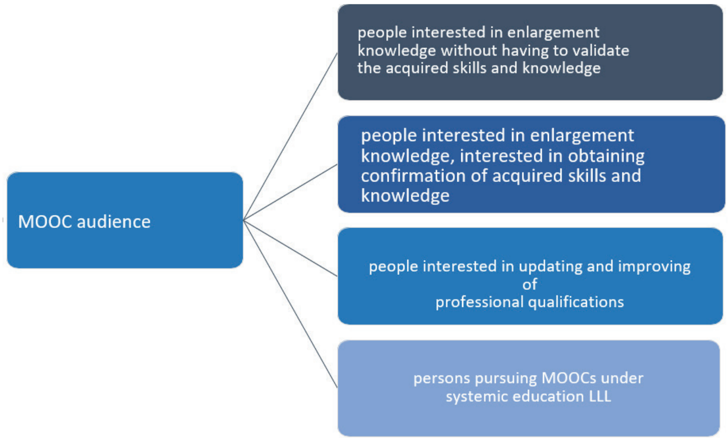


Figure 1. The MOOC audience includes several categories of users and learners

Source: Own work, based on Grodecka, K. et al. (2019).

“MOOCs for Sciences of Education” Project includes five MOOCs:

1. “Contemporary ICT Tools and Innovative Methods of Creative Education.” (coordinator dr hab. Eugenia Smyrnova-Trybulska prof. UŚ)
2. “How to Use Commas to Make Sentences Make Sense” (coordinator by dr hab. Małgorzata Bortliczek prof. UŚ)
3. “Entrepreneurship for the Youngest Students” (coordinator Dr. Renata Raszka)
4. “Introduction to Computational Thinking” (coordinator Dr. Tomasz Kopczyński)
5. “Sources of Scientific Information in the Internet Environment” (coordinator dr hab. Eugenia Smyrnova-Trybulska prof. UŚ) (Figure 2).

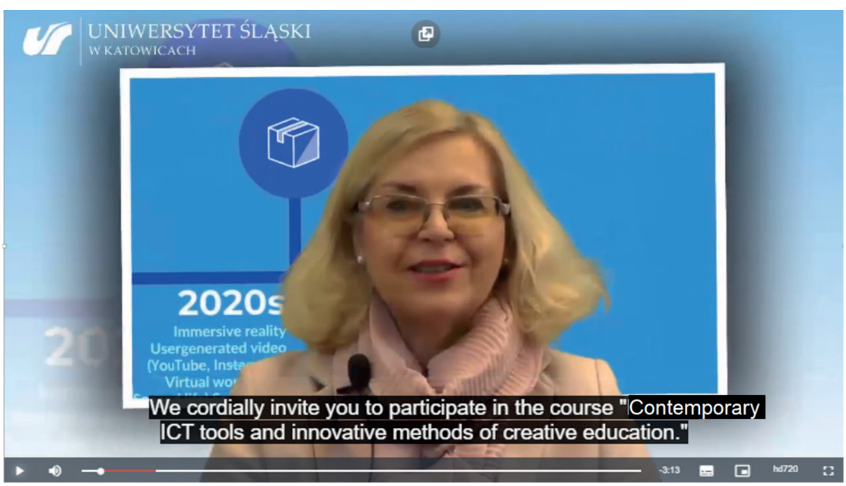
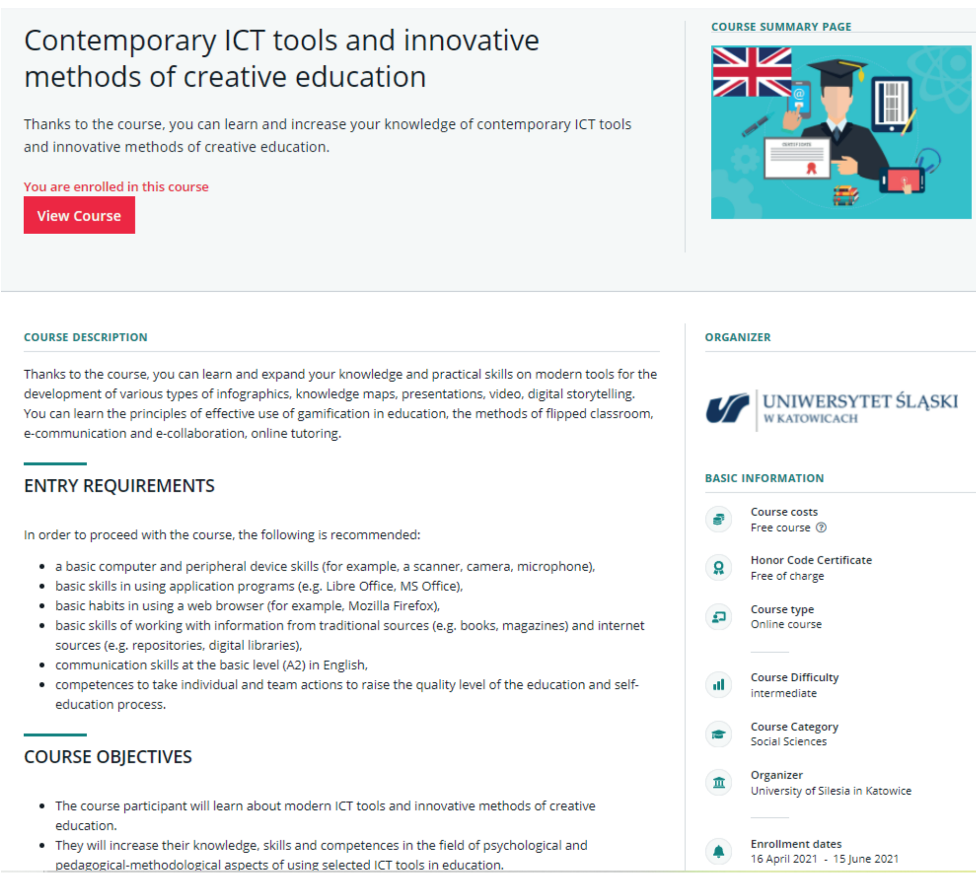


Figure 2. “Contemporary ICT Tools and Innovative Methods of Creative Education” – the MOOCs trailer

Source: www.navoica.pl.

Thanks to the course, “Contemporary ICT tools and innovative methods of creative education” students can learn and expand their knowledge and practical skills on modern tools for the development of various types of infographics, knowledge maps, presentations, video, and digital storytelling.
They can learn the principles of effective use of gamification in education, the methods of the flipped classroom, e-communication and e-collaboration, and online tutoring. The invitation and description of the “Contemporary ICT Tools and Innovative Methods of Creative Education“ course are presented in the trailer (Figure 2).
To start the course, students should have:

- basic computer and peripheral skills;
- ability to navigate in application programs;
- skills to use a web browser;
- a basic ability to work with information from traditional and internet sources;
- a readiness to take individual and team actions to improve the quality of the education and self-education process;
- basic skills of working with the Navoica educational platform.



F i g u r e 3. “Contemporary ICT Tools and Innovative Methods of Creative Education” MOOCs description

Among the main course objectives are:

- Learning about modern ICT tools and innovative methods of a creative education;
- Enhancing knowledge, skills and competencies in the field of psychological and pedagogical-methodological aspects of using selected ICT tools in education;
- Developing skills and competencies in the field of practical aspects of using modern ICT tools and active methods in education;
- Learning good examples of conducting education online with the use of selected ICT tools and innovative methods.

MOOCs contain 8 main Modules:

Module 1: The first module discusses infographics and mind maps, what they are for and how they can be used. Students learn the theoretical and methodological foundations, the principles of creating the above-mentioned methods of developing information and supporting learning. Users have an opportunity to follow a comparative analysis of the tools used to create infographics and mind maps, taking into account their advantages and limitations.

Module 2: The second module discusses how to design a professional multimedia presentation. Users can learn about different types of presentations and stages of their creation. Students can also learn about the computer programs used to create presentations, as well as how to make them available on the web.

Module 3: The third module is designed to discuss educational videos and tools which can be used for their creation. Students can become familiar with the varous types and classifications of didactic video. They can also learn the principles and methodology of developing a professional didactic video, as well as what programs can be used for their design. Examples of the practical use of didactic video in education illustrate the content assimilated during the module. The participants also learn what competencies are required to become a creator of professional didactic videos.

Module 4: Participants of the fourth module learn what a digital story is and what it is for. They can become familiar with different types of this tool, principles of its development, and the ICT to be used for its development. The information presented is illustrated with selected examples of completed digital story projects. Participants of this module can also learn what competences a person creating a digital story should have.

Module 5: The module explains gamification, theoretical and methodological aspects of its development, the use of games in education (gamification), their structure, game concepts, the stages of game development, game development programs, websites on the topic, the classification / types of games, as well as the required competences.

Module 6: The sixth module presents selected methods of innovative active teaching-learning, which are important at various educational levels, in particular, in shaping the IT competencies of the university student. It discusses the use of active teaching-learning methods, including problem-based teaching-learning (Problem-based learning, Project-based learning, Inquiry-based learning, flipped classroom (Flipped classroom), teaching – adaptive-learning. In addition, the module analyzes basic psychological and pedagogical aspects of ICT and e-learning to support educa-

tion processes, including the theories of constructivism, connectivism, the scientific aspects of the implementation of the current and immediate development zone, the psychology of constraints, and some others.
Module 7: The seventh module is designed to discuss ICT tools for e-communication and collaboration. In addition, it discusses skills and cooperation in the 21st century and the criteria for effective collaboration, the methodological and practical aspects of using ICT tools for e-collaboration and basic e-communication. The module also provides some examples of tasks on enhancing students' cooperation.
Module 8: The module provides an overview of online tutoring, discussing the psychological specifics of online communication as part of online tutoring; analyzing different online tutoring models and practices. The module outlines ICT tool clusters used for online tutoring, the competencies required of online tutors; discusses the specifics of interactivity and interactive didactic activities. It also describes the specifics of assessment and evaluation, which are conducted online. The module provides guidelines on how to develop and implement an online tutoring course; presenting the most important information on the specifics of managing and administering an online tutoring course.
Organisational conditions: Duration of the entire course – 10 weeks; Number of weekly modules – 8 modules; The number of student working hours throughout the course – 32 hours; The number of student's working hours during the week – 2–6 hours (average 4 hours) weekly.
Among the main methods of MOOCs elaboration were:

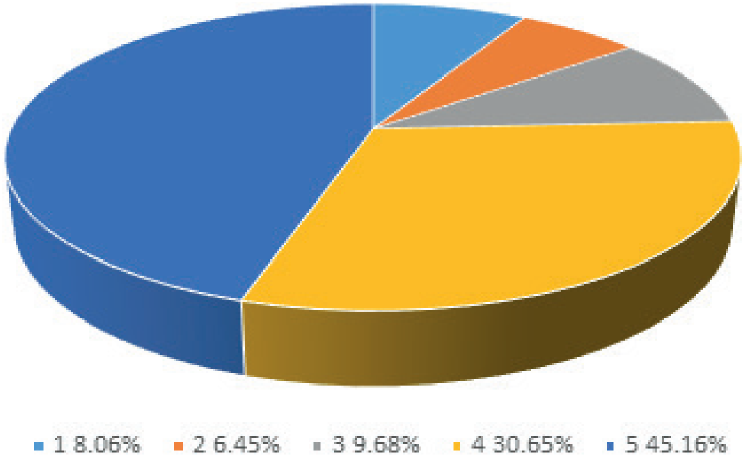
- ADDIE (Analyse, Design, Develop, Implement, Evaluate);
- SSADM (Structured Systems Analysis and Design Method);
- SAM (the Successive Approximation Model);
- LLAMA (the Lot Like Agile Management Approach).

The MOOC materials include a lot of different types of graphs and multimedia sources: Schemes, Photos, Graphs, Copy screen, Timelines, Video.
Videos are considered by researchers and educators as one of the most effective type of didactic materials. "Students who had fully watched online video lectures had higher scores on the final exam than others. The analysis can help those who plan to optimize online video lectures in e-learning programs" (Ozan & Ozarslan, 2016).
Criteria of evaluation of the MOOC by experts. The main criteria to develop and evaluate MOOC by experts include: a) subject, b) methodological and technical aspects as described in more detail by Grodecka et al. (2019: 34–59), the experts of the Foundation of young science and Novoica.pl.

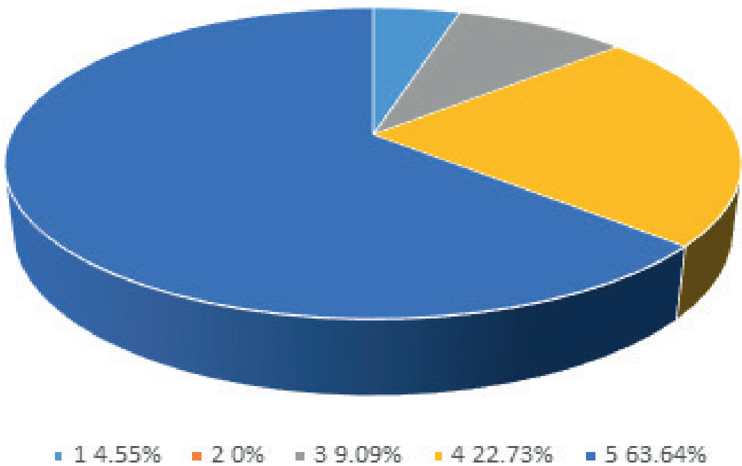
2. METHODOLOGY AND RESEARCH RESULTS

2.1. Methods of data collection, research tools

At the end of course, the students were invited to fill out the survey, specially designed and available in the MOOC to complete. It was used for research and analyses of the students' opinion of the course. The survey contains 14 questions in total. Some results are presented below. In particular, the students were asked about their opinion in concern of learning and reading in the MOOC (Figure 4, 5) as well as the Navoica platform as a carrier of the course (Figure 6, 7).



F i g u r e 4. The distribution of the students' responses to the question about their satisfaction with learning and readings – the 1st Polish edition (%) on a scale from 1 to 5 (1 – min, 5 – max)



F i g u r e 5. The distribution of the students' responses to the question about their satisfaction with learning and reading (the 2nd Polish edition) on a scale from 1 to 5 (1 – min, 5 – max)

As we can see, the number of students who assessed it with 4 (30.65%) or 5 (45.16%) points increased from 75.81% in the 1st Polish edition to 86.37% (4(22.73%) and 5 (63.64%)) in the 2nd edition. The improvement of the text content, its optimisation and differentiation had a positive impact and conditioned the students' opinion. It has significantly improved.

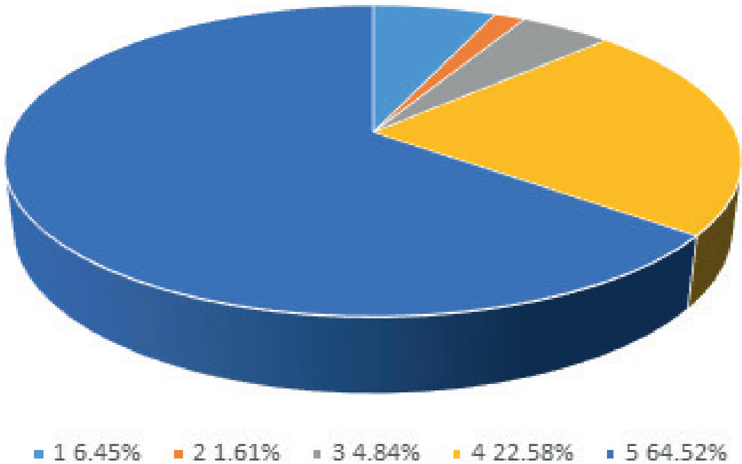


Figure 6. The distribution of the students' responses to the question about the students' satisfaction with the Navoica platform (the 1st Polish edition) on a scale from 1 to 5 (1 – min, 5 – max)

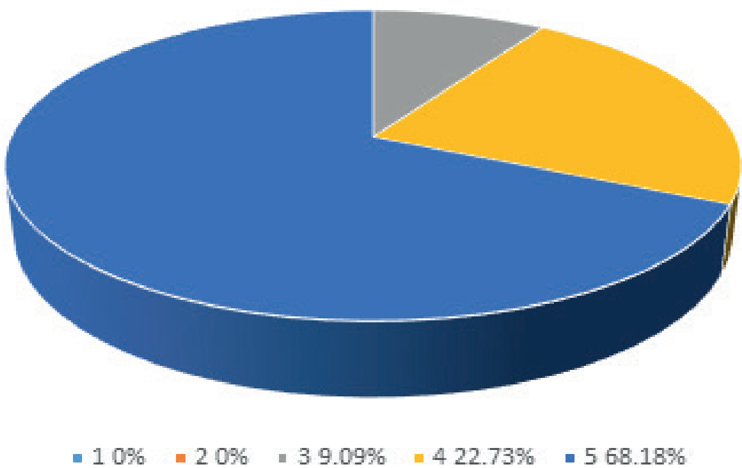


Figure 7. The distribution of the students' responses to the question on their satisfaction with the Navoica platform (the 2nd Polish edition) on a scale from 1 to 5 (1 – min, 5 – max)

The analysis of the answers on the question, concerning the students' satisfaction with the Navoica platform of the respondents survey, shows that the number of students who assessed it with 4 or 5 points increased from 22.58%+64.52% (total 87.10%) in the 1st Polish edition up to 22.73%+68.18% (total 90.91%) in the 2nd edition with a little increase. The Navoica platform based on Open EdeX system is permanently improved, updated and becomes more stable and reliable.

The distribution of the students' responses to the question about the volume of the course and its adequacy according to their expectations (Too short, or Just the right length, or Too long) is presented in Figure 8.

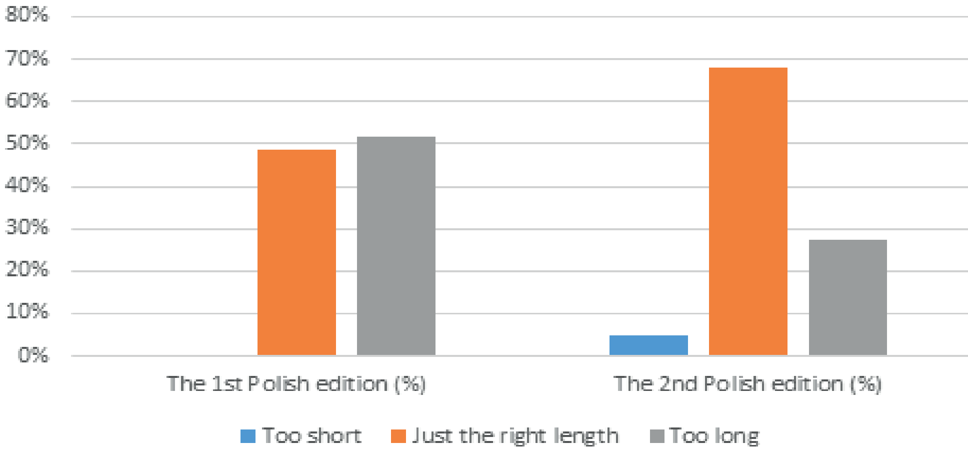


Figure 8. The distribution of the students' responses to the question about the volume of the course and its adequacy according to their expectations (Too short, or Just the right length, or Too long)

The analyses of the answers, concerning the students' opinion on the volume of the course and adequacy according to their expectations (Too short, or Just the right length, or Too long), shows that the number of students who choose the answer "Just the right length" increased from 48.39% in the 1st Polish edition up to 68.18% in the 2nd edition. The MOOC was improved by the authors, its volume was updated and optimized according to the suggestions and expectations of the students and their opinion received after the MOOCs 1st edition.

The distribution of the students' responses to the question concerning the level of the course difficulty according to their expectations (Too easy, or Just the right difficulty, or Too hard) is presented in Figure 9.

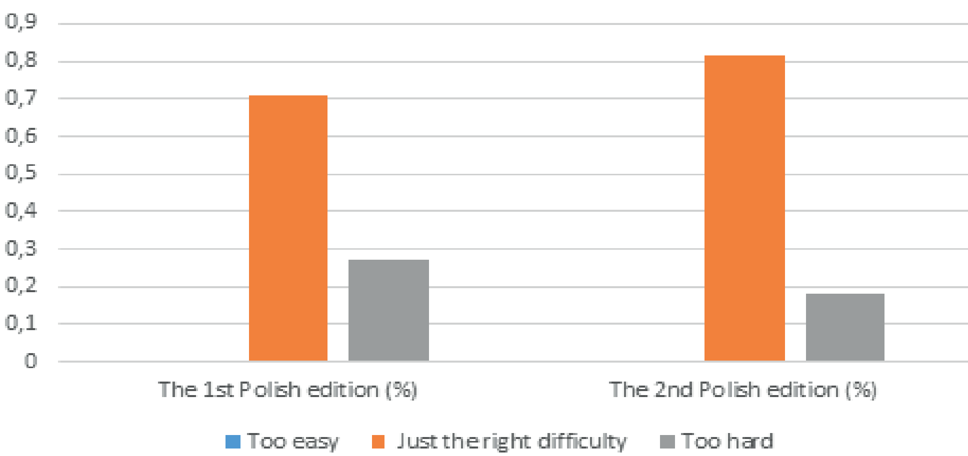


Figure 9. The distribution of the students' responses to the question concerning the level of the course difficulty according to their expectations (Too easy, or Just the right difficulty, or Too hard)

The analyses of the answers on the question concerning the students' opinion on the level of difficulty of the course (Too easy, or Just the right difficulty, or Too hard) shows that the number of the students who choose the answer "Just the right difficulty" is high and additionally increased from 70.97% in the 1st Polish edition up to 81.82% in the 2nd edition. The MOOC was improved by the team of authors and its level of difficulty was adjusted according to the suggestions and expectations of the students, received after the MOOCs 1st edition. The improving process will continue.
The survey also researched students' opinions if the course was interesting for them to follow, whether there were enough tasks and assignments to master the contents of the modules, about the possibilities of contacting the course teaching staff and their peers.
Additionally, the students were invited to fill out a questionnaire and take tests before and after taking the MOOCs. They included questions on the social matrix and those which concerned the students' competencies in the field of contemporary ICT tools and innovative methods of creative education. The deep comprehensive analysis of the students' answers will be published in another paper.
The distribution of the students' responses to the question if they would recommend the course to their friends is presented in Figure 10.

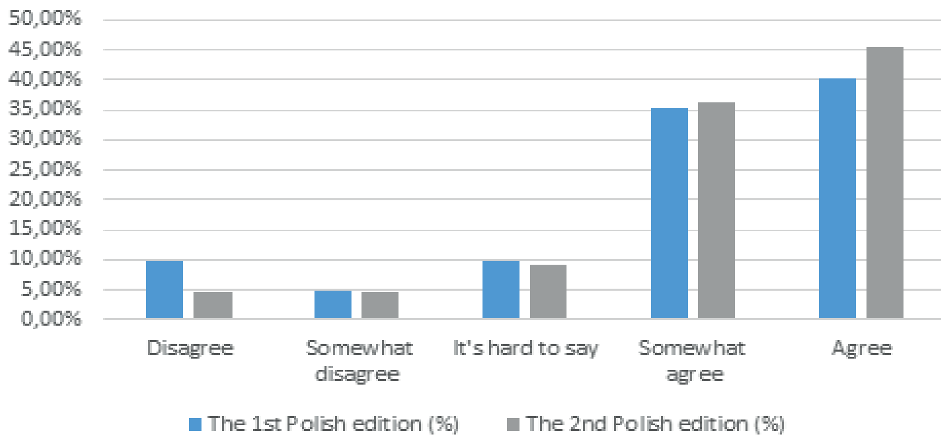


Figure 10. The distribution of the students' responses to the question if they would recommend the course to their friends

In the 1st Polish edition - Somewhat agreed (35.48%) and Agree (40.32%) – answered totally 75.80% and in the 2nd Polish edition – the answers "Somewhat agree" were chosen by 36.36% respondents and "Agree" by 45.45%, in total 81.81%. We can see that the majority of students would recommend the course to their friends and in the 2nd edition this number was even higher.

DISCUSSION

The research on the MOOCs design, implementation and evaluation was conducted by the experts from different scientific fields and areas.

Khalid, Lundqvist, & Yates (2021) elaborated the literature review, which "covers analysis of the recommender systems (RSs) that have been implemented in MOOCs, with the goal of providing insights on the current trends" in practice and research (2021). The research on construction of the quality evaluation index system of the MOOCs platforms based on the user perspective was done by Su, Guo, & Shao (2021). This study "determines the weight of each dimension and criterion by using the best worst method (BWM) (2021).

The research, conducted by Agudo-Arroyo & Callejo-Gallego (2021) "analyzes students' peer review method and provides the results of the online surveys designed to evaluate the MOOC courses" (2021). The study "focuses on determinants of the peer review, such as concrete experience during the course or external aspects, applying multivariate analysis of binary logistic regression" (2021).

We can see that the MOOCs in the focus of the experts' interest and research results are presented in different aspects, concerning their creation, implementation and assessment, including their platforms, course contents as well as the development of the students' competences. The data, obtained by surveying the students who had participated in the course "Contemporary ICT Tools and Innovative Methods of Creative Education" revealed positive dynamics between the 1st and 2nd edition of the MOOCs, implemented in 2020 and 2021 in Polish, in terms of their quality and students' overall satisfaction. Simultaneously, there are additional suggestions, which are going to be introduced in the next CMOOCs edition.

CONCLUSION

The two editions of the course were attended by more than 150 participants, who were the students of the first and second cycle of education within humanities and social studies, and education departments. The participants were reportedly economically inactive who could not afford paid courses and training. There were also participants who wanted to enhance their competencies in the area of contemporary ICT tools and innovative methods of creative education.

The developed MOOC was also adapted to the participation of people with disabilities and special educational needs; compliant with the requirements of Internet publication (WCAG 2.0), in Polish and in English.

It is also expected that the MOOCs, developed within the project "Direction to the MOOCs", will receive more interest from Polish students and participants from other countries with appreciation of the course's contribution to the development of ICT competencies and skills. After the first and second edition, accompanied by the students' surveys, the MOOCs will be improved accordingly before its third and other editions.

The whole project was aimed to develop the MOOCs which are up-to-date, meeting current needs for digital competencies and ICT skills, following the most recent best practices and theories in online learning. It is also believed to be in need especially in the period of the pandemic for the training of pre-service teachers and educators, and providing opportunities for further professional development of in-service teachers, university instructors, researchers and all other MOOCs users to enhance their digital competencies and ICT skills.

It is viewed to be of especial importance and necessity in conditions of the COVID-19 pandemic, when the majority of the educational activities moved to the virtual learning space, and e-learning became the main method, form and technology of learning and teaching in educational establishments at all levels.

This research is planned to be developed further to provide a deeper and more detailed analysis of the students' experience in MOOCs, considering their opinions on whether the course was interesting for them to follow, the adequacy of tasks and assignments to master the contents of the modules, the possibilities of interacting with the course teaching staff and other students and so on.

It is believed that MOOCs is a valuable contribution to the development of the theory and practice of online education, presenting wide opportunities for experimenting and developing effective methods of teaching and learning online.

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BUILDING PROFESSIONAL COMPETENCES OF SOCIAL WORKERS THROUGH DISTANCE LEARNING IN THE CONTEXT OF THE COVID-19 PANDEMIC

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Abstract: *The article is devoted to the issue of distance learning. It discusses the relevance and grounds of using distance learning tools in the education process of higher education institutions in the context of the COVID-19 pandemic and describes the organization of distance learning at the Borys Grinchenko Kyiv University during the COVID-19 pandemic. The authors present the professional competences of social work specialists and academic disciplines that form these competences on the example of the educational program "Social Advocacy" of the first level of higher education (Bachelor) as well as the basic ICTs in the process of distance learning used by teachers of the Department of Social Pedagogy and Social Work in the context of the COVID-19 pandemic. The authors introduce the expected results of implementation and realization of distance learning in the education process of higher educational institutions in the conditions of the COVID-19 pandemic.*

Keywords: COVID-19; distance learning; adaptation process; professional competences; social work specialist; professional training; information and communication technologie.

INTRODUCTION

The relevance of the study is due to the global pandemic COVID-19 and the lasting of adaptive quarantine in Ukraine from March 12, 2020 (On prevention of the spread of COVID-19 acute respiratory disease caused by the SARS-CoV-2 coronavirus in Ukraine, 2020). Due to quarantine restrictions, not only the business sector, government and public sectors needed adjustments, but also the education sector, so it was forced to make numerous changes in its functioning in order to continue to provide educational services. In particular, there are risks in the quality training of students of higher education institutions (hereinafter HEIs) in Ukraine.

Given the new challenges in the education system, the priority of its renewal in the HEI has become to improve existing and to introduce new tools of distance learning, which would ensure the further formation of professional competences of students of all specialties, accessibility, and effectiveness of higher education. The Borys Grinchenko Kyiv University was no exception and became ready for a new challenge of online learning, therefore appropriate organizational and methodological conditions were developed in this HEI.

Literature review

During the COVID-19 pandemic, researchers are increasingly focused on studying various aspects of the development and implementation of distance learning tools. In particular, the creation of effective blended learning and the introduction of adaptive learning in higher education institutions have been studied by N. Morze, E. Smyrnova-Trybulska, T. Terletska, L. Varchenko-Trotsenko, V. Vember (Morze & Vember et al., 2019; Morze & Varchenko-Trotsenko et al., 2021).

The challenges and needs of the educational institutions in the implementation of distance education and digital tools in the conditions of quarantine caused by the COVID-19 pandemic have been studied in different countries – Ukraine (Ivaniuk & Ovcharuk, 2020), Spain (García-Peñalvo et al., 2021), Peru (Canales Inga et al., 2021). Researchers emphasize the need to find new ways of teaching due to the impact of COVID-19 on the education system. In particular, to use new learning scenario in order to adapt the teaching processes without the students losing the acquisition of competences (Domínguez-Lloria et al., 2021).

University, as a social institution as defined in the European Higher Education Area, must be a benchmark in the preparation for beginning employment and education for the exercise of active citizenship. Therefore the education requires bringing together specific and generic competences (Regueiro et al., 2021).

The current state of digital learning and prospects for the development of digital competences in Ukrainian universities are presented in the research of such scientists as O. Buinytska, O. Kobylin, O. Kuzminska, M. Mazorchuk. They emphasize that to achieve the goals of higher education and support educational activities, modern universities should create a digital learning environment (Morze & Buinytska, 2019; Kuzminska & Mazorchuk, 2020).

Studying the challenges of vocational education in the context of the digital economy, researchers T. Noskova, T. Pavlova, O. Yakovleva stressed that changes in professional activities should be dynamically reflected in the professional training programs. They explored various categories of educational aspects of the distance learning environment: learning the content of educational material; communication for educational purposes through the network; self-management and self-realization in educational activities (Noskova & Pavlova et al., 2019).

R. Pavliuk, T. Liakh, O. Bezpalko, N. Klishevych studied the issues of training social specialists by means of research methods with the use of research training and ITC tools. In particular, they identified the features of training future professionals in the social sphere based on research; analyzed educational programs in the specialty "Social Work" (Pavliuk & Liakh et al., 2017), as well as approaches to developing a standard of the competences of using ICT in the system of science-based training of future social workers in Ukraine (Pavliuk & Liakh, 2019).

1. ORGANIZATION OF DISTANCE LEARNING AT BORYS GRINCHENKO KYIV UNIVERSITY IN THE CONTEXT OF THE COVID-19 PANDEMIC

The procedure for organizing distance learning at Borys Grinchenko University of Kyiv is specified in the Regulations on the organization of the education process (2017) (Regulations on the organization of…, 2017). The Regulations also provide the right and procedure for forming an individual educational trajectory for students of Borys Grinchenko Kyiv University, which is provided by the following regulations: Development strategy (program) of Borys Grinchenko Kyiv University for 2018–2022, (Development strategy (program)…, 2018); Regulations on the procedure for exercising the academic mobility right by the participants of the education process of Borys Grinchenko Kyiv University (Regulations on the procedure for exercising…, 2018).

Ensuring full-time and part-time education at Borys Grinchenko Kyiv University is implemented using distance learning technologies regulated by the Concept of digitalization for 2020–2022 adopted at the University (The Concept of digitalization…, 2020), which states the construction of the Digital Campus. According to that, all participants in the education process have access 24/7/365 to quality information, which will contribute to the higher quality of education for students and will increase the competitiveness of the University (Buinytska & Varchenko-Trotsenko et al., 2020).

The priority areas of digitalization for the University are following: development of high-quality open information and educational environment of the University; development of an open educational platform; improving the E-learning system; introduction of webinars, online seminars, video, and online lectures, video conferences; development of digital competence of participants of the education process; gradual transition to electronic document management; introduction of visualized business intelligence systems for quick decision making; introduction of personalized Internet access via wireless managed networks; implementation of "remote desktops" of employees through cloud technologies; creation of a digital campus with digital offices for students and employees; virtualization; cybersecurity (The Concept of digitalization…, 2020, p. 3; Kuzminska & Mazorchuk, 2020).

To implement distance (blended) learning, teachers and students at Borys Grinchenko Kyiv University work with the LMS Moodle (Modular Object-Oriented Dynamic Learning Environment), since September 2020, reformatted into the Digital Campus (Figure 1).

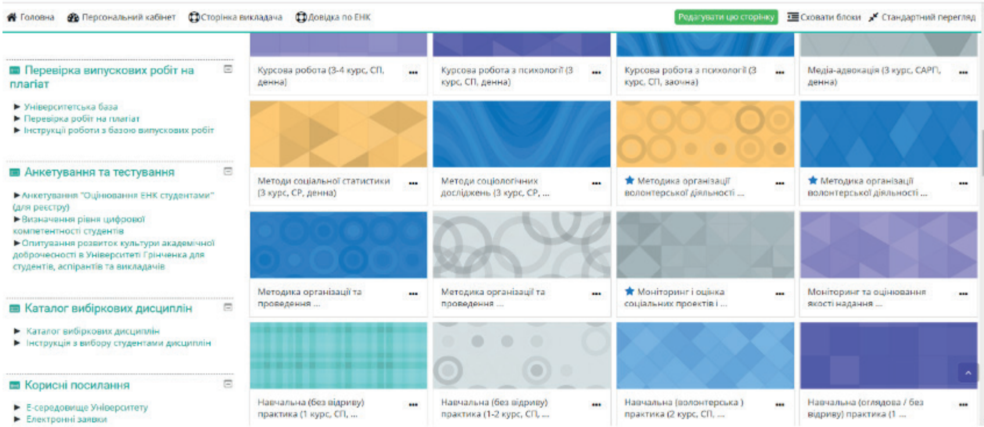

Figure 1. The platform for online learning at Borys Grinchenko Kyiv University

Source: own work based on the Moodle LMS (site https://elearning.kubg.edu.ua/).

Distance learning includes the following elements: means of providing educational material to the student; means of monitoring student performance; means of consulting the student by the program-teacher; means of interactive cooperation between teacher and student; the ability to quickly add new course information, correction of errors (Morze & Vember et al., 2019).

There are four types of subjects in the system of distance learning: a student – one who studies; a tutor – one who teaches; an organizer – one who plans educational activities, develops curricula, deals with the distribution of students in groups and the workload of tutors, solves various organizational issues; an administrator – one who ensures the stable functioning of the system, solves technical problems, monitors the statistics of the system.

The organization of an effective distance learning process requires systematic work with the program shell of both the student and the tutor, almost every day throughout the training period.

2. Training of social work specialists at Borys Grinchenko Kyiv University in the context of the COVID-19 pandemic

Information and communication technologies are gradually changing the structure of teaching and learning disciplines, and also add new elements and platforms for learning. Computerization of the educational process and the use of distance learning is one of the ways to increase its efficiency. The latest technologies increase the flexibility of learning, ie students can access knowledge regardless of time and geographical barriers. Therefore, information and communication technologies proved to be extremely relevant and important in the context of the COVID-19 pandemic, which minimized offline communication within universities.

Teachers, in particular socionomic specialties, which include social work, faced a difficult task – to provide quality training in a short time with the help of ICT, to form general and special competences of higher education, and also achieve program results provided by educational programs. And this was a serious challenge because most disciplines required interaction, group work, "live discussion" of problem situations, special training as a form of work.

In the context of the COVID-19 pandemic, the Department of Social Pedagogy and Social Work of Borys Grinchenko Kyiv University has introduced several ICTs into the educational process, taking into account professional competencies and program results.

So, training of social work specialists at Borys Grinchenko Kyiv University is carried out according to the educational programs of the first (bachelor's) and the second (master's) levels of higher education, based on the Standard of higher education in the specialty 231 "Social Work" (On approval of the Standard…, 2019).

The purpose of the educational programs is to train competent competitive specialists in the field of social work, capable to perform their duties at a high professional level and solving practical problems in the process of professional activity (Table 1).

Table 1. Educational programs in the specialty 231"Social work

Level of education	Educational program	The focus of the educational program
The first level of higher education (Bachelor)	Social Work	Formation of knowledge, skills, and practical skills in the field of social work with different groups of service recipients, as well as social work management
	Social Pedagogy	Formation of knowledge, skills, and practical skills in the field of socio-pedagogical activities with children, youth and families in various institutions of social education.
	Social Advocacy	Training of a manager in the social field capable to model and implement social work technologies; to establish effective social communication between different subjects of social work in the community.
The second level of higher education (Master)	Social work	The content of the subject area includes concepts, laws, principles, ideas that reveal the development of an individual, social group, community, society as a whole and form the professional competence of a specialist.
	Social pedagogy	Formation of knowledge, skills, and practical skills in the field of socio-pedagogical activities, organization and conduct of socio-pedagogical research, implementation of socio-pedagogical technologies
	Monitoring and evaluation of social programs	The content of the subject area includes the content, forms, and methods of development, management and evaluation of social programs and projects, monitoring and evaluation of the quality of social services by various actors of social work.

Source: own work based on the educational and professional programs in the specialty 231 "Social work" (site https://il.kubg.edu.ua/struktura/kafedry-instytutu/kafedra-sotsialnoi-pedahohiky-ta-sotsialnoi-roboty/osvitni-prohramy.html).

The most appropriate ICTs to ensure the formation of professional competencies and program results of educational programs in the specialty 231 Social work in a COVID-19 pandemic are specialized information systems, learning management systems (LMS), or so-called software and pedagogical systems. As a rule, such information systems consist of sets of modules that provide full-fledged distance learning. Multimedia technologies, one of the most promising and popular pedagogical information technologies have become the most common in the process of training a social specialist in the context of the COVID-19 pandemic. They allow you to create entire collections of images, texts and data, accompanied by sound, video, animations, and other visual effects (simulation); include an interactive interface, and other controls.

We will present the professional competences of social work specialists and courses through which they are formed on the example of the educational program "Social Advocacy" of the first (bachelor's) level of higher education (Table 2). (Educational and professional program…, 2019; Lekholetova & Lyakh, 2020, p. 137).

Table 2. Formation of professional competencies of social work specialists according to the educational program "Social Advocacy" of the first (bachelor's) level of higher education

Professional competences of a social work specialist of the educational program "Social Advocacy"	Courses that provide the formation of professional competence
Knowledge and understanding of the essence, significance, and types of social work and its main areas	Theory and history of social work; Organization of intersectoral cooperation in the social field; Technologies of professional communication in social work.
Knowledge and understanding of the legal and regulatory framework for social work and social security	Basics of social and legal protection; Technology for assessing the needs of recipients of social services; Media advocacy; Practicum on public speaking; Technologies of professional communication in social work.
Ability to identify, socially inspection and assess the needs of vulnerable groups of citizens, including those in difficult life circumstances	Social work with families; Social work with people with disabilities; Socio-pedagogical work with children in conflict with the law; Social prevention of domestic violence and child abuse; Technology for assessing the needs of recipients of social services; Organization of intersectoral cooperation in the social sphere.
Knowledge and understanding of the organization and functioning of the system of social protection and social services	Social work with families; Organization of intersectoral cooperation in the social sphere; Technologies of professional communication in social work.

Ability to apply modern experimental methods of working with social objects in field and laboratory conditions	Information and communication technologies in social work; Methods and organization of social research; Methods of street social work; Drama practices in social work.
Ability to develop ways to overcome social problems and find effective ways to solve them	Practicum on social advocacy; Organization of intersectoral cooperation in the social sphere; Practicum on negotiation.
Ability to provide assistance and support to clients, taking into account their individual needs, age differences, gender, ethnicity, and other characteristics	Social gerontology; Methods of street social work; Drama practices in social work.
Ability to develop and implement social projects and programs	Basics of technological support of social work; Methods of social design; Technologies of professional communication in social work; Advertising and communication activities of a social worker.
Ability to adhere to ethical principles and standards of social work	Theory and history of social work; Training of communication and creativity; Methods of street social work.
Ability to identify and attract the resources of partner organizations for social work to fulfill the tasks of professional activity	Methods of organizing volunteer activities; Organization of intersectoral cooperation in the social sphere; Technologies of professional communication in social work; Practicum on negotiation.
Ability to promote the welfare and social protection of individuals, social assistance, and support to those in difficult living conditions	Socio-pedagogical work with children in conflict with the law; Social prevention of domestic violence and child abuse.
Ability to select and apply various methods of social advocacy, to develop programs of advocacy campaigns	Technologies of social advocacy; Practicum on social advocacy.

Source: our work is based on the Standard of higher education in the specialty 231 “Social work” and educational-professional program 231.00.04 “Social advocacy” for the first (bachelor’s) level of higher education (Standard of higher education…, 2019; Educational and professional program…, 2019).

The main ICT in the process of distance learning, used by teachers of the Department of Social Pedagogy and Social Work in the context of the COVID-19 pandemic, are:

- Electronic lecturers, simulators, textbooks, encyclopedias;
- Creation and use of presentations and educational materials;
- Providing distance learning through Google MEET, ZOOM for practical classes during group work;

- Recording lectures in the Distance Learning Studios of the Borys Grinchenko Kyiv University and posting them on the YouTube channel of the Distance Learning Centre in limited or public access (optional) for applicants;
- Development of situational role-playing and intellectual games using artificial intelligence (AI). The use of artificial intelligence allows you to solve the difficult problems. For example, a set of software techniques used in computer games to create the illusion of intelligence in the behavior of computer-controlled characters;
- Modeling of processes and phenomena, acting out situations in pairs or groups with online counseling by an external expert;
- Conducting interactive educational teleconferences and workshops;
- Building a system of control and testing of knowledge and skills of students (use of control test programs);
- Watching movies and cartoons with further discussion of situations and highlighted problems, finding the effective solutions;
- Students search for prevention, advocacy and informational videos through the YouTube channel, other video hosting, and social networks;
- Implementation of design and research activities of students and teachers using Google Forms, telephone surveys, applying Viber, WhatsApp, Telegram, other social networks.

The application of distance learning technologies in modern conditions of training the social work specialists provide various possibilities, such as interactive teacher-student interaction in dialogue mode (option to receive a consultation, the operative decision of problem situations of educational, methodological, and organizational nature); fast delivery of educational materials to the student in electronic form; operational access to the Internet databases; remote testing; passing a virtual laboratory practicum; creation of "virtual groups" for the implementation of group training projects, and other (Morze & Vember et al., 2019). All of the above provides a basis for achieving learning outcomes in the training of social work specialists during a difficult period for the country. The program results of training specialists for the educational program "Social Advocacy" include:

1. search, analysis, and synthesis of information from various sources to solve professional problems and establish causal links between social events and phenomena;
2. fluency in oral and written communication in state and foreign languages on professional issues;
3. identification, formulation and solution of problems in the field of social work, integration of theoretical knowledge and practical experience;
4. formulation of own reasonable judgments based on the analysis of a social problem;
5. theoretical argumentation of ways to overcome problems and difficult life circumstances, the choice of effective methods for solving them, predicting the consequences;
6. development of long-term and current plans, programs of actions, operative effective decisions in difficult situations;

7. use of specialized software in solving professional tasks;
8. critical analysis and evaluation of the current social policy of the country, socio-political processes at the national, regional, and local levels;
9. use of relevant scientific research and application of research professional skills in providing social assistance;
10. analysis of socio-psychological processes in small and large groups;
11. application of prevention methods to avoid possible mental development deviations, behavioral disorders, problems of interpersonal relationships, to resolve conflicts, to prevent social risks and difficult life circumstances;
12. determination the content of cooperation with partner organizations in social work to perform the tasks of professional activity;
13. application of social diagnostic methods in the process of assessing the problems, needs, specific features, and resources of clients;
14. application of forms and methods of advocacy campaigns depending on the challenges of social reality;
15. making practical decisions to improve social welfare and to increase social security;
16. application of management methods to organize own professional activities and manage the activities of social workers and volunteers, other staff;
17. establishment and support of relationships with clients based on mutual trust and in accordance with the ethical principles and standards of social work, providing them with psychological support, and empowerment of clients;
18. establishment of cooperation with representatives of various professional groups and communities; using strategies of individual and collective representation of clients' interests;
19. identification of potential risk groups of consumers of social services requiring the advocacy of a social worker in various institutions;
20. identification of ethical dilemmas and contradictions in professional activities and the application of means of supervision to address them;
21. demonstration of tolerant behavior, respect for cultural, religious, ethnic differences, the distinction of stereotypes and prejudices;
22. demonstration of the ability to creatively solve problems and make innovative decisions, to think and apply creative abilities to form innovative ideas;
23. construction of the process and result of social work within the set tasks, application of quantitative and qualitative indicators, adjustment of the work plan following the results of the assessment;
24. development of social advocacy campaigns to establish effective interagency communication.

Students consider distance learning to be convenient and practical (Pavliuk & Muzychenko et al., 2020). The main benefits of distance learning in the context of the COVID-19 pandemic include: the presentation of the course material, taking into account the training and abilities of students; introduction of the newest pedagogical, psychological, and methodical developments; self-paced learning, training at a convenient time, in a certain place, getting an education without leaving the main work, no time limits for learning the material; breaking the material into separate functionally complete topics, which can be studied as they are mastered and correspond to the abilities of an individual student or a group as a whole; active communication between students of the group and the teacher, which significantly increases the motivation to learn, improves the assimilation of the material; greater opportunities to control the quality of education, providing discussions, chats, self-control, no psychological barriers; and no geographical boundaries for education.

CONCLUSION

The introduction and implementation of distance learning tools in the education process in the context of the COVID-19 pandemic are expected to improve the quality of professional training of higher education students, in particular, in the formation of professional competences of social workers. Among the expected results are 100% provision of E-learning system content of the disciplines of the Department of Social Pedagogy and Social Work for students of the first (bachelor's) and second (master's) levels of higher education; development and implementation of video seminars, webinars, video lectures with the application of modern digital technologies, and other. It should be noted that the expected results of distance learning of social work specialists in the context of the COVID-19 pandemic intersect with the expected results of the implementation of the university concept of digitalization.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 163–175
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SOME THEORETICAL AND PRACTICAL ASPECTS OF THE ORGANIZATION OF THE COMMUNITY OF TEACHERS (ON THE EXAMPLE OF INQUIRY-BASED LEARNING IMPLEMENTATION)

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Abstract: *The paper aims to determine the stages and conditions of the creation of academic communities of university teachers for the introduction of innovative pedagogical technologies, using Inquiry-Based Learning (IBL), to highlight the experience of creating such a community at the Borys Grinchenko Kyiv University (BGKU). Researchers have analyzed the organization of professional communities, the impact of their activities on the quality of education and improving the professional level of teachers. The paper contains the research of the practical aspects of the creation and organization of the work of an educational community of teachers, a set of theoretical (analysis and synthesis of Ukrainian and foreign scientific, pedagogical, methodological sources on research issues) and empirical (primary and repeated questioning of teachers of higher education institutions and teachers of secondary education institutions) were the methods used, as well as an analysis of the results obtained. The article demonstrates the impact of teachers` network functioning on teachers' professional activities and implementing IBL in mathematics teaching. It is revealed how participation in the community influences the use of innovative pedagogical methods of teaching mathematics. Teachers from BGKU and other universities were involved in the survey, which had a total of 72 respondents. The survey results were comprehensively analyzed and presented their graph interpretation. This article describes of some theoretical and practical aspects of the development of academic communities of university teachers for the introduction of innovative pedagogical technologies, using IBL at the educational institutions, where the staff work, research and collectively take steps to improve the learning process and research. It is revealed how participation in the community influences the use of innovative pedagogical methods in the teaching of mathematics.*

Keywords: Community; educational communities; community features; community components; organizing the work of communities; Inquiry-Based Learning (IBL); Erasmus+ PLATINUM.

INTRODUCTION

International studies show that one of the factors behind the progress of educational reforms depends on the individual and the collective capacity of teachers to contribute to improving the educational process. Two different comprehensive studies of the factors affecting student learning have come to the same conclusion: the most important variable in student achievement is the quality of the learning which they daily receive (Marzano, 2003; Hattie, 2012). In order for students to learn better, it is necessary to ensure the quality of teaching. This challenge is particularly acute given that the higher educational system in traditional teacher culture does not consider each discipline as an independent unit where autonomous subcontractors work – teachers are responsible for what happens within their individual subjects. In this culture of isolation, the teacher becomes the center of the individual improvement of his/her competencies and knowledge. Higher educational institutions, as a rule, develop and approve plans for teacher training, involve them in conferences, offer incentive mechanisms to master educational courses, seminars, and more. And now, with the transformation of education, this practice continues, despite convincing evidence that it has little effect on the quality of teaching as it is formal. In addition, in our opinion, the basic thesis of organizing and implementing the traditional approach to upgrading the skills of an individual teacher is erroneous. The intense focus on individuals reduces the conditions and limitations of the educational systems in which they operate.

A direct influence on improving teaching is the constant exchange of the pedagogical experience, a discussion of problems, learning the best practices of their colleagues, their implementation and further discussion in the community of those who are specialists in a particular subject area. Therefore, the implementation of such practices is critical. Educational communities provide the opportunity for continuing professional development and improvement.

Scholars note that learning communities are delivering positive results for both teaching staff and students. When teachers are part of a professional learning community, it reduces their isolation, increases their commitment to the mission and goals of the institution, creates a shared responsibility for the overall development of students, creates a powerful refresher process that enables the sharing of best teaching practices and enhances understanding of the content of the educational content and the role of the teacher.

The purpose of the article is to determine the stages and conditions of the creation of academic communities of university teachers for the introduction of innovative pedagogical technologies, using IBL, to highlight the experience of creating such a community at the Borys Grinchenko Kyiv University.

1. BACKGROUND RESEARCH

Networking is one of the main modes of collaboration in professional communities. A lot of experts have stressed new trends and the direction of developments of the relationship between individuals and the creation of communities in / via the Internet. In particular, Issa, Kommers (2013) in their research noted that „In the 21st century a new technology was introduced to facilitate communication, collaboration, and interaction between individuals and businesses. This technology is called Social Networking; this technology is now part of Internet commodities like email, browsing and blogging" (Issa & Kommers, 2013: 5). In the authors' research (Smyrnova-Trybulska & Żebrok, 2015) and (Smyrnova-Trybulska, 2017), some examples of the designing of Internet communities and research networks were analyzed and described. Moreover, the collaboration and self-training network, and its aims are focused upon. Two cases are provided as examples – the Internet platform "Improvement in the Net" and the international research network IRNet (Smyrnova-Trybulska & Żebrok, 2015).

Other authors have analyzed various social network sites in the context of modeling the new business-customer relationship and stressed that "the presence of the corporate sector in Social Network Sites (SNSs) presents a successful method of building proficient relationships with customers that are more compliant with the new facets of consumers' profile and behavior" (Isaías, Pífano, & Miranda, 2012: 248). Italian experts researched the matter of the validation of non-formal and informal learning using Internet communities and described "the case study of the community of practice (CoP) 'WEBM.org', … analyse and discuss the impact of this normative lack about the validation of non-formal and informal learning in Italy" (Leone, Guazzaroni, Carletti, & Leo, 2010: 111).

Other researchers focus on the internationalisation of a new kind of collaboration. They reflected that: "In recent decades there has been an enormous growth of scientific collaboration across national borders. The number of internationally co-authored scientific articles has grown at an average of 14% per year. Networking is now an important means of enhancing scientific quality. 'The spread of generic (as Twitter, Facebook, or Google+) or specialized (as LinkedIn or Viadeo) social networks allows sharing opinions on different aspects of life every day' (Colace et al., 2013: 37)". (Smyrnova-Trubulska, Morze, & Kuzminska, 2019: 71). As well as, "Web based communities are not only rich in the sense of large and expressive; they are especially rich in terms of socially aware and even vital for deriving trends in political apprehension and consumer behavior as well. Not only the interaction between people is crucial; more and more it is people's interaction with content through 'liking', 'favoring', '+1-ing', 'upvoting' and 'sharing'. It is possible to observe a rising or falling trend and predict the rest of the lifespan. However: "is it also possible to capture the causes underlying trend?" (Kommers & Simmerling, 2015). "A systematic review of research that uses social network analysis (SNA) to investigate virtual communities of practice (vCoPs)" was presented in the research of Shazia (2019).

The scholarly and professional communication is only a small component of a larger Research Lifecycle. It is important to use scholarly communication tools (Open Access for Researchers 1: Scholarly Communications, 2015) to expand access to the results obtained and to organize networking among participants of international teams of researchers (Smyrnova-Trubulska, Morze, & Kuzminska, 2019: 72).

The highest ranking Communication tools identified include: Social networks (e.g. FB, Twitter, Instagram); Blogs; Skype; Writing.com; Mind Miester (mind maps); Scribblar; Google Classroom; Trello; Google presentation; You Tube; Adobe Connect; Red Pen; Evernote; PaperRater (Morze, Makhachashvili, & Smyrnova-Trubulska, 2016: 360). An e-learning training course, the "Development of educational, scientific collaboration and project management with IC tools in universities" covers the actual issues of the organization of cooperation in education, assessment, and application and IC tools in scientific communication, collaboration, development of scientific projects, and research. (Smyrnova-Trubulska, Morze, & Kuzminska, 2019: 79)

According to an expert model assessment – the top ranking communicative tool falls into the *social media* category (23,21 points). The *social network* engines are designed to store, share, promote, reference and review academic output. The network type interface is designed to facilitate students' and researchers 'personal collaboration, navigation through the thematic span of academic output, and upload it into the public domain. The major purposes of this collaboration tool include: store; share; interact / network; review; disseminate; upgrade; rate; learn; charter a comprehensive, customized reference stock of one's research and/or education interests. (Morze, Makhachashvili, & Smyrnova-Trubulska, 2016: 362)

The formation and functioning of a community is of particular importance during the COVID-19 pandemic. The document devoted to education during the COVID-19 pandemic highlights the necessity "to promote the solidarity and understanding between the educational community members, this should be cultivated in the mid-term and long term" (UNESCO COVID-19, 2020).

Research Design and methodology

Increasing challenges in the educational system related to educational trends, granting independence to the Higher Educational Institution (HEI), increasing requirements for assessing the quality of education, the emergence of new requirements for socialization and professional and general competencies of students, led to the urgency of the use of internal resources of education systems to solve current educational problems process. One such internal resource we see as an association of professional experts motivated to discuss and look for solutions to make changes in the educational process, taking into account the subject, territorial, and target specificity. Such teams, groups of specialists of the pedagogical environment are called educational communities.

The term "community" is interpreted as a group of people who, for whatever reason, feel belong to one another and have common aspirations, goals, structures (Tönnies, 1887). Professional communities have a deep history. In Europe, medieval workshops were transformed into different forms of associations. In Ukraine, social communities more often existed on ethnic, demographic and territorial grounds, but professional ones were also represented in the form of manufactories, merchant guilds, and union of lawyers, an association of hunters, and more. The main purpose of such communities is the professional communication of colleagues and associates, during which the constant exchange of knowledge between participants ensures their personal and professional improvement (Verbets, Subot, & Khristyuk, 2009). Such associations can also be called a social community – a set of people united by relatively stable social bonds, a relationship that has common characteristics that give it unique identity (Vilkova, 2016).

Sociology is a question of professional communities. Merton defines the professional community as an organization of practitioners, recognized as professionally competent, who have united for the common interest and public good (Merton, 1982). Durkheim states that the idea of professional communities (groups, corporations) is based on solidarity, intellectual and moral homogeneity and naturally arises from the pursuit of one profession (Durkheim, 1990). That is, professional communities must be created in order to fulfill specialized competencies for the benefit of society at large and of relevance to their individual members.

Educational communities allow for the member to develop both personally and professionally. The learning provided by the community depends on the subject matter and objectives of the community itself. Joining a community means first and foremost access to that community's resources. These resources can be both tangible and intangible (Tönnies & Loomis, 2021). Many members of the professional community learn on a collective level, updating their tools, resources, processes and goals in accordance with the collective mind of the participants, which corresponds to the definition of community of practice given by Wenger in 1998. He interprets the concept of a "community of practice" as a group of people who come together around common problems and interests to share knowledge and learn from each other (Wenger, 1998). Participants' ability to influence community development can increase their social value and value in society (Ala-Mutka & Punie, 2009).

Contemporary writer Michael Fullan, who studies change in education, suggests that "teachers' ability to cope with, learn from, and help students learn will be critical to the future development of society." This means that co-operation and the teaching of teachers, their responsiveness to the needs of a changing society, their ability to communicate, sharing their knowledge and experience to solve problems together, is one of the most important issues in educational policy and practice (Fullan, 2012).

Research shows that the creation and functioning of communities is important for the educational process, as teachers are able to discuss and disseminate how they evaluate their educational activities, show samples of their teaching practice, improve their professional knowledge and skills, share new information and scientific sources of knowledge, which allow for the impact of innovative sources of knowledge, on their pedagogical activity, making management decisions and building a curriculum under certain conditions and changes in the results obtained in connection with changing pedagogical approaches, methods and techniques. They initiate and implement innovative educational projects, which, in turn, serve as tools to ensure the quality of education and, at the same time, the professional competence of teachers.

The term "educational community" is just beginning to integrate into the vocabulary of Ukrainian education. In Ukraine, it is more commonly associated with the virtual space, while foreign studies do not narrow the concept to the web interface. Some educators view the educational community as a dissemination of community-based classroom practices, using both community and human resources. Others identify, under the educational community, the involvement of specialists in educational institutions to improve the curriculum and educational tasks for students. For others, this means that students, faculty, and administrators teach each other through different forms and technologies.

For a clearer understanding of this concept, we define the components of communities (Figure 1).

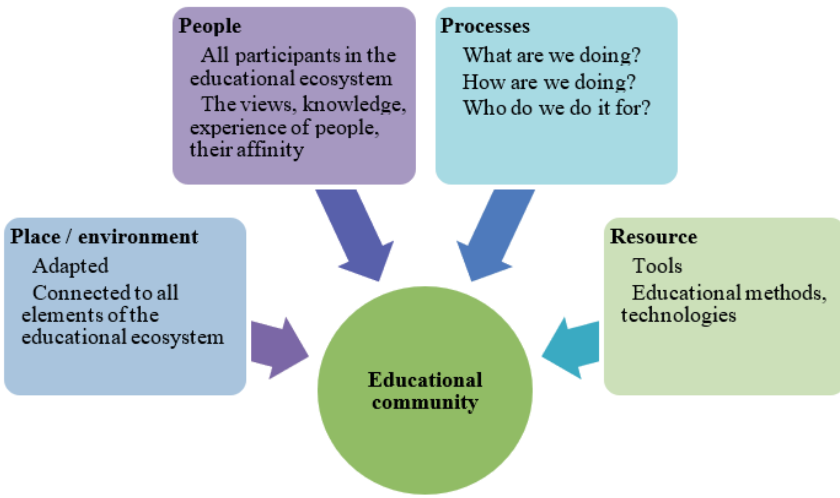


Figure 1. The components of communities

Source: Own work based on Pollard (2012).

The reasons why teachers are brought into the community include the following opportunities:

- solving topical problems in communities, when every professional not only finds the necessary solutions, but also gets the opportunity to apply them "here and now" in their pedagogical and colleagues' activities;
- implementation of ideas of a practical orientation and expediency – with communities aimed at the implementation of applied and in-demand development, which "pushes" to unite the stakeholders;
- innovative nature of the activity, which has great potential for professional self-realization, self-development and effective training;
- the attractiveness of working in a team that gathers professionals of a rather high level (in this case, the process of project work is required);
- the availability of a common bank of information resources, the emergence of new opportunities for open access to innovative developments;
- the ability to enhance the status of each community member and others (Solomatin, 2015).

Wenger identifies 5 stages in the development of the community of practice (Wenger, 1998), such as *Potential, Coalescing, Active, Dispersed, Memorable.*

One of the main conditions for the creation and functioning of the educational community is the common goal of its members. A community of teachers was created to institute inquiry-based learning in the study of mathematics in high school with the help of digital tools. The main stages of the creation of a community of teachers at the Borys Grinchenko Kyiv University for IBL implementation were:

- Organizing an organizational meeting with teachers.
- Develop a community-building strategy.
- Preparation of an IBL survey questionnaire.
- Conducting a survey.
- Conducting IBL seminars.
- Identification of the main features of the professional community.
- Creating a community of mathematicians.
- Creating a site for the math community and a wiki page.
- Creating a Facebook page for the community.
- Facebook page support, creation and support of the respective site page.

The capacity-building phase began with an organizational meeting where community members identified directions, relevant activities, and tools for the community to function and expand.

The initial survey of community participants involved identifying respondents with their seniority, the disciplines they teach, the educational institution where they work, their needs and problems in teaching mathematics.

During the community reunion phase, workshops, training courses and workshops were held to address the following issues:

- The concept of "community", including thefeatures of the functioning of the community and its function.
- STEM education and innovative methods – Project-Based Learning (PrBL), Problem-Based Learning (PBL), IBL. Similarities and differences of the methods PrBL, PBL, IBL.
- Research questions. Criteria inquiry questions.
- IBL stages and study cycles. Model 5E of IBL implementation.
- Examples of mathematical research environments in GoLabz.

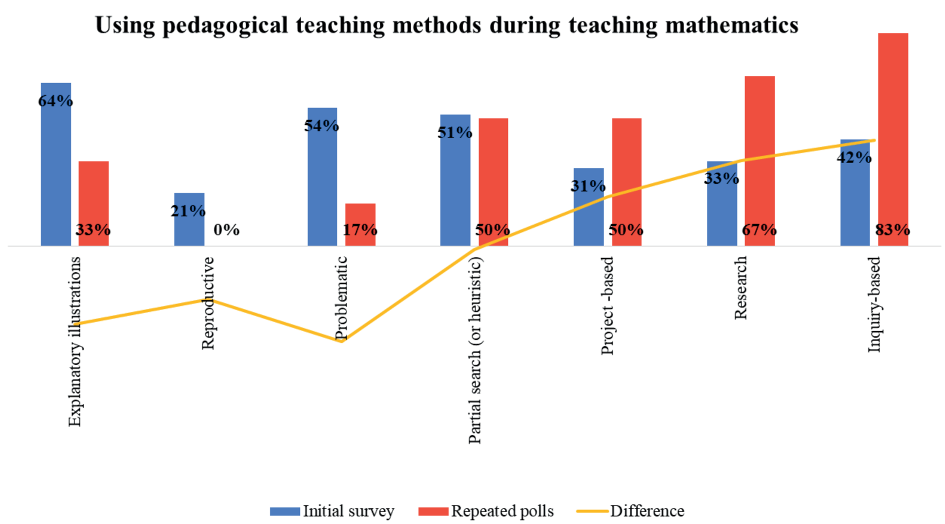
The stage of activity in the created community involves the creation and discussion of training cases, exchange of experience in implementing IBL, holding open classes, developing templates for research problems, creating a database of mathematical modeling problems. Currently, community teachers have been actively working at this stage. This made it possible to investigate the impact of community functioning on teachers' professional activities and the process of implementing IBL in mathematics teaching.

During the research of practical aspects of the creation and organization of the work of the educational community of teachers, a set of theoretical (analysis and synthesis of Ukrainian and foreign scientific, pedagogical, methodological sources on research issues) and empirical (primary and repeated questioning of teachers of higher educational institutions and teachers of secondary educational institutions) methods were used, as well as analysis of the results obtained. The research was carried out within the framework of the international project, "Partnership for learning and teaching in university mathematics (PLATINUM)", programme Erasmus+ KA203 – Strategic partnerships for higher education, 2018-1-NO01-KA203-038887.

Teachers from Borys Grinchenko Kyiv University and other universities are involved in the survey, in which 72 respondents took part. All participants in the survey were active participants in all activities, were involved as participants in trainings, meetings for discussion, provided fitbacks, and shared their own experiences throughout the existence of the community.

2. RESULTS OF THE RESEARCH

One of the goals of the study was to find out if community involvement had an impact on the use of innovative pedagogical mathematics teaching methods. The survey results of the educational community showed that the percentage of teachers who started using the project method (30.6% at the beginning of the community, 50% at the stage of community activity), research (33.3% and 66.7%) and a research-cognitive approach (41.7% and 83.3% respectively) increased significantly (Figure 2).

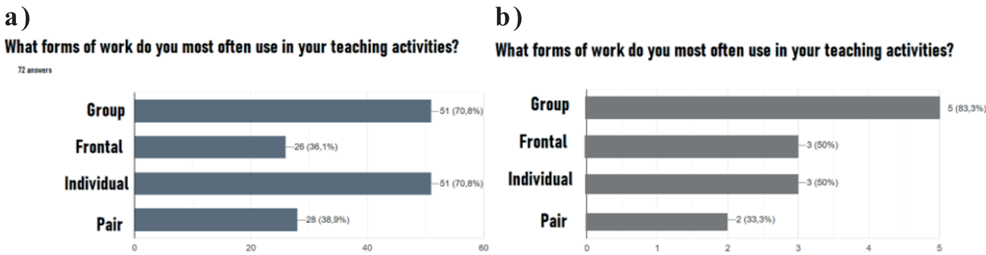


F i g u r e 2. Changes in the use of innovative pedagogical methods in teaching mathematics

S o u r c e: Own work.

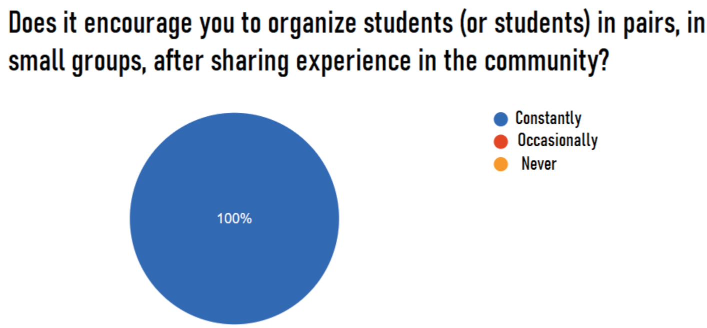
It is interesting that there are changes in the forms of work that community members with students have begun to apply. At the beginning of the joint activity, the teachers most often used the group form of work (70.78%) and the individual (70.78%). After the exchange of experience and participation in workshops, the group form of work of students became the priority (83.3%). The percentage of use of individual forms of work decreased by 20.8% (Figure 3).

All study participants acknowledged that sharing experiences in the community encourages them to organize student learning in pairs, or in small groups (Figure 4).



F i g u r e 3. Changes in the use of forms of work in teaching mathematics by teachers before (a) and after (b) participation in the workshop

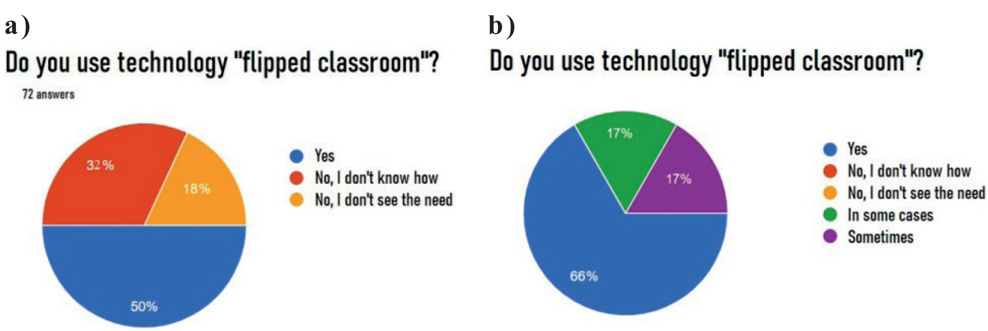
S o u r c e: Own work.



F i g u r e 4. The result of the survey on the organization of work in groups

S o u r c e: Own work.

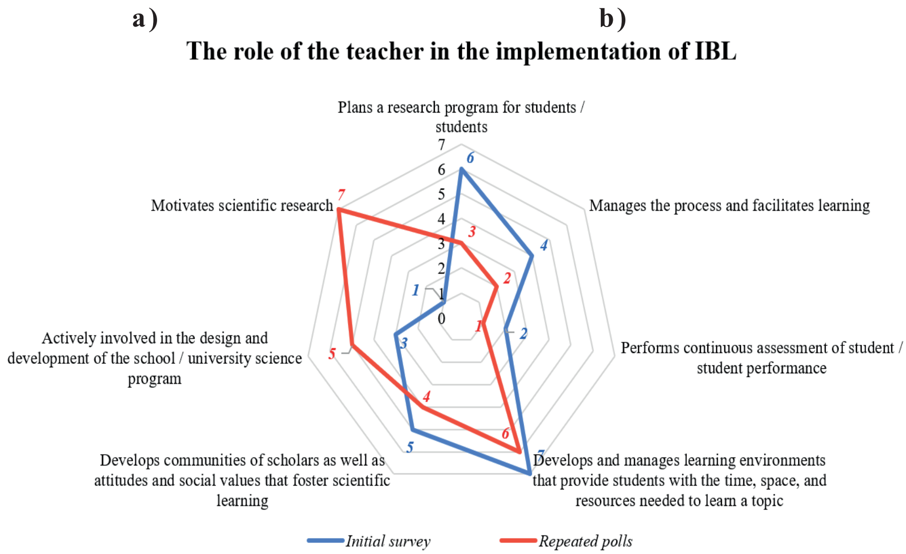
One of the technologies that were being developed during the community meetings was the flipped learning technology. The result of sharing experiences and identifying the features of the organization of this approach in the study of mathematics has led to an increase in the percentage of teachers (at the beginning of community work – 50%, at the stage of community activity – 66.7%), who began to use the "flipped classroom learning" method in their own professional activity (Figure 5).



F i g u r e 5. Changes in the use of "flipped classroom" technology in mathematics teaching by teachers before (a) and after (b) workshop

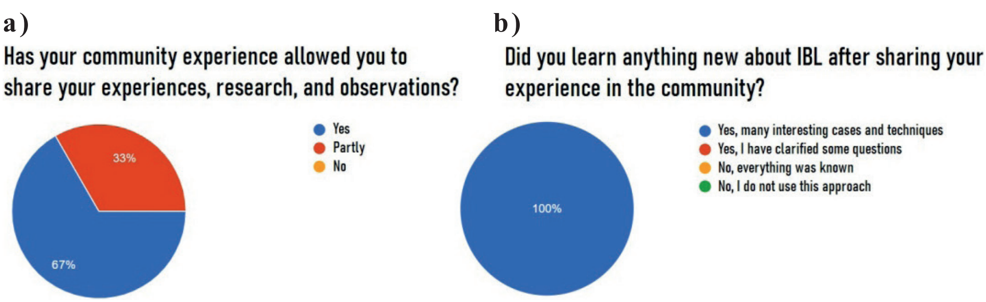
S o u r c e: Own work.

Participants in the educational community have defined their role in applying IBL. The primary and secondary polls showed a difference in priorities. The participants ranked the role of the teacher from 1 to 7, where 1 is absolutely not important, and 7 is extremely important. As the result shows, teachers are interested in engaging with Model 5E (Bybee, Taylor, Gardner, Van Scotter, Powell, Westbrook, & Landes, 2006), that is, students' motivation for research and cognitive activity, while planning itself has become less important, demonstrating the willingness of teachers and their students to use the open inquiry in IBL (Banchi & Bell, 2008) (Figure 6).



F i g u r e 6. Changing the role of the teacher in the implementation of IBL by teachers before (a) and after (b) workshop

S o u r c e: Own work.



F i g u r e 7. Results of analyzing the impact of community engagement

S o u r c e: Own work.

Analyzing the role of the community in implementing IBL for mathematics teaching, teachers answered the question, "Did you learn anything new about IBL after sharing your experience in the community?": 100% – Yes, many interesting cases and techniques. To the question "Has community work allowed you to share your experiences, research, and observations?": Yes – 66.7%, Partly – 33.3% (Figure 7).

DISCUSSION AND CONCLUSIONS

The experience of creating and participating in the teaching community of teachers of mathematics and information technology has confirmed the assumption that professional communities can enrich the process of the professional development of university professors due to a number of benefits of their functioning: a community of people interested in knowledge sharing is created; the designing of educational environments in which participants can share resources; the reduced time to search and use information; facilitating the process of the implementation of innovative technologies; conditions are created to ensure the quality of education; training courses are updated through the introduction of new cases; the university has the opportunity to expand international cooperation. Activities within the project "Partnership for learning and teaching in university mathematics (PLATINUM)", involves creating and maintaining professional communities not only in a single educational institution, but also the expansion of the community internationally, the introduction of innovative approaches and the latest information resources. The competent introduction and support of the Teacher Communities provides the opportunity to increase the professional level of the teacher, the level of student preparation, and is a powerful motivational tool for promoting the teaching and self-improvement of the teachers. Future research is focused on exploring digital resources to meet community needs and develop proposals for ways to develop communities, as well as increasing the soft and key competencies of teachers and learners.

ACKNOWLEDGEMENTS

The research, the results of which are presented in the article, was conducted within the framework of the project, "Partnership for learning and teaching in university mathematics (PLATINUM)", Program Erasmus + KA203 – Strategic partnerships for higher education, 2018-1-NO01-KA203-038887. This article reflects the views only of the author, and the European Commission cannot be held responsible for any use which may be made of the information contained therein.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 176–186
https://doi.org/10.34916/el.2021.13.15

ARTIFICIAL INTELLIGENCE TRAINING – APPROACHES, RESULTS, ANALYSES AND CONCLUSIONS

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Abstract: *The development of the digital society is directly related to the training and use of algorithms and concepts of artificial intelligence. Packages of strategic documents have been developed at European and national level, which set as a main goal for education the introduction of elements of artificial intelligence in different educational levels and forms of education. In recent years, experimental training in artificial intelligence (AI) has been applied in school education in Bulgaria. New approaches are also applied in the training of computer science students. The report addresses some issues and challenges in organizing and conducting this training. Some guidelines and approaches for creating an appropriate curriculum in the field of knowledge structuring and semantic modelling are outlined. As a result of the conducted experimental training, it was established that this subject can be successfully studied in secondary school.*

Keywords: artificial intelligence, logic programming, knowledge structuring and semantic modelling.

INTRODUCTION

The logic in the development of our civilization follows the tendency of constant rise, passing first through the Agrarian, and then through the First, Second and Third Industrial revolutions. Following this trend, the Fourth Industrial Revolution (Schwab, 2016) today sets twenty-three turning points in the digital age. Almost all changes are related to the application and development of computational thinking and artificial intelligence. This makes the requirement for educational systems to build these key competencies, knowledge and skills in all educational levels more and more relevant (Tuomi, 2018).

To achieve these goals, packages of strategic documents have been created at global, European and national levels, concerning the study of artificial intelligence (AI) and the development of computational thinking. Despite the requirements and expectations of the digital society, the experience in studying AI (especially in school education) worldwide is insufficient. This motivates us to share our experience in teaching artificial intelligence in different educational levels in Bulgaria and to share and analyse the results.

The rest of the article is organized as follows: Section 1 provides a brief overview of research in this area. Section 2 discusses our approach to AI education in secondary school and in university. Section 3 aims to share their experience and presents the results from conducted experimental training. Finally, section 4 concludes the contribution.

1. RELATED WORKS

Digital technologies and computer science in particular have contributed greatly to the scientific and technological development of modern society. The term Computational Thinking (CT) is used to denote key ideas in computer science and computer science (Bocconi, 2016). This topic is becoming increasingly relevant in the field of education at all levels of education. The importance is determined not only by the content considered, but also by the positive impact that its study can have on the development of general thinking skills (Guggemos, 2021).

As can be seen from Figure 1 in computational thinking, different concepts and approaches are used, which include different aspects of analytical knowledge (logic, algorithms, modelling, abstractions, evaluation), as well as the approaches for their achievement (thinking, creation, permanence, cooperation, etc.).

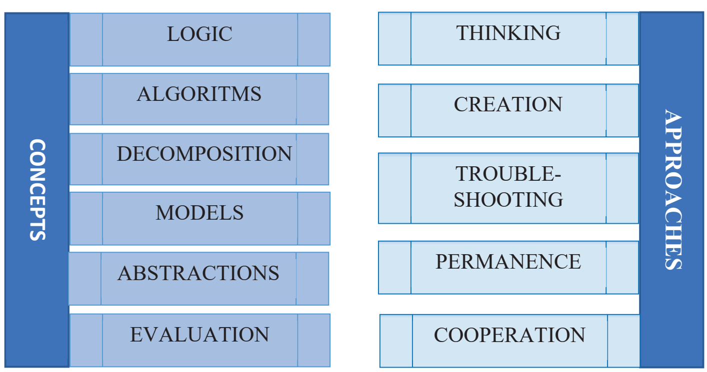


Figure 1. Computational thinking. Concepts and approaches

Source: Own work.

Computational thinking is the subject of research in pedagogical science. It is built gradually in the process of learning at all educational levels. Artificial intelligence is a discipline whose approaches, goals and objectives contribute most to the development of computational thinking (Harangus, 2020).

The importance of AI training presupposes the creation of packages of strategic documents. According to the European Community's White Paper on Artificial Intelligence (White Paper On Artificial Intelligence – A European approach to excellence and trust, 2020), more than € 20 billion in funding is provided each year under the Digital Europe, Horizon Europe and European Structural and Investment Funds for the development of skills needed to work in the field of AI and to adapt the education systems of individual European countries. The report of the Committee on Culture and Education to the European Parliament on the application of Artificial Intelligence in education (Tuomi, 2020) published in 2020 provides a thorough analysis of the need to train professionals to develop and apply intelligent approaches in various areas of modern business and services.

Bulgaria has also adopted a Concept for the development of Artificial Intelligence until 2030 (Concept for the development of Artificial Intelligence in Bulgaria until 2030). The document examines the potential of AI for smart growth and a prosperous democratic society and identifies as a priority "the creation of knowledge and skills for the development and use of artificial intelligence". On this basis, the Bulgarian Ministry of Education and Science approved a basic curriculum for AI, which can be used in the education of students in compulsory, profiling, elective and extracurricular training from various schools, classes and forms of education.

These strategic documents justify the need for enhanced formal and informal learning of AI at all levels of education. Universities have expanded their educational programs to this level of competence. In the last few years, the study of artificial intelligence has been introduced in different countries in different types of schools and at different educational levels (Holmes, 2019).

2. OWN APPROACHES

In recent years, in parallel with the development of the reference architecture of virtual physical space (Stoyanov, 2018) and its adaptation for e-learning (VES) (Stoyanov, 2020), the team of the DeLC laboratory at the Faculty of Math and Informatics at Plovdiv University developed a comprehensive concept for studying AI in school (Glushkova, 2020) and university education.

AI training at school is a challenge for the pedagogical community. The results shared by experts in different countries are impressive, but significant problems are identified (Balaganur, 2019), some of which are:

- The training is conducted in different schools, different classes and in different forms. The fact is that training in an inappropriate curriculum can greatly compromise the learning process.
- Lack of connection with students' knowledge of other subjects is a problem that can lead to excessive abstraction of the curriculum.
- In AI training it is necessary to apply other approaches and other style of training for which there are no trained teachers. Insufficient teacher training

leads to excessive complication of the teaching material and to demotivation of the students.

To solve some of the problems, our team applies the following approach:

- Creating a basic curriculum with clearly defined modules (Introduction to AI, Solve problems with search, Knowledge and semantic modelling, Selected topics from "modern" AI). This curriculum is approved by the Ministry of Education and provides for formal education from 8^{th} to 12^{th} grade. Separate modules can be used to train different groups of students in interest clubs.
- Structuring the curriculum according to the traditional school methodology and development of teaching aids. This greatly assists teachers in the process of their prior preparation.
- Providing various interdisciplinary links with other subjects and the life experience of students and creating a system of learning tasks for the main topics of the curriculum. This increases the motivation and activity of all participants in the learning process.
- Organizing the process of preparation and current qualification of teachers. The solution of this task is realized together with the university and other non-governmental organizations, as well as with the participation in national and international projects under the above-mentioned European programs and structural funds.

Unlike school education, AI training has a long tradition in universities. The accumulated experience and the motivated interest of the university students, especially in the field of computer science, make this process natural and effective (Hinojo-Lucena, 2019). However, new trends require continuous improvement and change of curricula and learning approaches. The fact is that the development of intelligent systems operating with knowledge is impossible without the intelligent structuring of this knowledge. Attention is usually paid to the intelligent behaviour of programs, but the extremely important topic of structuring knowledge is greatly underestimated. In this sense, our team has made some changes in the teaching approaches of this discipline, relying on the structuring of knowledge, semantic modelling and logical programming. The basic algorithms and concepts of classical and modern AI are presented and considered in this aspect.

3. RESULTS AND ANALYSES

Let's look at the results of the training conducted at school and university. In order to make a correct analysis, we will consider only the formal training conducted with all schools and university students in their courses. The reason to neglect (for now) the training in various elective courses and interest clubs is that in these groups only motivated and active learners participate, which naturally leads to higher results.

3.1. Results and analyzes of AI training in school education

During this school year in Plovdiv district we introduced experimental training in Artificial Intelligence in the specialized training of XI grade, profile "Software and Hardware Sciences" in two schools. The training is conducted according to the curriculum approved by the Ministry of Education and Science, using the developed textbooks on the first topic "Solving problems through search" (Stoyanov, 2019). 62 students participated in the experiment. In the course of the training we conducted several studies, the results of which are presented below.

To the questions Q1: "Do you think that studying AI is useful for your future development?" And Q2: "Does AI training motivate you to continue studying it next year?" 40% of students answered "Yes" and 22% with "Largely". Only 8% of the surveyed students answered "No". Also, a large part of the students (65%) are motivated to continue studying AI next year.

In addition to questions related to students' attitudes to learning, the questionnaire included questions regarding the topics studied. The main goal of artificial intelligence education is for students to acquire knowledge, skills and competencs related to the basics of this discipline. As can be seen from Figure 2 students have acquired the necessary knowledge of the subject, the main tasks and role in the development of modern society; knowledge of the main characteristics and features of the Fourth Industrial Revolution; they have mastered the basic algorithms for searching in the "state space" and have understood the basic characteristics and possibilities of applying evolutionary strategies in solving problems.

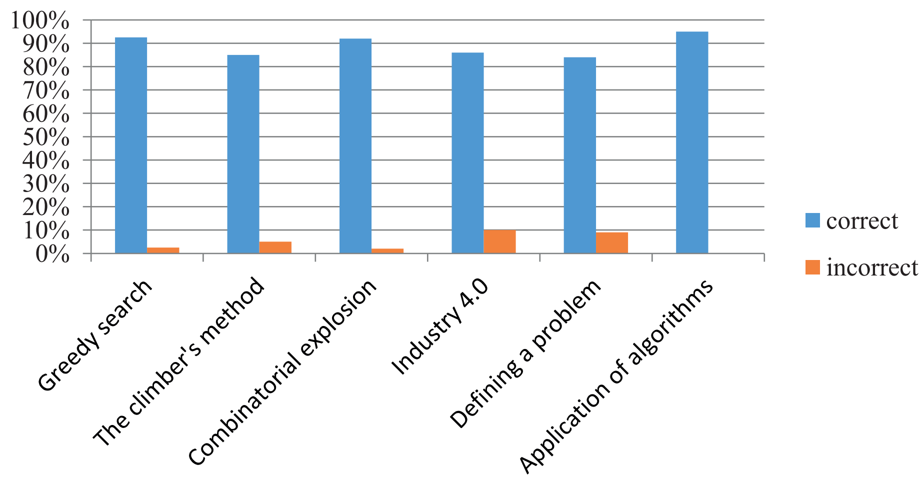


Figure 2. Students' knowledge and skills on the studied topics

Source: Own work.

Artificial intelligence is a multidisciplinary science that is related at various levels to mathematics, computer science, physics, chemistry, history, etc. Creating a system of learning tasks related to students' knowledge of other subjects is one of the key approaches used in teaching (Tabakova-Komsalova, 2020). Considering tasks for generating tourist routes, searching for a way out of a labyrinth, moving robots in a vegetable garden, generating an irrigated (irrigation) plan in the conditions of intelligent agriculture and modelling competitive game spaces are successful ways to apply formal algorithms for search and problem solving. This reduces abstraction and increases the interest, activity and motivation of students in the learning process. The answers of the students related to their opinion about the application of AI today and in the near future confirm once again the need and importance of teaching AI in school. Students think reasonably and set their expectations based on the basic principles and concepts studied during the year. In support of this, they share some of their ideas for the use of AI that would improve lives: "Robot capable of distributing patients in the hospital, AI analysis of radiography, decoding of the viral genome, COVID vaccine search"; "… with the advent of new technologies, there are likely to be those that have the ability to cure currently incurable diseases; remote medical examinations; medical robots performing precise operations impossible for humans"; "… digital personal assistants"; "… fully automated production of food, construction and industrial goods, intelligent agriculture"; "… robots in electronic security and the fight against misinformation"; "… smart homes with smart devices that save energy, and in smart cities to improve services and reduce congestion."

As can be seen from the students' answers, they understand that the development of digital technologies is related to artificial intelligence and its application in all spheres of life. They understand the need to study AI at school and want to continue their education in the coming years.

At the end of the school year we were provided with information about the assessments of students on the topics of the curriculum to achieve the didactic aims. The average success of all students is Very Good 4.81, as the fluctuations in different schools and classes is very small. From the obtained data we can conclude that the students have mastered the teaching material, they understood the main characteristics of the problems, acquired skills to solve these problems with the methods of AI, which achieves the goal and the expected learning outcomes. During the school year the students applied the search algorithms for solving various practical tasks through the studied programming languages in the obligatory profiled preparation.

3.2. Results and analyses from AI training of university students in computer science

At the university, the study was conducted with students majoring in specialities "Informatics" and "Software Engineering". The training is conducted with all full-time and part-time students. The change of the curriculum justifies the need to learn the logical programming language Prolog. At the end of the 2020/2021 school year, a survey was conducted, the results of which will be presented below.

To the questions Q1: "Do you think that studying AI and logical programming is useful for your future development? and Q2: "Does AI training motivate you to continue studying and using it?" 61.43% of students answered "Yes", 15% with "To a large extent". With a resounding "No" only 4% of the surveyed students answered, and a large part of the students (68%) were motivated to continue studying it and to engage in logical programming. The comparative analysis with the students' answers shows a high level of similarity, as the higher percentage of positive answers of the computer science students is completely justified (Table 1).

Table 1. Comparative analysis of the answers of school and university students

University/Schools	Number of students	Q1 Yes (%)	Q1 Largely (%)	Q1 No (%)	Q2 Yes (%)
University students					
Plovdiv University, Specialty „Informatics“	47	60%	14%	4%	67%
Plovdiv University, Specialty “Software engineering”	96	63%	16%	4%	69%
School students					
School I	22	40%	20%	9%	64%
School II	40	41%	23%	7%	66%
Total	**205**	**55%**	**17%**	**5%**	**90**

Source: Own work.

In addition to questions related to students’ attitudes to learning, we included in the questionnaire questions related to the topics studied in the AI course. The percentage of correct answers is presented in Figure 3.

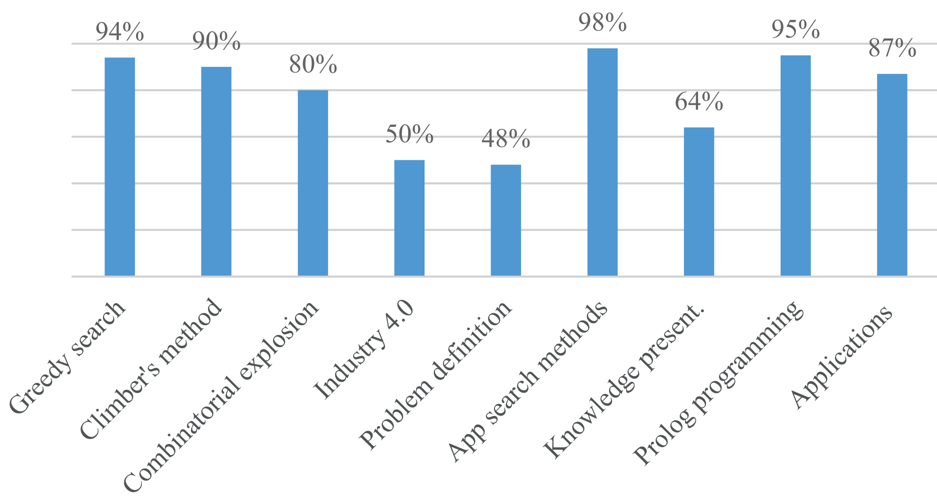
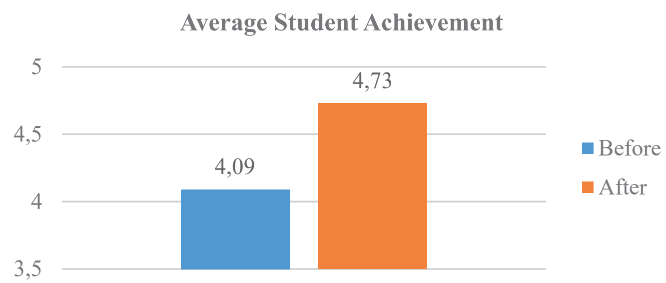


Figure 3. Learning outcomes on various topics in %

Source: Own work.

Along with the questions related to the assimilation of the study material, the students were asked several additional questions to establish the existence of links with other scientific and applied activities. Students think reasonably and set their expectations based on basic principles and concepts. They understand that the development of digital technologies is related to artificial intelligence and its application in all spheres of life. They understand the need to study AI and want to develop in this field.

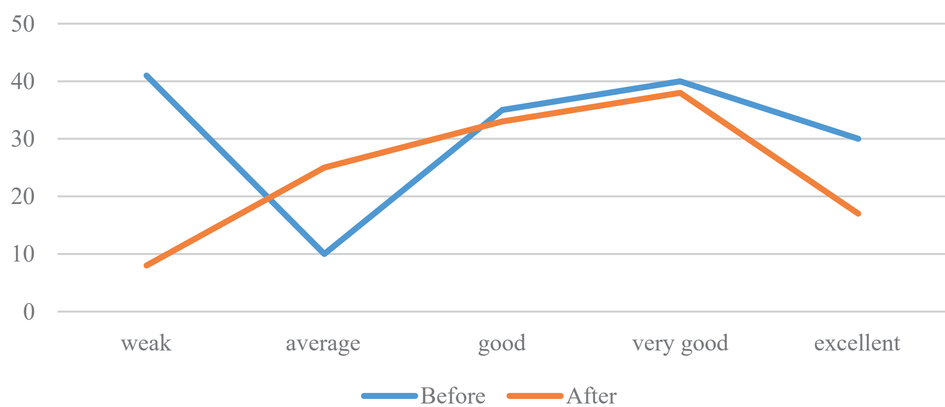
Figure 4 presents a diagram of the average grade in AI courses before and after applying the presented approach. There is a significant increase in the average success of students, which is largely due to their increased motivation and activity.



F i g u r e 4. Average university student achievement before and after application of new approaches

S o u r c e: Own work.

The distribution of grades at the end of AI training in the computer specialties of PU "Paisii Hilendarski" before and after the application of the presented approach are visualized in Figure 5. The shift of the Gaussian distribution to the right explains the relatively high average success (4.73) after the end of 2020/2021 school year.



F i g u r e 5. The assessment of students before and after the application of the presented approach

S o u r c e: Own work.

Teacher training is perhaps the most important task in this process. To a large extent, these teachers did not study AI during their university education. The AI topic is specific and in order to conduct effective student training, continuous and in-depth teacher training is required. In the last three years, our team has organized qualification courses for 42 teachers, as follows: 18 participants in a course of 16 lessons and 24 – in a course of 60 lessons. About 50% of teachers teach in a specialized high school; 25% – in a vocational school, and 12.5% – in a general education school.

A survey was conducted, according to which the maintenance qualification courses (up to 32 hours) are extremely insufficient. They say that despite the textbooks, they do not feel safe enough in their work and want to continue their education in more depth.

From the surveys we can conclude that teachers are motivated to teach this subject in school because they believe that it is useful and promising for their students. This, of course, reflects on the desire of teachers to continue their education by studying other topics of classical and "modern" artificial intelligence. They shared that they want to deal with robotics, machine learning and various AI applications.

CONCLUSION

The formation of computational thinking is a process that is closely related to the teaching of artificial intelligence in secondary school and university. The approaches are different and are related to the characteristics of the respective learners. The results of the formal compulsory education in the experimental groups of university and school students are similar, which gives grounds for the conclusion that the educational content, teaching methods and approaches are suitable for achieving the main didactic goals.

When analysing the training in elective courses and interest clubs at the university and in the high school, we find much better results, which are undoubtedly related to the higher motivation of both the learners and the trainers. The preparation of teachers is a key task on which the success of AI training and development of computational thinking in secondary school education largely depends (Moudgalya, 2021).

The future plans of the team are to develop a complete package of textbooks for all major topics of the school curriculum and to continue to improve the chosen approach to university student learning. It is necessary to create an extended curriculum and teaching resources for teacher training to train students from different schools, classes and forms of education in the field of AI.

ACKNOWLEDGEMENTS

The results published in this article are part of a study conducted with the financial support of project FP21-FMI-002 "Intelligent Innovative ICT in Research in Mathematics, Informatics and Pedagogy of Education" of the Scientific Fund of Plovdiv University "P. Hilendarski" in Bulgaria.

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Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 187–198
https://doi.org/10.34916/el.2021.13.16

STEAM COMPETENCE FOR TEACHERS: FEATURES OF MODEL DEVELOPMENT

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Abstract: *The paper considers approaches to the development of model of STEAM competence for teachers. The concept of STEM/STEAM competence and their components are analyzed. The existing models of STEM/STEAM competence of foreign and Ukrainian researchers are considered, their components are described. The factors affecting the development of STEM competence model for teachers are identified.*
Based on the analysis of the considered researches, the authors developed the model of STEAM competence for teachers, defined and described its components. To clarify the structure of the model of STEAM competence for teachers, the authors conducted a diagnostic survey of Ukrainian educators. Its results are analyzed. They confirmed the correctness and completeness of the structure of the proposed model.

Keywords: STEM, STEAM, STEM competence, STEAM competence, teachers.

INTRODUCTION

One of the ways to modernize and upgrade science and mathematics education in the world is the development of STEAM education. The main purpose of its implementation is to empower people through the development of technical and science education (based on the establishment of links between the STEM-industries), taking into account the need to develop the critical and creative thinking skills of pupils and students. It is important to apply this approach from primary school to higher education to provide the nation with four categories of intellectual investments, which include (Siekmann & Korbel, 2016: 44):

- creative teachers who are able to successfully teach STEAM disciplines;

- scientists, engineers and IT professionals who investigate and develop the technological progress necessary for the country's economic success and for the solving global problems;
- technologically experienced workers who are able to create, design, maintain and operate complex technological innovations;
- scientifically and technologically literate citizens who can critically research, understand, and respond to challenges to improve the environment.

The development of competencies in the field of STEM is relevant in today's world. In particular, this is reflected in the EU recommendations on the development of key competencies for lifelong learning (Council Recommendation of 22 May 2018 on key competences for lifelong learning, 2018: 3; Recommendation 2006/962/EC of the European Parliament and of the Council, 2006, p. 13).

The basis of STEM-education is the integration of science and mathematical disciplines with the engineering and technical ones – ***"STEM disciplines"*** (mathematics, physics, chemistry, biology, engineering, computer science, astronomy, and geography). The prerequisites for the development of competencies in the field of STEM are *mathematical competence and basic competencies in science and technology*. They are identified in the EU as the keys to lifelong learning.

In accordance with the Law of Ukraine "On Education", mathematical competence and competencies in the field of natural sciences, engineering and technology are also defined as key and should be formed during the acquisition of secondary education (Law of Ukraine «On Education», 2017). The Concept for the development of science and mathematical education (STEM education), approved in 2020, defines the competencies developed by STEM education (The concept of development of natural and mathematical education (STEM education), 2020): cognitive skills; data processing, interpretation and analysis skills; engineering thinking; research skills; algorithmic thinking and digital literacy; creative qualities and innovation; technological skills; communication skills. At the same time, they are not defined as STEM competence. Thus, solving the issue of determining the structure of STEM/STEAM competence is relevant and open for research today. This is especially important for teachers who teach STEM/STEAM subjects.

Paper goal. This paper reviews the results of the research that examined the STEAM competence model development for teachers.

Research methods. The present authors have used the following research methods and tools for the investigation (2020):

- survey;
- interview with Ukrainian educators;
- documents and content analysis;
- analysis of research papers.

108 Ukrainian educators have taken part in the present research. The survey was created during this project which purposed to gain data on the awarness level of Ukrainian educators about STEAM competence, the STEAM competence model and their respective components.

1. RELATED WORKS

The papers of such Ukrainian and foreign researchers as T. Anisimova, N. Balyk, O. Barna, T. Barnaby, C. Baumer, O. Barylnyk-Kurakova, M. Boiko, A. Carnevale, S. Ceylan, T. Corbett, S. Dembitska, C. Dumaresq, H. Firman, L. Hrynevych, H. Jang, I. Kaniawati, P. Korbel, I. Korobova, O. Kuzmenko, M. Melton, V. Oleksiuk, V. Osadchyi, F. Sabirova, B. Sejati, S. Semerikov, K. Seyit, O. Shatunova, G. Shmyger, G. Siekmann, N. Smith, M. Song, B. Soo, A. Zeynep, N. Valko etc. are devoted to the issue of defining the concept of "STEM competence", the development of its structure and models.

According to UNESCO, *STEM competence* is a person's ability to properly apply the knowledge, and skills of STEM subjects in their daily life, workplace or in the educational context. These competencies should not be limited and developed within the traditional boundaries of separate areas of existing knowledge (e.g., separate physical or digital competence), (Soo, 2019: 11).

Australian researchers G. Siekmann and P. Korbel define in their paper (Siekmann, & Korbel, 2016) not STEM competence, but the various skills found in the field of STEM. They classify STEM skills as technical because they believe that the purpose of their formation is to increase people's ability to adapt to work and/or life due to the rapid pace of technology development. Thus, according to G. Siekmann and P. Korbel, STEM skills are the ability to produce scientific knowledge (based on mathematical skills) in order to design, create and develop engineering (technical and technological) or scientific products and services (Siekmann, & Korbel, 2016: 19).

A similar approach is followed by Turkish researchers S. Ceylan, A. Zeynep and K. Seyit. They consider the following *STEM skills* as the main ones: the ability to solve engineering issues, engineering design, the individual components of digital and social competencies, the ability to match (associative skills), creativity, innovation, interculturalism, flexibility, adaptability, entrepreneurship, communication, and cooperation (Sen, Ay, & Kıray, 2018: 85).

One of the methods of determining knowledge, skills and abilities in the field of STEM, as well as STEM competence, is to establish a link between professions in science & technology and the specific components that characterize them.

A. Carnevale, M. Melton, N. Smith were among the first who conducted fundamental research to define the concept of "STEM competence" and its structure. Their research "STEM: Science Technology Engineering Mathematics" (USA, 2011), (Carnevale, Smith, & Melton, 2011) was based on an analysis of the database of occupations of current employees in the United States called *O*NET* (Occupational Information Network), which at that time contained a description of more than 965 occupations and related competencies (cognitive and non-cognitive). The focus of the research was on an analysis of competencies related to the STEM professions.

A.P. Carnevale, M. Melton and N. Smith define *STEM competence* as a set of basic cognitive and non-cognitive competencies associated with the STEM professions (Carnevale, Smith, & Melton, 2011: 99).

Figure 1 shows the components of *STEM competence*, according to the structure proposed in (Carnevale, Smith, & Melton, 2011: 8):

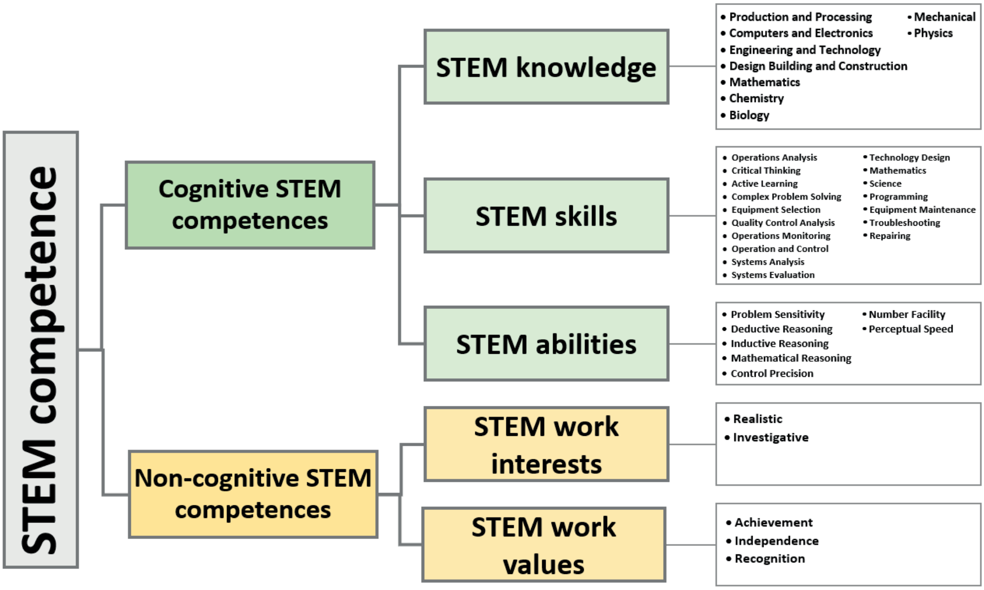

Figure 1. The structure of STEM competence based on A.P. Carnevale, M. Melton, & N. Smith (USA, 2011)

Source: Own work based on Carnevale, Smith, & Melton.

Similar research to determine the components of STEM competence, based on an analysis of the database of occupations O*NET, was also conducted by H. Jang in the United States in 2014 (Jang, 2016).

H. Jang identified 5 groups in the *structure of STEM competence*. Each of the groups consists of knowledge, skills and activities (Jang, 2016, p. 17):

- solving problems (13 components);
- working with people (18 components);
- working with technology (6 components);
- working with an organizational system (8 components);
- working with resources (7 components).

The researcher explains this division by the fact that STEM working professionals should have competencies that go beyond science, technology, engineering and mathematics. In addition to these competencies, they should be able to solve clearly defined issues (using knowledge of STEM disciplines), communicate with other professionals, understand how they work in organizations, be able to manage time, resources, data, etc. (Jang, 2016: 20). In general, the structure of STEM competence according to H. Jang, contains 52 components. 7 of them belong to knowledge, 18 – to skills, with 27 belonging to activities.

Ukrainian researchers have also paid attention to the definition of “STEM competence” and its components.

N.V. Valko (Valko, 2020: 192) defines *the STEM competence of a pre-service teacher of sciences and mathematics* as an integrative formation, the structure of which includes knowledge, activity and value-motivational components.

The research (Hrynevych, Morze, & Boiko, 2020) by L.M. Hrynevych, N.V. Morze and M.A. Boiko smartly defines the components of STEAM competence. According to the authors, these components include the following: mathematical competence, competence in natural science, information and digital competence, civic and social competence, cultural competence, environmental literacy, entrepreneurship and knowledge of a foreign language. The authors considered the components of STEAM competence based on the research of H. Jang (Jang, 2016).

N. Balyk, O. Barna, G. Shmyger and V. Oleksiuk consider *STEM competence* as a dynamic system of knowledge and skills, ways of thinking, values and personal qualities that determine the ability to innovate: readiness to solve complex issues, critical thinking, creativity, organizational skills, cognitive flexibility, teamwork, emotional intelligence, evaluation and decision making, and the ability of effective interaction and negotiation (Balyk, Barna, Shmyger, & Oleksiuk, 2018).

The authors developed a STEM competence *model for teachers' training and lifelong learning,* which is also based on the H. Jang model (Jang, 2016).

The proposed model contains four groups of competencies (skills in problem solving, communication skills, technological & engineering skills, system skills, and resource management skills). Each of them consists of knowledge, skills and activities. The main components of this model are presented in (Balyk, Barna, Shmyger, & Oleksiuk, 2018).

At the same time, the basic components of STEM competence of different researchers (Balyk, Barna, Shmyger, & Oleksiuk, 2018; Jang, 2016; Partnership for 21st Century Skills, 2008) also include the following: an ability to identify the problem; ability to formulate a research task and determine ways to solve it; ability to apply knowledge in different situations; understanding other points of view in problem solving; ability to solve issues out of the ordinary; ability to apply higher order thinking skills. It should be noted that most of these components are components of research competence.

2. RESEARCH RESULTS

Analyzing the components of the above structures and models of STEM/STEAM competence, it should be noted that each of them (in addition to the knowledge, skills and abilities in the field of STEM/STEAM) contains *activity* and/or *value-motivational* components.

These components include the following: critical and creative thinking, resource management, teamwork, complex problem solving, engineering thinking, algorithmic thinking, systems assessment, etc. Many of these components are characteristics and personality traits that belong to *soft skills*. Thus, it is logical to combine them into a separate group.

In addition, the components of the structures of STEM/STEAM competence (analyzed above) include those related to research activities that are characteristics of STEAM subjects. Therefore, *research competence* will definitely be a component of STEAM competence.

While developing the structure of STEAM competence, it is also necessary to take into account *key competencies* (civic, social competence, environmental literacy, etc.), as great engineering inventions, technical discoveries, significant scientific and technological progress are often used by mankind for destructive purposes that can have undesirable consequences, catastrophes, sometimes on a planetary scale. Therefore, it is extremely important to educate conscious citizens who understand the consequences of their activities.

Based on the analysis of the above structures and models of STEM/STEAM competence, the experience of implementing STEAM education of leading Ukrainian and foreign scientists and practitioners, as well as our own experience, we determined that the components of the ***structure of STEAM competence*** include:

- knowledge in the field of STEAM;
- STEAM skills;
- digital competence;
- research competence;
- soft skills;
- some other key competencies.

At the same time, the current issue is to determine the structure of *STEAM competence for teachers*. The training of teachers who are able to successfully teach the STEAM subjects is extremely important for the formation of students' scientific worldview and the development of the scientific potential of the country as a whole. This is also noted within the research (Siekmann & Korbel, 2016).

In addition, in the process of developing STEAM competence models, it should be understood that the model for teachers will differ in its components and level of competencies from the corresponding STEAM competence models for scientists, engineers, STEAM skilled workers, etc.

T.I. Anisimova, F.M. Sabirova and O.V. Shatunova believe that in the process of training teachers for STEAM education, it is necessary not only to combine the disciplines and practices of STEAM (natural and engineering sciences, technology, design/art, and mathematics), but also to include pedagogy and psychology (Anisimova, Sabirova, & Shatunova, 2020: 208). This means that the structure of the STEAM competence of teachers should include the competence related to their professional activities, i.e., methodological competence. At the same time, the disciplines of the engineering unit should be focused on the development of the design and research competencies of pre-service teachers, in particular the design and modeling skills that are need by them to train engineers (Anisimova, Sabirova, & Shatunova, 2020: 208).

The structure of STEM competence proposed by T. Barnabi, C. Baumer, C. Dumaresk and T. Corbett includes (in addition to content, skills and abilities) teaching practices and assessments, which consist of methodological competence components (such as the development, implementation and analysis of STEM lessons and the appropriate methodology; involving students in the targeted use of pedagogical technologies on the basis of knowledge, skills and abilities in the field of STEM for fulfilling their creative abilities and potential, etc.), (Corbett, Dumaresq, Barnaby, & Baumer, 2014: 4–5).

B.H. Kim and J. Kim in (Kim & Kim, 2016: 1918) consider the so-called "*teaching competence in STEAM education*", which is actually a methodological competence. Its main components include the following: understanding of subjects, methods of teaching and learning, motivating students to learn, understanding the learning needs of students, creating educational environment and conditions for learning, assessing student achievement, etc.

Considerations regarding the inclusion of methodological competence in the structure of STEAM competence for teachers are also confirmed by the results of our research (Figure 2).

To clarify the structure of the STEAM competence model for teachers, the authors conducted a diagnostic online survey (using Google Forms) of Ukrainian educators in 2020 (Strutynska, 2020). 108 Ukrainians took part in the survey. Some results of this survey are presented in Figure 2–3.

Q.: Rate on a scale from 0 to 5, how important is each of the proposed components for the development of STEAM competence of teachers *(0 – not important, 5 – very important).*

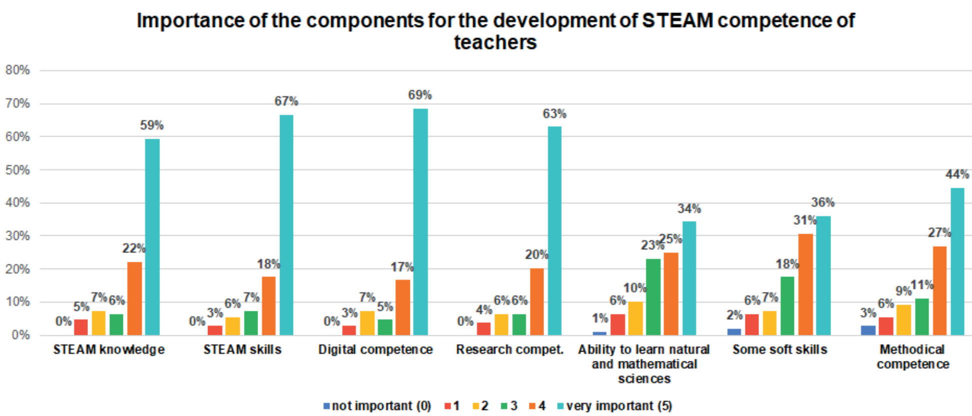

Figure 2. Answers to questions about the importance of components for the development of the STEAM competence of teachers

Source: Own work.

Figure 2 shows that 44% of respondents rated *methodological competence* as very important. It also means that educators have an understanding that the teachers of STEAM disciplines must not only have a thorough knowledge, skills and abilities in the field of STEAM, but also have the appropriate methods of teaching them.

Q.: Rate on a scale from 0 to 5, how important are soft skills for the development of STEAM competence of teachers *(not important, 5 – very important).*

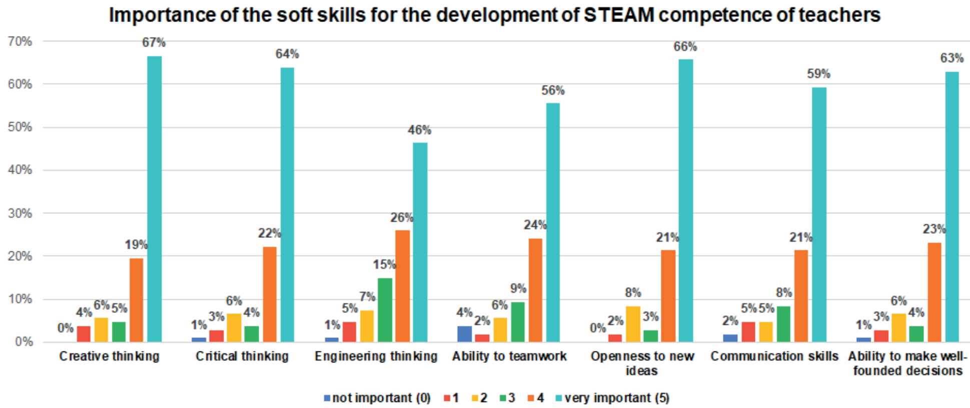

Figure 3. Answers to questions about the importance of soft skills for the development of the STEAM competence of teachers

Source: Own work.

Figure 3 shows that among the most important components for the development of the STEAM competence of teachers, respondents focused on *creative and critical thinking* (67% and 64%, respectively), *openness to new ideas* (66%) and *the ability to make informed decisions* (63%). This means that educators have an understanding that for the development of STEAM competence, it is also necessary to develop *soft skills*.

Thus, based on the analysis of the components, we have developed ***a generalized model of STEAM competence for teachers*** (Figure 4):

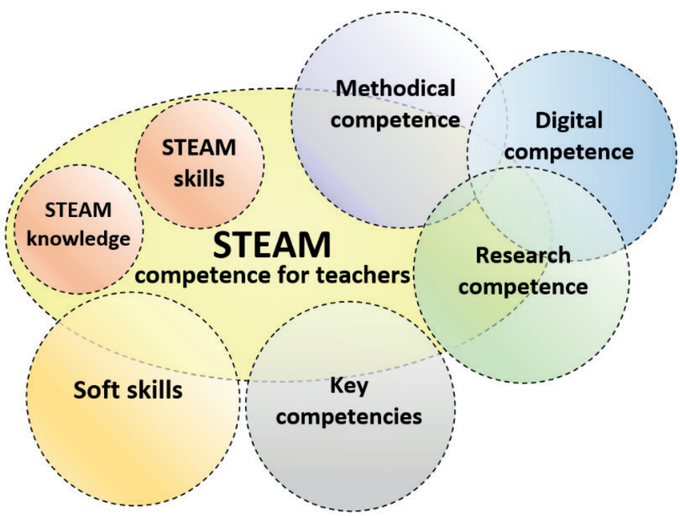

Figure 4. A generalized model of STEAM competence for teachers

Source: Own work.

Table 1 shows the main components of the proposed model:

Table 1. A generalized model of STEAM competence for teachers

The name of the component of STEAM competence	The main components include
STEAM knowledge	mathematics, technology, engineering, design planning, modeling, natural sciences (physics, astronomy, chemistry, biology, geography), foreign (English) language, basics of design
STEAM skills	mathematical skills; technological skills, engineering design (needs identification, design, prototyping and model making); equipment maintenance; the presentation of real world phenomena using a variety of scientific, mathematical, technological and engineering models; research of the basic fundamental concepts and principles of science, engineering, technology, mathematics through connections with other sectors (history, language, art, culture, etc.); use of mathematical and scientific principles, considerations for forecasting results, the solving of technological and technical issues; the design and use of various resources (data, materials, tools) to safely and effectively solve problems that require the integration of concepts, methods and skills from different disciplines; monitoring
Research competence	an ability to identify the problem; ability to formulate a research task and determine ways to solve it; activity planning; ability to research and compare; ability to apply knowledge in different situations; understanding other points of view in solving problems; ability to solve a problem out of the ordinary; verification and experimental confirmation of research results; engineering and design thinking, systems analysis, systems evaluation
Methodical competence	understanding the principles of STEAM education as an integrated approach in different disciplines; development of STEAM curricula (or STEAM disciplines); the development, implementation and analysis of STEAM lessons; a knowledge of the laws, principles and methods of teaching & learning STEAM, including methods that support higher-order thinking and creative problem solving; motivating students to learn STEAM, understanding the learning needs of students, creating learning environments and conditions for learning STEAM, assessing learning outcomes
Digital competence	a knowledge of computer science required for the subject area, obtaining data from various sources, their analysis, processing and interpretation; algorithmic thinking, the use of digital technologies in the subject areas of STEAM
Soft skills	critical thinking, creative thinking, communication skills, responsibility, an ability to teamwork, motivate team members, an ability to solve complex problems, decision making, openness to new ideas, an ability to use resources management
Some other key competencies	an ability to learn, civic competence, social competence, environmental literacy, entrepreneurship

Source: Own work.

STEAM training for teachers of different STEAM disciplines (and, accordingly, the development of their STEAM competence) will differ depending on their specialization that is also confirmed by the results of the research (Figure 5):

Q.: Is the process of STEAM competence development the same for the training of different specialists in STEAM fields (physicists, biologists, mathematicians, etc.) and, accordingly, for the training of teachers of different STEAM disciplines?

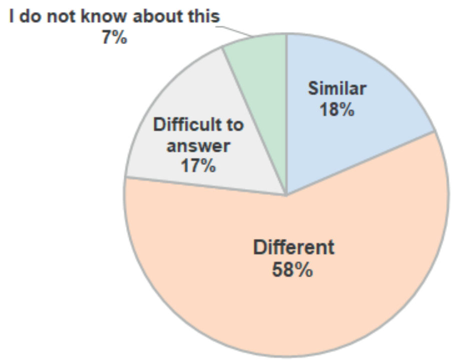

Figure 5. Answers to questions about the development of STEAM competence for the training of different specialists in STEAM industries

Source: Own work.

CONCLUSION

The development of STEAM education and its trends is important, and this is a priority in Ukraine and the world. The present needs require systematic training in the field of STEM/STEAM education, that is confirmed by the experience and relevant research of the Ukrainian and foreign scientists.

The study result is the development of a model of STEAM competence for teachers. Its components are selected not only based on the relevant Ukrainian and foreign experience, but also are confirmed by the survey of educators. Based on the conducted research, we can make conclusions about the necessity to form the STEAM competence of pre-service teachers who will teach STEAM disciplines and will be able to form the STEAM competence of their students.

Developing the STEAM competence of pupils and students requires administrators and educators to update the content of school and university education in accordance with the requirements of today.

Focusing on the modern labor market, educational professionals should radically update curricular programs, especially those that are directly related to preparing the younger generation for new roles in society. Their mastery of technologies, knowledge and skills can help meet the needs of the digital society in the future.

Since STEAM education is implemented through an interdisciplinary approach in the developing curricular programs at the educational institutions of different levels, then in this regard, it is important to develop educational programs for the training of pre-service teachers in the field of STEAM and forming their STEAM competence. This can be implemented through the improvement of educational programs for students who study the natural sciences at pedagogical universities.

Perspectives for further research are:

- an analysis of the integration principles of STEAM disciplines;
- an increase of the awareness of educators regarding the interdisciplinar aspects of the STEM/STEAM education;
- determining of the ways to form STEAM competence to train different specialists in the STEAM fields (physicists, biologists, mathematicians, etc.) and, accordingly, to train teachers of different STEAM disciplines.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 199–209
https://doi.org/10.34916/el.2021.13.17

THE TEMPLATES METHODS IN E-LEARNING OF HIGHER MATHEMATICS

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Abstract: *The article considers the peculiarities of the implementation of the templates method in the process of e-learning of higher mathematics for automated generation and visualization of tasks using cloud services. It reveals the essence of the templates method; its advantages as a real and accessible method of automating the creation and use of packages of practical mathematical tasks, and also their visualization. A survey conducted among students sproved the convenience and efficiency of using the method of templates in the process of teaching higher mathematics. The authors discuss features and methodological aspects of the implementation of the templates method using Google Sheet and Overleaf cloud services in the process of e-learning of higher mathematics. The authors present the algorithm of the organization of e-learning of students with use of templates consisting of two stages and highlight the advantages of cloud services in the implementation of the template method in the process of teaching higher mathematics. They include an operational reflection, a comparative analysis of work performed, etc.*

Keywords: template method; educational process; e-learning; higher mathematics; cloud services.

INTRODUCTION

Intensification of the university learning process, diversification of its forms (including e-learning, blended learning), an easy and fast access to information resources bring about a number of important problems. They include the development of quality methodological and didactic materials for students (tasks for independent and control works, tests, visual aids, etc.). This problem is especially relevant in the context of e-learning, which involves the necessity to radically change the approach to the organization of the educational process in higher education institutions, and obviously requires much more time and effort from teachers and students. Therefore, it is important that tasks solve various aspects of this problem through the following: automatic generation of mathematical tasks to ensure multivariance in the learning process; design of mathematical task texts for students' good visual perception; saving teachers' time in developing the content of tasks; optimization of students' time and effort in the process of solving mathematical tasks; organization of independent work of students in the presence of a significant number of already solved mathematical tasks in free access on the Internet; organization of interaction of teachers and students by means of cloud-oriented learning technologies, etc. Undoubtedly, the selected aspects are relevant for all university disciplines, but they acquire a special significance in the process of teaching higher mathematics.

1. ANALYSIS OF CURRENT RESEARCH

According to the results of research, automation of the process of creating and solving mathematical problems allows you to effectively organize both classroom, including remote and independent work of students, reduces unproductive time and effort of students.

Various aspects of the use of automatic generation methods for the development of mathematical methodological and didactic materials have been the subject of research by a number of scientists (Gangur, 2011), (Singh, 2012), (Siu Cheung Hui, 2013), (Nguyen, 2012), (Bodnenko, 2015), (Semenikhina, 2020), (Vollrath, 2015). Thus, V. Byzov (Byzov, 2018) developed an approach to generating tests using a document template in the computer typesetting system LaTeX. The author notes that LaTeX allows you to create documents that contain mathematical formulas of any complexity, edit TeX-files with an external program or script, and correctly convert the source code of the document into a PDF file, regardless of the version of LaTeX. Y. Konovalov and S. Soboliev (Konovalov, 2016) considered different approaches to the construction of automatic generation of control tasks in mathematics, outlined their advantages and disadvantages. We want to note that there are some interesting examples of algorithms for generating problems from some sections of linear algebra and mathematical analysis (Singh, 2012), (Abe, 2013).

In his works, S. Radchenko (Radchenko, 2018, Radchenko, 2019) considers the main ideas of the so-called templates method for generating tasks are given, the mathematical basis of the used algorithms and methodological bases of its realization. The author proposes and substantiates the main advantages of the template method:

- mass creation of mathematical tasks without the use of special programming systems;
- ensuring individualization and control of classroom and extracurricular work of students;
- visualization of educational information that improves the quality of the educational process.

At the same time, the analysis of scientific works showed that the use of methods and technologies for automatic generation of didactic content in e-learning, in particular, involving all the features of cloud services, has not yet been the subject of scientific research.

The aim of this study is to find out the peculiarities of the implementation the templates method in the process of e-learning of higher mathematics for automated generation and visualization of tasks using cloud services. To achieve the goal of the study, the following tasks are formulated: to analyse the methodological aspects of using the templates method as a real and affordable method of creating and using packages of practical mathematical tasks for students; to reveal the possibilities of cloud-based learning technologies for the implementation of the method of templates in the process of learning higher mathematics.

2. MATERIALS AND METHODS

To achieve the goal we used a set of appropriate methods: analysis of research to establish the problem of automatic generation for the development of methodological and didactic materials in mathematics, in particular, in the development and use of task packages; synthesis, generalization, systematization for theoretical substantiation of methodical aspects of using the template method in the process of teaching mathematics; empirical: diagnostic (conversation, questionnaire) to establish the importance of using the method of templates in the process of teaching mathematics. The study was conducted on the basis of Borys Grinchenko Kyiv University (Ukraine) during 2020–2021. The experiment involved 29 first-year students majoring in Computer Science, studying the discipline "Higher Mathematics" (15 ECTS credits, including Linear Algebra and Analytical Geometry, Mathematical Analysis, Differential Equations). The study took place in four stages: the first stage, theoretical, aimed at clarifying the theoretical foundations of the study. The second stage, practical, involved the creation of packages of practical tasks in the process of studying the topic "Gaussian method for solving systems of linear algebraic equations" using the templates method and its implementation using cloud services, as well as preparing methodological support for this process. At the third stage, the templates method was introduced into the practice of university teaching of higher mathematics. At the fourth stage, the attitude of students to the effectiveness of the templates method in the process of teaching higher mathematics was studied. The research was performed within the framework of a complex scientific topic of the Department of Computer Science and Mathematics of Borys Grinchenko Kyiv University "Mathematical methods and digital technologies in education, science, technology", DR № 0121U111924.

3. MAIN RESULTS

The essence of the template method is to create a special environment for the formation of an array of similar tasks and transfer them to an easy to read and perceive electronic format (e.g., PDF). The idea of the method is to combine the capabilities of any spread sheet editor and text editor TeX.

To find out the importance of using the template method in the training process, we conducted a student survey. Thus, 79.3% of students believe that it is more convenient for them to receive tasks that are well visualized, has typographic quality. The vast majority of students (75.9%) support the idea of unifying the presentation of mathematical formulas and sets of symbols. Interestingly, almost all students (96.6%) say that it is more convenient for them to use an automated system that reduces actions to thinking about the solution algorithm. In fact, in our mobile and fleeting times, it is no longer interesting for students to fill the answers in the context of solving exercises in standard phrases repeatedly (manually). As a positive result of using the templates method in teaching, we consider the fact that 65.5% of students say that they noticed a difference in learning outcomes after using the templates method. 79.3% of respondents believe that the template method is convenient, and 69.0% think that it is flexible.

At the same time, about half of students (44.8%) are hesitant about the benefits of receiving individual tasks that are unique to each student. We attribute this uncertainty to the fact that not all students are conscientious and uphold the principles of academic integrity.

In favour of the use of the templates method during the development of students' practical skills show the results of certain mathematical exercises (solving systems of equations by Gaussian method and multiplication of matrices). Thus, there are 15–17% of errors in the tasks of students who did not use the templates method and 3–7% of errors in the students' tasks using the templates method.

It is worth noting a number of problems that are successfully solved in the study of higher mathematics using the templates method as a real and affordable method of automation as the creation and use of packages of practical mathematical tasks and their solution by students in the learning process.

1. Any system of exercises will be effective if they are maximally individualized. All students have different levels of mathematical training, which significantly affect their understanding of the material, the scope and correctness of the tasks. The template method provides variation of the content of tasks according to the level of the student. In addition, to develop skills of, for example, solving systems of linear equations by different methods, it is enough not to leave the ring of integers, which simplifies the computational component of the process of mastering the method, increasing the content, which is actually the purpose of learning.
2. Due to the rapid development of digital technologies, the problem of control of students' knowledge is complicated by the fact that many didactic tools (tasks, tests, etc.) with solutions are freely available on the Internet. Students can receive up-to-date information from various sources and share it. Sometimes solving their mathematical problems turns into finding ready-made solutions on the Internet. The templates method allows not only to create any number of exercises with different parameters, but also to quickly change packages of already formed tasks. This reduces the ability of students to use ready-made results, which improves the quality of learning control.

3. An important requirement for the effective organization of the educational process is to save teachers' time when working with methodological and didactic materials. The template method allows you to develop learning materials in individual sections and quickly make changes without compromising the context and form with minimal time and effort.
4. The availability of the templates method is due to the fact that it does not require of teachers special knowledge in programming, is open and understandable to a person who has a sufficient amount of widespread software.

Methodological materials, especially practical, should be as accessible as possible for students. Individual blocks of exercises, collected from different sources, can differ significantly in several respects: fonts and their notation, a set of symbols for the formulation of similar tasks, text support, and so on. As practice shows, students feel discomfort associated with unusually presented material due to the ambiguity of its perception. The templates method allows students to submit educational material in accordance with a carefully selected format that takes into account the peculiarities of students' visual perception of educational information.

The main methodological aspects of using the template method will be considered on the example of creating packages of practical tasks in the process of studying the topic "Gaussian method for solving systems of linear algebraic equations", in particular, systems of four equations with four unknowns. We present the problem from two sides: the formation and presentation of mathematical exercises in a convenient format with the help of a spread sheet editor, as well as ensuring the process of solving tasks in a cloud environment.

Students are given a joint task to solve a system of linear algebraic equations (SLAE). The solution can be implemented in a cloud environment in the classroom or distance learning process. Each student has the opportunity at any time to choose their own way of solving the task. This solution of the task will be automatically executed in the cloud environment of TeX format editor, followed by the presentation for teacher and students. In order to turn all students performing the tasks, may present the results of their own work.

The use of integers (column of free terms, coefficients before unknowns and solutions) is mandatory, as it frees students from the optional complications of arithmetic and makes the process of solving more obvious. For the first step of mastering the method, such a restriction is quite justified. Note that in this process, classroom work is not the main thing, because students can perform actions remotely synchronously without losing the effect of communication.

GENERALIZED MODEL OF EXERCISE FORMATION:

a. Using the prepared templates in the table editor, the required number of numeric arrays in the form of rectangular tables is created.
b. A document is created using the TeX text editor, which provides the final look of the tasks.
c. The final form of the document with the list of tasks in PDF format is sent to students for processing.

d. Simultaneously with the implementation of paragraph b, a copy of the same set of tasks for the teacher is formed with the answers that are laid down in paragraph a.

The whole process of forming a new set of tasks is quite fast. It lasts one minute and can be used during classes with students.

Let's show the algorithm of application of a method of templates with use of cloud services (web-based spread sheet program Google Sheets and the collaborative cloud-based LaTeX editor – Overleaf [overleaf.com]):

Step 1. Preparation of a file with templates.

1. An online Google Sheet document is created with worksheets for each student, as well as a summary table (a separate Google Sheet worksheet) for the teacher. The document for students forms templates according to the algorithm for solving a specific problem, in our example – solving SLAE. Important: the materials of each participant in the joint work are protected by appropriate access.
2. Student cells are unified by addresses within the document.
3. One cell is allocated on each student sheet for the result of the student's work in text format with TeX codes.
4. Links are created to the same type of student cell addresses with the designations of their names on the teacher's sheet.

Stage 2. Working with the template.

5. With simple actions with standard formulas, students synchronously perform the transformation of their tables (i.e. perform tasks in a single document in Google Sheet, each student on a separate sheet), corresponding to individual systems of equations. In the comments, they indicate only the indexes of the rows of the tables, and the formation of the text of solving tasks is automatic.

A fragment of the Google Sheet document after step 5 is shown in Figure 1.

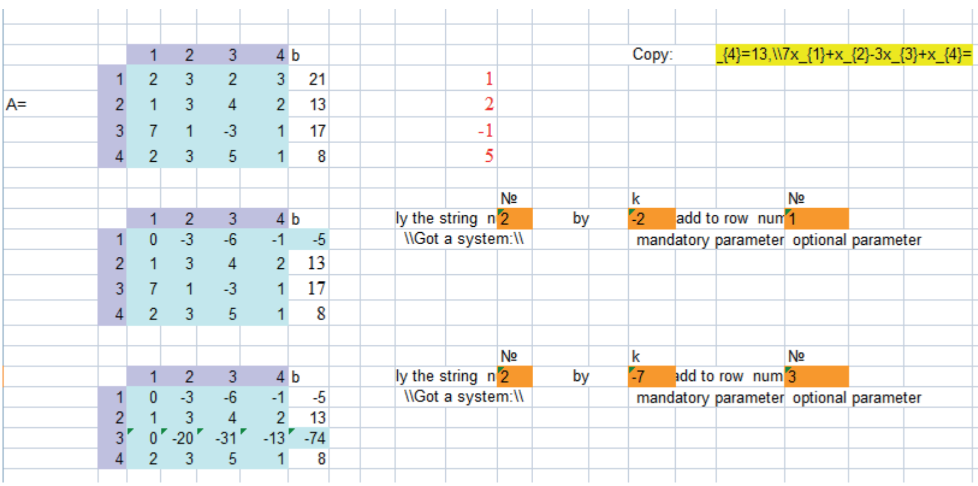
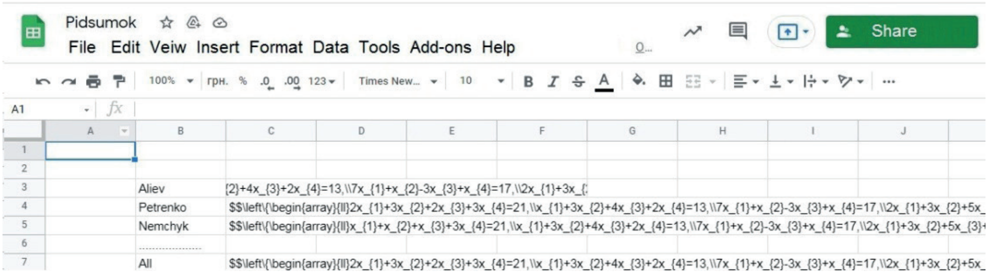


Figure 1. A snippet of the desktop in Google Sheet

Source: Own work.

6. Then the procedure of pasting all the answers with the names of students, the result of which is placed in the teacher's sheet is done (Figure 2).



F i g u r e 2. A file with all answers with the names of students

S o u r c e: Own work.

7. The student also sends the completed task to the teacher in the form of a PDF file formatted in the cloud-based TeX editor. The quality of the result after the conversion will be typographic, which has a decisive advantage over the text written by the student himself. Note that students and the teacher with students can share the results of work not only in a PDF file. These can be TeX files that can be edited in any text editor and then converted to PDF without compromising the overall quality of the document.
8. On the teaching sheet of the online file we have a general table of references to all the results of students during the time period defined by the conditions of consideration of the task (in the line "All" we have the final version of the summary solutions).
9. The teacher converts the text from the results sheet into PDF, as a result we have the opportunity to quickly analyse the activities of students and provide a quick reflection on the basis of the obtained data (Figure 3).

In the process of work the question arises – what are the advantages of implementing the template method provided by Google Sheet and Overleaf cloud services? The most important is the operational reflection and comparative analysis of the work performed, which is difficult to do when working with application software installed on a local computer. The use of cloud services also allows:

- the teacher will significantly speed up the process of preparation for the lesson and check the work thanks to the template for joint work in the Google table, and he/she can immediately create a methodological support for independent work of students (for example, a video manual);
- students, in addition to acquiring professional competences, masters the components of digital competence, identified, for example in [Bell]: Cultural (how to behave), Cognitive (how to do), Constructive (how to use), Communicative (how to communicate) Confident (how to belong), Creative (how to make), Critical (how to evaluate), Civic (how to participate).

Therefore, the Google Sheet cloud service in the context of our study is used to create a common resource for synchronous activities (learning and self-learning) and interaction (reflection, analysis of work performed). It should be noted that any program (service) that provides such a functionality (useful in this aspect are the functions IMPORTRANGE, VLOOKUP, MATCH, INDEX), can be used to implement the templates method. The lack of programming makes this method accessible and mobile, as a large number of Internet services and software for different platforms allow the use of this method for different devices. In addition for many desktop or laptop, you can use the templates method on other devices (tablet, smartphone, etc.). The previous considerations concerned mainly exercises with numerical quantities. But mathematics operates in many cases with symbolic variables and spatial images (for example, in Problems in the Theory of Algorithms, Data Mining, Group Theory, etc.). What can the template method offer for such material? You can also use a spread sheet to operate on cell indexes. For example, you need to construct an arbitrary "word" by composing it from the characters that are located in the cells of a particular continuous column. Using an arbitrary sequence of indexes, you can randomly mix these cells in the process of pasting their contents.

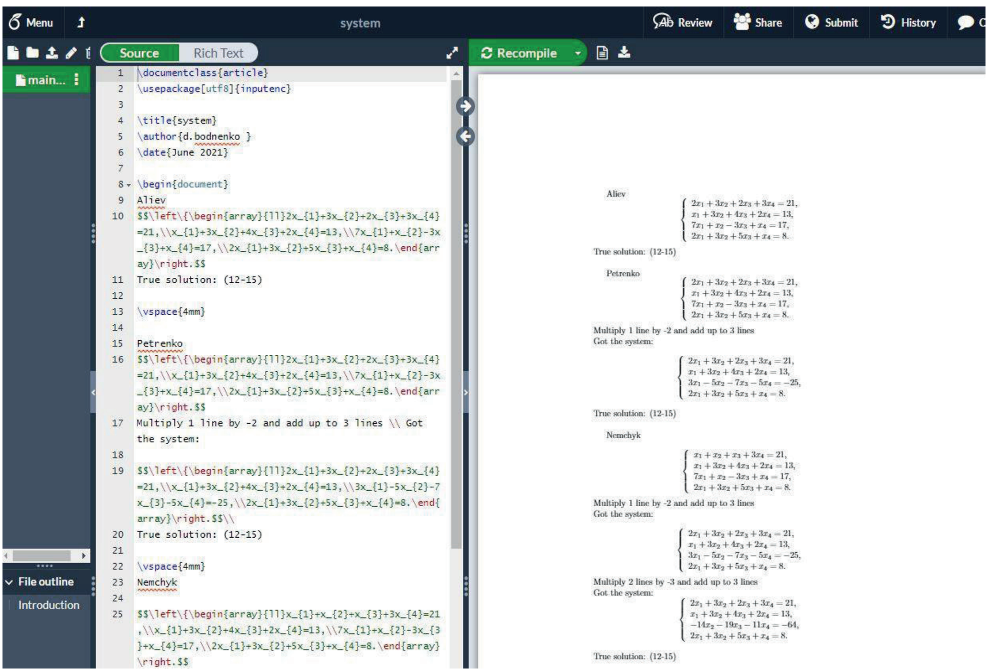


Figure 3. A snippet of the final view of a student-generated PDF solution automatically generated by the cloud-based Overleaf editor

Source: Own work.

Here is an example. Let the set K = {e, a, b, c} with an algebraic operation given by the Kelly table:

·	e	a	b	c
e	e	a	b	c
a	a	e	c	b
b	b	c	e	a
c	c	b	a	e

Show that the group is Abelian but not cyclic. Find the orders of all its elements.
Using the template method, the Kelly table is formed randomly depending on the predetermined result. All possible variants of the Kelly table are considered. In the class, students can choose any version of the table for joint or individual solution with the opportunity to quickly check the results. In addition, using the templates method, it is possible to expand the list of questions for students in this task.
It is worth noting that the template method can also be useful for demonstrating illustrative examples during lectures. The peculiarity of the illustrative material provided by the lecturer is the need to achieve the main goal in a limited period of time, avoiding many details that arise when solving more complex tasks in practice. Demonstrating several exercises solved in one method allows the student to choose the most convenient option for understanding the theoretical material.
There can also be consolidated educational materials in Google Classroom, create LMS resources and integrate specialized services (SCM), involve in diagnostics (Google forms) and promotion (social services), etc.

CONCLUSION

The essence of the presented template method consists in creating a special electronic environment for forming an array of similar tasks and transferring them to an easy to read and perceive electronic format (for example, PDF). The idea of the method is to combine the capabilities of any spread sheet editor and TeX text editor. The advantages of the templates method as a real and accessible method of automating the creation and use of packages of practical mathematical tasks, and their solution by students include: variation of the content of tasks according to the level of mathematical student training; the quality of control of students' knowledge by providing them with unique tasks, the solutions of which are not freely available on the Internet; minimum time spent by teachers to create methodological and didactic materials without the use of programming, etc. The convenience and efficiency of using the templates method in the process of teaching higher mathematics was confirmed as a result of a student survey. The methodological aspects of using templates as a real and accessible method of creating and using packages of practical mathematical problems for students are analysed on the concrete example.
This study reveals some peculiarities of the implementation of the template method for automated generation and visualization of tasks with the use of cloud services in the process of e-learning of higher mathematics. In particular, it presents an

algorithm for organizing learning using the environment of templates and Google Sheet and Overleaf cloud services, which consists of two stages. Finally, it highlights the advantages of cloud services for the implementation of the template method in the process of teaching higher mathematics: operative reflection and comparative analysis of the performed works, etc.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 210–224
https://doi.org/10.34916/el.2021.13.18

THE ETHICAL ASPECTS OF ICT USAGE IN INTERCOMMUNION WITH PARENTS OF PRESCHOOLERS WITH SPECIAL EDUCATIONAL NEEDS

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Abstract: *In today's world, the use of information and communication technologies (ICTs) has become much more relevant because of the COVID-19 pandemic. The consequences of quarantine restrictions have sharpened the problems connected with the education and upbringing of preschoolers with special educational needs (SEN), who needed to establish an effective intercommunion of parents with specialists through ICT. The authors' aim was to clarify the theoretical basis of the research problem and to determine the ethical aspects of the ICT usage in communication with parents of preschoolers with SEN. Based on the methods of analysis, synthesis and generalization, the authors presented a theoretical review of the feasibility of ICT in the process of working with preschoolers, outlined the specifics for children with SEN, and established the role of ICT in cooperation of teachers with parents of preschoolers in preschool educational institutions (PEI). Empirical material was collected using the method of written survey (questionnaire) of parents. The research group consisted of parents of preschoolers with SEN (n=124) from four PEIs in Ukraine. The results testified to the existing problems and difficulties that parents face in the process of communication through ICT. The key and additional ethical aspects of the use of ICT in communication between teachers and parents are identified, which not only raises knowledge about information content, but also produces* *a friendly attitude between all participants, aimed at compliance with socio-ethical norms of behaviour, respect and mutual trust.*

Keywords: information and communication technologies (ICT), preschool children with special educational needs, parents of preschoolers with special educational needs, communication, ethical aspects of communication, distance learning.

INTRODUCTION

According to the amended Law of Ukraine "On Education" (2017), inclusive education is defined as a system of educational services guaranteed by the state, based on the principles of non-discrimination, consideration of human diversity, effective involvement and inclusion of all participants of the educational process. (Zakon Ukrainy "Pro Osvitu", 2017: 13).

Salamanca Declaration and Framework for Action on the Education of Persons with Special Educational Needs (hereinafter referred to as SEN) state that the education of children with SEN is a common task of parents and professionals (Salamanska deklaratsiia ta ramky dii shchodo osvity osib z osoblyvymy osvitnimy potrebamy, 1994). Families and parents can be improved by providing the necessary information through ICT. Both parents and professionals (teachers, educators, psychologists) may need support and encouragement in terms of learning to co-work as equal partners.

According to the Ministry of Education and Science of Ukraine in 2020/2021 preschoolers with SEN were provided with 4369 special groups organised in 1630 preschool educational institutions, where 61668 children get a preschool education and 3796 inclusive groups organised in 2242 institutions where 6849 children are educated. All inclusive resource centres (IRCs) are digitalized, the information and educational system of the AS "IRC" and the website are functioning to provide convenient access to services, which is especially relevant in the modern realities of quarantine. There was created a mobile application on IOS and Android platforms, which improve access to services, the quality of children's and adults' life with disabilities, promote effective communication in society (https://mon.gov.ua/ua/osvita/inklyuzivne-navchannya/statistichni-dani).

Informatization of the education sector in Ukraine has certain achievements. ICT (information and communication technologies) are increasingly used to improve the organization of the educational process. The COVID-19 pandemic has changed the perception of education and the format of its provision. Categories of children with SEN were particularly vulnerable. Therefore, it is important to develop parents' digital competence and competence of safe behaviour on the Internet, establishing trusting and open communication with teachers and professionals on the Internet. Following ethical requirements in the communication of teachers with parents in the virtual space will help to establish partnerships, stabilize the parents' emotional state, get adequate feedback, increase the effectiveness of assistance.

The *purpose of the article* is to find out the theoretical basis of the research problem and to determine the ethical aspects of the use of ICT in intercommunion with parents of preschoolers with special educational needs. The *structure* of the study design provides a justification for the ICT expediency in the process of working with preschoolers, review of the specificity of work with children with SEN regarding the use of ICT as a means of intercommunion between teachers and parents of preschool students; description of methodological tools and research results; analysis of the survey conducted among parents and the necessity to take into account ethical aspects in the process of intercommunion of teachers with parents with the help of ICT.

1. THEORETICAL BACKGROUND

1.1. Benefits of ICT usage in the work with preschoolers

Various aspects of the ICT usage in the preschool educational process are studied in many fields of science (by pedagogues, psychologists, physicians, etc.). Explicating information and communication technologies as a set of technical means and methods of information data transformation to gain new knowledge, abilities and skills (Arnott, Grogan, & Duncan, 2016; Chaudron, Di Gioia, Gemo et al., 2017; Masoumi, 2021), scientists consider it necessary to use them in a dosed and content-based way in working with preschool children. The role of ICT in the preschool educational organization process lies in the fact that:

- there is an optimization of the process of development, education and preschoolers' upbringing, which contributes to the implementation of all educational tasks, for example, – the formation of children's health competence (Andriushchenko, Lokhvytska, Rudenko et al., 2021); development of children's creative skills in play activities (Arnott, Grogan, & Duncan, 2016) etc.;
- children can communicate freely and comfortably with their peers (emotionally, verbally, symbolically) (Chaudron, Di Gioia, Gemo et al., 2017; Rahiem, 2021);
- thanks to the vivid clarity of ICT, children's attention is activated, their need for emotionally rich information is met, which affects the development of all cognitive mental processes and the formation of personality in general (Masoumi, 2021);
- a diverse and high-quality developmental play/digital environment is created, which is favourable for the personal growth of the child, which "would provide the child a full security and educational values" (Pulak, 2018: 221).

At the same time, as L. Crescenzi-Lanna and M. Grané-Oró (2016) assert, the ICT usage in preschool education should not become an end in itself. The psychological characteristics of a preschool child are primarily determined in situations of interaction with adults (parents and teachers) and depend on their psychological and pedagogical influence, which determine his/her mental development (Crescenzi-Lanna & Grané-Oró, 2016). The use of ICT in the work with preschoolers ensures their integration into society, activates the process of an individual's cognition of the world around, promotes the mastery of technical skills when working with gadgets. However, "choosing the most appropriate educational ones for children is difficult and problematic for both teachers and educators" (Papadakis & Kalogiannakis, 2017: 256). A successful use of ICT in the educational process of preschool education depends on the state of ICT competence formation of teachers, who act as intermediaries between the demands of parents and society's demands for the growth of the younger generation (Veličković & Stošić, 2016). This imposes on the teacher compliance with a number of requirements:

- awareness of ways to use ICT in preschool education to improve its quality (Roszak & Kołodziejczak, 2017);
- providing positive motivation for the use of ICT in professional activities and the desire for their own professional self-development through ICT (Kara & Cagiltay, 2017);
- awareness of the many-sided spectrum of ICT and the knowledge formation about modern information and communication technologies (Otterborn, Schönborn, & Hultén, 2019);
- mastering modern information and communication technologies, gaining experience in the ICT usage with all subjects of preschool education (children and parents) (L. Chen, T.-L. Chen, Lin, & Liu, 2018).

The success of ICT will largely depend on the readiness of preschoolers' parents, their ability to use the Internet to enrich their knowledge and skills on the upbringing and development of preschoolers, self-education, focus on partnership with teachers and other professionals (Nordkvelle & Olson, 2005). Thus, the ICT usage in preschool education involves the implementation of the educational process with preschoolers and the establishment of effective communication and partnership with their parents. Thanks to various means of ICT, teachers of preschool educational institutions are able to diversify the forms of support for the educational process, improve the quality of cooperation with parents to improve the development, education and training of their children.

1.2. Peculiarities of ICT usage in work with children with special educational needs

The issue of support for inclusive education is relevant in today's environment. Ukrainian scientists Skrypnyk, Martynchuk, Klopota et al. (2020) considered the peculiarities of supporting children with special educational needs in educational institutions, the importance of interaction between teachers, parents and specialists. Analysis of research on the creation of an inclusive environment in preschool education shows that the ICT usage expands opportunities for socialization of children with SEN, improves the quality of education and is a means of supporting inclusive education (Geta, Zaika, Kovalenko et al., 2018; Epitropova, Petrov, Stoyanov et al., 2019). Thus, Zaika and Chernov (2018) investigated the peculiarities of the use of information and communication technologies in preschool education in the education and upbringing of children with special educational needs from the standpoint of compensating for physical disabilities with the help of the latest tools. The authors emphasize the importance of ICT in overcoming communication barriers (if disability is related to sensory and perceptual disorders); optimization of the process of learning and education (for disorders of the autism spectrum it is more comfortable for the child to communicate with an adult through technical means); organization of distance learning (possibility to teach distantly and educate a child, if for various reasons he/she cannot attend preschool); clarity in the presentation of educational material (illustration of the material with the help of a video series, interactive whiteboard), etc. (Zaika & Chernov, 2018: 63).

Scholars studied possibilities of using ICT in work with preschoolers within an inclusive group. The advantages of using this technology in inclusive education are outlined, the types are characterized, the criteria for selection of high-quality multimedia resources are determined. Scientists pay attention to software development taking into account the individual interests, abilities, strong and weak sides of a child with SEN (Epitropova, Petrov, Stoyanov et al., 2019). The use of ICT helps to meet the specific needs of children with different abilities. Teachers and parents are attracted primarily by the flexibility in their use, their functionality, the ability to be creative in the education and upbringing of children with SEN, to interest children, to help them be successful. In the conditions of quarantine restrictions we identify such key principles of distance learning of children with SEN as: the principle of interactivity; differentiation; individual approach; flexibility. Among the features of distance learning and education of this category of children is the transition from a direct model of learning to coaching; synchronous and asynchronous learning; use of available visual material; interactive activities; sustainability of education; creating a safe environment and taking into account the health of the child with SEN (Bondarenko, 2018: 41). Communication with parents of preschoolers with special educational needs through ICT is especially important. The success of the child's integration into the educational process, adaptation and socialization in the peer group will largely depend on parents. For such parents, ICTs become a means of communication with an educator, practical psychologist, social worker, and other specialists, who provide comprehensive socio-pedagogical and socio-psychological support to the family, minimizing difficulties in learning, development and care of a child with disabilities. Therefore, while using ICT in the process of education and training of preschoolers with special educational needs, it is important to take into account the age of the child, his/her psycho-physiological capabilities, interests and abilities. The situation of the use of ICT during the inclusive process in the PEI should include an adult as a mediator between the child and the technical means. In terms of distance learning, parents should become partners of teachers, other professionals to act effectively in the best interests of the child.

1.3. ICT as a means of intercommunion with teachers and preschoolers' parents

The use of ICT helps to expand the boundaries of intercommunion with teachers and parents raising a child with disabilities, allows the latter to be active participants in the educational process.

Having analyzed scientific sources on the research topic, it was found that the ICT usage in cooperation with teachers and students' families allows a wide range of information space; combining individual and group forms of work, building individual educational trajectories; creating shared network content; establishing distant forms of communication of subjects of educational interaction; forming ICT competence as one of the essential competences (Nordkvelle & Olson, 2005; Papadakis & Kalogiannakis, 2017; Pulak, 2018). As Y. Nordkvelle & J. Olson (2005) consider, due to organized effective communication, the relationship between the participants of the educational process is established, which helps to carry out psychological education of parents and the sequence of their educational tasks, jointly determine the time for distance education of preschoolers (directly via Skype, watching video presentations) (Nordkvelle & Olson, 2005). Establishing close intercommunion with teachers and parents contributes to the choice of appropriate programs or the creation of special ones for the development of the child at home (Crescenzi-Lanna & Grané-Oró, 2016). In the course of interaction between these subjects of the educational process by advising parents as customers of educational services, their education is carried out on the feasibility of using different ICTs with children at home (Pulak, 2018).

Noteworthy is the question: how to improve the communication process using ICT as a tool? This research perspective was actively studied by scientists in the context of training teachers for professional activities (Boiko, Morze, & Varchenko-Trotsenko, 2020; Marcial, 2017). In particular, the importance of following the ethical principles of interpersonal communication in the ICT usage was emphasized. Researcher Marcial (2017) identified such principles as integrity, awareness of the consequences of joint actions, conscious attitude to the task performance, appropriate use (in accordance with the rules and regulations) of the computer for games and activities on the Internet, trying to "minimize the effects of the digital divide by providing access to digital materials", etc. (Marcial, 2017: 100). Boiko, Morze, and Varchenko-Trotsenko set out criteria for the effectiveness of communication and cooperation between teachers and students with classmates during distance learning (Boiko, Morze, & Varchenko-Trotsenko, 2020). It is proved that the ethics of interaction in the online format performs a whole system of functions: transfer by carriers of norms and requirements to communication partners, perception of the environment, education and socialization of communication participants, formation of their moral consciousness (ibid). In addition, communication and cooperation in distance learning is a complex multifunctional phenomenon that involves taking into account the personal factors of its participants. The results of this study form the basis for outlining the idea of research: to determine the ethical aspects of the use of ICT communication with parents of preschoolers with special educational needs.

In general, on the basis of the theoretical study of the scientific source base of the initiated research, we can make the following generalizations:

- the use of ICT in the activities of preschool education contributes to ensuring the quality of the educational process;
- ICTs are actively implemented for the purpose of education, upbringing and development of preschool children with special educational needs;
- requires the increase of ICT competence formation in teachers to use ICT between all subjects, in particular, as a means of communication with parents of students, which contributes to the establishment of partnerships;
- the issue of defining ethical aspects of ICT involvement in communication between teachers and parents is urgent, which not only replenishes knowledge about information content, but also produces a friendly attitude, following moral values and adherence to socio-ethical domains of behaviour.

2. RESEARCH METHODS

The following theoretical methods were used to conduct the study: analysis, synthesis, generalization, comparison, as well as empirical methods: questionnaires, graphical methods of compilation and data processing.

Collected empirical data was based on the results of a survey of parents whose children have SEN and attend preschool educational institution ("Child Development Center «I + family»") (Kyiv), "Swallow", "Satellite", "Dolphin" (Cherkasy), "Lyubavonka" (Pereyaslav) Ukraine) during the pandemic September 2020 – April 2021. The survey involved parents of children with special educational needs (n=124), of whom 83.9% (n=104) – are women and 16.1% (n=20) are men. This suggests that in most cases, the child's upbringing is carried out by the mother.

A questionnaire containing 12 questions of different types (open, closed, optional, statements, etc.) was developed for the survey. The questionnaire was made using Google Forms. The questions of the questionnaire were aimed at identifying the peculiarities of communication between parents of children with special educational needs and finding out the problems and difficulties they face in the process of ICT usage. Parents were interviewed by completing online questionnaires. The content of the questions is given in the results of the investigation.

3. RESEARCH RESULTS

3.1. Analysis of the survey results of parents of children with SEN

According to the results of the survey of parents of children with special educational needs, it was found that parents have different problems in education, development and care: medical (rehabilitation), psychological, pedagogical, legal, social and material. Raising a child with disability certainly affects the life of the family. Thus, despite the fact that 87.1% of respondents (n=102) are under the age of 40, 41.9% (n=52) of them do not work and have to take care of a child. Accordingly, it affects the financial soundness of the family, among the existing problems, the majority of respondents 67.7% (n=84) mentioned the lack of finances to maintain a sufficient standard of living, the lack of normal living conditions 22.6% (n=28).

Financial problems are increased by problems of emotional burnout, psychological and physical nature. In particular, 32.3% (n=40) indicated a lack of childcare efforts; 52% (n=64) – for feelings of inadequate support, assistance, lack of a specialist; 41.9% (n=52) of the surveyed parents asserted that there was no one to leave the child with (Figure 1).

The majority of parents – 58.1% (n=72) often experience stress, tension due to health problems of the child. A significant number – 80.6% (n=100) need specialist advice, socio-pedagogical and psychological support. Ethical issues of interaction with preschool children, strengthening attachment with the child, calm and effective communication, formation of spiritual and moral qualities are important for parents. Parents constantly need additional information on the care, upbringing and education of the child. It was found out that almost half of the surveyed parents were not satisfied with the level of their own knowledge on child care and upbringing – 45.2%

(n=56). Only 12.9% of those were satisfied (n=16). According to the results of the survey, most parents raising a child with special educational needs are concerned about the following issues: further education of the child – 96.8% (n=120); specific content and volume of state social assistance, benefits, and payments – 67.7% (n=84). However, it does not diminish the importance of conducting correction classes with the child at home. This was evidenced by 41.9% (n=52) of respondents (see Figure 2).

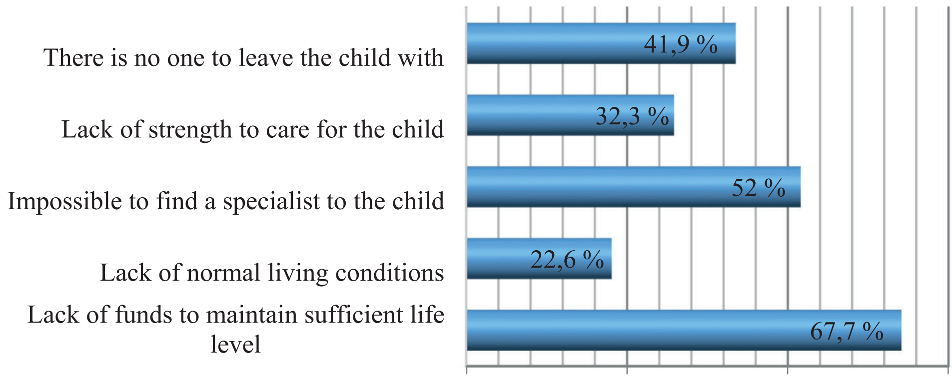

Figure 1. Respondents' answers to the question: "What problematic issues (problems) are currently relevant for you?"

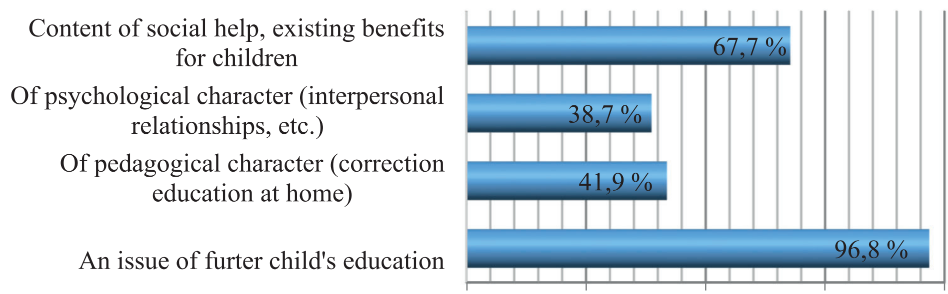

Figure 2. Respondents' answers to the question: "What kind of information do you lack and would like to get?"

A significant number of respondents – 38.7% (n=48) indicated the urgency of issues of interpersonal relationships in the family, interaction with the child. Issues of interpersonal relationships become especially important, taking into account the fact that outside the educational institution parents communicate mainly with relatives – 87.1% (n=108) and with child's friends on the playground, who also have SEN – 22.6% (n=28).

To the question: "What do you think is the most difficult in organizing a child's life?" respondents answered: "Lack of support from society", "Unethical comments and recommendations from relatives and friends, neighbours", "Social adaptation and maximum self-care", "Organization of communication between children and peers", "Lack of knowledge on how to develop a child psychologically and physically; how to communicate effectively with specialists, teachers", "Everything is difficult".

In general, almost half of the surveyed parents – 45.2% (n=56) are assisted in the upbringing and development of the child by other family members. However, it should be noted that parents are generally informed about the structures that can provide such assistance. Among the mentioned preschool education institutions, social service institutions (centres of social services), public organizations. The majority of respondents – 67.7% (n=84) know about the functioning of private correctional and developmental psychological centres.

However, unfortunately, respondents do not appreciate the quality of social services, including counselling on psychological and ethical issues, in the centres of social services. Only 38.7% (n=48) assess the work of these institutions as "satisfactory"; the majority – 54.8% (n=68) consider it to be "unsatisfactory". Especially parents feel the necessity for specialist advice on the child's condition and behaviour during quarantine. Estimates of services provided by the public sector are slightly higher. Thus, to the question: "What is your assessment of the activities of non-governmental (public) organizations that work with children with disabilities?" we received the following answers: "satisfactory" – 48.3% (n=60); "Difficult to answer" – 45.2% (n=56); "Unsatisfactory" – 6.5% (n=8).

To the question: "What help (information) would you like to get within the preschool institution that your child is currently attending?" parents answered: "Information about developmental classes at home with the child in quarantine", "How to organize free time for the child", "Tips for correctional work and communication with the child", "How to teach a child independence (dress, eat, etc.)", "Correctional classes with a child at home, at least online", "Psychological nature, entry into society, the content of social assistance". Parents were concerned about the uncertainty of the situation with quarantine restrictions, emphasizing that due to the lack of regular classes with children, they lost previously acquired skills.

It was found out that respondents get information on child care and development mainly from the following sources: "advice from other parents raising children with SEN" – 77.4% (n=96); "Consultations of specialists in special institutions (polyclinics, PEI, etc.)" – 74.2% (n=92); "Special literature on development and education" – 45.2% (n=56). Among the most acceptable and effective ways to obtain the necessary information, respondents noted the following: "Online consultation", "Consultations and joint training programs", "Internet resource", "Mobile communication, online communication (social networks, messengers, Skype, closed groups on Facebook)", "E-mail or Viber, meetings in the format of conferences-lectures", "E-mail", "Correspondence on the Internet, conversation on a smartphone".

It was found out that in preschool institutions, the parents, whose pupils were involved in the survey, the communication process involves a different range of activities aimed at providing socio-pedagogical support, various types of assistance and support in general. Thus, all respondents could name the main forms of effective communication with parents using ICT, in particular: the official website of the educational institution on the Internet; page in social networks; conducting thematic online parent meetings, consultations, webinars using materials developed in Microsoft PowerPoint; an open day and an excursion to the institution in the form of a promotional video on the official website and social media pages of the institution;

distance lessons with children via Skype, etc. Parents paid attention not only to the content aspect of the interaction, but also noted the importance of a friendly attitude on the part of teachers and specialists, understanding of the situation, tact. Among the problems and difficulties that parents have in the process of communication through ICT were: fear of a breach of confidentiality, lack of sufficient training to use ICT, the need to spend a lot of time participating in activities, classes for children, forced teacher's long absence (illness, etc.) to which the child gets accustomed; inaccessibility of the Internet and modern digital devices, etc.

Thus, in the context of ICT development and quarantine restrictions, there is an urgent need for active use of information and communication technologies in an inclusive educational environment in general and communication with parents of children with special educational needs in particular. For its successful implementation, it is important to determine the ethical aspects of communication with parents of children with SEN.

3.2. Peculiarities of ethical aspects of ICT usage in intercommunion of teachers and parents

The analysis of the survey results demonstrated that parents of children with special educational needs often deny online learning, do not believe in the child's capabilities, do not possess sufficient knowledge of ICT, give up and do not want to study more. In quarantine, all these states get worse, that's why the parents' support, establishing effective communication with them is necessary. The success of interaction with parents will depend on both the information quality and educational environment and the ability to communicate in cyberspace. There are common ethical requirements that are important for all participants of the process. There are the following components: the culture of presenting information; culture of perception and use of information; culture of using new information technologies.

When thinking about network etiquette, it is important to remember that on the Internet, the spiritual and moral, including ethical, rules of behaviour in communication with parents raising children with SEN are the same as in real life. Politeness, tact, kindness, respect, tolerance and other spiritual and moral qualities of a person should be manifested in the Internet space.

To ensure effective intercommunion with parents in the network in compliance with ethical standards, one should think about how to organize communication with them in the best way. It can be done through various forms, namely: video conferencing, forum, chat, blog, e-questionnaire, online lecture, webinar, online training, online marathon, etc.

In particular, using the chat, parents can get information that they are interested in, or take part in the discussion. It gives opportunities to learn from the others' mistakes, to observe, to comment. For parents of children with SEN, it is recommended to use the forum more actively. It's a kind of communication on the Internet, which involves creating topics for discussion by parents, the ability to view all the replies, moderating the discussion process. At the same time, it is not advisable to choose a single form of online communication. They can be used partly or all depending on the goal, stated by the teacher. For example: groups in Viber (Telegram, WhatsApp) with text chat promote fast communication with parents. A closed group on Facebook is valuable for this category of parents, it can be found in search results, but the content is available only to group members. In such a group, participants feel more protected, so they are free to express their opinions, more open to communication. Online training sessions and online marathons can be especially interesting for parents. In particular, online marathon – a series of webinars / video lectures and tasks using various platforms and social networks; is competitive in nature, limited in time. At the stage of preparation for any online lesson, it is important to analyse the possibilities of different platforms and services that should be used by the teacher. Their choice will depend on the technical abilities and goals of the online lesson, the level of parents' technical training (McDevitt, 2021).

Effective communication on the Internet with parents of children with SEN is facilitated by the ability to ask open-ended questions. It will shape their ability to adapt easily, develop mobility and independence. It is advisable to ask open-ended questions: at the beginning of a lesson or conversation; to move on to another topic of conversation; to encourage reflection; when it is necessary to find out the requests and interests of group members. In the context of the presented study, emphasis was placed on open-ended questions that make parents think, analyse their actions, and contribute to the appearance of new interesting ideas for interaction with the child with SEN. Such questions will allow parents to speak freely about their feelings, anxieties and fears, which undoubtedly occur when caring for a child with a disability.

Basic questions are recommended to be displayed on the screen, one can highlight keywords. At the same time, it is not always advisable to use open-ended questions within a limited time. They can also "scare" parents who are not used to online communication. In addition, communication with parents shouldn't turn into their interrogation or unreasonable questioning.

It is important to conduct systematic parents' online surveys. The need for the survey arises in the following cases: collection of expectations; collecting feedback; evaluation of educational material. Virtual boards will be useful for surveys and other types of work. It is a network social resource designed to organize joint work to create and edit images and documents, real-time communication. The virtual board allows to visualize the material, it is a direct carrier of educational information, allows to work in real time with several parents, provides interaction of a teacher with group members and allows to get quick feedback (Proshkin, 2017).

Developing recommendations for establishing effective communication with parents of children with SEN, it is important for parents to maintain a stable emotional state. Only in a calm state will they be able to support the child adequately. In addition, parents should be ready to act as members of an online team, to become partners of teachers in the process of child's education and upbringing.

To establish a partnership between the teacher and the child's parents with SEN, it is necessary to encourage parents, explain the importance of classes with the child online; offer a dosed number of tasks for each day with mandatory feedback; make a questionnaire for parents about the difficulties they faced during quarantine, and work on it as a team; record a learning monologue for the child and send it to the parents (it will help them to organize a learning environment for the child, motivate them to perform tasks responsibly); to build reliable relations with parents gradually on the basis of benevolence, to develop their trust and at the same time independence. As a rule, it is advisable to provide parents regularly with information which their child has learned, what he/she has succeeded, and what still necessary to be worked on. This information will help you understand how to help your child to become more successful in the group. It is necessary to take photos of successful completion of the task, to send support and encouragement messages to parents. Detail is important for parents of children with SEN. So, just sending an e-mail or other emoticon is not enough. Phrases such as "everything is fine" tend to lead to misunderstandings, inaccuracies and difficulties. At the same time, it is important to remember that it is not advisable to wait for parents to ask specialists for advice. It is recommended to provide information to parents even in the absence of a request, reminding them at every opportunity of the importance of maintaining mutual communication on the basis of network etiquette.

According to the results of this work, the following key and additional ethical aspects in the intercommunion of teachers with parents of preschoolers with SEN are outlined. Key ethical aspects include:

- follow integrity, be aware of the consequences of joint actions, treat the performance of tasks in good faith, use in accordance with the rules and regulations a computer for games and activities on the Internet, "minimize the effects of the digital device by providing access to digital materials", etc. (Marcial, 2017: 100);
- not to disclose information provided about a child with SEN by other parents, to observe confidentiality, not to publish information from private letters without the consent of their senders;
- take into account the individual characteristics of parents; stages of their emotional experiences, from the time when they learned about the problems of child development; understand and adequately respond to possible aggressive manifestations;
- defend their own point of view on the upbringing, development and care of a child with SEN, but do not offend others if their opinion, position differs; always preserve one's own dignity and respect the dignity of the interlocutor; not to focus on inaccurate or unfortunate questions of other parents about the child with SEN; not to get annoyed if the interlocutor does not understand the explanation; avoid incorrect remarks, comments.
- Additional ethical aspects include:
- use correct terminology, avoid complex concepts, professional slang;
- in the process of communication to value their time and the time of interlocutors; strictly follow the topic of discussion in the group; use special chats only for professionally oriented communication, do not write messages that do not relate to issues of education, development and care of a child with SEN;
- if the group members are interested in a special (narrow) topic related to the rehabilitation of a child with SEN, it is better to create a separate community.

CONCLUSIONS AND FURTHER RESEARCH PERSPECTIVES

Based on the theoretical analysis of the research problem and the results of empirical research, it was found that it is important to establish reliable and close relationships with parents in order to involve preschoolers with SEN in the educational process using ICT effectively. This issue became topical during the COVID-19 pandemic. The use of ICT in cooperation with teachers and other professionals with preschoolers' parents requires mandatory adherence to the culture of presenting information, perception and use of information, the use of new information technologies. Key and additional ethical aspects of ICT usage in intercommunion with parents of preschoolers with SEN are highlighted, including: observance of confidentiality, integrity, awareness of consequences of joint actions, use of proper terminology, consideration of parents' individual features, observance of certain time limits in the process of interaction; preserving one's own dignity and the dignity of the interlocutor, maintaining a stable emotional state of parents. The most effective forms of online communication with parents were groups in Viber (Telegram, WhatsApp), a closed group on Facebook, online training sessions and online marathons. It is established that the use of open-ended questions in the process of interaction encourages parents to think, develops mobility and independence, allows them to speak freely about feelings and anxieties.

Further study requires the problem of training professionals to establish effective communication with parents of preschoolers with SEN within a changing environment, the algorithm of providing socio-psychological support to parents using ICT in distance education.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 225–237
https://doi.org/10.34916/el.2021.13.19

DISTANCE MATHEMATICS LESSONS IN PRIMARY SCHOOL: SERVICES FOR CREATING INTERACTIVE EXERCISES

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Abstract: *The article is devoted to the research of the issue of using online services LearningApps, Google Classroom, Classtime, Classdojo for organizing distance learning of mathematics in primary school. According to the results of the scientific literature analysis, which are confirmed by the data of 'teachers' questionnaires, these services are the most common among primary school teachers in Ukraine. At the same time, working in these online services requires from the teacher a certain level of ICT competence, knowledge and the ability to apply algorithms for creating interactive exercises in individual templates and in certain services. Based on the analysis of the possibilities of these services for the creation of different types of mathematical tasks, the authors developed a content module, the purpose of which is to train future primary school teachers for creating interactive exercises in mathematics. The paper presents the results of experimental work with students majoring in 013 'Primary Education' of the South Ukrainian National Pedagogical University named after K.D. Ushynsky (Odesa, Ukraine) and Izmail State University of Humanities (Izmail, Ukraine). Having studied the module, 32% of students showed a high level, 49% – sufficient, 16% – intermediate, and only 3% low level of skills in working with the services LearningApps, Google Classroom, Classtime, Classdojo.*

Keywords: ICT, online services, interactive tasks, mathematics, primary school.

INTRODUCTION

The issue of distance learning for school students has become relevant due to the quarantine restrictions caused by the Covid-19 pandemic. Ukrainian scientist N. Morse defines distance learning as an educational technology that enables communication between teachers and distant students using digital technologies (Morse,

Buinytska, & Varchenko-Trotsenko, 2016). Thus, scientists and teachers have intensified the search for online services to effectively organize their lessons.
In the scientific field, there are publications with an analysis of online services and recommendations for teachers on work with individual services (Skvortsova, Britskan, & Haievets, 2020; Skvortsova & Britskan, 2018; Skvortsova, Onopriienko, & Britskan, 2019; Holguin-Alvarez, Rojas, Romero-Hermoza, Ledesma-Perez, & Cruz-Montero, 2021; Kopniak, 2018; Zaitseva & Muravieva, 2017; Izyumskaya, 2019; Novolokina, 2019).

1. USING ONLINE SERVICES IN TEACHING MATHEMATICS TO PRIMARY SCHOOL STUDENTS

Studying the organization of primary school 'students' education using digital learning resources (Khairova, Gabdullina, Gafurov, & Valeeva, 2020), Himaletdinova R. and Aryabkina I. recommend using the services of Classroom, Picasaweb, Google Docs, Cacoo, Scratch Mit Edu (Himaletdinova & Aryabkina, 2019). Kiricek K. and Torosyan D. offer the use of the services of Google Classroom, LearningApps, Online Test Pad (Kiricek & Torosyan, 2021) in mathematics lesssons. For teaching mathematics, Novolokina I. suggests employing the educational online resources Classtime, Edpuzzle, Kahoot, Learning Apps, Liveworksheets, Mentimeter, Triventy, Wizer.me. (Novolokina, 2019); Perez W., Arenas A., Cariapaza D. point to the educational platform «Edmodo» (Perez, Arenas, Cariapaza, & Brito, 2021). Herewith, special software tools are also used in primary school mathematics lessons, in particular www.delmat.info (Žilková, Partová, Gunčaga, Nemcová, Kopczyński, & Zegzuła, 2019).
For improving primary school 'students' computing skills, S. Skvortsova and R. Romanyshyn suggest using both interactive task banks and interactive calculation exercises created by teachers and involving the online services LearningApps, Liveworksheets, Wizer.me, as well as computing simulators in the educational online space Mexico (Skvortsova & Romanyshyn, 2020).
The most common service among the discussed services is the service for creating interactive exercises – LearningApps. The works of Zaitseva S., Muravyova E., Izyumska O., Skvortsova S., Onopriienko O., Britskan T. (Zaitseva & Muravieva, 2017; Izyumskay, 2019; Skvortsova & Britskan, 2018; Skvortsova, Onopriienko, & Britskan, 2020; Eyrikh, Bazhenov, Povkh, Alekseeva, Korosteleva, & Soliman, 2020) are devoted to the research on the possibilities of using this service in primary school.
Using the services of LearningApps and UmalGRA, Kiseleva O. developed a distance course in mathematics for primary school students, "Young smart men and smart women". The author proved that the creation of tasks in these services increases students' motivation and interest in learning and avoids the monotony of exercises (Kiseleva, 2018).
The work of S. Skvortsova and T. Britskan presents the generalized results of the online survey of primary school teachers of Ukraine on the use of these online services in mathematics lessons. It was revealed that the most popular services for creating interactive exercises are LearningApps, Google Classroom, Padlet, Classtime, Classdojo, H5P, Lino.it, Kahoot!.

The research by Barbara Kołodziejczak shows that teachers are increasingly willing to use IT tools to support learning, but their knowledge of portals and ready-to-use learning environments is minimal (Kołodziejczak, 2019). At the same time, the study by Nataliia Morze, Eugenia Smyrnova-Trybulska and Mariia Boiko found a difference in the percentage between teachers of Ukraine and Poland in trying to take into account educational trends – 60.4% (Ukraine) and 31% (Poland), respectively, and those who do not take into consideration modern trends in education – 3.1% (Ukraine) and 0% (Poland) (Morze, Smyrnova-Trybulska, & Boiko, 2019).

Thus, training teachers to use online services to organize a distance lesson seems to be quite relevant. One of the services that allows for the creation of interactive content is H5P. Therefore, S. Skvortsova, T. Britskan and O. Onopriienko developed a technology of training future primary school teachers for work in the H5P service. As a result of experimental training, 83% of future primary school teachers have mastered the ability to create interactive exercises in mathematics using H5P (Skvortsova, Onopriienko, & Britskan, 2019).

S. Skvortsova and T. Britskan developed an e-course for teachers, "Internet resources for creating educational and game content in mathematics for junior students". This course aims to acquaint teachers with the capabilities of the online services LearningApps, Google Classroom, Classtime, Classdojo.

The peculiarities of the content of the course and the organization of experimental training are revealed in the article by S. Skvortsova, T. Britskan and Ya. Haievets (Skvortsova, Britskan, & Haievets, 2020). The authors present the results of a comparative analysis of the most common online services in three categories: 1) services for creating a virtual classroom, and its filling with interactive exercises and other educational content (LearningApps, Google Classroom, Classtime, Classdojo), 2) services for distance learning (Padlet, Lino it); 3) services for conducting a distance lesson in the form of a conference (Zoom, Skype, Microsoft Teams). The summarized results of the online survey of Ukrainian primary school teachers on using these online services in mathematics lessons are presented. Thus, we have identified the most popular online services among teachers – LearningApps, Google Classroom, Classtime, Classdojo, the need to train students – future primary school teachers for work in these online services is quite urgent.

The aim of the article is to analyze the possibilities of the online services LearningApps, Google Classroom, Classtime, Classdojo for creating interactive math problems for primary school, and to present the results of experimental training of future teachers – specifically, students majoring in the specialty of "Primary Education".

2. A COMPARATIVE ANALYSIS OF THE ONLINE SERVICES LEARNINGAPPS, GOOGLE CLASSROOM, CLASSTIME, CLASSDOJO

At the preparatory stage for the experimental training of future primary school teachers, we analyzed the possibilities of using the online services LearningApps, Google Classroom, Classtime, Classdojo; mainlyregarding the filling in of the lesson / course with educational materials and tasks.

As a result of a comparative analysis of online services, we have determined the possibilities of each of them for the organization of mathematics education. It is convenient for the teacher in the LearningApps service to have a library of interactive tasks that they can use. The teacher can also create their own interactive exercises. To do this, LearningApps offers the teacher a variety of templates: "Find a pair", "Classification", "Numeric line", "Simple ordering", "Free text answer", "Image fragments", "Quiz" and "Fill in the blanks". Teachers are also attracted to this service by means of presenting the conditions of tasks: in the form of text, images, sounded text, audio and video, as well as the ability to use different ways to add images, audio, and video to the tasks. Creating interactive exercises in mathematics, one often needs to download pictures with problems, short notes of problems, schematic drawings, diagrams. The LearningApps service provides three ways to add images: 1) the use of images from Pixabay, Wikipedia Flickr; 2) select the image by copying the URL to it; 3) download images from your own computer.

Mathematical dictation is a common form of tasks in primary school, which involves presenting tasks in speech form. To select a certain element in the form of sounded text, one needs to print the text and choose the language in which the sounding will take place from the available list. The teacher can also write some cues to the sounded text for students. In the LearningApps service, ready-made audio can be added to tasks in two ways: 1) use the audio library from the YouTube archive; 2) use audio by specifying the video URL also from YouTube. Even in the case of linking to a video, only the audio portion will be displayed on the child's screen.

When creating a task in the LearningApps service, a video can be added to the task condition. To do this, the teacher should select the appropriate check mark in the "Pairs" section and: 1) use the video library from the YouTube archive; 2) use the video by typing in its URL from YouTube. It is very useful that creating a pair, elements of different formats can be combined. Thus, the teacher can create mathematical dictations with the help of the "Pairs" template and a combination of elements of different formats. The advantages of this form of mathematical dictation are that each student can listen to the task as many times as he/she needs and perform the tasks in any order (Skvortsova, Onopriienko, & Britskan, 2020).

It is obvious that a teacher in teaching mathematics will use not one service, but several. We should note that the LearningApps service allows the integration with other services. Any exercise created in this service has links and a QR-code, with which it is very convenient to integrate them into other services, including Google Classroom and Padlet. It is also possible to insert interactive exercises into tasks in these services using the embeded code.

For the organization of distance learning mathematics for primary school students, instant testing, provided by interactive exercises, is of great importance. All templates of the LearningApps service are interactive – based on them, tasks are created, which are automatically checked by the service. The variety of templates for interactive exercises and different options for presenting information in tasks significantly distinguish this service from others.

Unlike LearningApps, Google Classroom does not provide an opportunity to create interactive exercises – almost all templates for creating tasks imply an open answer.

The only way to create a task that will be checked by the service automatically is Google Form. But, in this service, compared to LearningApps, it is possible to submit training materials that are not subject to verification and evaluation.

Open-ended tasks can be presented as a document downloaded from a computer or Google Drive or links to other content, including interactive exercises and YouTube videos. Students can be instructed on how to complete the task and what format they should send it to the teacher for review. The results of the tasks are sent to the teacher in the following ways: 1) a document is created and sent from a personal computer to Google Disk; 2) a text file is downloaded from a student's computer; 3) a photo of the completed in the notebook task is uploaded; 4) a screen with the results of interactive exercises is added; 5) an audio recording of the answers to the questions using a dictaphone in the gadget is recorded and then uploaded to Google Classroom. Using the Google Form application, the teacher can create a test task that will be checked by the service automatically. This task, according to the link code, can be imported into other services, including Padlet. In the Google Form application, the teacher can create questions in text format or give links to videos from YouTube, to which students can give short (template with short answers) or extended (template paragraph) answers.

It is worth noting that tasks created in Google Classroom cannot be imported into other services, but the teacher can provide a link to the training course created in this service.

Classtime's opportunity to create interactive tasks, as well as that of Google Classroom, is limited. But, unlike Google Classroom, there are many more templates for creating interactive exercises – it's "One correct answer", "Several correct answers", "True/false", "Match", "Match (+1 answers in line)", "Set the order", "Text selection", "Select an area"; and the text template allows for the creation of open-ended tasks. Regardless of the choice of template, the teacher can add images, text, LaTeX formulas and videos from YouTube when creating each task. When preparing a task in the "Text" template, the student is expected to write a text answer. This task is not interactive, then the teacher checks the correctness of its performance. Using the Classtime service, the teacher has the opportunity to import questions from the Khan Academy and the EIT library.

Unlike LearningApps and Classtime, the Classdojo service does not allow the teacher to create interactive tasks. Like Google Classroom, this service offers students open-ended tasks, and students can send their answers in a variety of formats – text, video, photos and drawings. But, unlike Google Classroom, in the Classdojo service, a student can send an answer only in the format chosen by the teacher when creating the task. Unlike the LearningApps and Classtime services, the Classdojo service does not have its own task library. However, this service is of interest to students with an attractive e-journal and grading system, a means of calculating skills and helping the teacher organize the class's educational process, involving students, teachers, and parents. To create tasks in the Classdojo service, the teacher comes to the portfolio section and clicks to create tasks. The creation of tasks in this service and in Google Classroom is limited to open-ended tasks and only in the form of text. However, the teacher can add links to interactive tasks created with other services and other content, including videos from YouTube.

Thus, we have discussed the possibility of creating interactive exercises in mathematics in the services LearningApps, Google Classroom, Classtime, Classdojo. The consideration of these services is the content of experimental training to prepare future primary school teachers for creating interactive exercises in mathematics.

3. EXPERIMENTAL TRAINING OF FUTURE PRIMARY SCHOOL TEACHERS FOR CREATING INTERACTIVE EXERCISES

3.1. The aim, tasks and tools of the study

The study aimed to teach future primary school teachers – students of pedagogical universities – to create interactive tasks in the services LearningApps, Google Classroom, Classtime, Classdojo.

The experimental study was conducted in the 2020-2021 academic year at the State Institution "South Ukrainian National Pedagogical University named after K.D. Ushynsky" (Ushynsky University) and Izmail State University of Humanities (Izmail University). At Ushynsky University, fourth-year students (17 students) mastered a separate module, "Using information technologies in teaching problem-solving" while studying the elective discipline, "Methods of teaching problem-solving", and at Izmail University, second-year students (20 students) studied the module, "ICT in teaching mathematics to primary school students" within the normative discipline, "Methods of teaching mathematics".

In the process of experimental research, the following tasks were solved: 1) development of the course / module program; 2) experimental training of students for work in the services LearningApps, Google Classroom, Classtime, Classdojo (lectures, workshops); 3) an analysis of the quality of students' interactive exercises created in these services by criteria (methodical, technical and aesthetic) and levels of development of interactive content; 4) determining the level of students' knowledge about the capabilities of the online services LearningApps, Google Classroom, Classtime, Classdojo and the opportunity to create interactive problems in mathematics in these services; 5) an analysis of the results of the students' – learners of the module – survey on the motivation to create interactive exercises in mathematics and on the reflection of the acquired competence for further work.

3.2. Results

The first stage of the experimental study involved the development of a module of the elective discipline program, "Specifics of using ICT in teaching problem solving" at Ushynsky University, and supplementing the already developed discipline program with a module, "ICT in teaching mathematics to primary school students" at Izmail University. The purpose of these modules is to form in future teachers the ability to create interactive exercises and learning tasks in the services LearningApps, Google Classroom, Classtime, Classdojo. These skills were formed in students during 4 lectures and 4 practical classes.

At the second stage of the experimental research, it was planned to hold lectures and practical classes with students according to the educational program of the disciplines. When mastering topic №1, students were offered a comparative description of the possibilities of creating a virtual class in the online services Google Classroom, Classtime, LearningApps, ClassDojo, the advantages and disadvantages of the individual services were identified, algorithms for creating a virtual class in each of them, filling it with tasks and inviting students to the virtual class were proposed, the possibilities of assessing tasks and recording the results of tasks in the electronic journal were also considered.

In the lessons on topic № 2, "Online services for creating interactive problems in mathematics", students gained theoretical knowledge and practical skills to create interactive exercises using various service templates. Thus, at the first lecture the peculiarities of creating educational tasks in Google Classroom and ClassDojo services were considered. In the context of considering the creation of learning tasks in Google Classroom, the aspect of creating test tasks using Google Forms was taken into account. The students applied the acquired knowledge in a practical lesson, creating their training courses in Google Classroom and ClassDojo services.

The next lecture discussed the peculiarities of creating interactive tasks using the services LearningApps and Classtime. We should note that acquaintance with all the templates took place by the demonstration of the service on the projector screen and the joint creation of tasks with the teacher, as well as by performing interactive tasks in mathematics in real time. Also, when getting acquainted with each template of the service, teachers provided an algorithm for creating a task in this template and mentioned which types of mathematical problems were advisable to use a particular template. Students created their own interactive problems in practical classes in compliance with mathematics textbooks, using the algorithms provided.

The third topic was a comparative analysis of the possibilities of these services for creating interactive exercises. While mastering this topic, students learned that tasks can be submitted in text format in all the services considered: LearningApps, Google Classroom, Classtime, Classdojo. One can submit tasks in image format in all the services mentioned above (LearningApps, Google Classroom, Classtime), except the service Classdojo. Tasks can be created only in the form of a table in Classtime, using the template "Match (+1 answers per line)". In these services, one can add video and audio only from YouTube, which is not very convenient for teachers. Links to other content in such services as LearningApps, Google Classroom, Classdojo can be provided. Interactive tasks can be imported, including those created in LearningApps, into a service like Google Classroom.

Of great importance for the organization of distance learning are services that allow teachers to create interactive tasks that are automatically checked by the system. On the one hand, the student receives instant feedback after solving the problem, and on the other hand, the teacher, in a virtual journal, immediately sees the student's results, and if necessary, can review his/her work. Therefore, we compared the online services in view of the possibility of creating interactive exercises – tasks that are checked by the service and the available templates for creating interactive exercises.

It should be noted that it is only LearningApps where all templates are interactive, in Classtime and Google Form only some of them are.

We compared the templates for creating interactive exercises based on the need of the creation of math problems. A lot of math problems involve entering answers – the results of arithmetic operations, the numerical values of the components of arithmetic operations, problem solving, and so on. For this type of task in the LearningApps service, the template "Free text response" can be used, and the condition can be provided in the form of text, images, sounded text, audio and video.

The creation of a similar task in Google Form is possible using the Short Answers template, where the answer contains only one word, or the Paragraph template, where the answer must be expanded. Tasks created in the template "With short answers" and "Paragraph", are checked by the teacher. A completely similar task can be created in the Classtime service using the "Text" template. This task involves recording the textual answer to the question in an expanded form, but it is not interactive, and the teacher checks its correctness.

The most attractive way to create interactive exercises in mathematics, especially oral problems, is a template that allows the student to enter the answers in the text of the problem. To do this, the LearningApps service has a "Fill in the blanks" template. There are two options – either the student will choose the answers from the list or enter them. The task condition can be submitted as text, image, audio or video.

If the type of task is chosen in LearningApps where the student will fill in the blanks by selecting them from the drop-down list, a similar task can be created in Google Form using the "Drop-down list" template. The Classtime service has a "Text selection" template, which assumes that students must choose the correct answer from the proposed text options.

The correct answer to fill in the blanks can be created in other templates. Thus, the LearningApps service has an "Image fragments" template. To create an interactive exercise, tasks should be added in the form of an image, certain fragments of the image in which the gaps are to be filled must be marked with certain markers. It is worth noting that the markers that indicate gaps in the image can be selected in different colours, which reduces the number of answer options. Answer elements can be represented as text, images, sounded text, audio and video.

It should be noted that a similar task cannot be created in Google Form; whereas in the Classtime service one can use the "Select an area" template. Here, students must choose the correct answer from the suggested options, which are presented exclusively in the image format, by clicking on the appropriate fragment of the image.

Mathematical interactive exercises are mostly created in templates such as "Free text answer" and "Fill in the blanks". At the same time, the possibility of forming pairs is of some interest. To create an interactive exercise using the "Find a pair" template, a LearningApps user must create a pair by specifying two elements that match each other. The pair element can be represented as text, image, sounded text, audio and video. It is convenient that by creating a pair, one can combine elements of different formats, as well as the fact that three extra elements that will not have pairs can be added. Then we create certain settings: the pairs created on the child's screen will disappear instantly or one must first create all the pairs, and only then click on check.

If in LearningApps pairs are formed by dragging, in Google Form and Classtime the pair can be considered as the intersection of a row and a column of the table. Thus, a similar task can be created in Google Form using the "Answer Options Table" template, where the student seems to find the answer to a certain question by marking the intersection of the task / question row and the column – answer options. Also, a similar task, but with a few correct answers, can be created using the "Grid of flags" template, where there can be two marks in one line. In the Classtime service, there is also an opportunity to present the task in the form of a table: the student chooses the task and the correct answer is marked. In this service, it is possible to create tasks with one or several correct answers, but another template – "Match (+1 answers per line)" must be chosen. Despite the possibility of making pairs in the form of a table in the services of Google Form and Classtime, we believe that the use of such tasks in primary school is impractical.

To create interactive tasks, it is sometimes advisable not to form pairs, but to drag the task element to a specific area, thus carrying out the classification. To create an interactive exercise in the LearningApps service using the "Classification" template, the service user must create 2–4 groups – classes and upload elements to each of them. They can specify a group name using text or images. The elements of each group can be represented in the form of text, image, sounded text, audio and video, and the maximum number of elements of one group should not exceed 10, and each group may have a different number of elements. Next, we make some adjustments: and the grouped items will appear gradually or immediately.

A similar task can be created in Google Form using the "Flags" template, where each task will contain several correct answers, and the student must mark them with flags. In Classtime, one can create a similar task in the "True/false" template, which allows the teacher to choose one of two options – true/false – for each question. Since there are only two answer options, the probability that the student can randomly choose the correct answer is quite high.

Many math problems involve restoring a certain order of numbers, geometric shapes, and so on. To do this, one can use the "Simple ordering" template in the LearningApps service. The task element can be represented in the form of text, image, sounded text, audio and video.

A similar task can be created in Google Form using the Linear Scale template, where students need to answer questions by selecting a specific number on the scale (1 to 10). A similar template is available in the Classtime service – "Set the order". But, unlike LearningApps, these elements can only be presented in text format.

A certain part of math problems in mathematics textbooks by S. Skvortsova and O. Onopriienko, which are valid in Ukraine, involves the selection of questions to the condition of the problem, and vice versa, a schematic drawing to the problem, or an analysis scheme to the text of the problem. Such tasks can be created in the LearningApps service using the "Quiz" template. The task condition and answers can be represented as text, images, sounded text, audio and video in this template. Questions with one correct answer or several answers can also be created.

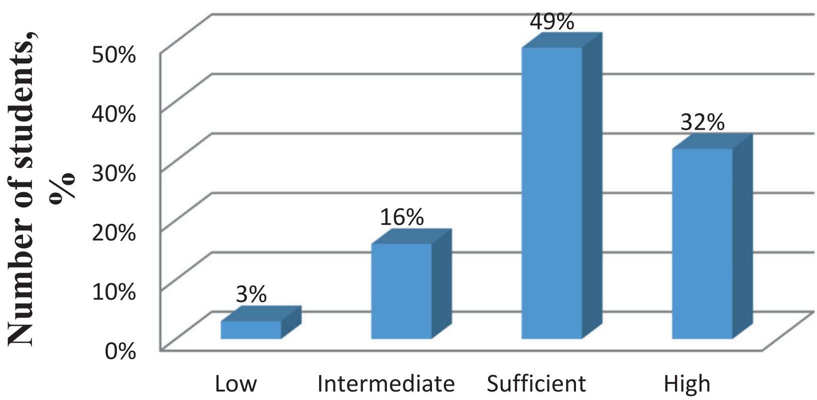
In Google Form, quizzes can be created in the form of tests, but only in text form with one correct answer (template "3 answer options"), or with several correct answers (template “Flags”). In the Classtime service, test tasks can also be created using the template “One free answer” and “Several correct answers”. But, unlike Google Form, in Classtime, both tasks and answer options are allowed by the service to be submitted in the form of text or images.

The third stage of the experimental study involved an analysis of the quality of students’ interactive exercises created in the services LearningApps, Google Classroom, Classtime, Classdojo by certain criteria and levels.

Students’ performance of individual projects was assessed according to methodological, technical and aesthetic criteria, and the following levels: low, intermediate, sufficient and high, which are described in detail in the article (Skvortsova, & Britskan, 2018).

At the fourth stage of the study, the results of students’ work were analyzed and the following results were obtained (figure 1): almost all students (97%) mastered the knowledge and skills to create interactive exercises in these services, only 3% of students showed low mastery of these services. This 3% of students missed classes and did not show a desire to individually and independently acquire the knowledge and skills necessary for creating the interactive exercises.

At the fifth stage of the experimental research it was planned to conduct an anonymous survey of students – learners of the module – on their motivation to create interactive exercises in mathematics. According to the results of the survey, the developed module, “Specifics of using ICT in teaching problem solving” and “ICT in teaching mathematics to primary school students” interested students (97%) and motivated them to continue working with online services in their future professional activity.



F i g u r e 1. Results of assessing students’ individual projects

S o u r c e: Own work.

CONCLUSIONS

We studied the most popular online services for creating interactive exercises among Ukrainian primary school teachers– LearningApps, Google Classroom, Classtime, Classdojo and discussed the advantages and disadvantages of each of them for creating interactive exercises in mathematics. We asserted that the LearningApps service gives the teacher more opportunities to organize mathematics education, which allows them to create almost all types of interactive math problems. This service offers a variety of templates, a variety of forms of task presentation, and options for setting up a task for the student. But, unfortunately, LearningApps has recently removed the opportunity to create a virtual classroom, and therefore, an e-journal. The options of a Virtual classroom and e-journal are available in Google Classroom, Classtime, Classdojo, but they provide limited opportunities to create interactive exercises or no opportunities.

During the experimental learning of the modules, "Specifics of using ICT in teaching problem solving" (Ushynsky University) and "ICT in teaching mathematics to primary school students" (Izmail University), students – future primary school teachers, using four topics were presented with the advantages and disadvantages of these services for creating math problems of different kinds. It was pointed out which templates are the most appropriate for the organization of oral numeracy, mathematical dictation, work on math problems, work with geometric material, etc.

The paper presented the results of the experimental training of future teachers – students of specialty 013 "Primary Education", during which they learned – according to the purpose of the mathematical task – to select the appropriate service and template and create an interactive service exercise using the algorithms provided. The complexes of the interactive exercises created by the students in the services LearningApps, Google Classroom, Classtime were assessed according to the criteria that determined the methodological expediency of choosing a template and the methodical literacy of task development, as well as the technical level of task development and aesthetics of task presentation. According to these criteria, the levels of students' mastery of the skills of creating interactive tasks in the services LearningApps, Google Classroom, Classtime were determined as low, intermediate, sufficient and high (Skvortsova, Britskan, 2018). A low level presupposed the available fragmentary knowledge and skills to create interactive tasks; the student can arrange the work of school students in the service on ready-made interactive content, but has difficulty in monitoring the process of solving interactive tasks and assessing the results of students' achievements. The results of experimental training show that 3% of the students have acquired a low level of mastering these services. The intermediate level indicates that the student has some theoretical knowledge about the service and is able to create their own exercise in the model, but has difficulty setting up the service when creating their own interactive content. 16% of the students reached this level. A sufficient level demonstrates that the user is aware of the service's peculiarities and can create standard tasks using images and has the knowledge and skills to configure the service for school students and assess their results. The results of the examination of students' works prove that the majority, in particular, 49% of students have achieved a sufficient level of mastering of these online services. A high level shows that the student's knowledge is profound, strong and systemic; the student is able to create interactive content and edit their own tasks depending on the needs of the lesson, to organize the work of school students with a series of educational tasks and the further assessment of students' academic achievements. 32% of the students reached this level.

The results of the experimental training prove the effectiveness of the modules, "Specifics of using ICT in teaching problem solving" and "ICT in teaching mathematics to primary school students" in the educational process to apply the acquired skills in further professional activity in teaching mathematics to primary school students. Further research could be focused on expanding the range of online services for training future primary school teachers.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 238–248
https://doi.org/10.34916/el.2021.13.20

THE TEACHER IN THE SYSTEM OF DEVELOPING STUDENTS' DIGITAL COMPETENCE

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Abstract: *Higher education institutions must provide training for a graduate who has a high level of digital competence. Such training can be implemented in the digital educational environment of a higher education institution. The article describes the essence of the concept of "digital competence". European and domestic approaches to the study of the formation of digital competence of specialists are analyzed. Teachers of higher education institutions play an important role in the development of digital competence of future teachers. The digital educational environment requires from them a different approach to the organization of the educational process, the acquisition of new skills and abilities to work in the digital educational space. In this context, it is necessary to develop a strategy for preparing teachers to work in the digital educational environment. The Ternopil Volodymyr Hnatiuk National Pedagogical University Center for Digital Transformation of the Educational Environment conducted a survey of teachers to assess the level of their own digital competence and readiness to work in the digital educational environment. The authors describe the process of implementation of the program for the development of digital competence of teachers at Ternopil Volodymyr Hnatiuk National Pedagogical University.*

Keywords: digital competence; digital technologies; digital transformation; digital educational environment; teacher.

INTRODUCTION

Today, the world is undergoing a digital transformation of education. Digital tools are not only tools, but also the environment for living of modern person. They open wide opportunities for improving the educational process, the organization of distance, blended and lifelong learning. Digital transformation of the educational environment requires from teachers a different approach to the organization of the educational process, the acquisition of new skills and abilities to work in the digital educational space. It is higher education institutions that should provide training for graduates with a high level of digital competence. The future teacher during the training should gain skills and abilities to organize and work in the digital society, the ability to form an individual educational trajectory using digital tools and resources. Such training can be implemented in the digital educational environment of a higher education institution. A teacher of specialized and professional disciplines plays an important role in this training.

Methods

To achieve this goal, a set of theoretical methods was used: analysis of scientific sources on the research problem, separation of the conceptual apparatus of research, synthesis, generalization, systematization to substantiate the theoretical aspects of digital competence of teachers. Empirical research methods were used to determine strategies, regulations for the organization of e-learning and the development of digital competence of teachers.

BACKGROUND RESEARCH

Citizens of European countries and many countries in other parts of the world live in a digital society – a society heavily filled by digital technologies. Information society technologies are defined as offering services based on the use of digital technologies, the Internet, digital content, electronic media. Digital society is where digital transformation of all processes, an important link among which is education, is taking place.

The digital transformation of Ukrainian education is taking place in accordance with national and European regulations. These regulations substantiate the requirements for the digital transformation of education and the development of digital competence of professionals.

In 2018, the European Parliament and the Council of the EU adopted the Framework Program on renewed key competences for lifelong learning (2018/C 189/01), in which digital competence is recognized as one of the eight key competences for a full life and activity of citizens. Digital competence is defined as the confident and critical use of information society technology for work, leisure, study and communication.

The European Framework for the Digital Competence of Educators (DigCompEdu) considers 22 competences (Redecker, 2017). They are grouped into six areas: professional environment; search, creation and sharing of digital resources; management and use of digital tools in teaching; digital tools and learning assessment strategies;

use of digital tools to develop students' abilities; development of digital competence of students.

In the Concept of the New Ukrainian School, information and digital competence is one of the most important among the ten key competences. It involves the confident, but at the same time critical, use of information and communication technologies (ICT) for the creation, searching, processing, exchanging of information at work, in public space and private communication (information and media literacy, basics of programming, algorithmic thinking, working with databases, Internet security and cybersecurity skills, understanding the ethics of working with information (copyright, intellectual property, etc.) (Ghrynevych et al., 2016).

The professional standard of a teacher of a Ukrainian general secondary education institution defines information and digital competence as one of the teacher's key competences. It includes the ability to navigate in the information space, to search and critically evaluate information, to operate it in professional activities. The modern teacher must effectively use available and create new electronic digital educational resources (Professional standard, 2020).

According to the Concept of development of digital competences, the rapid development of digital technologies and the introduction of innovations in all areas require improving the quality of the training of modern professionals and modernization of all areas to fulfil modern requirements of the digital society. The development of a system for the growth of digital competence of specialists and a system of indicators for monitoring the level of development of digital competence are the main problems in the development of digital competences facing the education in Ukraine (Concept, 2021).

Therefore, in the context of digital transformation of education, it is important to form, support and develop digital competence of future teachers. This will contribute to achieving the required level of competitiveness of the specialist in the labour market, their adaptation to the digital society. Possession of digital skills will ensure the use of new digital resources by teachers, which will help to improve the quality of education.

Peculiarities of development of digital competence of a specialist, formation and measurement of digital competences have been considered in research.

Krumsvik defined digital competence as the mastery of teachers to use information technology in their professional activities (Krumsvik, 2011). According to Scuotto and Morellato, digital competence is the ability to flexibly research and solve new technological situations, analyse, select and critically evaluate data and information, use digital potential to solve problems (Scuotto, Morellato, 2013). According to Gutierrez's research, digital competence is seen as values, beliefs, knowledge, the ability to use digital technologies to acquire knowledge (Gutierrez, 2011).

Ferrari considered digital competence in the set of knowledge, skills, strategies on digital technologies that are needed to take on tasks, solve problems, communicate, manage information, collaborate, create and share digital content (Ferrari, 2012).

Digital competence helps professionals to acquire other key competences, such as language, mathematics, cultural awareness (Mattila, 2015).

O. Kuzminska, N. Morze, H. Henseruk, E. Smyrnova-Trybulska, O. Spirin considered the issues of formation of teachers' digital competence (Smyrnova-Trybulska, 2018; Morze, 2017). V. Bykov noted that the teacher's digital competence is knowledge, skills and abilities in the field of information technology and the ability to apply them in professional activities (Bykov, 2008).

The digital competence of the pedagogical worker should ensure the development of all its components: from media literacy to processing, critical evaluation of data, security and cooperation on the Internet (Morze, 2019). The modern teacher must be able to use open resources and technologies for professional development, to form in students the ability to effectively use digital technologies to solve various problems and tasks.

Thus, digital competence is considered important for modern educators. It helps teachers acquire and update the skills needed for their professional activities.

In higher education institutions, it is necessary to design a digital educational environment to implement a strategy for the development of future teachers' digital competence.

1. LEVEL OF THE DIGITAL COMPETENCE OF TEACHERS AT TERNOPIL VOLODYMYR HNATIUK NATIONAL PEDAGOGICAL UNIVERSITY

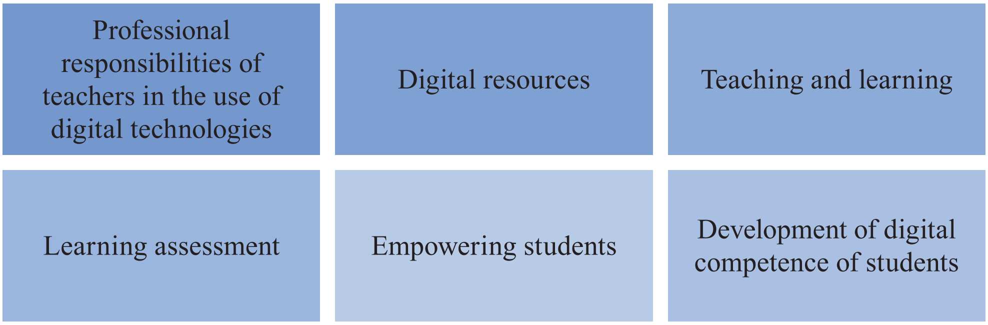
An important role in the development of digital competence of students in the digital educational environment of higher education is assigned to the teacher. Modern teachers must be able to apply various digital tools and resources in their professional activities. The process of interaction between teachers and students is changing. The teacher becomes a tutor who accompanies the trajectory of student training.

A digitally competent teacher must be able to encourage students to actively participate in all processes of the digital society. They should play an important role in the process of achieving high learning outcomes by students and be an example of how to properly and critically use digital technology in the learning process. At the same time, the teacher needs to learn and constantly develop their own digital skills.

It is important in the context of our study to determine the level of development of digital competence and readiness of teachers to work in the context of digital transformation of education.

The development of digital competence of future professionals is one of the main tasks in the planning and developing of digital educational environment of Ternopil Volodymyr Hnatiuk National Pedagogical University (Henseruk, Buyak et al., 2020). To implement this task, a strategy for the development of digital competence of future teachers has been developed. An important place in it is given to the teacher of the educational program, which is acquired by the future teacher. The development of digital competence of future professionals takes place in the process of studying digital and professional disciplines. In this context, it is necessary to prepare teachers for the use of digital technologies in the educational process and the introduction of new modern forms of learning.

At the beginning of 2020, the Centre for Digital Transformation of the Educational Environment at Ternopil Volodymyr Hnatiuk National Pedagogical University conducted a survey of teachers to assess the level of their own digital competence and readiness to work in the digital educational environment. 225 teachers took part in the survey. The survey was conducted in accordance with the the European Framework for the Digital Competence of Educators, which contains six modules (Figure 1).



F i g u r e 1. The Modules of the European Framework for the Digital Competence of Educators

S o u r c e: Own work.

The professional responsibilities of teachers in the use of digital technologies are expressed not only in the readiness to use them in the educational process. They are defined as a willingness to cooperate in learning, the ability to communicate and develop yourself in a digital environment.

According to the survey, only 25% of respondents communicated with colleagues and students using digital means. 28% of teachers used digital technologies to share professional materials and work with other teachers. 30% of respondents communicated with colleagues using digital technologies. Thus, only a third of teachers used digital technology for communication, collaboration and professional development.

The module "Digital Resources" includes the ability of teachers to choose digital tools and create their own materials using them. According to the survey, 35% of teachers selected digital resources on the basis of certain criteria and critically evaluated them. 38% of respondents used digital tools to create training materials or modify existing ones. However, only 20% of teachers used tools to protect information in the digital environment.

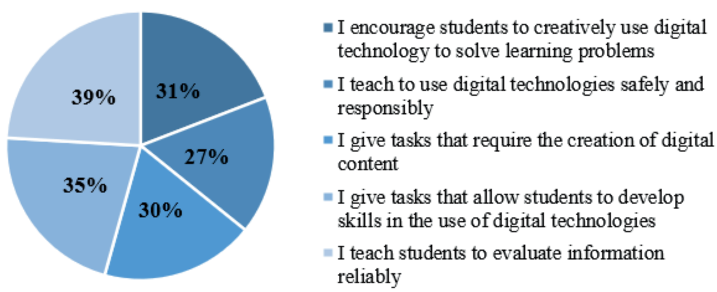
"Teaching and learning" includes the teacher's ability to create, plan and implement digital technologies at different stages of educational activities. Student-centred learning is important. The student should be at the centre of the learning process, and the teacher himself will act as a tutor. According to the survey, only 31% of teachers actively used digital technologies in the process of organizing student learning. The Covid pandemic has made adjustments to the organization of the educational process. It was necessary to move from the traditional format of classes to mixed forms of learning by actively including in the educational process various digital tools and online courses.

"Learning assessment" involves the use of digital tools for the implementation of existing methods of student assessment, the introduction of formative assessment.

It involves providing students with feedback and analysis of their activity in the digital environment. 40% of respondents used the LMS Moodle platform to assess and track student progress. However, only 25% of respondents used digital tools to organize formative assessment.

The module "Empowerment of students" involves the use of digital technologies by teachers to build an individual trajectory of students. It is important to eliminate differentiation in their access to appropriate technical devices and digital resources. According to the survey, only 32% of teachers discussed with students the possible problems that arise when performing learning tasks using digital devices. 30% of respondents used digital technology to organize the learning process that would best meet the individual needs of students. 39% of teachers used digital technologies to involve students in the educational process. However, these were mainly presentations, educational videos, rarely electronic tasks and educational games.

Important in the context of our study were the results of a survey of teachers on the module **"Development of digital competence of students"**. This is an important component of digital competence of the teacher. One third of the respondents who took part in the survey confirmed that they carry out this type of activity (Figure 2).



F i g u r e 2. The module "Development of digital competence of students"

S o u r c e: Own work.

Part of teachers (30%) gave students tasks that allowed them to develop their digital competence. 27% of teachers discussed safety with students while working with digital technologies. 39% of respondents assessed the reliability of the received information. Thus, according to the results of the study, teachers demonstrated a sufficient level of mastery of digital technologies. However, there was a trend of growing interest in the use of digital technologies in the educational process.

2. PROGRAM FOR DEVELOPMENT OF THE DIGITAL COMPETENCE OF TEACHERS AT TERNOPIL VOLODYMYR HNATIUK NATIONAL PEDAGOGICAL UNIVERSITY

The digital transformation of education in Ukraine, the rapid development of digital technologies, the transition to distance and blended learning have changed approaches to the organization of the educational process at Ternopil Volodymyr Hnatiuk National Pedagogical University. During 2020–2021 there was a digital transformation of traditional approaches to learning in the process of implementing the strategy of digital educational environment of the university.

The Centre for Digital Transformation of the Educational Environment studied and developed modern strategies for the development of digital competence of teachers and students of the university.

The development of the model of the program of digital competence growth of teachers at Ternopil Volodymyr Hnatiuk National Pedagogical University was carried out in several stages (2020–2021). The analytical phase included the study of experience, analysis and comparison of teacher training systems in the digital educational environment in European countries. The second stage was the stage of modelling. At this stage, a theoretical model of the program for the development of digital competence of the teacher was designed.

In the course of the research, the following principles of development of the teacher's digital competence have been determined:

- coordination of the development program with the main trends in the development of education at the global and European levels;
- coordination of the development program with the tendencies of digital transformation of education in Ukraine;
- use of relevant modern theories in the context of e-learning;
- correspondence of the development program with the European system for the Digital Competence of Educators DigCompEdu;
- compliance of the development program with the standard "Teachers of higher education institutions".

Program for the development of digital competence of teachers at Ternopil Volodymyr Hnatiuk National Pedagogical University includes:

- wide opportunities for formal, non-formal and informal teacher education;
- methodical support, information support, stimulation of teachers.

The development of digital competence of the teacher at all stages took place continuously in accordance with the individual abilities of every person, their needs and creative potential.

The Centre for Digital Transformation of the Educational Environment together with The Centre of Distance Learning conducted a series of training courses and seminars on the development of digital competence of teachers on the organization of the educational process in terms of distance and blended learning. The content of seminars and training courses was formed in accordance with the professional affiliation of teachers and the peculiarities of the organization of the educational process of a particular educational program.

Topics of the training and seminars:

- Digital tools in the professional activities of the teacher.
- Digital tools for communication in the e-learning process.
- Technologies for recording and editing video lectures.
- The art of computer presentation.
- Digital tools for formative assessment.
- Digital gaming tools.
- Tools for creating digital content.

For each seminar, guidelines for the use of a specific digital tool were developed. During the seminars, proven methods of conducting classes in the process of blended learning were shown for teachers. Particular emphasis was placed on the module "Development of the digital competence of students." Teachers were offered an example of tasks that can be given to students to develop their digital competence. Such tasks promote the development of soft skills.

As an example, a task "Creating a chronological historical event" was proposed for humanities students. Task text: "Simulate the event of the Revolution of Dignity using digital tools to create knowledge maps."

Teachers of professional disciplines also offered students tasks that involved the use of digital tools. It is worth noting, that educators do not have to be able to work with a certain digital tool. To formulate tasks, they need to know the capabilities of a particular digital resource and clearly describe to students the content of the task.

Below is an example of an interactive video on the study of a certain topic of the discipline "Lexicology" of the educational program "Secondary education (English language and literature)" (Figure 3). The task was created by a third-year student of the first (bachelor's) level of higher education.

At the next stage of the study, we developed a questionnaire for teachers to identify the dynamics of their digital competence. The questions of the questionnaire also concerned digital means and tools for organizing the educational process.

In addition to the Ternopil Volodymyr Hnatiuk National Pedagogical University e-learning system (Moodle platforms), teachers (86%) began to use various digital tools more often in the organization of the educational process. It is worth noting the use of tools and services of digital tools in the educational process at different stages of the lesson and for different purposes.

Most often, teachers use digital tools in lectures (60.9%) and practical classes (65.2%), less often in seminars (38%) and laboratory classes (25%). 2.2% of teachers use digital tools during other classes.

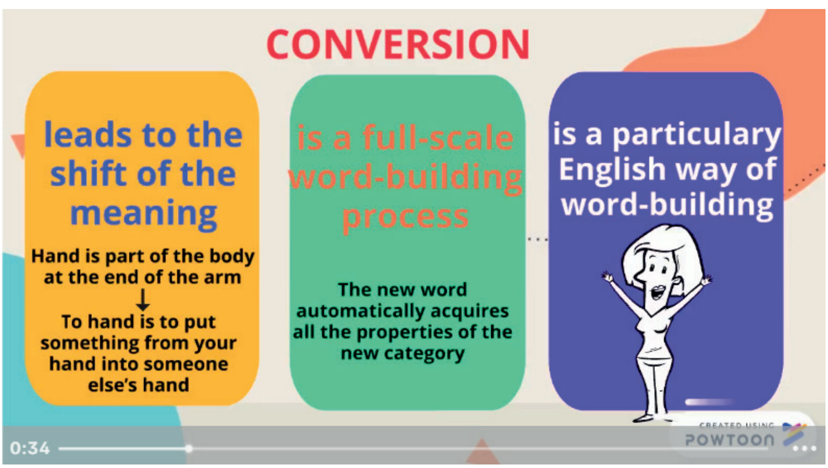


Figure 3. The example of a task created by students using the Powtoon digital tool

Source: Own work.

For joint work with students in the process of distance learning teachers used platforms for online classes: Zoom, Google Meet, BigBlueButton (98.9%); Google services: Google Docs, Google Presentations, Google Spreadsheets, Google Surveys, Google Class (57.6%); electronic boards: Padlet.com, Miro.com, Jamboard.com (32.6%).

Digital technologies have changed the approaches and criteria for assessing student achievement. It is important today to use the method of formative assessment, which allows students to understand and track their own progress and create their own learning trajectory, 82.7% of teachers used the resource Mentimeter, Socrative and Wordwall in formative assessment, 12.3% – Learningapps, 5% – other digital tools. 33.7% of teachers used electronic boards for feedback for classes outside Moodle: Padlet.com, Miro.com, Jamboard.com, 46.7% – other digital tools, 19.6% – do not use at all. It is worth noting, that 33.7% of teachers use the Mentimeter tool and 16.3% – Kahoot.

The number of teachers who offered homework and individual creative projects involving the use of digital technologies has significantly increased. Such tasks contributed to the formation of such skills: the ability to think critically, solve problems creatively and easily adapt to the process of digital transformation of society. 71.6% of teachers offered this type of task in the form of interactive presentations, 38% – in the form of interactive videos, 33.7% – in the form of mind maps, blocked diagrams on various topics, chronology of events, 31.75% – in the form of infographics. (Figure 4).

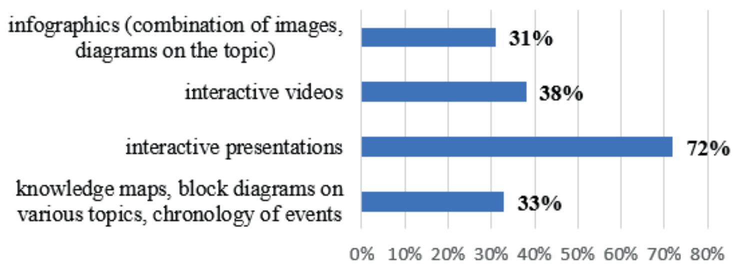


Figure 4. Digital tools for students to complete tasks

Source: Own work.

90.2% of respondents used Viber, 84.8% – e-mail, 31.5% – Messenger, 23.9% – Telegram, 10.9% – Skype to communicate with students.

All digital tools mentioned in the survey were considered by the teachers as the most effective in improving the quality of the educational process. In their opinion, everything depends on the type of lesson and its topic. The university teacher plays an important role in the functioning of a high-quality open digital educational environment of the university, in which the development of digital competence of students takes place.

CONCLUSION

In order to prepare competitive teachers, it is necessary to introduce a system of development of their digital competence in a higher education institution. An important place in this system is given to the university teacher, who should promote the development of digital competence of students. For this purpose, it is efficient to talk about designing the digital educational environment of the educational institution, creating a professional program for the formation of the digital competences of both teachers and students. This environment should be created in accordance with the following principles: defining who learns as an active subject of educational process; their focus on self-education, self-development; accounting their individual characteristics, training in the context of future professional activity.

The digital competence of a teacher of a higher education institution goes beyond the specific use of digital technologies in teaching. The digital transformation of the system of advanced training modern teachers is important to achieve a high level of their digital competence.

The Centre for Digital Transformation of the Educational Environment at Ternopil Volodymyr Hnatiuk National Pedagogical University has developed special courses for the development of digital competence of teachers. The courses significantly enriched the teacher's knowledge, which is confirmed by the survey.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
“E-learning”, 13, Katowice–Cieszyn 2021, pp. 249–265
https://doi.org/10.34916/el.2021.13.21

THE PORTRAIT OF A SOCIAL EDUCATOR AS A CARRIER OF INFORMATION-DIGITAL COMPETENCE

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Abstract: *The rapid process of digital transformation and the COVID-19 pandemic required in a relatively short time to adapt to new social conditions, master new types of communication and at the same time provide an atmosphere of comfort in the new digital environment. The task of creating psychologically comfortable interpersonal relations in a digital society, creating conditions for the self-development of the individual, productive interaction with other people relies on social educators. This is what distinguishes the role of a social educator from the role of a teacher. In difficult conditions today, social educators must have not only professional competences, but also have a high level of the digital competence to solve the tasks assigned to him. Therefore, the purpose of the research is to develop a portrait of a social educator as a bearer of information-digital competences in the contemporary modern society. The study provides a comparative analysis of the functionality of the teacher and social educator in the context of digital transformation; determining the conformity of competences formed during training; development of a model of the information-digital competence of a social educator and determination of ways of its formation.*

Keywords: information-digital competence; descriptors of information-digital competence; social educator, digital portrait of social educator.

INTRODUCTION

The rapid development of technology has led to the digital transformation of all spheres of society, which provides a great chance for their development, and at the same time poses a challenge. The process of digital transformation was accelerated by a pandemic caused by COVID-19. Institutions, educational institutions had to work remotely, to ensure work in which not only employees needed to master new digital technologies and tools, but all citizens-consumers of social services. The changes that took place required everyone to adapt in a fairly short time to new social conditions, master new types of communication and at the same time provide an atmosphere of comfort in a new digital environment. This has significantly changed the ways of thinking, and especially the requirements for the digital competence of citizens, created prerequisites for constant training based on frequent changes in activities, including through gadgets. Under such conditions, the teacher turns into a facilitator, moderator, tutor, becomes a bearer of his own competences acquired in terms of formal, informal education, which allows him to earn a living by forming and developing other necessary for life competences, attitudes, behaviours, etc. In fact, he becomes a professional intermediary between programmes, digital resources and the result of their mastery, which will be successful if psychological comfort and positive motivation is created. The task of creating psychologically comfortable interpersonal relations in the digital society, creating conditions for the self-development of the individual, promoting its development, productive interaction with other people relies on social educators. This is what distinguishes the role of a social educator from the role of a teacher. In difficult conditions today, a social educators must have not only professional competences, but also have a high level of the digital competence to solve the tasks assigned to him. Azlinda Azman, Paramjit Singh Jamir Singh, Jonathan Parker, Sara Ashencaen Crabtree (Azman, Singh, Parker, & Grabtree, 2020), (Silva, 2009), Pollianna Galvão, Daniel Carvalho de Matos, Wirna Lima Gomes (Galvao, Matos, & Gomes, 2018), Rana Duncan-Daston, Maude Hunter-Sloan, Elise Fullmer (Duncan-Daston, Hunter-Sloan, & Fullmer, 2013) and other researchers, including Ukrainian have studied the issue of the social pedagogues' digital competences. A lot of research has been published on the definition and development of the digital competence of the teacher, but the information-digital competence of the social educator is barely mentioned there are no works in describe the information-digital competence of the social educator is highlighted. Therefore, the purpose of the research is to develop a portrait of a social educator as a bearer of the information-digital competence in modern society. The main goals are to carry out a comparative analysis of the functionality of the teacher and social educator in the context of digital transformation; determining the conformity of competences formed during training; development of a model of information-digital competence of a social educator and determination of ways of its formation.

1. QUALIFICATION INDICATORS OF A SOCIAL EDUCATOR

In general, the requirements and criteria for assessing the professional qualification indicators of a social educator competence of employees, which are formed according to the essence of the profession and the labour market, are regulated by professional standards. For the most part in the literature basically there are two terms in the literature – „vocational standards/professional standards" and „occupational standards". Professional standards are indicators of competence in certain professions and types of classes that are established by the state or professional body. Professional labour standards are indicators that determine how much a person meets the work performance requirements in a certain type of occupation (Semyhina & Pozhydaieva, 2020).

For a better understanding of the peculiarities of the activity of a social educator, the authors we will conduct a comparative analysis of the main qualification indicators of the teacher and social educator. In accordance with the professional standard of the profession, the teacher's task is to limit learning by forming key competences in education applicants, developing intellectual, creative and physical abilities that are necessary for learning and successful self-realization (Professional standard by professions, 2020).

To implement certain tasks assigned to his functions, the teacher must have 15 professional competences (Figure 1):

Subjects training (integrated courses)	• Linguistic and communicative competence • Subject-mathematical competence • Information and digital competence
Partner interaction with participants of the educational process	• Psychological competence • Emotional and ethical competence • Competence of pedagogical partnership
Participation in the organization of a safe and healthy educational environment	• Inclusive competence • Health-saving competence • Design competence
Management of the educational process	• Prognostic competence • Organizational competence • Evaluation and analytical competence
Continuous professional development	• Innovative competence • Lifelong learning • Reflective competence

Figure 1. Labour functions and competencies of a teacher

Source: Own work.

Since the professional standard for the profession „Social Educator" in the conditions of digital transformation is not approved, for analysis we will use the „Regulation on Psychological Service" (The Law of Ukraine, No. 509, 2018), which defines the types of activities carried out by a social educator and the functions of the service. The document highlights six main functions and clearly does not specify the necessary professional competences, but there are only descriptions of typical professional tasks and a general list of what a specialist should be able to do (Table 1).

The defined functions and abilities of a social educator indicate that their main task is to social assistance, protection, ensuring the comfort of the individual in a social environment, while the main functions of the teacher are activities teaching and educational. Social educators are assistants and mentors in the periods of personality formation, who help in independent problem solving without interfering in its affairs, who work to solve the problem of personality socialization, because the focus is on the development and formation of personality. (Bezpalko, 2015).

Table 1. Functions and skills of a social educator

Social Educator	The ability of a social educator
Diagnostic and prognostic	Select the optimal diagnostic tools; analyze, generalize diagnostic results; to predict the features of socialization of the individual; take into account the specifics of social groups.
Organizational and methodological	Determine priority areas of activity; plan the stages of activity; establish cooperation.
Correction and development	Forecast and plan life path; to carry out correction and development work; establish connections and provide assistance; stimulate personality.
Consultative and communicative	Make a communicative presentation; select methods of influence; to prevent and overcome conflicts; select tools and techniques of communication.
Educational and preventive	Organize individual, group, mass forms of preventive work; socio-positive activity; promote a healthy lifestyle; possess the ways and forms of preventive work.
Socio-protective	Create conditions for maintaining faith and achieving positive results; inform about rights and guarantees.

Source: Own work based on The Law of Ukraine, No.5 09, 2018.

2. PREPARATION OF MASTER'S SPECIALTY „SOCIAL PEDAGOGY"

We will investigate the formation of certain skills in the preparation of masters in the specialty „Social pedagogy". Preparation of masters in the educational and professional programme „231.00.02. Social Pedagogy" at Borys Grinchenko Kyiv University focuses on the necessary knowledge, skills and practical skills in social and pedagogical activities and on the development of leadership, teaching and technological competences (Educational and professional programme: Social pedagogy, 2019). According to the educational and professional programme, graduates should have the following competences (Table 2):

In accordance with the Professional Standard „2446.2 Social Worker" (2021) it is recommended to expand the competences that a specialist should possess (Table 3). The knowledge, skills and skills gained by a social educator in the formation of these competences (see Table 3) require understanding and use of digital tools, and in the list of components of the educational and professional programme there is a single discipline „ICT in professional activity" of 4 credits, which is insufficient for the formation of the information-digital competence of a social educator.

Table 2. Competences of alumni of the educational and professional programme „Social pedagogy"

Competence	Forming Ability
Integral competence	Ability to organize and conduct social and pedagogical activities, conduct research, carry out social and pedagogical activities of the interdisciplinary team in an inclusive educational environment.
General competence	Ability to abstract thinking, analysis and synthesis. Ability to develop and manage projects. Ability to evaluate and ensure the quality of work performed. Ability to communicate in a foreign language. Ability to conduct research at the appropriate level. Ability to show initiative and entrepreneurship. Ability to adapt and act in a new situation. Ability to generate new ideas (creativity). Interpersonal interaction skills. Ability to work in a team.
Special (professional, subject) competences	Ability to understand and use modern theories, methodologies and methods of social and other sciences. Ability to identify socially significant problems and factors to achieve social well-being of different groups of the population. Ability to professionally diagnose, predict, design and model social situations. Ability to implement methods and technologies of innovative practice and management in the system of social work. Ability to communicate with representatives of other professional groups of different levels. Ability to assess the process and result of professional activity and the quality of social services. Ability to professional reflection. Ability to collaborate and group motivation, facilitation of group decision-making processes. Ability to bring knowledge and own conclusions to specialists and non-practitioners. Ability to show initiative and entrepreneurship to solve social problems through the introduction of social innovation. Ability to identify professional identity and act on the values of social work. Ability to critically assess social consequences of human rights, social inclusion and sustainable development of society. Ability to form a positive image of the profession, its status in society. Ability to effectively manage an organization in the field of social work. Ability to develop, test and implement social projects and technologies. Ability to introduce the results of scientific research into practical activity. Ability to organize and conduct social and pedagogical activities with children, families, in educational institutions. Ability to carry out social and pedagogical activities of an interdisciplinary team.

Source: Own work based on Educational and professional program of master degree „Social pedagogy", 2019.

Table 3. Competences that are recommended to be added to professional ones

Competence	Forming Ability
General competence	Z.02 Ability to ensure confidentiality of personal information about social assistance recipients. Z.03 Ability to use information and communication technologies. Z.05 The ability to learn and be trained, to self-education, continuous professional development. Z.09 Ability to initiate, plan and manage changes to improve existing and develop new social systems. Z.11 The ability to establish social interaction, cooperation, manage versatile communication, prevent and resolve conflicts. Z.12 The ability to constantly learn and be modern, to self-education, continuous professional development.
Special (professional, subject) competences	A4. The ability to diagnose complex life circumstances of persons who have fallen into difficult life circumstances by various methods. A6. Ability to keep the necessary documentation when identifying potential recipients of social services. B4. Ability to conclude a contract for the provision of social services with a potential recipient of social services and maintain the necessary documentation. C(V)5. Ability to organize regulatory and informational and methodological support of social workers and social workers-specialists. Ye2. Ability to calculate the performance indicators of social services and their assessment. Zh2. Ability to use media and social networks to improve social work. Zh3. Ability to participate in interagency meetings, measures to prevent social problems within the administrative-territorial unit. Ability to implement methods and technologies of innovative practice and management in the system of social work.

Source: Own work.

3. INFORMATION-DIGITAL COMPETENCE OF A SOCIAL EDUCATOR

The changes occurring in society, both in educational and professional activities, concern especially the professional training of modern specialists in the social sphere, since their activities are related to work in society, analysis of social challenges. Taking into account the development of information and communication technologies, researchers Pavliuk, Liakh, Klishevych (Pavliuk, Liakh, & Klishevych, 2017) developed the structure of ICT competence of the future social specialist by transforming the structure of ICT competence of teachers recommended by UNESCO (Figure 2):

	Technological literacy	Deepening knowledge	Knowledge creation
Understanding the role of ICT in education and professional activities	Knowledge of educational and social policy	Understanding of educational and social policy	Innovations in educational and social policy
Curriculum and evaluation	Basic competences	Application of competencies	Competence of knowledge society
Educational and research activities	Use of technology	Using complex tasks	Self-education
ICT	Basic tools	Complex tools	The latest technology
Professional development	Literacy in digital technologies	Management and directions	social specialist as a role model

Figure 2. Structure of ICT competence of a social specialist

Source: Own work based on Pavliuk, Liakh, & Klishevych, 2017.

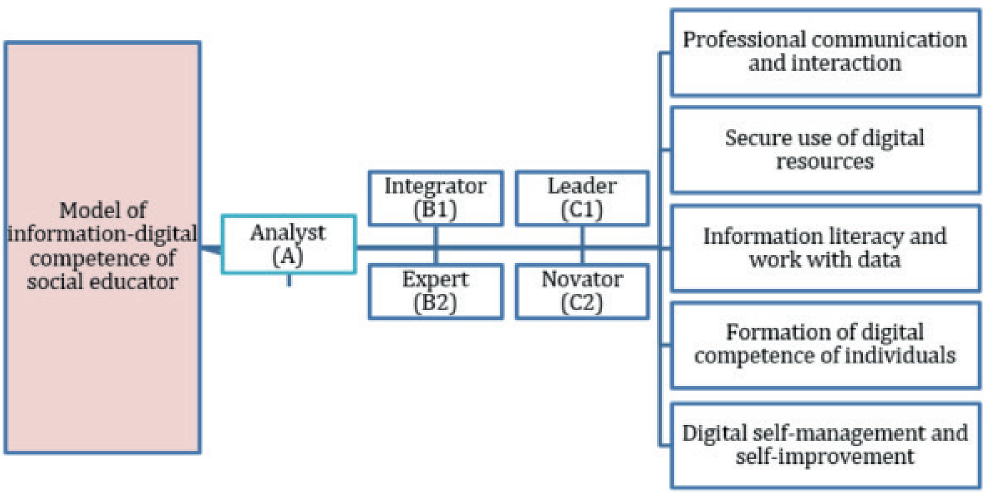
The high professionalism of social educators is extremely relevant and important, since the fate of people who turn to them for help especially now, during the digitalization of society, which in turn significantly accelerated the quarantine restrictions associated with the COVID-19 pandemic. The widespread use of digital technologies, „life" in network society, online communication, etc. encourage changes to the defined structure of ICT competence, as well as general and professional competences. Analysis of the main international and Ukrainian documents, among which the Concept of digital competence development (Order, No. 167-p, 2021), The Digital Competence Framework for Citizens: DigComp 2.1 (Carretero, Vuorikari, & Punie, 2018), European Framework for the Digital Competence of Educators: DigCompEdu (Redecker, 2017), ISTE Standards for Educators (2017), Professional standard for a group of professions „Teachers of higher education institutions" (Law, No. 610, 2021), Draft of the Concept of Digital Transformation of Education and Science for the period up to 2026 (2021), Digital Education Action Plan (2021–2027), Teacher's Digital Competence Standard (Morze, Gladun, Vember, & Buinytska, 2018), Corporate standard of teacher's digital competence in university (BGKU, 2021) etc., and the objective actualization of the use of digital tools in the activities of social educators and their preparation outlined the need to develop a structural model of the information-digital competence of social educators.

The main areas of the standard of information-digital competence of a social educator are defined:

- Professional development and self-improvement
- Professional communication and interaction
- Information literacy and work with data
- Secure use of digital resources
- Formation of information-digital competence
- Digital self-management

As more and more attention is paid to international academic mobility, cooperation of the university with European educational institutions, we believe that the levels of information-digital competence should be as close as possible to European ones. At the same time, increasing the requirements for the level of the information-digital competence of social teachers in the conditions of „living online" caused by COVID-19, encourages the allocation of one mandatory level "A" – Analyst. At this level, a social educator must understand, know the potential and be able to use the digital tools that are necessary to ensure his professional activities.

Sufficient and high level, in accordance with European standards and description of the framework of digital competence of the citizen (DigComp UA, 2021), will contain two sublevels: Integrator (B1), Expert (B2) – sufficient level; Leader (C1), Novator (C2) – high level. Integrator is a social educator who creatively uses, incorporates the use of new digital tools, constantly expanding their list. At the Expert level, the social educator creatively, critically, uses digital tools and technologies, experiments with integrating them into professional activities open to new ideas. The Leader level requires a social educator to have a certain approach, to constantly develop in practice, to share experiences using digital tools with colleagues, to analyze and take into account the shortcomings of certain tools and technologies. The highest level - Innovator, provides the ability to select and develop new approaches and methods, introduces digital innovations, experiments with digital tools, motivates others to use them in practice. The specified structural model is presented in Figure 3.



F i g u r e 3. Structural model of the information-digital competence of social educators

S o u r c e: Own work.

The proposed model of information-digital competence covers the key needs of a social educator in the context of society digital transformation and is aimed at the practical use of means and services of digital technologies and increasing the level of digital literacy of the individual. The generalized structure of the information-digital competence of a social educator in accordance with the model determined by the authors are presented in Table 4.

Table 4. Generalized structure of the information-digital competence of social educators

Scope of competence	Title of competence
Professional communication and interaction	Critical perception of information for proper communication Participation in professional networking communities Dissemination and exchange of data using digital technologies Collaboration and interaction through digital technologies
Secure use of digital resources	Use of digital devices and software Using the Internet and online resources, online applications Compliance with copyright and use of licenses Protection of personal data and privacy Compliance with Internet security and network etiquette
Information literacy and work with data	Browsing, searching, filtering information and digital content Managing data, information, content Realization of requests and needs using digital technologies Modification and development of necessary digital content Understanding the significance of instrumental and representative types of literacy in the life of the individual
Formation of information-digital competence of personalities	Promoting the use of digital resources in the main spheres of society life Organization of selection and processing of digital tools for problem solving Creating new content that will provide easy adaptation personality in digital society Increasing positive motivation and interest in digital technologies
Digital self-management and self-improvement	Digital Identity Management Self-realization in digital society Self-assessment of the level of digital competence and elimination of gaps Professional self-development in a digital environment The use of digital technologies for continuous professional development

Source: Own work.

The proposed structure is not established, it can change in accordance with the challenges of the labor market, the state of development of digital literacy, the emergence of new digital services and technologies.

4. DIGITAL PORTRAIT OF A SOCIAL EDUCATOR

To develop a portrait of a social teacher as a carrier of information-digital competence in modern society, we will take as a basis the structure of information-digital competence and define digital technologies that can be applied in the process of professional activity.

Quarantine restrictions have become one of the catalysts for the chaotic and unreasonable introduction of digital technologies, since no appropriate analysis was done and an individual approach was not taken into account. As noted by I. Kuropas „modern digital technologies expand opportunities for access to information, development of personal competence, establishment of interaction and communications, as well as for expressing their own opinion, for creativity, self-realization, protection of their rights and manifestation of civic activity. It's not only about social media posts, but also about the adaptation of traditional formats to new realities" (Kuropas, 2021). A key role in the adaptation of the individual to a new digital society relies on social educators, so their training in educational institutions should be carried out taking into account modern requirements.

Let's take a closer look at each of the areas of application of the information-digital competence.

Especially important in today's conditions caused by the COVID-19 pandemic, when almost all communication takes place online, is the competent organization of professional communication and interaction. To understand each competence, the authors adapted and selected a list of necessary skills and skills descriptors, which are important for future social educators (Table 5).

Table 5. Competences and descriptors of the field „Professional communication and interaction"

Title of competence	Schematic designation	List of descriptors
Participation in professional network communities and creation of new ones		Join professional network communities, initiate active discussions, establish professional business contacts Be able to create and promote professional communities with digital tools
Dissemination and exchange of data using digital technologies		Be able to select and apply digital technologies for the dissemination and exchange of data, take into account the rules of confidentiality and authorship
Critical perception of information for proper communication		Understand and take into account the relevance of using digital tools for communication Skills to analyze, select and use digital tools for effective professional communication according to the needs of the audience Be able to adapt different rules of communication to a specific audience
Cooperation and interaction through digital technologies		It is correct and appropriate to select digital technologies taking into account the context, age category, cultural and social features Be able to create common digital content, organize group work, implement joint social initiatives, network projects, experiment with new forms of cooperation organization

Source: Own work.

The implementation of professional activities of a social educator today cannot occur without the use of digital resources. To organize effective work, you need to know how to choose resources taking into account goals, features and needs, how they can be modified and improved, how to properly and safely use. In order to provide recommendations for their selection, dissemination, use, modification, it is necessary to observe copyright, to be able to protect personal data, etc., as shown in the specified descriptors (Table 6).

Table 6. Competences and descriptors of the field „Secure use of digital resources"

Title of competence	Schematic designation	List of descriptors
Use of digital devices and software		Be able to safely configure and use gadgets for your own needs and activities Correctly select, install and use software, online services, applications
Using the Internet and online resources, online applications		Be able to use the Internet properly, safely use online resources Prevent online crimes in a digital environment Understand the technology of creating online resources, applications, be familiar with their administration Be able to detect questionable Internet resources
Compliance with copyright and use of licenses		Be able to use and distribute content in compliance with copyright and privacy rules Understand the principles of distribution of copyrights and licenses for content, data, etc.
Protection of personal data and privacy		Understand how to use and share personal information Know and be able to reliably protect personal data, privacy in the Internet and digital environments
Compliance with Internet security and network etiquette		Know and adhere to the ethics of communication, rules of conduct, integrity, legal norms in the Internet and digital environments Know and adhere to security measures on the Internet, understand the risks and threats in the network environment Be able to protect yourself and others from bullying, cyberbullying, phishing and other dangers

Source: Own work.

During a sharp increase in access to information, the movement of communication online due to the pandemic COVID-19, the increase in the flow of disinformation in the modern world, which poses a threat to life, information literacy is a key competence to solve the problem of disinfodemia. Information literacy „promotes access to information, freedom of expression, protection of privacy, prevention of violent extremism, promotion of digital security, etc." as noted in the Seoul Declaration on Media and Information Literacy (2021-19) and is called to increase information literacy to overcome gaps in access to information, ensure open, inclusive and safe development of technologies, solving the problem of misinformation. A necessary, in our opinion, list of descriptors is shown in Table 7.

Table 7. Competences and descriptors of the field „Information literacy and work with data"

Title of competence	Schematic designation	List of descriptors
Browsing, searching, filtering information and digital content		Be able to formulate needs, set searches, analyze critically and select the necessary data, content in digital environments Be able to check the reliability of sources and reliability of information
Managing data, information, content		Be able to select, process and store information, content Be able to accumulate, organize, form visualized understandable reports
Realization of requests and needs using digital technologies		To be able to select and use digital services and technologies for social services, professional development, recreation, savings, etc.
Modification and development of necessary digital content		Be able to create digital content in different formats and integrate into other data arrays, modify and edit existing content Use a variety of services and tools to modify content, give it creative attractiveness Understand the benefits and limitations of services and tools
Understanding the significance of instrumental and representative types of literacy in the life of the individual		Be able to track and take into account know-how on the dissemination of new technologies (computer, network, technological), to have instrumental literacy Be able to analyze information that has an impact on the needs of society in communication and to understand the meaning of information, visual, media literacy, to have representative literacy Be able to track media influence on different social groups, solve different social problems with media involvement

Source: Own work.

The formation of digital competence is an important factor in supporting digital transformation processes. Social educators will have to develop the ability to independently evaluate and master new digital tools as they appear and at the same time need to learn how to popularize them, acquaint others with them, explain their need and use. These basic abilities are presented in Table 8.

Table 8. Competences and descriptors of the field „Formation of digital competence of individuals”

Title of competence	Schematic designation	List of descriptors
Promoting the use of digital resources in key areas of society		Know and train others to use digital resources to ensure social well-being To be able to support others in the development of digital competence
Organization of selection and processing of digital tools for solving problems		Teach to assess needs, select and use digital tools to respond and meet these needs Be able to ensure accessibility through resource settings
Creating new content that will provide easy personal adaptation in the digital society		Be able to create simple and understandable digital content, make innovative changes to existing digital products Use digital services and technologies to create and distribute content for easy adaptation of other personalities
Increasing positive motivation and interest in digital technologies		Encourage others to use digital technologies to solve social problems, ensure communication, avoid health risks, find opportunities for self-development, etc.

Source: Own work.

In the digital society, digital self-management has become important, i.e. the ability to use digital tools to manage themselves, their time, their lives, manage the flow of their lives, develop and improve (Table 9).

Table 9. Competences and descriptors of the field „Digital self-management and self-improvement”

Title of competence	Schematic designation	List of descriptors
Digital identity management		Understand what digital identity is, know what information and what means are collected about the individual
Self-realization in the digital society		Critically evaluate yourself and your own environment, be able to navigate, develop, adapt in a digital environment Acquire training to use a digital environment for self-expression, self-improvement

Self-assessment of the level of digital competence and elimination of gaps	Be able to identify gaps in the development of digital competence and build a personal trajectory of development, to carry out constant monitoring of own development
Professional self-development in the digital environ-ment	Be able to use digital educational resources for self-development, improvement of professional practices, etc. Be able to use digital tools for resource management
The use of digital technologies for continuous profes-sional development	Be able to determine the need and choose resourc-es, plan, organize and carry out self-education and professional development

Source: Own work.

For the formation of knowledge, skills and abilities defined in Tables 5–9 there is a large list of digital resources that can be used in the professional activities of a social educator. Our study presents only a small part of the possible digital resources for each areas of application of the information-digital competence. The combination of the areas of application of the competence, the list of competences and digital resources for the formation and development of the information-digital competence are reflected in the digital portrait of the social educator (Figure 4).

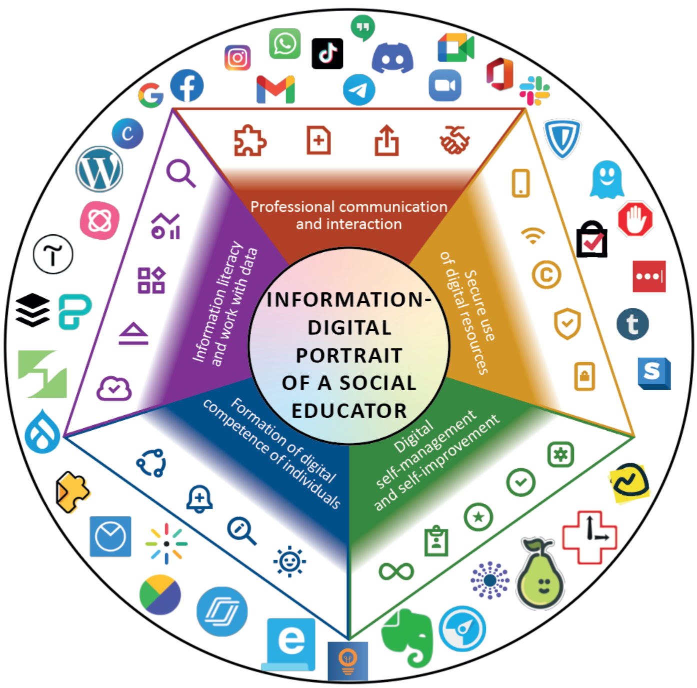


Figure 4. Digital portrait of a social educator

Source: Own work.

Among the presented tools (Figure 4), the possession of which will allow to prepare competitive social educators, we will single out the main groups - tools for working on the Internet, tools for working together, tools for working with electronic documents, tools for online communication, tools for organizing events, content creation tools, visualization tools, work organization tools, project management tools, learning management tools, productivity tools, cybersecurity tools and more.

We will not dwell on the description of the tools related to each of the groups, as they are constantly updated, improved, new ones appear and existing ones cease to be used. When training social educators, it is necessary to constantly monitor the development of digital technologies to teach them new modern tools that will help in professional activities. In addition, modern specialists must independently analyze the latest digital technologies, search for and master the work with new digital tools, self-study in open mass online courses to be able to provide quality professional assistance.

CONCLUSION

In modern conditions it is important to ensure the creation of psychologically comfortable interpersonal relationships in the digital society, to create conditions for self-development of the individual, to promote its development, to help organize productive interaction with other people. These are the main tasks that are entrusted to social educators. To solve them, the social educator must have not only professional competences, but also have a high level of digital competence. The analysis of general and special competences defined by the educational and professional training programme for masters in the specialty “Social Pedagogy” confirmed the inconsistency of the needs of the digital society.

Based on the study of major international and Ukrainian documents on digitization and development of digital competence, a structural model of information-digital competence of social educator has been developed, which covers the key needs of social pedagogy. A detailed description of the generalized structure and descriptors of information-digital competence of a social educator, analysis of digital resources for the formation and development of the information-digital competence are contained in the digital portrait of a social educator. The digital portrait of a social educator reflects his key needs in the context of digitalization of society and focuses on the practical use of tools and services of digital technologies to improve digital literacy.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 266–277
https://doi.org/10.34916/el.2021.13.22

ON THE USE OF SOCIAL NETWORKS IN TEACHERS' CAREER GUIDANCE ACTIVITIES

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Abstract: *The article reveals the essence of professional orientation as a system of interaction between a young person and a educator (teacher, teaching staff, society), which is aimed at meeting the needs of the person in professional self-determination. The authors make a content analysis of Internet sources to identify resources that can be used to support career guidance activities and present a classification of Internet resources by types of career guidance work: diagnostic (online testing), agitation (university and interested institution sites), advisory (career guidance sites, network services), information and orientation (professions directories, job sites), accompanying (support development software), organizational (chats, e-platforms for communication), and by types of career guidance activities: sites for meetings (network services), for immersion (specialized software), for consulting (online tests, career guidance sites), for excursions (institution sites), for projects (educational resources). Emphasis is placed on social networks and possibilities of their use in career guidance activities due to the large number of users, the informal nature of communication within the network, which is more interactive (almost one-time exchange of ideas and resources). The practical state of teachers' readiness to use social networks in career guidance was studied and it was found that despite the 100% inclusion of pre-service and service teachers in social networks, their readiness to involve them in career guidance is insufficient.*

Keywords: career guidance, career guidance activities, professional self-determination, social networks, digital technologies, teachers' career guidance activities.

INTRODUCTION

The economic downturn is due not only to lack of jobs, but also to the fact that the modern youth choose their careers, usually based on social media trends without taking into account individual inclinations and abilities, their own intellectual and financial capabilities, as well as regional and national labor market needs.

Generation Z (people born at the turn of the XX–XXI centuries) is characterized by impatience, Internet addiction, fragmental/ clip thinking, hyperactivity, etc. This has an impact not only on the peculiarities of generation Z training, but also on their professional orientation. According to the analysis of youth psychophysiological features, the use of digital technologies and tools is promising for the organization and conduct of career guidance.

At the same time, the most successful period for such activities is adolescence. In this period there is the formation of a stable professional interest and conscious professional intention. It is during this period that career guidance work allows to inform pupils about the different professions, helps them to determine personal qualities. Thus a choice of profession, future professional activity, choice of educational institution for further education is provided. This choice will meet their interests, reflecting their values and alignment with the needs of the labour market.

At the same time, the most important stage of professional self-determination of adolescents is 5–9th grades and it falls out of teachers' career guidance activities, and high school students often make professional choices based on social media trends and obsessive virtual advertising, often influenced by professional agitation rather than conscious career guidance. Therefore, the need, on the one hand, to intensify the teachers' career guidance activities in 5–9th grades of school, and on the other hand, to attract digital tools to carry out such activities, has become urgent. In particular, the problem of using social networks in teachers' career guidance activities is actualized.

1. ANALYSIS OF CURRENT RESEARCH

Analysis of research findings helps characterize various aspects of teachers' preparation for career guidance activity. Among them problems which teachers face with regard to the inclusion of career guidance in the life orientation curriculum (Modiba & Sefotho, 2019); the teachers' attitude to the situation when responsibility for career guidance activities transfers to the school (Watermeyer, Morton, & Collins, 2016); teachers' suitable attitude toward high school students concerning their career guidance (Ochiai, Satoh, Okamoto, & Kunimoto, 1995); the role of teacher in career guidance (Henry, 1973; Wong, Yuen, & Chen, 2021); the positive impact of subject teacher as a career influencer (Holman, 2014; Hutchinson, 2013; Munro & Elsom, 1999); the teachers and students experience in involving parents in career guidance (Phokane, 2012); readiness for professional orientation of primary school students (Zavitrenko, 2013); pre-service computer science teachers' readiness for career guidance work in secondary schools (Ponomarova, 2017); pedagogical means of professional counseling of young people through the Internet (Osadchyi, 2005).

Following the analysis of these scientific findings, it was established that the problems of teachers' in preparation for career guidance and the use of information technologies in teachers' professional activities were systematically solved, but the study of the use of social networks in teachers' career guidance activities has not yet become systemic. It should be noted that, despite the active spread of digital technologies, resources and tools in the educational process, findings on the problems of pre-service teachers training to use social networks in career guidance today is almost absent.

The **purpose** of the study is to substantiate the feasibility of using social networks in teachers' career guidance activities.

The purpose leads to the following **tasks**: 1) to conduct a theoretical analysis of approaches to the interpretation of the category "career guidance"; 2) to provide a classification of Internet resources from the standpoint of their use in teachers' career guidance activities; 3) to describe the features of the use of social networks in teachers' career guidance activities; 4) to investigate the practical state of readiness of pre-service and service teachers to use social networks in career guidance and justify the feasibility of their use.

2. MATERIALS AND METHODS

2.1. Research base

The study was conducted based on Makarenko Sumy State Pedagogical University, Borys Grinchenko Kyiv University. The pedagogical experiment was attended by 154 students of 4 course of specialties "014 Secondary Education" (specializations – mathematics, computer science), 56 service mathematics and computer science teachers in Sumy (Ukraine) and and 85 students of 3–4 courses of specialties "122 Computer science", 22 service mathematics and computer science teachers in Kyiv (Ukraine).

2.2. Stages of research

The study took place in four stages: the first stage – theoretical, aimed to clarify the concept «career guidance». The second stage – describes the classification of Internet resources from the position of their use in teachers' career guidance activities. In the third stage, the peculiarities of the use of social networks in the teachers' career guidance activity are described. The fourth stage was to conduct the practical state of teachers' readiness to use social networks in career guidance.

Based on the author's survey, a comparative analysis of the pre-service and service teachers' readiness to use social networks in career guidance activities was carried out.

Questionnaire

1. What cloud services (educational platforms) are you familiar with?
2. What services do you use in your professional activity?
3. What social networks accounts do you have?
4. What do you use social networks for?
5. Do you use Google Forms for surveys?

6. Do you know how to develop thematic posters, announcements, posts for various social networks?

To compare the positions of students and teachers, the answers were subjected to a correlation analysis: on the basis of percentage data for each of the answer the authors calculated Pearson's correlation coefficient,

$$r = \frac{\sum_{i=1}^{n} x_i y_i - \frac{1}{n}\sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sqrt{\sum_{i=1}^{n} x_i^2 - \frac{(\sum_{i=1}^{n} x_i)^2}{n}}\sqrt{\sum_{i=1}^{n} y_i^2 - \frac{(\sum_{i=1}^{n} y_i)^2}{n}}} \quad (1)$$

the probability of which was tested by Student's test with (n–2) degrees of freedom by the formula $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$, where *n* is the sample volume, with the hypotheses "H_0 – correlation coefficient *r=0*, the linear relation is absent" and " H_a – correlation coefficient *r≠0*, a linear relation between the data is present" (Liashchenko & Holovan, 1996).

3. MAIN RESULTS

3.1. Career guidance activities and the use of Internet resources to its support it

The essence of career guidance in most studies is understood as a system of interaction between a young person and a educator (teacher, teaching staff, society), which is aimed at meeting the needs of the person in professional self-determination. It is emphasized that career guidance work is, first of all, a process of interaction, and not some one-sided action (for example, a teacher); secondly, the basis of this interaction is the needs of both the person and society, which do not always coincide. Therefore, the teacher in such interaction should be a mediator between the young person and society, agreeing on the needs of each side. It should also be noted that it is important to achieve pupils' professional self-determination, which is seen as the ability to learn about individual characteristics (the self-image) and to make the best decision.

Content analysis of Internet sources showed that today there is a large number of resources that can be used to support career guidance (Figure 1).

Nowadays, Internet resources can be divided by types of career guidance work into the following: diagnostic, advocacy, consulting, information and guidance, support, organizational (Figure 2).

Internet resources by types of career guidance activities are divided into: software for meetings, software for immersion, consulting, excursions, project resources (Figure 3).

Let us note that this classification is conditional and does not claim to cover the types of Internet resources in the field of career guidance fully. However, a few remarks should be made on the implementation of teachers' career guidance activities based on digital technologies.

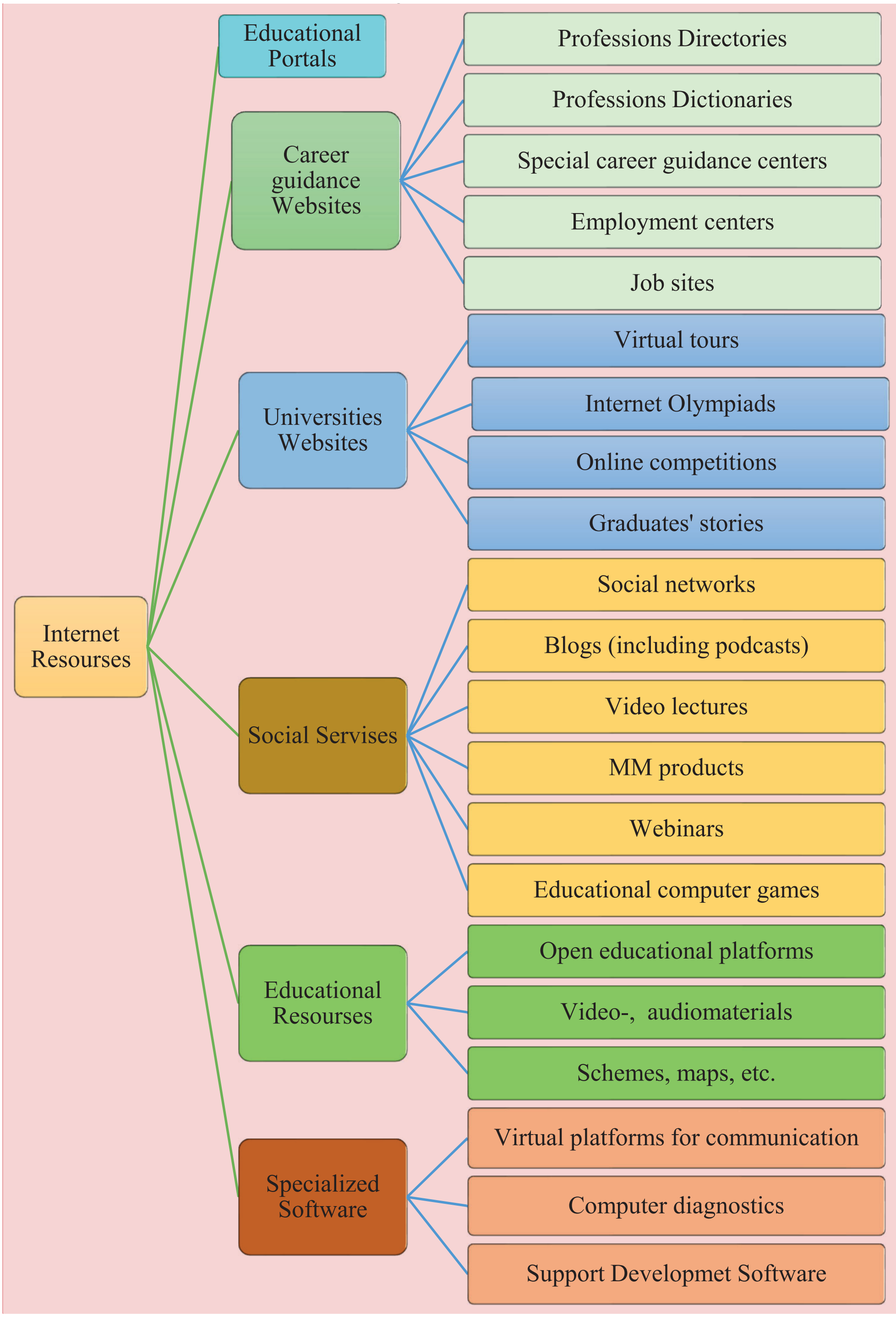
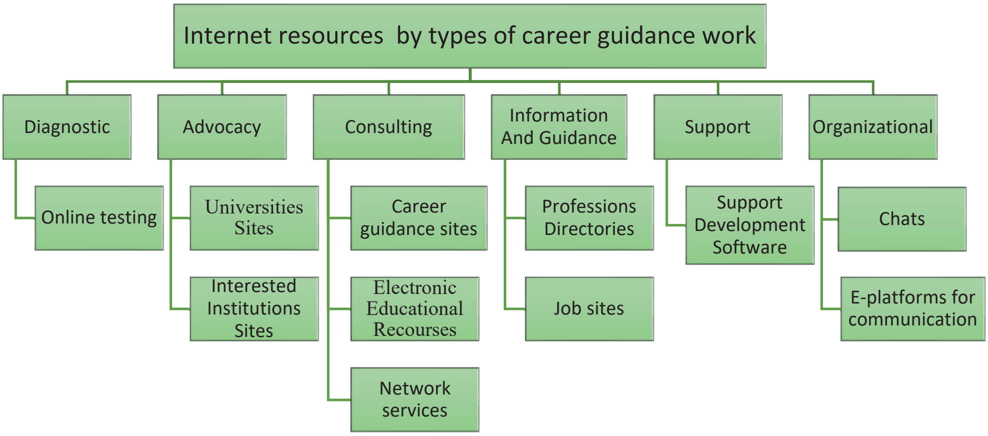


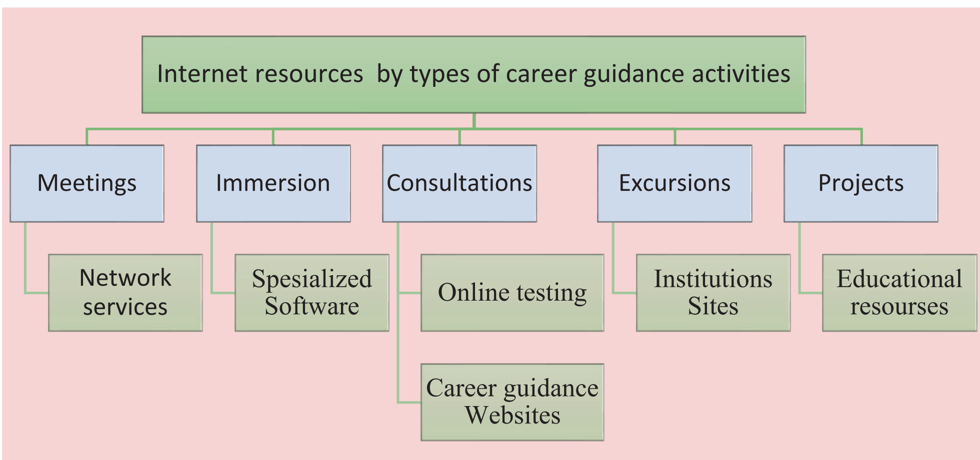
Figure 1. Internet resources for career guidance activities

Source: Own work.



F i g u r e 2. Classification of Internet resources by types of career guidance work

S o u r c e: Own work.



F i g u r e 3. Classification of Internet resources by types of career guidance activities

S o u r c e: Own work.

When organizing project activities in career guidance work, one should take into account the diversity of digital resources and promote their diversity among pupils. This can be done by proposing projects related to professional choice: "Why is the teaching profession eternal?", "How many professions does the IT industry have today?", "Where can You get the design manager profession?", "Top 20 the most popular professions in Sumy/ Kyiv region", "What are the professions of the future", "What professions will the country need in 10 years", etc.

We see a promising promotion of open educational resources among pupils, as well as various competitions in the teachers' career guidance activities. At the same time, it is important to emphasize that it is necessary to take into account not only one's own preferences, but also the requirements of the profession to the person. It is also necessary to take into account career guidance activities of representatives of certain industries, such as representatives of the IT industry, who have the latest information on the labour market and can guide the choice of specialization, promising areas of development, specifics of professional adaptation, employment, prospects in career. In this case, it becomes possible to get acquainted with the field, immerse oneself in the profession and compare one's own expectations with reality.

Since it is not a problem today to automate calculations according to certain algorithms, it is natural to consider the prevalence of resources with computer career guidance diagnostics. Thus, the Proforientator website (http://proforientator.info/?page_id=100) offers a number of computer tests that allow everyone to determine their own professional personality type (J. Holland test, http://proforientator.info/?page_id=6016), motives for choosing a profession (http://proforientator.info/?page_id=6014), motives for choosing a field of work (http://proforientator.info/?page_id=6249), to build your own "Map of interests" (http://proforientator.info/?page_id=6006). On this resource you can take tests to determine the ability to certain professions, to determine the priorities of professional choice, etc.

According to the results of the content analysis of Internet resources related to the professional orientation of young people, we propose the following:

1. Digital technologies affect the form and level of career guidance activities.
2. Due to Internet resources, it is possible to raise students' awareness of professions.
3. Internet resources can simplify professional diagnostics, then to promote a conscious professional choice based on pupils' understanding of their professional preferences and aptitudes. Due to specialized techniques, a series of different tests in the systems "man-technique", "man-nature", "man-sign system", "man-artistic image", "man-man" allow pupils to get ideas about their potential and advantages in a particular profession.
4. Internet resources promote free access to sources of professional orientation, which provides an opportunity to form an idea of the profession and the requirements that the profession places on the person.
5. Among Internet resources, social networks is a separate group of means that are most in demand of young people today and the potential of which is not described by scientists in the context of career guidance.

3.2. Social networks as a group of Internet resources for career guidance

The concept "social network" has several meanings in the conceptual and categorical apparatus of sociology. We define social network sites as web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system (Boyd & Ellison, 2017).

The peculiarity of the construction of social networks is that their content is filled by the users themselves, and in addition to communication, the authors have the opportunity to consume media content and the full range of entertainment products, economic, political and other activities.

The most popular social networks today are:
Twitter – http://twitter.com (microblogs); Facebook – http://www.facebook.com/; Linkedin – http://www.linkedin.com/; Instagram – https://www.instagram.com/; Telegram – https://telegram.org/; Google+ – https://plus.google.com.

Studies of the content of social networks and people's reactions to various content have shown that:

- the opinion of "friends" is important for a person-user of a social network: if an individual has received a positive experience on a certain issue, it is very likely that this opinion will be taken into account by his "friends" on the network;
- the desire to share ideas not in one, but in several networks is popular, because this expands the audience of communication and the ability to collect opinions of users with different worldviews, ages, preferences;
- social networks allow you to inform users about something quickly and cheaply, for example, to organize "draws", which due to the belief in winning contribute to the rapid dissemination of information among people from more than one community;
- social networks provide the ability to track feedback through likes, reposts, comments, as well as the activities and reactions to these activities of others to improve their own.

These factors determine the need to use social networks in teachers' work, not only for educational but also for career guidance.

In favour of mastering social networks we can point to a large number of users, the informal nature of communication within the network, which is more interactive (almost one-time exchange of ideas and resources).

In the context of teachers' career guidance work, the main purpose of their work in the network is to increase the level of involvement in a particular group, retain attention, expand the target audience, collect feedback, opinions, suggestions, manage negative feedback, increase resource visibility, study student demand. This is a complex process that requires the use of various techniques and tools: monitoring resources, creating and planning posts, communication with students, analyzing the results of such interaction.

3.3. The results of the experiment

Bachelor's graduates, pre-service teachers, and service teachers were asked to answer the questionnaire. The survey results are presented in Table. 1.

We see that the attitudes of service teachers and graduate students (pre-service teachers) to the use of social networks are fundamentally different, there is no correlation between them, which is confirmed statistically at the significant level of 0.05 (hypothesis H_0 is accepted). Therefore, it should be concluded that as of today, teachers do not sufficiently use the potential of social networks in their professional activities. At the same time, the use of such potential by pre-service teachers (bachelor's graduates) is promising.

The distribution of answers on the awarness about Internet resources for career guidance and ways to use them in career guidance is also not satisfactory (Figure 4).

Table 1. Survey results

Question	Answers	Students	Teachers	Correlation coefficient	Degrees of freedom –2	T_{crit}	T_{exp}	Hypothesis
1) What cloud services (educational platforms) are you familiar with?	For lesson	25%	100%	–0,05	6	2,44	–0,13	H_0
	Classtime	31%	100%					
	Moodle	100%	17%					
	Zoom	100%	100%					
	Skype	54%	87%					
	Google Meet	56%	68%					
	Google Classroom	64%	89%					
	else	19%	12%					
2) What services will you use in your professional activity?	For lesson	16%	100%	0,26	6	2,44	0,68	H_0
	Classtime	19%	100%					
	Moodle	32%	5%					
	Zoom	100%	100%					
	Skype	32%	23%					
	Google Meet	56%	43%					
	Google Classroom	100%	89%					
	else		12%					
4) What social networks accounts do you have?	Instagram	100%	45%	–0,44	4	2,77	–0,98	H_0
	FaceBook	100%	100%					
	Telegram	100%	57%					
	Viber	100%	100%					
	e-mail	56%	100%					
	else	100%	43%					
5) What do you use social networks for?	e-communication	100%	87%					
	information distribution	100%	56%					
6) Do you use Google forms for survey?	Yes\No	54%	34%					
7) Do you know how to develop e-materials for different social networks?	thematic posters	76%	34%	–0,12	1	12,7	–0,12	H_0
	advertisements	87%	41%					
	posts	95%	32%					

Source: Own work.

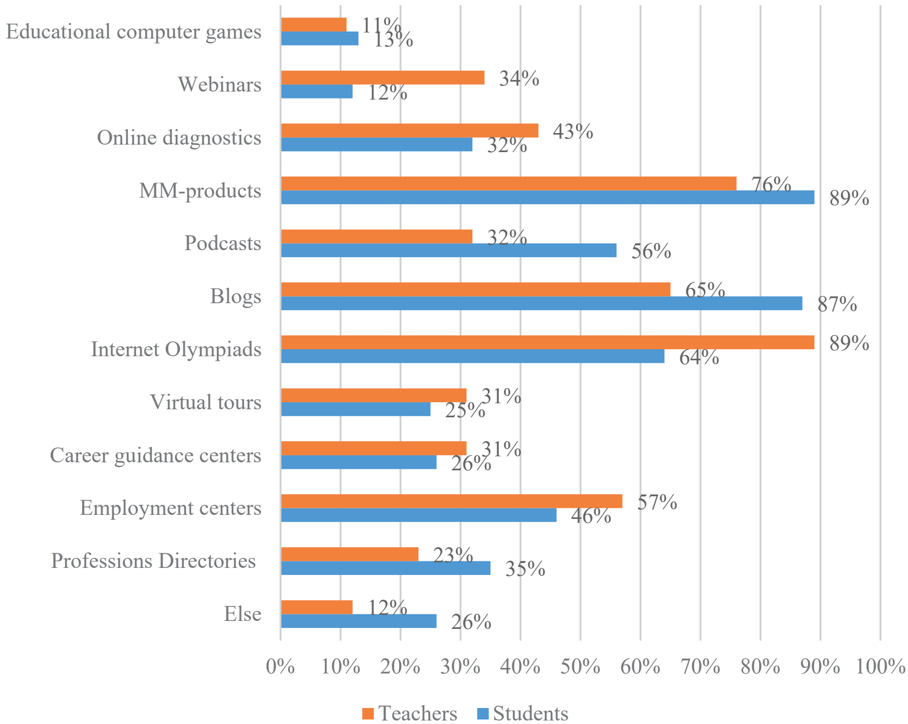


Figure 4. Results of the survey on career guidance resources

Source: Own work.

The analysis of the answers leads to the conclusion that despite the 100% involvement of pre-service teachers in social networks, the ability to attract the resources and services to the professional, including career guidance activities, is insufficient. The situation with service teachers is similar.

CONCLUSION

1. Professional orientation is understood as a system of interaction between a young person and a teacher, which is aimed at meeting the needs of a young person in their professional self-determination.
2. Internet resources can help pupils make informed professional choices based on their awareness and their professional preferences and aptitudes. Internet resources by types of career guidance work are divided into: diagnostic (online testing), campaign (university and interested institutions sites), advisory (career guidance sites, network services), information and guidance (professions directories, job sites), support (support development software), organizational (chats, e-platforms for communication). Internet resources by types of career guidance activities are divided into: sites for meetings (network services), for immersion (specialized software), for consulting (online tests, career guidance sites), for excursions (institution sites), for project (educational resource).

3. Every day, on average, a person spends more than two hours communicating on social networks, and therefore a teacher should use social networks for extracurricular activities. Social networks, as web services that enable large groups of people to communicate and integrate them into virtual communities of interest, can be a tool for career guidance. Teachers' mastering of the use of social networks is seen as a priority for their professional development, because social networks make it possible to influence pupils' career guidance, encourage self-determination in professions, simplify the organization of surveys and processing results, quantify them and predict conclusions.
4. A large number of users and informal communication within the network, which is more interactive (almost one-time exchange of ideas and resources), testify in favour of mastering the use of social networks by teachers. In the context of career guidance, the main purpose of teachers' networking is to increase the level of involvement in a particular group, retain attention, expand the target audience, collect feedback, opinions, suggestions, manage negative feedback, increase resource visibility, study student demand. This is a complex process that requires the use of various techniques and tools: monitoring resources, creating and planning posts, communication with students, analyzing the results of such interaction.
5. According to the analysis of the survey results, we state 100% involvement of pre-service teachers in social networks with a simultaneous lack of readiness to involve the resources and services in career guidance.

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E-learning in the Time of COVID-19
Scientific Editor Eugenia Smyrnova-Trybulska
"E-learning", 13, Katowice–Cieszyn 2021, pp. 278–293
https://doi.org/10.34916/el.2021.13.23

EDUCATIONAL AND INFORMATIONAL ELECTRONIC ENVIRONMENT ORGANIZATION FOR APPLICANTS OF THE PROFESSIONAL MA PROGRAM, "MANAGEMENT OF E-LEARNING IN THE INTERCULTURAL SPACE"

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Abstract: *The article substantiates the need for the training of specialists who can provide the quality organization of e-learning for e-learning managers, it also presents the main components of the educational program. The concept of the information-educational environment in modern conditions of the digital transformation of education is analyzed, with modern models of the introduction of e-learning in the educational process are considered. The necessity of the creation and use of the information-educational electronic environment for the formation of necessary competencies of designing of e-learning is proven, the model of the organization of educational environment for applicants of the educational program which includes the program, innovative pedagogical techniques and digital technologies is also provided. During the study of the creation and use of an effective information and educational environment in the training of e-learning managers, a set of theoretical (analysis and synthesis of Ukrainian and foreign scientific, pedagogical and methodological sources on the topic of the article) and empirical (student surveys, modeling of educational and information environment) methods and analysis of the obtained data were obtained. The authors describe the results of a survey of students on their satisfaction with the created electronic environment, as well suggestions for improving its components, determining the list of digital tools and services that they often use, along with improvements in the features of the educational process for an educational program at the Borys Grinchenko Kyiv University.*

Keywords: e-learning, e-learning manager, educational and informational environment, communication, collaboration.

INTRODUCTION

Problem statement: The containment of the COVID-19 pandemic led to the closure of educational institutions, 1.57 billion pupils and students (90% of the world's population) were forced to study remotely. Such conditions have led to serious challenges for the educational system including: adaptation of educational policy to today's requirements, strengthening the financial support of educational institutions, modernization of their material and technical base, organization of effective distance or blended learning, problems of objectivity of intermediate and final control of students, the unpreparedness of the majority of participants in the educational process for forms of distance and home learning, etc. (Hrynevych, Ilyich, Morze, Proshkin, Shemelynets, Linyov, & Riy, 2020).

At the same time, there is a question of the quality of e-learning, so the report, 2021 EDUCAUSE Horizon Report (Pelletier et al., 2021) focuses on the quality of online learning as a technology, the use of analytics, open resources, a combination of mixed and hybrid models of training courses.

The forced mass transition to e-learning during the quarantine period has become a global challenge for the entire educational environment, including higher education. On the one hand, universities are developing IT infrastructures (Spivakovsky, Vinnyk, & Tarasich, 2014; Morze, Glazunova, & Smyrnova-Trybulska, 2017), including functioning electronic libraries, e-research centres (for example, Oxford e-Research Centre), the digital is being developed into an environment and investigations into the training of specialists in e-learning, e-science, e-democracy and the implementation of e-management approach at the university environment (Raho, Al-Ani, & Al-Heeti, 2015) are being considered. On the other hand, the results of the survey obtained by the Ministry of Digital Transformation of Ukraine (Ministry and the Committee for Digital Transformation of Ukraine, 2019) show that 37.9% of Ukrainians aged 18–70 have digital skills below average, another 15.1%, in general, do not own digital devices. Thus, 53% of the population of Ukraine according to the methodology of digital skills assessment used by the European Commission is below the "average level". At the same time, insufficient attention is paid to the training of specialists who can effectively manage the e-learning process in the educational field to ensure the quality of education in educational institutions and the corporate sector. The importance of the task of training specialists who will be able to:

- analyze the market offerings of available information systems and technologies for the construction and development of IT infrastructure and information-educational e-environment;
- test, implement and evaluate IT technologies for the e-learning system;
- choose the forms and digital tools for presenting educational e-content;
- develop instructions for the use of digital tools and e-content;
- organize the educational process using the information-educational e-environment, which includes LMS, and evaluate its effectiveness;

- monitor the use and satisfaction of participants in the educational process with components of the information and educational e-environment;
- manage the educational process using the resources of information and educational e-environment to provide quality educational services 24 * 6 * 365, etc.

The solution to the problem of training relevant specialists in the development and implementation of a special master's program, and the organization for applicants for effective information in the educational environment with the formation of the necessary competencies of e-learning design, its methodological support and support in the current technological state is utmost urgency.

The article aims to theoretically substantiate and analyze the creation and use of electronic information and the educational environment in the preparation of the MA program, "Management of e-learning in intercultural space" at the Borys Grinchenko Kyiv University based on the model and survey results.

BACKGROUND OF RESEARCH

An analysis of the recent research and publications shows that scientists have been working in the field of distance learning for many years. In particular, the research of experts is devoted to the theoretical concepts of distance learning, an analysis of the features of the use of different LMS and forms of presentation and delivery to students of didactic teaching materials (Kukharenko, Rybalko, & Syrotenko, 2002; Smyrnova-Trybulska, 2018; Spirin & Naumuk, 2020), among others.

The interesting conclusion concerning teaching successful online courses in higher education based on a review of the literature using Cooper's framework was developed by Kebritchi, Lipschuetz, & Santiague (2017). They concluded that „to address these challenges in online education, higher education institutions need to provide professional development for instructors, trainings for learners, and technical support for content development." (Kebritchi et al., 2017).

Many scientists have studied the concept of the "information and educational environment". It is interpreted differently in modern pedagogical science. This demonstrates the semantic capacity of the essence of this term and the alternative views of researchers. Scientists believe that the information and educational environment is:

- a set of different subsystems: informational, technical and educational-methodical, the implementation of which provides support for the educational process and its participants (Tsymbal-Slatvinska, 2019).
- a system capable of self-development created by the subjects of education, in which connections and relations are established between the subjects and components based on information activities to achieve educational tasks (Kopnyak, Korytska, Litvinova, & Nosenko, 2015);
- organizational and methodological tools, a set of technical and software means of storage, processing, the transmission of information that provide operational access to information and the implementation of educational scientific communications (Gurevich, 2013).

Also in the scientific literature, there is the concept of the *electronic educational environment* (EEE). The order of the Ministry of Education and Science states that, "The Electronic educational environment is a set of conditions for [the] teaching, education and development of students, provided by modern educational, information and communication (digital) technologies". (Ministry of Education and Science of Ukraine, 2020). Many universities already have a legal framework for creating and organizing such environments. In particular, NUBIB of Ukraine defines the EEE as a systemically organized set of information, technical, educational and methodological support in the form of technical and software means of the accumulation, storage, processing and transmission of information that provides operational access to educational resources and provides educational or scientific communications between university administration, research and teaching staff, students and listeners (Kvasha, Zazymko, Klich, & Trakai, 2016).

Also, the information and educational environment is developing in BGKU and accordance with the Concept of digitalization for 2020–2022, a Digital Campus is created, where all participants in the educational process have constant access to information, and digital technology solutions are so intertwined with basic management and educational processes, that employees and applicants for higher education can no longer do without the services provided in *the information and educational environment* (IEE). The information and educational environment is, in essence, an adaptive model of global, national, information spaces, which inherits their most characteristic functional properties, in particular the space of joint learning activities based on digital tools in the communicative aspect, joint actions by establishing appropriate rules and regulations documents – in the integration aspect (Buynytska, 2019).

Distance learning in Ukraine has been implemented for about twenty years, starting with the introduction of public policy in 2000 in this direction, which is specified in the Concept of Distance Education, continuing with the adoption of other legislation, such as the "Regulations on Distance Learning" in 2015. There is a discussion of its updated version and the recognition of distance learning in the new version of the law "On Higher Education" in 2019. However, distance learning became most relevant during the pandemic. Distance learning means an individualized process of acquiring the knowledge, skills, abilities and methods of human cognitive activity, which occurs mainly through the indirect interaction of distant participants in the educational process in an open environment, which operates based on modern psychological, pedagogical and information and communication technologies. (Regulations on Distance Learning, 2015).

Today, along with the concept of distance learning, e-learning is used. In our study, we will follow an approach to the definition of e-learning, such as the use of digital tools to ensure the quality of the educational process by improving access to learning resources and tools, as well as electronic communication and collaboration.

The learning format is divided into traditional (f2f – face to face), hybrid (or mixed) and distance (online). If the area of traditional didactics is a low level of the use of technological tools in teaching and learning, learning in this format is traditional – mainly in f2f format, the e-learning area goes beyond the traditional boundaries of learning in the direction of the virtual space with digital tools, interactive multimedia tools and control systems for distance learning.

With the introduction of distance and e-learning, there is a need to have professionals who have the skills to effectively implement this form of education in educational institutions to ensure its quality. Foreign research shows that the issue of determining the competencies of such specialists has been considered by scientists and educators for a long time.

Most researchers in the field of e-learning implementation pay attention to preparing students for the use of digital technologies. For example, Keengwe & Kidd (2010) summarize e-learning best practices, identify how a teacher can help students develop skills in research, problem-solving, critical thinking, and knowledge management through web-based collaboration tools using virtual spaces, “knowledge rooms” in which students collaborate. Freeman, Patel, Ryan, & Scott (2013) on behalf of the Austrian Ministry of Education, Science and Culture present the results of a study on the content management system in the field of e-learning. To meet this requirement, the authors provide an overview of the market for manufacturers of individual systems and various evaluation procedures and selection criteria for e-content management systems.

However, researchers in the use of digital tools in the educational process outline the problem of training for the organization of e-learning, including in the corporate sector. In particular, Cardos Vasile and Tiron-Tudor (2009) identified that one of the most important competencies that an e-learning manager should have is the ability to manage an e-learning project within the framework of the quality of the continuous activity. They estimate that poor knowledge-sharing practices cost Fortune 500 companies $31.5 billion annually.

Keramida (2016) identifies six basic skills inherent in e-learning managers: a general understanding of how e-learning works; support in the current state of e-learning by industry trends and labour market requirements, leadership skills; communication skills, asset management and placement of electronic resources; time management skills, mastery of innovative teaching methods and technologies, design of the electronic educational environment. Leadership, communication, interpersonal, technical, presentation skills (soft skills) distinguishes them from project managers in e-learning and researches (Dhondi, 2014).

The training of e-learning managers in different countries is carried out in different ways. For example, the training of e-learning managers at the Holon Institute of Technology (Israel) is organized in the following main areas: Technology, databases and programming; Design, user interfaces, work with graphics and video; Psychology, work with people, presentation and presentation of information materials.

When training a manager (England), attention is paid to the following functions:

E-learning organizer, responsible for creating an e-learning strategy and managing individual projects; Strategist; Learning analyst; Project manager; Marketeer; Developer responsible for developing e-learning programs and structuring content; Instructional designer; Writer; Graphic designer; Programmer; Audio-visual specialist; Tester; E-tutor or mentor (tutor), responsible for counselling in the process of training online students; Administrator; Coach; Subject-matter expert; Expert (Assessor).

The most popular skills for working as an e-learning manager in the US are (E-Learning Specialist Salary, 2015):

- creation and maintenance of a database for the analysis of participants' learning outcomes, their feedback and resolution of technical issues;
- coordination and support of proposals for e-learning, marketing and technical infrastructure;
- developing new online courses and converting existing courses into an e-learning format, from curriculum analysis to final assessment;
- recommendation and search for special computer programs and network services, content creation and interactive media.

Standards of new professions and specialities that complement each other and in the integration of competencies can also be considered as competencies of the e-learning manager (Poland):

- Methodist of distance learning (235103).
- Designer of multimedia applications, animations and computer games (251302).
- Examiner online (235902).
- Multimedia educator (235901).
- Distance learning teacher. (235907) (Classification of occupations and specialties for the needs of the labor market, 2014).

In Ukraine, an analysis of vacancies, company websites, employee profiles on LinkedIn demonstrate the renewal of professions in the field of e-learning management and identify the following professions: producer of educational projects, pedagogical designer, designer of educational experience, curriculum management specialist, UX/UI designer, manager Product Manager, Community Development Manager, User Experience Researcher, Developer, Evaluation Manager, Creative Director, Learning Data Analyst, Tutor, Facilitator, Digital Resource Librarian, Content Strategist, Game Developer, Insight Manager, Multimedia Designer, Specialist in learning science, personalization manager, career consultant, course localization manager, content curator, expert, author, developer of educational solutions, screenwriter, psychometrician.

An analysis of international and domestic experience is the basis for determining the features of the training of e-learning managers in educational institutions, which (Morze, Kuzminska, & Glazunova, 2017):

- is based on global approaches to the training of specialists in the field of e-learning, provides for the delivery of relevant documents to graduates (taking into account the experience of training these specialists in different countries, including Israel, England, USA, Estonia);
- involves the study of modern Internet services, ways to manage the educational process based on them, the organization of formal, non-formal and informal learning based on modern digital technologies, the introduction of pair, collective project activities;
- based on competency principles;
- ensures the introduction of the basics of adaptive learning, which are close to the real «production» process.

To train such specialists, it is necessary to create special electronic information and an educational environment that would meet certain requirements. To develop

a model of such an environment for future e-learning managers, existing e-learning models were analyzed. In particular, Anderson's Online Learning Model (Anderson, 2004), and Picciano's Blending with Pedagogical Purpose Model (Picciano, 2017). The peculiarity of these models is that the educational environment in addition to the educational digital content (LMS, CMS, Media) should provide tools for cooperation, the content of which is formed by the subjects of educational activities, independent learning, dialogue, surveys, analysis, evaluation, social and emotional, reflection and reasoning (Picciano, 2017). And all these components must be taken into account when creating an electronic environment. The author believes that teachers 'work in distance learning and even using means of electronic interaction cannot be separated from communication. These two aspects are closely interconnected and interdependent. In this way, communication and collaboration are connected in the same way.
Bates more broadly describes the educational process in the period of digitization. Specifically, he considers learning as part of the culture and identifies the components of the relevant environment: learning characteristics, content, skills, learning support, resources and assessments (Bates, 2015).

1. RESEARCH METHODS

Investigate the creation and use of an effective information and educational environment in the training of e-learning managers (analysis and synthesis of Ukrainian and foreign scientific, pedagogical and methodological sources on the article's topic) and empirical (survey of students, modelling education and information environment) methods and analysis of the received data.

2. RESEARCH RESULTS

In 2017, the Borys Grinchenko Kyiv University of introduced an educational and professional program entitled, "Management of e-learning in the intercultural space", which was amended in 2020 and passed state accreditation.
The need for changes was identified after the introduction of the relevant State Standard (reference to the standard) and an analysis of the labour market of Ukraine and the definition of requirements for e-learning specialists, during consultations, including with heads of educational institutions and surveys of students and graduates of the speciality 073 Management (OPP Management of e-learning in the intercultural space of Borys Grinchenko Kyiv University) and the transition to distance learning of all educational institutions during the quarantine of 2020–2021.
The formation of professional competencies of specialists in e-learning management is based on a comprehensive approach, which includes: creating a favourable information and educational electronic environment and support system for educational communication, improving the content of education and research, and infrastructure of higher education. To use the appropriate electronic environment and its development, its structure was determined (Figure 1).
Additionally, we have determined that the organizational component includes: approval and accreditation of the educational program, its updating according to the the

needs of the market and the state standard; content component – filling with modern content, organization of cooperation, communication and selection of innovative pedagogical technologies, technological component – definition of the use of the best platforms necessary for the best outcomes in the educational process, and the definition of modern digital technologies for their application.

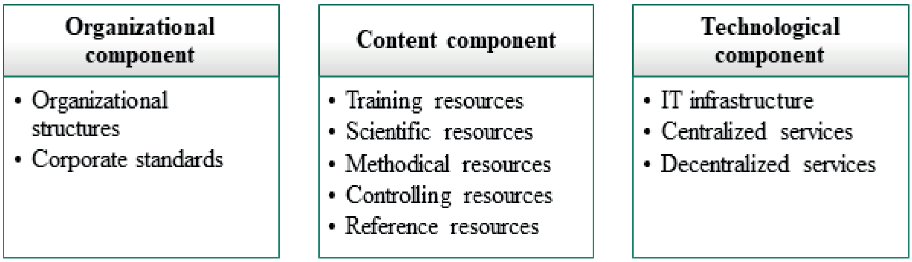


Figure 1. The structure of the information and educational electronic environment

Source: Morze, Protsenko, & Kuzminska, 2017.

When designing the model of the organization of information and educational environment for applicants, we took into account the main areas of acquisition of competencies and deepening and expanding knowledge in the areas – management and administration, digital technology and electronic didactics (Figure 2).

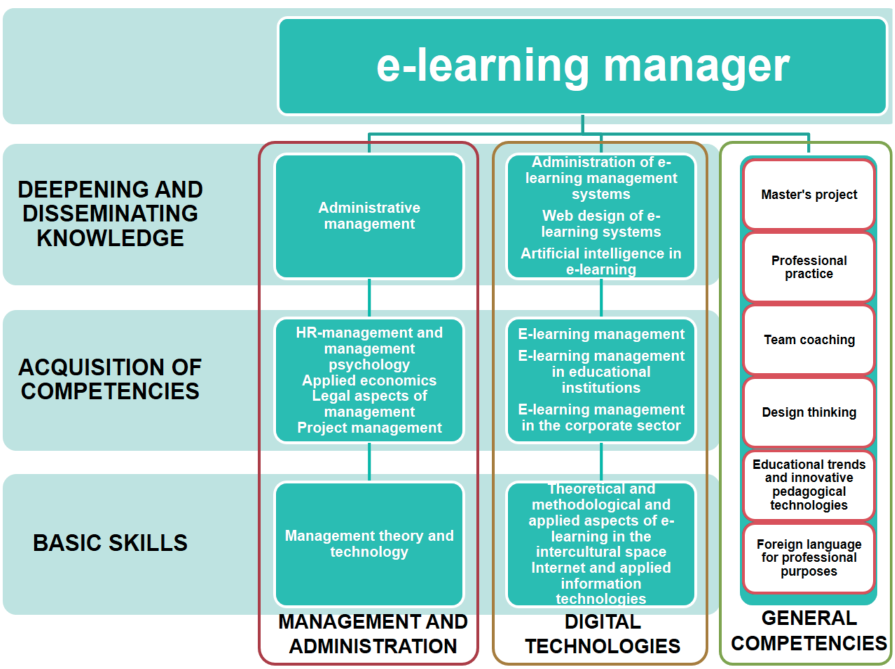


Figure 2. The main components of the educational program

Source: Own work.

In the course of the research, a model of the organization of information-educational electronic environment for applicants of the educational program was developed, which takes into account its peculiarities (Figure 3).

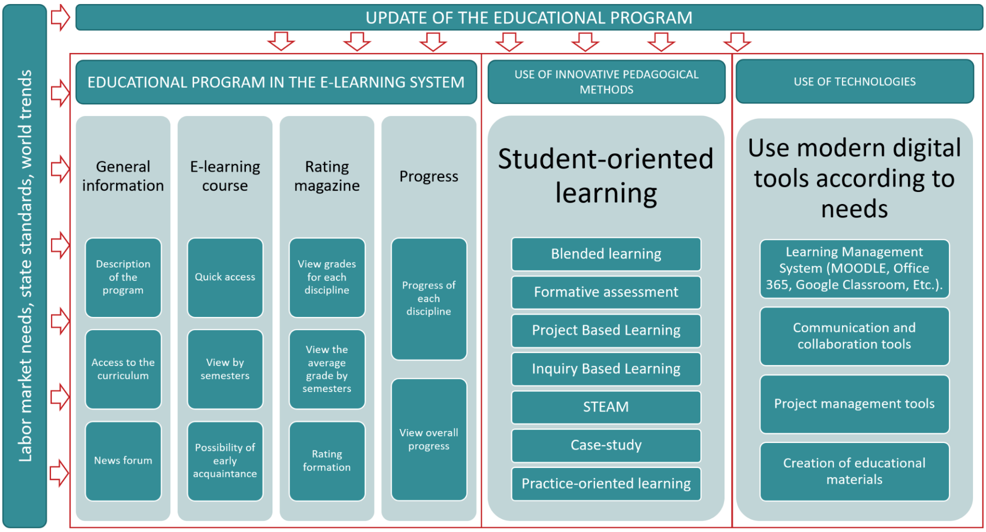


Figure 3. A model of the organization of informational and educational electronic environment for applicants of professional program

Source: Own work.

The University has been implementing e-learning in the educational process for over 10 years (www.kubg.edu.ua), respectively, the prerequisites for the training of e-learning managers and the introduction of a certain model of the e-learning environment. In particular, all students have personalized access to e-learning resources, for all subjects created in the learning management system (LMS Moodle) e-learning courses that meet the approved uniform requirements, registration for an e-learning courses is carried out following the educational program.

The course of the educational program contains its general description, references to normative documents, all *electronic learning courses* (ELC) of disciplines (during the semester) provided by the educational institution (Figure 4), configured journal of assessments (Figure 5) in which it is possible to track the assessments of each student throughout the semester. This course is displayed in the Personal Account of the applicant of the e-learning system.

In each ELC to monitor their activities, students have access to such elements as a journal of assessments, information about the submission of works, the presence of users in the ELC, announcements (news), as well as information about upcoming events. Thus, the built structure of the electronic environment allows not only e-learning but also a platform of distance learning for students.

The effectiveness the implementation of blended learning, the quality of the created electronic environment depends on the quality of the training materials, which, at present allows access from anywhere and at any time.

According to a survey of students of Borys Grinchenko Kyiv University (https://forms.gle/nZsjMtT6wEmvrSVk8), which was attended by 119 students of 4 different directions of study (eg masters, in which the qualification according to the diploma is «E-learning Manager» and students with the selective specialization «Management of e-learning» at the Faculty of Information Technology and Management and at the Pedagogical Institute), respondents use the following resources for learning: e-learning courses, massive open online courses, personalized educational materials, video channels, mobile applications, social networks, search engines, audiobooks, ebooks (Figure 7). The survey was conducted in 2020.

So, we see that students prefer structured online resources. An effective solution is to use e-learning and distance education technologies; the creation of e-learning courses and other types of e-learning content; standardization in the development of electronic content and e-learning environments and the global transition from LMS to TMS (Training Management System) (Morze, Buinytska, & Varchenko-Trotsenko, 2016). Students who participated in the survey identified the following benefits of e-learning (Figure 4):

- the opportunity to choose a convenient time to study;
- the ability to perform tasks online;
- the ability to perform tasks in parts;
- possibility to return to the passed material;
- availability of materials of different formats.

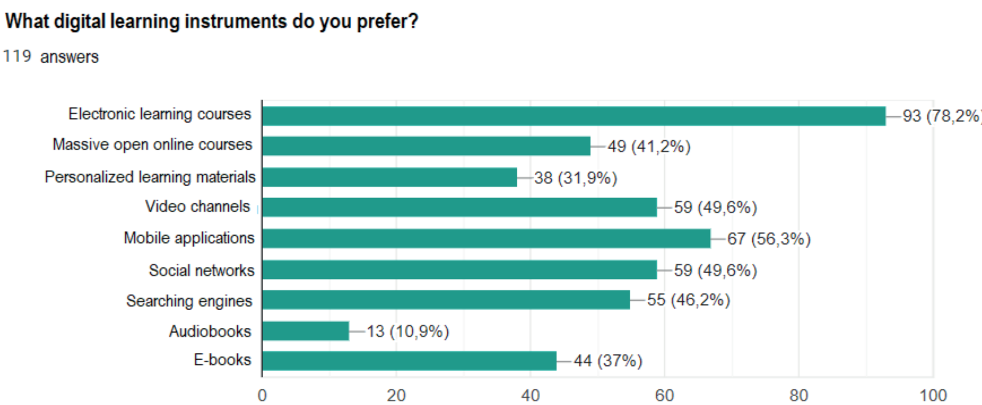
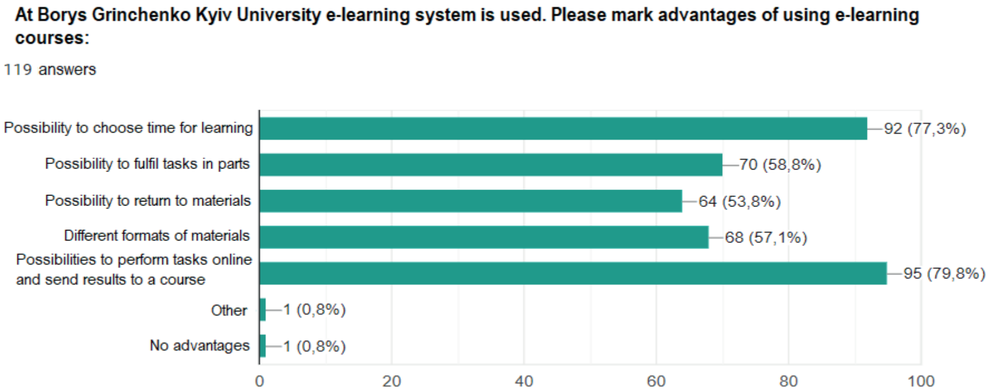


Figure 4. Distribution of respondents' answers to the question, 'What digital learning instruments do you prefer'?

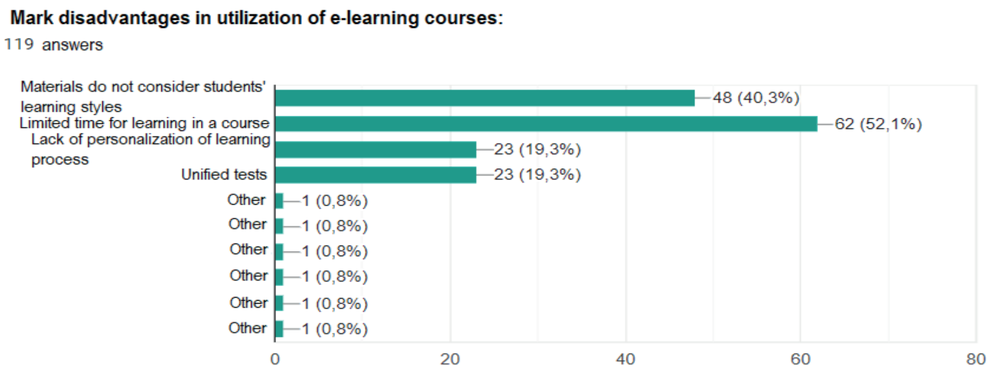
Source: Own Work.

Therefore, the introduction of e-learning courses helps to personalize the educational process. However, unified ELCs do not fully address the students' requests for an individualized learning approach. In particular, respondents to the survey noted among the main disadvantages of the ELCs are the limited training periods and the lack of consideration of individual training features in the selection of materials. Some of the respondents also noted that they lacked personalization in the educational process and noted the uniformity of tests among the negative factors (Figure 6).



F i g u r e 5. Distribution of respondents' answers to the question concerning the Advantages of e-learning courses

S o u r c e: Own Survey.



F i g u r e 6. Distribution of respondents' answers concerning the disadvatages in the utilization of e-learning courses

S o u r c e: Own Survey.

E-learning developers are challenged to take into account the needs of users to ensure better learning outcomes. The main challenges of the survey are to ensure the diversity of presentation formats, the choice of training periods, the complexity of the tasks and tests, the level of complexity of the course and the sequence of study of the material. Implementing adaptive learning can ensure that these needs are met (Figure 7).
During the educational process, teachers and practitioners use innovative pedagogical methods for the use of ELC:
Blended Learning involves a combination of different forms and methods, actively using the "inverted classroom" from which teachers provide students with new material in the form of video lectures or other digital learning developments, which students review in advance. The classes themselves are "turned over" with the help of digital media materials; usual activities in the classroom and outside of it changes places, i.e., there is a transformation of the classroom and the independent phases of learning – learning the material takes place outside the classroom, and the checking

of the understanding of the material – together with teachers, where they answer questions raised by applicants during video lectures.

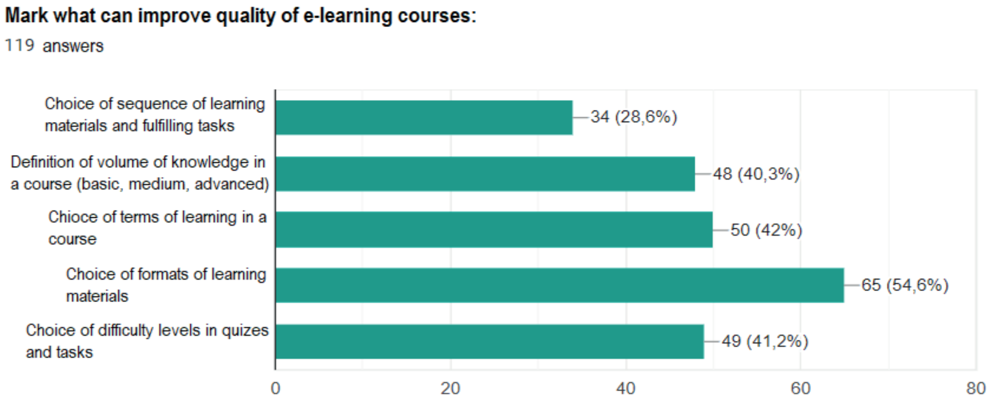


Figure 7. Distribution of respondents' answers concerning the question of improving the quality of e-learning cources

Source: Own Survey.

Formative assessment involves tracking the personal development of applicants and the course of their learning experience and competencies; furthermore, they can independently monitor their progress and realize what points should be emphasized.
Project-Based Learning is based on the use of real problems that need to be solved. Working in teams with peers, applicants identify the steps that are needed to solve problems and then implement these steps.
Inquiry-Based Learning is based on increasing the involvement of applicants through active independent work to find answers to theoretical and practical questions.
STEAM provides for the integration of learning content and the use of various forms of activities, researching to test the hypotheses through the use of the equipment and virtual laboratories. The conduct of STEAM classes in the organization of project activities of applicants uses group work, where each group must work at the same time on different parts of the project – to conduct an experiment, hypothesize, discuss problems, search for information and more.
A case-study involves the study of simulated situations and real examples of the introduction of electrical training (cases); collection and analysis of insufficient information; discussion of possible solutions to problems; and, determining the best solutions.
In general, in all disciplines, training is practice-oriented to ensure that applicants acquire effective skills.
The formation of the masters program contains not only certain competencies but also personal characteristics and skills of interpersonal interaction (soft skills), which is based on the embedded model (Sustainable Employability Skills for Engineering Professionals…). Training according to this model does not require the introduction of additional courses – soft skills are formed in the process of discussions, brainstorming, teamwork, role-playing games, educational and social projects, field trips and internships in schools and more.

DISCUSSION

This study is in line with the current trends and directions of research in the field of the e-environment and its quality evaluation.

The experts from different countries discovered an e-learning educational environment. In particular, a new instrument for assessing e-students' perception of the educational environment and e-learning educational atmosphere measure (EEAM) was researched by Mousavia, Mohammadia, Mojtahedzadeha, Shirazib, & Rashidic. In their study, they stressed that „Assessing [the] educational atmosphere in e-learning settings by EEAM could provide managers and investors with useful information to settle an effective education system by prioritising the necessary changes." (Mousavia et al., 2020). The tool, which was elaborated by researchers and presented in this study could use future research in various e-environments in different universities and countries.

A research report on some aspects of increasing the effectiveness and comfort of the scientific and educational process in university electronic environment was described in a study by Smyrnova-Trybulska (2016).

Other experts conducted a review of „all the instruments to propose a new framework conceptualizing technology-supported learning environments (TSLEs) for future instructional designs, and research on learning environments" (Chang et al., 2015). Described "studies took more into consideration the technical, cognitive and social dimensions… The results provide insights into an overview of the instruments used for TSLEs, implications for the instructional design of TSLEs, and trends in the current and future research on perceptions of TSLEs" (Chang et al., 2015).

CONCLUSIONS AND FURTHER RESEARCH PERSPECTIVES

The outlined problem of training relevant specialists for the organization of e-learning is solved by the stages described in the article on the development and implementation of a special master's program, as well as the organization of an effective informational and educational environment for entrants to form the necessary e-learning design competencies. Based on the competencies defined in the e-learning manager training model, a model of the organization of information-educational electronic environment for educational program seekers was created, which includes not an only an educational-professional program with a list of basic and optional components, but also innovative pedagogical technologies and resources. During the research, a set of theoretical (analysis and synthesis of scientific, pedagogical and methodological sources on the topic) and empirical (student surveys, modeling of educational and information environment) methods and analysis of the data were performed. The created model was tested and a study of its effectiveness was conducted by surveying students on the quality of education. The results of the survey will be used not only to analyze the educational process but also to improve and modernize the educational program. In particular, taking into account the needs of students allowed for the creation of an information and educational electronic environment, which includes e-courses on the LMS MOODLE platform, corporate accounts in Microsoft and Google clouds, access to tools and services, including services for independent and individual work, educational communication, the creation of electronic didactic materials, the control and diagnostics of students' academic achievements, tools for organizing independent research activities, joint applications and virtual classes. We see the prospects for further research in a detailed analysis of students' needs for the use of mobile applications, research on the features of the introduction of adaptive systems and taking into account the individual characteristics of students in the implementation of distance learning.

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Scientific Editor Eugenia Smyrnova-Trybulska
“E-learning”, 13, Katowice–Cieszyn 2021, pp. 294–308
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THE CONDITIONING OF THE DIGITAL ENVIRONMENT ON COGNITIVE PROCESSES OF MODERN STUDENTS: THE OPINION OF TEACHERS OF UKRAINE

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Abstract: *The present publication reflects the results of the latest research in the field of theory and practice of learning in the growing dominance of artificial intelligence and digital reality. The simultaneous presence of people in two worlds – the physical in the virtual causes the emergence of a special cognitive style – clip thinking. The article presents the results of the analysis of the essence of the phenomenon that distinguishes modern people from previous generations – a special cognitive style, which is manifested in clip art. Clip thinking is the antithesis of linear thinking and causes a fragmentary perception of the world in the form of a clip without establishing relationships. Clip thinking is an individual’s protective reaction to the rapid growth of information flow, to the oversaturation of information that a person is unable to comprehend, process and remember. The article presents the results of an online questionnaire submitted to Google forms and analyzes the opinion of the educational community of Ukraine on the causes of clip thinking, the main aim of which is the influence of the digital environment on the cognitive processes of modern students. According to teachers’ observations, the peculiarities of cognitive processes of modern students and their preconditions are determined. A comparison of the answers to the questionnaire of teachers from different levels: primary, basic, specialized schools, as well as colleges and universities. The conclusion is made of the need to introduce new teaching methods that take into account the clipping* *thinking of students, and provide for the presentation of educational information in both material and digital form, as well as with the use of hyperlinks.*

Keywords: digital environment, distance learning, cognitive processes, clip thinking, modern teaching methods.

INTRODUCTION

The last few years have become transformative in the system of life of people around the world. Such transformations affected the spheres of production, science, culture, art, medicine, and education. The pandemic, caused by Covid-19, quarantine restrictions strongly update the theory and practice of learning, including distance learning in schools around the world. And although modern pre-schoolers, schoolchildren, and other students are representatives of the digital generation, the generation of children who do not think of their lives without gadgets, without connection to the virtual world, without constant contact with it 24/7, at the same time, this is the reality that gives rise to the feature of cognitive processes. Smyrnova-Trybulska, E., Noskova, T., Pavlova, T., Yakovleva, O., & Morze, N. (Smyrnova-Trybulska, Noskova, Pavlova, Yakovleva, & Morze, 2016; Smyrnova-Trybulska, 2018) note that the digital environment allows modern man to instantly act on information that is updated daily. Scientists emphasize the ability to analyze and work with big data (tools for working with electronic documents), point to multitasking, which requires the student to be multifunctional and organized (tools for organizing work). Thus, digital competence today is one of the keys, which allows a person to navigate in the modern world, and at the same time, causes serious cognitive processes, including clip thinking.
The purpose of this publication is to present the results of an experimental study of the problem of clip thinking of modern pupils/students of Ukraine, which is developing under the influence of digitalization, as well as a presentation of approaches to building teaching methods they take into account clip thinking. The research methods are a survey of teachers and lecturers of Ukraine, analysis of survey results.

1. CLIP THINKING AND SIGNS

The basis of all cognitive processes, including thinking, is the human brain. Although the architecture and general structure of the brain are determined mainly by genes, the fine structure of neural networks is formed on the basis of experience and can change significantly (Cromby, Newton, & Williams, 2011). Ukrainian psychologists have found that under the influence of ICT, the human brain undergoes rapid changes due to the formation of new neural connections while weakening the old ones (Honcharenko, Vavrik, Vereschak et al., 2014). Both scientists and teachers observe this aspect in modern students, that is a change in thinking style from linear – logical to clip (Nesterova, 2016; Aksenov, 2014).
Scientists from the Ural University (Russia) Rezer, T., Symaniuk, N., Kuznetsova, E. compare clip and linear thinking, and conclude about the advantages and disadvantages of each type of thinking (Rezer, Symaniuk, & Kuznetsova, 2018). The

positive aspects of clip thinking include the speed of information processing and decision making; clip thinking, referring to the emotional and pragmatic part of the human mind and helps to navigate in a world oversaturated with all sorts of information. However, making analytical conclusions, building theoretical constructions and, as a result, gaining knowledge is possible only with the help of linear thinking. We agree with the conclusions of the authors and support the thesis about the need to take into account the clip thinking of pupils and students, as well as the need to form methods of mental activity – analysis, synthesis, comparison, generalization, classification as the basis of logical thinking.

The change in the style of human thinking occurred as a result of the simultaneous presence of man in two worlds – physical and virtual. IT makes it easier for a person to access any information and speeds it up. Moreover, thanks to hyperlinks on the Internet, a person can specify certain concepts, theses, theories, and facts. But the pages to which the hyperlink leads are not content related to the original page. Thus, a person gets used to thinking with separate thoughts that are not logically related to each other, without trying to systematize and generalize them, he is engaged in a type of clip thinking (Skvortsova, Onopriienko, & Britskan, 2019; Skvortsova & Britskan, 2019).

Clip thinking is a consequence of the rapid introduction of information and communication technologies into all spheres of human life. This is evidenced by the analysis conducted by Dautov, D., Korochentseva, A., and Mohamed Kadom Mahdi Al Hussini (Dautov, Korochentseva, & Hussini, 2019), from the standpoint of the active influence of man-made society and reducing the general background of mental activity, in terms of the role of information systems, including the media and the Internet, from the standpoint of a certain stage in the development of human relations and the information world, in terms of human consciousness and thinking. Clip thinking encourages a person to make immediate ill-considered decisions, bypassing the analysis of the situation of the problem and its factors (Girenok, 2016), in this regard, there is a decrease in the level of reflection and introspection. Korochentseva, A. and Mohamed Kadom Mahdi Al Hussini (Dautov, Korochentseva, & Hussini 2019) conclude that one of the main factors contributing to the change of human thinking is the technological evolution and the emergence of new sources of information, and the main source of influence on human thinking is the media, which on the one hand provide access to a large number of information sources, but also impose advertising focused primarily on the emotional sphere, rather than its semantic component. As a result, a person avoids an additional mental load, because the information is as simple as possible, and therefore, the effectiveness of analytical thinking is significantly reduced, which leads to the inability to perceive long-term linear information and the phenomenon of clip thinking. The analysis of researches of possible American and English scientists concerning the transformations of cognitive processes under the influence of development of modern technologies is given in Lysak, I., Belov, D. (Lysak & Belov, 2013). Agreeing with the influence of IT on the processes of attention, memory and thinking, the authors note that it is unacceptable to absolutize the negative impact of IT on cognitive processes; based on the results of the analysis of applied research, and such a conclusion cannot be made. According to these authors, the use of IT has a positive effect on the development of the functions of the right hemisphere of the brain, the development of spatial thinking, which can promote creativity. At the same time, the results of the analysis of research by scientists from the Laboratory of Human Communication and Interactive Media at Stanford University and the Institute for Future Thinking at Oxford University show that the constant use of computer technology leads to reduced stability and concentration and analytical thinking (Lysak & Belov, 2013).

Clip thinking is the antipodal of linear thinking, which presupposes a sequential perception of information, and manifests itself in the endless flickering of segments that determine the choice of various educational technologies.

The heterogeneity of the information flow, its fragmentation and illogicality of the incoming information, the high speed of switching between its fragments, the lack of a holistic perception of the surrounding world are essential characteristics of clip thinking (Volkodav & Semenovskikh, 2017; Bkhat, 2018).

The ability to access information that is contained in hyperlinks, the ability to explore issues on other Internet sites, access to a variety of information, joining many news feeds of social networks, causes such a feature of human thinking as computer surfing, which is derived from clip thinking. Modern people do not read the full text, but only look at the beginning and end of the text, and, as for the middle – people look diagonally, quickly turning the pages. Obviously, in this case, we cannot talk about the logical processing of content, its understanding and memorization. Quickly browsing the Internet, following the hyperlinks, a person also tries to do several things at once, and this property is called by scientists as multitasking. B. Oakley (Oakley, 2020) defines multitasking as a constant switching of attention, which prevents new ideas and concepts from developing and leads to the impossibility of building full-fledged logical connections. Multitasking is also seen by scientists as the ability to perform two or more actions simultaneously, and in this context, multitasking in digital generation students is imaginary because the student's brain does not focus on any of them (Skvortsova & Britskan, 2018). Researchers from Stanford University's Human Communication and Interactive Media Laboratory and the Institute for Future Thinking at Oxford University understand multitasking as the simultaneous perception of information and attempts to perform several actions simultaneously or directly one after the other; and only 3% of people who simultaneously perform from two to six cases successfully combined multiple streams of information (Lysak & Belov, 2013).

Proceeding from the fact that the human brain is not physically adapted to operate with reality, it works with models and abstractions. A fragmentary perception of the world in the form of a clip deprives the model of the world of context - the relationship of new information with the existing base in the form of a set of facts, statements and conclusions, and as a result, the clip loses its own context and turns from a means of correcting the model into information noise. The main danger of the clip perception of the world is the created illusion of knowledge, when it seems to a person that he knows more than he actually does, which leads to the fact that he is not able to correctly evaluate his own actions, which are based on this knowledge.

2. METHODS, TECHNIQUES AND METHODS OF RESEARCH

In May–June 2021, we conducted an anonymous survey of primary, secondary and high school teachers, as well as teachers of colleges and universities in Ukraine. The questionnaire was developed by the authors to study the views of teachers on the preconditions of clip style thinking and other features of cognitive processes in modern students, as well as to determine the causes of changes in the cognitive processes of the digital generation. The questionnaire contained closed-ended questions with four or more answer options. When answering the questionnaire, respondents could choose one or more answer options or add their own version.

The questionnaire was submitted in Google form and was distributed through the professional communities of teachers on the social networks Viber and FB. The survey covered 536 respondents from all over Ukraine. The most active boules are representatives of the Odessa region (21.8%; 117 individuals), Dnipropetrovsk region (17.2%; 92 individuals), Kyiv (8%; 43 individuals) (Figure 1).

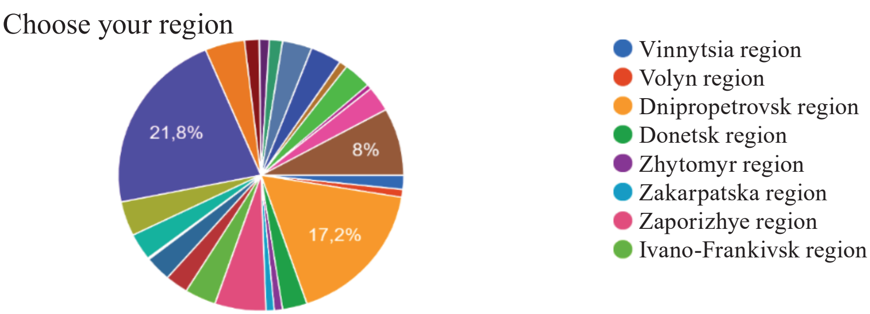


Figure 1. Distribution of respondents by regions of Ukraine

Source: own work.

In the questionnaire, teachers in primary school (46.6%; 250 respondents), basic schools (23.3%, 125 respondents), profile (basic) school (11.2%; 60 respondents), schools, college (2.4%; 13 respondents), teachers in higher education (16.4%; 88 people) (Figure 2), of which 51, 3% (275 people) have work experience from 10 to 20 years, 19.2% (103 people) (Figure 3).

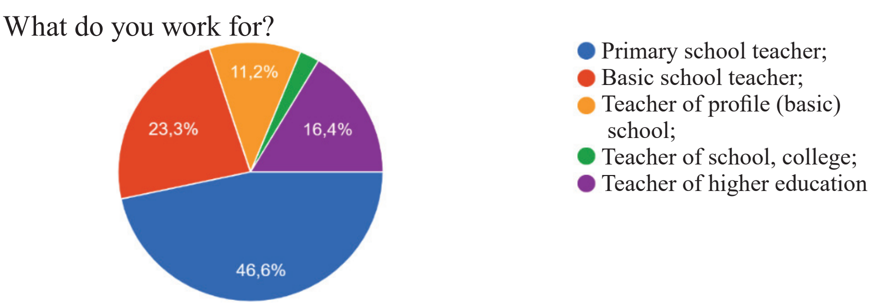


Figure 2. The number of respondents in the field of education

Source: own work.

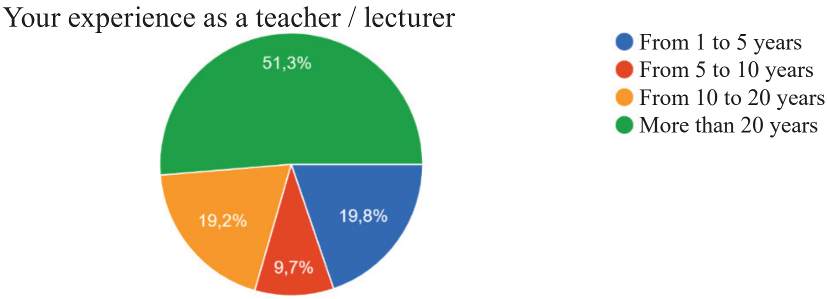


Figure 3. Distribution of respondents by length of service

Source: own work.

45.9% (246 respondents) – teachers in primary school, 29.9% (160 respondents – teachers of mathematics, 9.5% (51 respondents – teachers of informatics, 5.8% (31 respondents – teachers of physics, 5.4% (29) – teachers of Ukrainian language and literature (Figure 4).

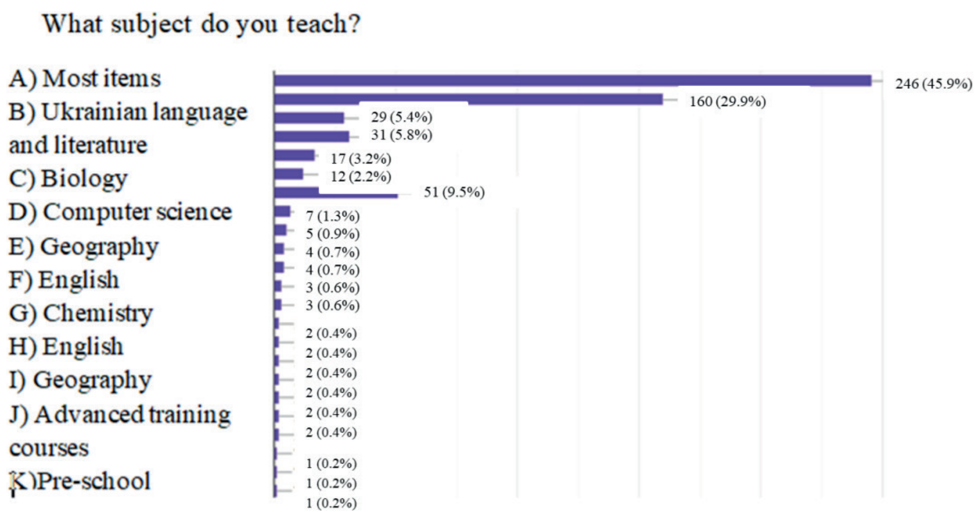


Figure 4. Distribution of respondents by subject taught

Source: own work.

2.1. Prerequisites of Clip Thinking

Teachers had to answer the question, "What do you think was the prerequisite for the emergence of clip thinking?". Respondents were asked to choose one or more answers: A) the revolution in information technology, virtualization, gamification, robotics and computerization of various spheres of life of modern man; B) the emergence of generation Z with its corresponding features; C) change of neuropsychological processes that determine the formation of clip thinking / consciousness by the transition from conceptual-logical thinking to the network. Or write your own version – D) Your version.

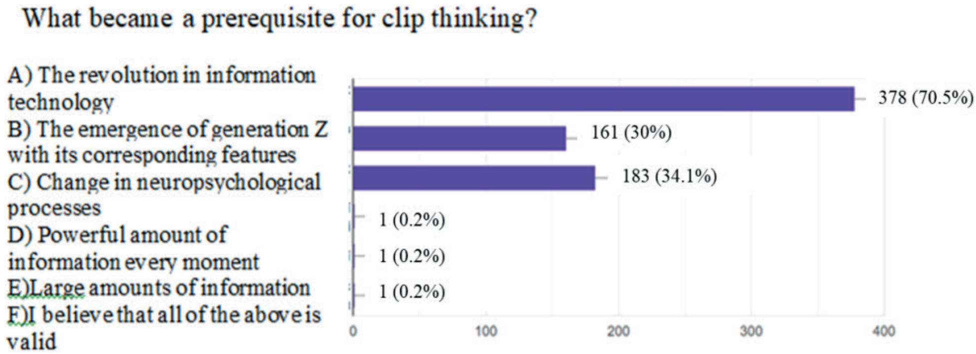


Figure 5. Distribution of respondents' answers regarding the preconditions of clip thinking

Source: own work.

As we can see, 70.5% (378 people) of respondents consider the revolution in information technology, internetization, virtualization, gamification, robotics and computerization of various spheres of modern life as a prerequisite for a special cognitive style – clip thinking (option A). 34.1% (183 people) noted changes in neuropsychological processes that determine the formation of clip thinking and the transition from conceptual and logical thinking to the network (option C). 30% (161 people) associate clip thinking with the emergence of a new generation – Generation Z (option B).

We analyzed the answers to this question in separate groups of respondents. Thus, only option A was given as a reason for the emergence of clip thinking and was chosen by 42.4% of primary school teachers, 47, 2% of basic school teachers (%), 40.5% of teachers of specialized schools, 45.5% of university teachers, 69.2% of college and college teachers. At the same time, respondents could choose several answer options. 9.2% of primary school teachers answered this question and chose options A) and C); 8.4% – A) and B); 5.6% – A), B) and C). Among primary school teachers, we have the following distribution: 12% chose two answer options A) and B); 0.8% – A), C), adding this option "Large amounts of information"; 7.2% – chose A) and C); 7.2% named three reasons A), B), C). Among the teachers of the profile school, we have the following distribution of answers to this question with the choice of option A: 18.3% – A), C); 11.7% – A), B); 8.3% – A), B) and C). 7.7% of teachers of schools and colleges believe the reasons for the emergence of clip cognitive style A), C); 7.7% named three reasons A), B) and C). 15.9% of university teachers chose A) and C) as the reasons for the emergence of clip thinking; 3.4% – A) and B), 5.7% – three reasons A), B), C). At the same time, there were answers in which the revolution in information technology, internetization, virtualization, gamification, robotization and computerization of various spheres of modern human life are not considered to be the reason for the emergence of clip thinking. Only option B was chosen by 15.2% of primary school teachers, 13.6% of basic school teachers, 3.3% of specialized school teachers, 9.1% of university teachers. 2.4% of primary school teachers, 1.6% of basic school teachers, 3.3% of specialized school teachers, 7.7% of college and school teachers, 1.1% of university teachers named two options, B) and C) as the reasons for clip thinking.

Thus, a new stage in the development of world society – the introduction of ICT in all spheres of life causes the peculiarities of the cognitive style of students, which is manifested in the idea of clip thinking. Obviously, in the learning process, including distance or blended learning should take into account the features of cognitive processes that accompany clip thinking.

2.2. The peculiarities of cognitive processes of representatives of the digital generation

The next question of the questionnaire: "Have you observed in the last 5 years such features of cognitive processes in students?" provided five options for response: A) Deterioration of stability and duration of attention; B) Problems with memorizing information; C) Decrease in analytical and synthetic abilities; D) Higher level of IQ of students; E) Your option.

As you can see from the diagram shown in Figure 6, 72.2% (387 people) identified a deterioration in the stability and duration of attention (option A), 64.4% (345 people) – problems with memorizing information (option B), 62.3% (334 people) – a decrease in the analytical and synthetic abilities of pupils / students of the digital generation (option C). And only 7.3% (39 people) reported a higher level of IQ (option D). It is obvious that this state of development of cognitive processes creates certain problems with the perception, understanding, processing and memorization of educational information. These data indicate the need to find new teaching methods that take into account the peculiarities of the cognitive processes of students / students of the digital generation.

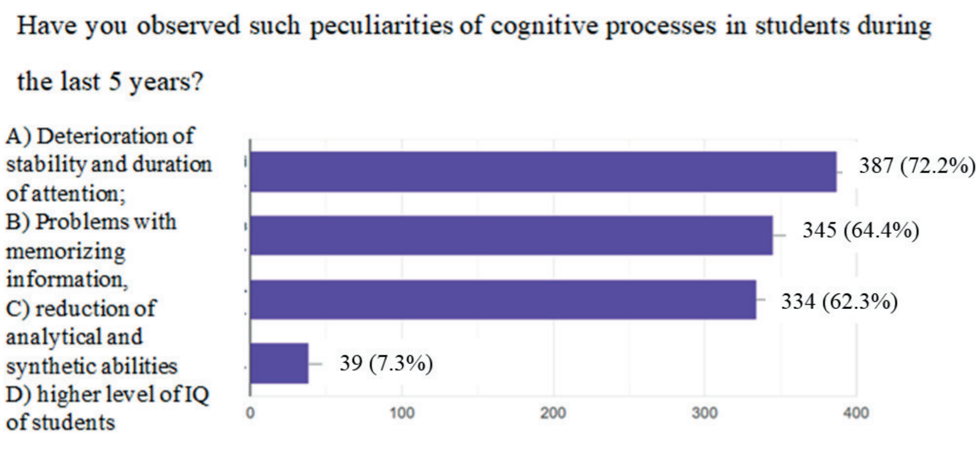


Figure 6. Distribution of respondents according to the options for answering questions about the features of cognitive processes in modern pupils / students

Source: own work.

The results of the analysis of responses by categories of teachers / lecturers are presented in table 1.

As a result of the analysis of the data of table 1, option A, it can be shown that from primary to basic and profile school the stability and duration of attention is in the range of 15% – 10%, and slightly improves in basic school. This can be explained by the age-related features of the neural and functional development of the human brain. Namely, in 10–11 year old students, the frontal lobes and frontal cortex, which are responsible for arbitrariness, for self-regulation acquire signs of maturity, although the actual development of these areas of the brain does not stop and lasts almost 30 years. But in this context, the data of university professors look a bit strange, noting that a feature of digital generation students is the instability and shortness of attention, which of course, hinders quality education at the university. It should also be noted that college teachers did not mention option A) separately in their answers. Problems with memorizing information (option B) decrease slightly from primary to basic school, and then increase to profile. This can be explained by the fact that in primary school the methods of logical memorization of educational information are beginning to take shape, and it is possible that in primary school we already have some changes in this property.

Table 1. Options for respondents to answer the question, "Have you observed such peculiarities of cognitive processes in students during the last 5 years?"

Answer option	Primary school teachers (%)	Basic school teacher (%)	Teachers of profile school (%)	College teachers (%)	University teachers (%)
A	14.8	9.6	10.0	–	45.5
B	10.4	4.0	8.3	–	9.1
C	8.4	5.6	5.0	38.5	18.2
D	4.8	3.2	–	–	–
A,B	14.4	16.8	8.3	15.4	3.4
A,C	6.8	12.8	13.3	7.7	15.9
A,D	2.0	–	–	–	–
B,C	4.4	4.8	6.7	15.4	11
B,D	0.8	–	–	–	–
A,B,C	30.8	39.2	43.3	15.4	5.7
A,B,C,D	1.6	2.4	3.3	–	–

Source: own work.

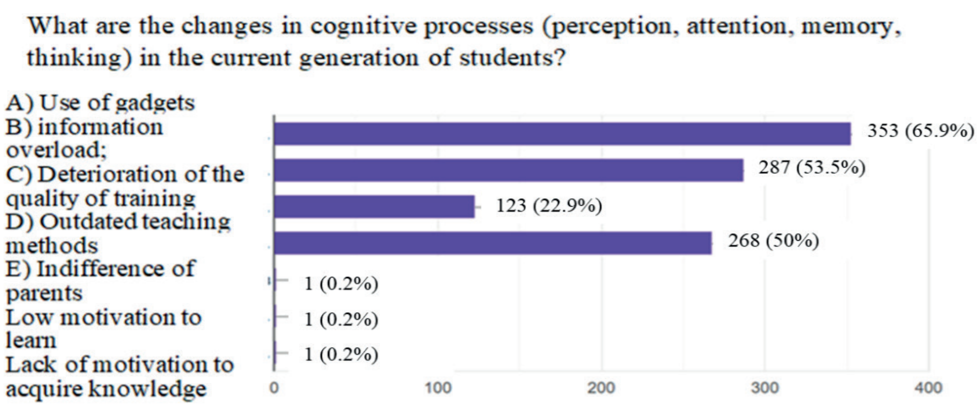
Decreased analytical and synthetic abilities (option C) is more pronounced in primary school students, due to the immaturity of their brain structures (frontal lobes and frontal cortex), for college students, which can be explained by the contingent of these institutions. 18.2% of the answers of university teachers about the presence of reduced analytical and synthetic abilities in students are also related to the modern contingent of students entering universities with existing problems in school education. Speaking about the positive impact of ICT on the development of students, some scientists note the higher level of IQ students. Thus, Gary Small and Gigi Vorgan, claim that children who work with gadgets show a higher IQ, they have better cognitive abilities than those who hardly use a computer (Small & Vorgan, 2008). According to the observations of Jackson, Witt, Games, etc., children who use the Internet have a higher academic performance than children who do not use the Internet (Jackson, Witt, Games, Fitzgerald, von Eye, & Zhao, 2012).

The responses of primary and basic school teachers correlate with the results of these studies for a small percentage of students, but teachers of specialized schools, colleges and universities, universities did not observe this feature. It is possible that students of this age group are all already connected to digital devices and the Internet.

2.3. The reasons for changes in cognitive processes of modern students

The next question, which was proposed to answer teachers and educators, was aimed at determining the cause of changes in cognitive processes (perception, attention, memory, thinking) in the current generation of students. Respondents were offered five possible answers: A) Use of gadgets. And therefore a simultaneous stay in the physical and virtual world; B) Information overload and the simultaneous need for new information; C) Deterioration of the quality of training of students at the previous stage of education; D) Outdated teaching methods that do not take into account the peculiarities of the digital generation; E) Your option.

As can be seen from the diagram (Figure 7), 65.9% (353 people) of respondents said that the reason for changes in the processes of perception, attention, memory, thinking in the digital generation is the constant use of gadgets, which offers a person simultaneous learning in the physical and virtual world, which attracts children and young people more than the physical world (option A).



F i g u r e 7. Distribution of respondents by answer options to questions about the reasons for changes in cognitive processes in modern students

S o u r c e: own work.

These data correlate with the data of the Institute of Psychology of the National Academy of Pedagogical Sciences of Ukraine, which show that modern children have acquired an excessive ability to absorb digital information, that the virtual world acts like the physical and requires the child to form those abilities that allow it to exist in this world (Honcharenko, Vavrik, Vereschak et al., 2014).

53.5% (287 people) of teachers and lecturers determined that the reason for the deterioration of cognitive processes is that they are, on the one hand, overloaded with information, and on the other hand, need new information (option B). It is obvious that under such conditions it is impossible to perceive it and process it qualitatively. 50.0% (268 people) see the problem in outdated teaching methods that do not take into account the peculiarities of the digital generation (option D). At the same time, 22.9% (123 people) believe that the problem lies in the deterioration of the quality of training of students at the previous stage of education (option C).
The analysis of the reasons of the deterioration of cognitive processes at pupils / students of the digital generation on categories of respondents is given in table 2.

Table 2. Options for respondents to answer the question, "What are the changes in cognitive processes (perception, attention, memory, thinking) in the current generation of students?"

Answer option	Primary school teachers (%)	Basic school teacher (%)	Teachers of profile school (%)	College teachers (%)	University teachers (%)
А	18.8	15.2	15.0	15.4	8.0
Б	10.4	7.2	13.3	–	10.2
В	4.0	–	–	15.4	3.4
Г	9.6	10.4	1.7	15.4	4.5
А, Б	17.2	8.8	10.0	–	12.5
А, В	2.8	2.4	8.3	–	3.4
А,Г	11.6	11.2	11.7	7.7	10.2
Б,В	–	–	3.3	7.7	4.5
Б,Г	5.2	8.8	3.3	7.7	10.2
В,Г	–	2.4	–	–	4.5
А,Б,В	1.6	1.6	6.7	7.7	5.7
А,Б,Г	10.8	14.4	11.7	7.7	14.8
А,В,Г	2.4	4.8	3.3	7.7	–
Б,В,Г	–	9.6	3.3	–	–
А,Б,В,Г	2.8	–	5.0	–	8.0

Source: own work.

CONCLUSION

This comprehensive and deep study of the outlined problem, conducting a serious observational experiment which provides a reason to believe that today we have an important problem of change in the cognitive processes of modern students under the influence of the digital world and artificial intelligence. We point to the clipping of students' thinking as a consequence of digitalization.

The use of gadgets, and connection to the Internet, allows a person to survive in a fast-changing world, instantly receiving the necessary information. In this way, there is a growing need for new information on the one side, and on the other side there is an oversaturation of information that causes computer surfing, forming a lack of habit of reading the page completely, and the perception of information presented on Internet pages separately. The presence of hyperlinks, adjusts a person to perceive information without establishing links between content elements in the form of a clip in which there is no context. Thus, the duration and stability of attention decreases, the selection of semantic parts of information, the establishment of relationships between them becomes increasingly difficult, the ability to logically process the content deteriorates. Thus, at the theoretical stage of the study, the essence of clip thinking and its derived features of cognitive processes were determined, which became the basis for the development of a questionnaire for school teachers and university teachers. An analysis of the results of the survey shows that the main reason for the emergence of clip thinking, according to Ukrainian teachers, is the revolution in information technology, internetization, virtualization, gamification, robotics and computerization of various spheres of modern life. It is the entry of IT into all spheres of life of modern man, his excessive ability to assimilate digital information that causes a different style of thinking, and a different means of learning.

These data points correlate with the results of research by Polish scientists (Mokwa-Tarnowska & Tarnowska, 2019), in which it was proposed students of Generation Z prefer online text and images and they use Internet resources to teach real skills. As a result of a survey of Polish students, researchers found that representatives of Generation Z are willing to use online learning materials, only 5% said they do not want to learn from Internet resources or activities (p. 226). Almost three quarters of respondents (74.4%) believe that extended lessons via the Internet are an attractive way to learn, and only 5.6% hold the opposite view. As a result of the analysis of the questionnaires, it was found that according to the observations of teachers of Ukraine, the current generation of students has deteriorated the stability and duration of attention, there are problems with memorizing educational information, there is a decrease in analytical and synthetic abilities. Teachers in Ukraine associate these changes with the constant use of gadgets, which offers a person a simultaneous stay in the physical and virtual world, which is more attractive to children and youth than the physical world; with information overload and with the simultaneous need for new information; with outdated teaching methods that do not take into account the specifics of the digital generation.

The obtained experimental data correlate with the conclusions of K. Frumkin on the inability to perceive long linear information of one type, reduced analytical thinking, as well as an inability to perceive long-term linear information and the phenomenon of clip thinking (Frumkin, 2010). Also, our study confirms the conclusion of Dautov, Korochentseva, & Mohamed Kadom Mahdi Al Hussini (Dautov, Korochentseva, & Mohamed Kadom Mahdi Al Hussini, 2019) that along with thinking, attention also undergoes significant changes. In particular, under the influence of clip thinking, such properties of attention as the distribution and switching of attention are enhanced, which allows a person to work with large information flows with less energy, but concentration and stability of attention are weakened. Dautov, Korochentseva, and Mohamed Kadom Mahdi Al Hussini experimentally proved a decrease in productivity of attention among representatives of the digital generation with an increase in indicators of clip thinking. At the same time, the authors emphasize the high reproducibility of attention resources among the digital generation with a high level of clip thinking, which somewhat compensates for the low level of attention productivity in general. Thus, according to Ukrainian teachers, changes in cognitive processes are caused by the use of digital technologies, and on the other hand, it is impossible to teach modern students without the use of IT in the educational process. Therefore, the opinions of scientists are aimed at finding effective means of teaching students – as representatives of the digital generation based on IT.

Scientists from Russia insist on the use of information technologies in the educational process (Rezer, Symaniuk, & Kuznetsova, 2018). Based on the peculiarities of clip thinking, which consists in the perception of small pieces of information (Volkodav & Semenovskikh, 2017) suggest organizing information in the form of clips; use bright, clear and visual presentations with clear, imaginative and memorable wording. Bkhat insists on the structuring of information in the form of clips, changing the presentation format, using bright, clear and visual presentations that will improve the learning process of young people with "clip-thinking" (Bkhat, 2018). The author sees this as a way of adapting "clip culture" to educational technologies by means of rethinking the pedagogy of classes. Thus, the prospects for further research we see in the search for effective approaches to teaching students, who are obviously representatives of the digital generation that constantly uses IT.

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"E-learning", 13, Katowice–Cieszyn 2021, pp. 309–322
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THE ADMINISTRATION OF THE DIGITAL ENVIRONMENT OF HIGHER EDUCATIONAL INSTITUTIONS: THE IDENTIFICATION OF USERS

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Abstract: *The article considers the issue of administration of the digital environment of higher education institutions in terms of the identification of users. Each higher education institution sets its requirements, features of functionality, which leads to the constant adaptation of such systems for each educational institution. Therefore, it was decided to design and develop a digital educational environment of the university, which would digitize the basic educational and management processes of a typical free economic zone, but taking into account the peculiarities of the educational process at the Zhytomyr Polytechnic State University. When conducting educational activities with distance learning technologies using a digital educational environment, it is important to consistently identify, authenticate and authorize participants in the educational process. Therefore, this paper focuses on these issues from the point of view of the administrator of the digital environment. The article describes in detail the capabilities of the digital environment administrator, which are: editing student accounts, providing roles, managing users, roles, rights, rules, routes, and menus. Detailed attention is paid to the management of roles and their functionality. The use of the above-described approaches to the identification, authentication, and authorization of participants in the educational process does not guarantee the observance of academic integrity, in particular, when students undergo higher knowledge assessment and certification procedures.*

Keywords: administration, digital environment, higher education institution, identification of users.

INTRODUCTION

The digital transformation of all levels of education, as well as the beginning of the COVID-19 pandemic in Ukraine and the world, led to the transition to the educational process using distance learning technologies, which led to the problem of higher education institutions need to immediately translate as many educational and management processes form. There are currently many options for implementing this, including automated management systems for higher education institutions. However, each higher education institution sets its requirements, features of functionality, which leads to the constant adaptation of such systems for each educational institution. This, in turn, is a waste of time, money, and resources. Also important is the fact that not always available systems allow taking into account all the necessary functionality required for the implementation of a particular institution of higher education. All of the above leads to the fact that some of the functionality remains outside of digitalization, which in the context of distance education requires improvement.

Therefore, it was decided to design and develop a digital educational environment of the university, which would digitize the basic educational and management processes of a typical higher education institution, but taking into account the peculiarities of the educational process at the Zhytomyr Polytechnic State University.

As discussed by the authors in (Morozov & Vakaliuk, 2021), the digital environment consists of 4 components, among which the main role is played by the organization, which is responsible not only for the structure of the university, activities in higher education institution, etc. but also for the administration of the digital environment (see Figure 1).

Organizational component:

⇒ Administration
- o Role management
- o Distribution of user access rights
- o Personal accounts of users (teachers, students, administrator)
- o Training and support staff
- o Access to the internal network of free economic zones

⇒ HEI measures

⇒ Structure of HEI

⇒ Corporate mail

Figure 1. Organizational component of the digital environment of higher education institution

Source: Own work.

1. THEORETICAL BACKGROUND

Recently, in the context of the COVID-19 pandemic, many scientists are paying attention to e-learning (Hessah, & Afnan, 2021), (Jansson et al., 2021), (Vogt et al., 2021), (Wong et al., 2021), (Sailer et al., 2021).

At the same time, the problem of designing the digital environment of higher education institutions has recently been considered by more and more scientists. In particular, Diahyleva, Gritsuk, Kononova, Yurzhenko considered the educational electronic environment of maritime higher education institutions through computerized adaptive testing (Diahyleva et al., 2020). Morze, Kucherovska explored ways to design a digital educational environment for K-12 education (Morze & Kucherovska, 2020), another group of authors suggested approaches to integrating business simulation software into the learning environment of technical university (Antoniuk et al., 2021). Dotsenko proposed to consider the information and educational environment through the use of competency training simulators for the study of general technical disciplines (Dotsenko, 2021).

Lytvynova considered the cloud-oriented learning environment of secondary school. She thinks that implementation of COLE at secondary schools provides endless opportunities for both teacher and student-created conditions for innovation and learning (Lytvynova, 2017).

Shyshkina considered service models of the cloud-based learning environment of the educational institution. The author revealed the main types of the service models of design and deploy the cloud-based infrastructure of the educational institution; considered the advantages and disadvantages of the cloud-based approach (Shyshkina, 2017).

Spivakovsky, Petukhova, Kotkova and Yurchuk inspected historical approach to modern learning environment (Spivakovsky et al., 2019).

Kuzminska, Mazorchuk, Morze, and Kobylin also researched attitude to the digital learning environment in Ukrainian Universities. They verified using the empirical data factor analysis the theoretical model structure of the university's digital studying environments (Kuzminska et al., 2019). Fabiano Nicola considered ethics and the protection of personal data (Fabiano, 2019).

However, there are no studies on user identification and administration of the digital learning environment.

That is why in this paper, we **aim** to describe the administration of the digital environment of a higher education institution in terms of the identification of users.

2. RESULTS

When conducting educational activities using distance learning technologies using a digital educational environment, it is important to consistently identify, authenticate and authorize participants in the educational process.

2.1. Identification, authentication and authorization of participants in the educational process

By identification, we mean assigning a certain identifier to a participant in the educational process, authentication – checking the identity of the users based on data provided by the users, which in practice often comes down to checking the login and password. Authorization is the granting of rights to the user to perform specific actions (Yakovina & Fedasyuk, 2008).

These tasks become extremely relevant when conducting forms of current or semester control of education and during the certification of higher education when participants in the educational process interact with each other through the Internet. If it is impossible to unambiguously authenticate the participant of the educational process, the possibility to establish the validity of the results of the current or semester control or certification disappears.

The letter (The letter, 2020) provides methodological recommendations of an organizational nature. Emphasis is placed on the fact that the institution of higher education (HEI) must ensure the observance of academic integrity and, accordingly, identify the applicant, which is extremely important during the semester control and certification of applicants for higher education.

To identify participants in the educational process in the digital educational environment, we use the assignment of unique identifiers to higher education seekers and university staff (persons who are representatives of the teaching and teaching staff of the higher education institution). The user's login will serve as such a unique identifier. In local databases of separate elements of the digital educational environment, additional assignment of numerical identifiers (ID) for concrete groups of participants of the educational process is possible. For example, when storing a list of higher education applicants in tabular form, a convenient way of identification would be to assign a unique numeric value associated with a specific applicant, similarly, a unique numeric employee ID will be used in the higher education institution's table in digital educational environment.

To ensure a single authentication of participants in the educational process, it is proposed to use LDAP-authentication by separating a separate server for this task (Mokriev, 2020). This will allow all participants in the educational process to use a single login and password in all online services of the digital educational environment (Portal, 2021).

2.2. Digital environment administration

The administrator of the digital learning environment manages the roles, rights, and rules, as well as the distribution of user access rights.

As a result of the distribution of access rights, employees and students of higher education institutions have a single login and password with which they can enter: personal accounts of users, the internal network of the university, corporate mail, and educational portal.

All this provides a complete and unambiguous identification of the users of the educational process in the digital environment of the higher education institution.

So, let's focus on the administration of the digital environment (Portal, 2021). The administrator of such an environment has the right to edit student accounts, assign roles, manage users, roles, rights, rules, routes, and menus (see Figure 2 and 3).

Consider in detail each element. In the "Student Accounts" section, the administrator has the right to view the general list of student accounts, save as a new user, view information about a specific student, edit account data, and delete a student (see Figure 4).

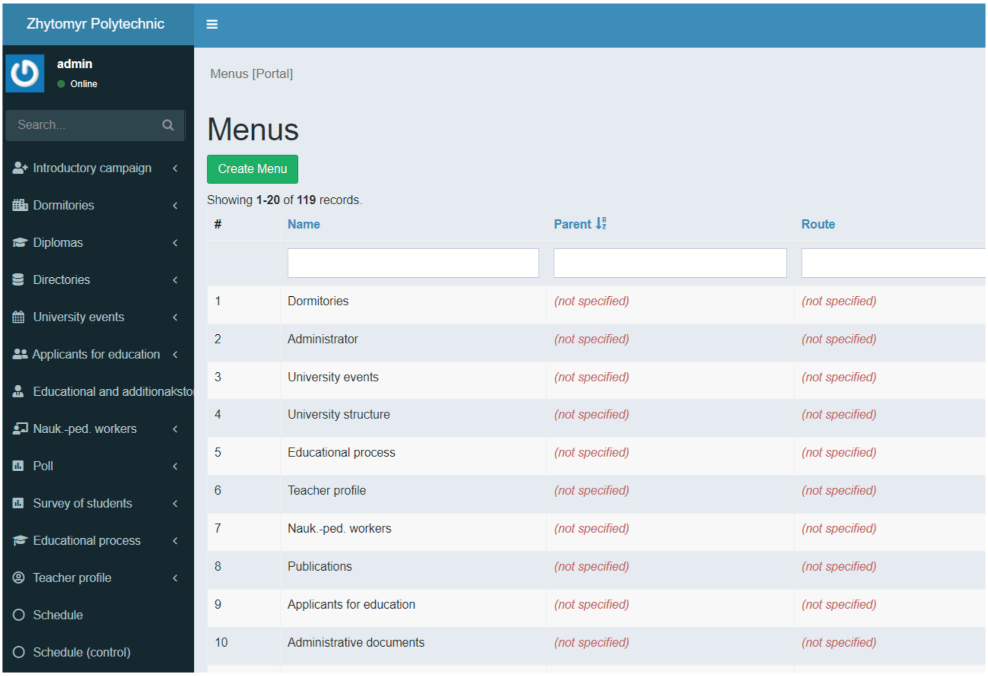


Figure 2. Digital environment of Zhytomyr Polytechnic State University

Source: Own work.

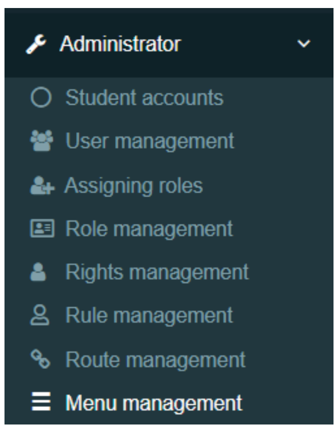


Figure 3. Administrator menu

Source: Own work.

When clicking on the view student account, the administrator can view the following data: student ID, username, authorization key, password, corporate email address, user status, ID card, name, date of birth, type of education document, series, and a number of the document, date of issue, full name in English, beginning and end of studies, faculty, educational degree (level), a form of study and other data (see Figure 5).

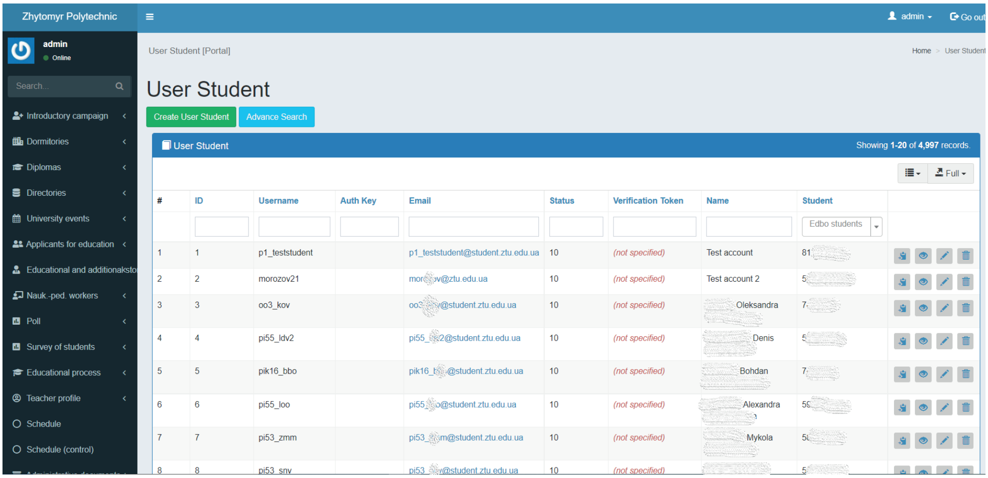


Figure 4. Student's accounts

Source: Own work.

Also here the administrator can save as a new user, update the data (including resetting the password) and delete the account (see Figure 5). At the same time, clicking "edit" on the previous page (Figure 4) allows the administrator to update only certain fields of this account (see Figure 6).

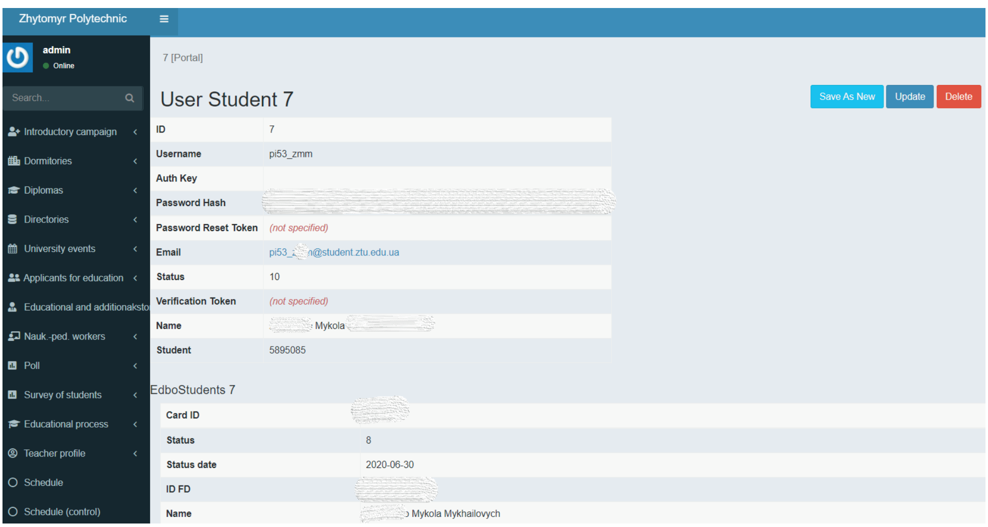


Figure 5. View student account

Source: Own work.

In the "User Management" section (see Figure 6), the administrator sees all users, as well as their data: username, full name, user type, e-mail, registration time, last login time, and activation. In addition, the administrator in this section can lock/

unlock a specific user, then have the opportunity to log in to the environment under that user ( ), generate and send a new password to the user ( ), update data ( ), and delete user ( ).

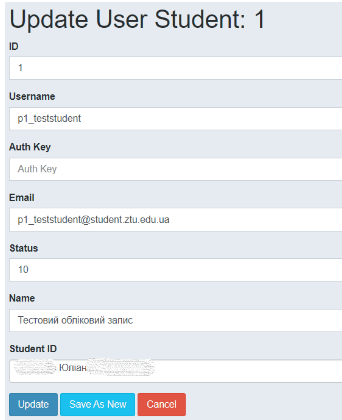
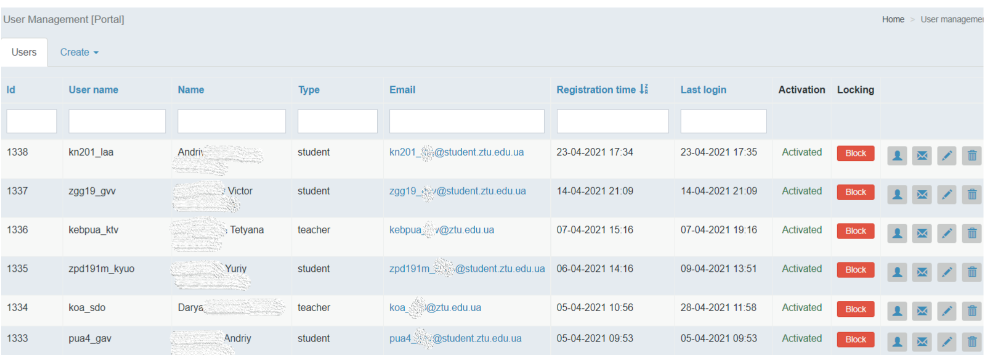


Figure 6. Updating student information

Source: Own work.



User Management [Portal]

Home > User manageme

Users Create

Id	User name	Name	Type	Email	Registration time	Last login	Activation	Locking	
1338	kn201_laa	Andri	student	kn201_ @student.ztu.edu.ua	23-04-2021 17:34	23-04-2021 17:35	Activated	Block	
1337	zgg19_gvv	Victor	student	zgg19_ v@student.ztu.edu.ua	14-04-2021 21:09	14-04-2021 21:09	Activated	Block	
1336	kebpua_ktv	Tetyana	teacher	kebpua_ v@ztu.edu.ua	07-04-2021 15:16	07-04-2021 19:16	Activated	Block	
1335	zpd191m_kyuo	Yuriy	student	zpd191m_ @student.ztu.edu.ua	06-04-2021 14:16	09-04-2021 13:51	Activated	Block	
1334	koa_sdo	Darya	teacher	koa_ @ztu.edu.ua	05-04-2021 10:56	28-04-2021 11:58	Activated	Block	
1333	pua4_gav	Andriy	student	pua4_ @student.ztu.edu.ua	05-04-2021 09:53	05-04-2021 09:53	Activated	Block	

Figure 7. User Management

Source: Own work.

In the section "Assigning roles" (Figure 8), the administrator can provide individual roles for a specific user ( ). Thus the administrator chooses what roles to give to the given user (Figure 9). The Role Management section (Figure 10) manages the roles and functionality of each role, where you can view, update, and delete a specific role.

All the management of roles and their functionality can be represented in the form of a diagram (see Figure 11). In particular, as we can see from the presented scheme, some roles have full access to functionality, some – partial. In addition, some roles provide new data, some only view data, others edit, and some delete data.

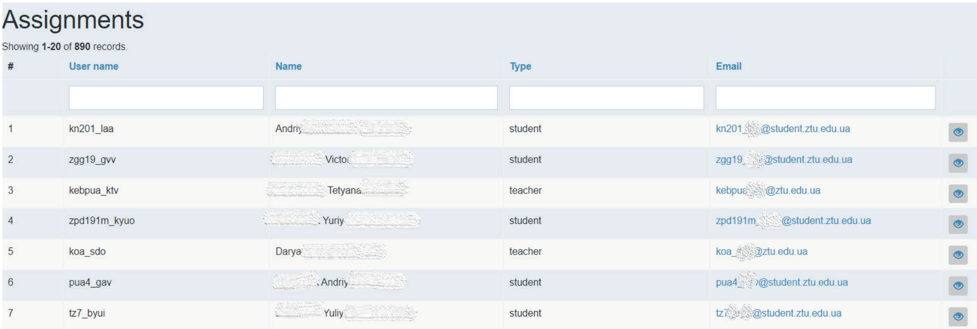


Figure 8. Assigning roles

Source: Own work.

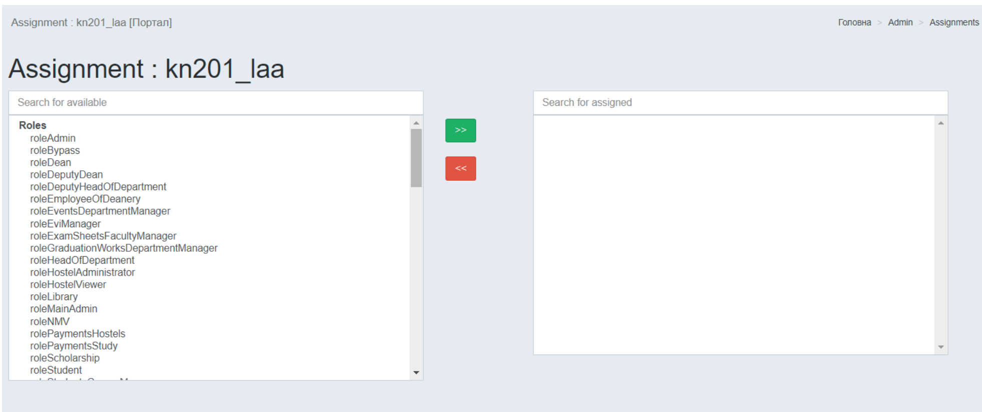


Figure 9. Assignment roles

Source: Own work.

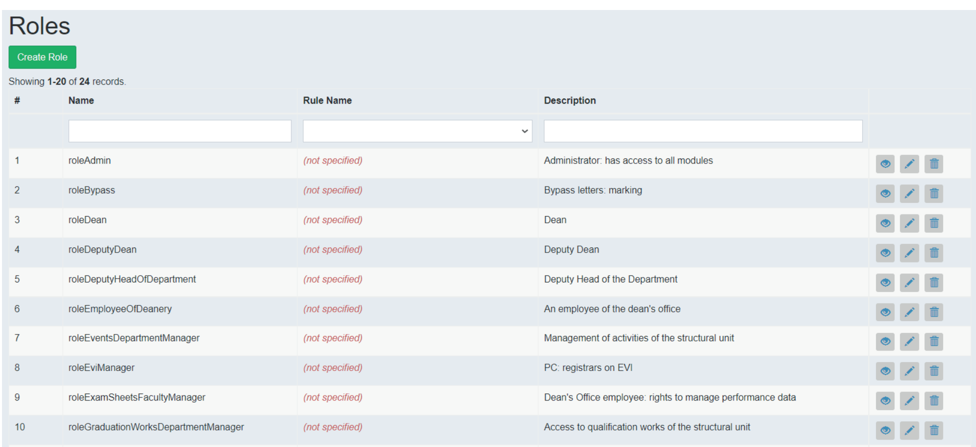


Figure 10. Role Management section

Source: Own work.

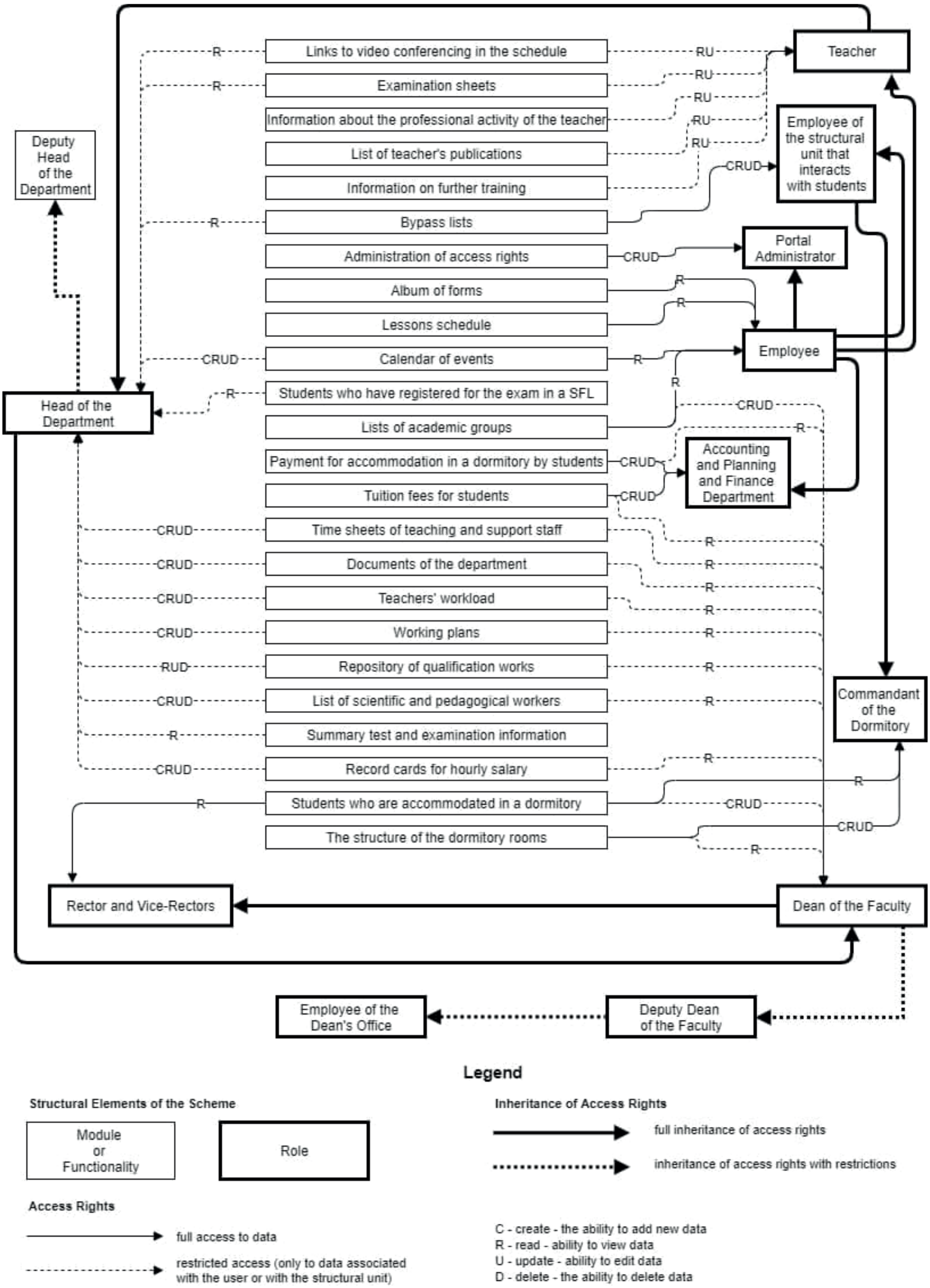


Figure 11. Role management scheme

Source: Own work.

Thus, the diagram shows the following roles: rector and vice-rectors, dean of the faculty, deputy dean, dean's office employee, dormitory commandant, head of the department, deputy head of the department, teacher, accounting, employee of the structural unit that interacts with students, administrator, employee. In addition, this diagram presents all the functionality of the portal and modules, as well as how they are provided for specific roles: links to video conferencing in the schedule; credit and examination information of success; information about the professional activity of the teacher; list of teacher's publications; information on teacher training; bypass letters; administration of access rights; album forms; lessons schedule; calendar of events; list of students registered at EVI / EFVV; lists of academic groups; payment for accommodation in dormitories by students; tuition fees; timesheets of teaching and auxiliary staff, documents of the department, teaching load of teachers, working curricula, a repository of qualification works, list of scientific and pedagogical workers, summary test-examination data, tables for hourly wages of students housed in dormitories, the structure of dormitory rooms.

This scheme of presentation of functionalities and roles illustrates all the possibilities of the digital educational environment.

The next task is the authorization task, which involves granting access rights to an authenticated user. To solve the problem of authorization in the context of the proposed structure of the digital educational environment in (Morozov, 2021) we highlight the following basic roles: "Employee", "Teacher", "Head of Department", "Dean of the Faculty", "Rector and Vice-Rectors".

"Employee" – the basic role, it is allowed to view the lists of academic groups, the calendar of events, the schedule of higher education, approved forms of documents. Based on the role of "Employee" is defined the role of "Teacher", which additionally can attach to the schedule links to video conferencing or messages for higher education, to put grades in test scores, enter information about their publications in the database, increase qualification and performance of points of professional activity by the License conditions for educational activities.

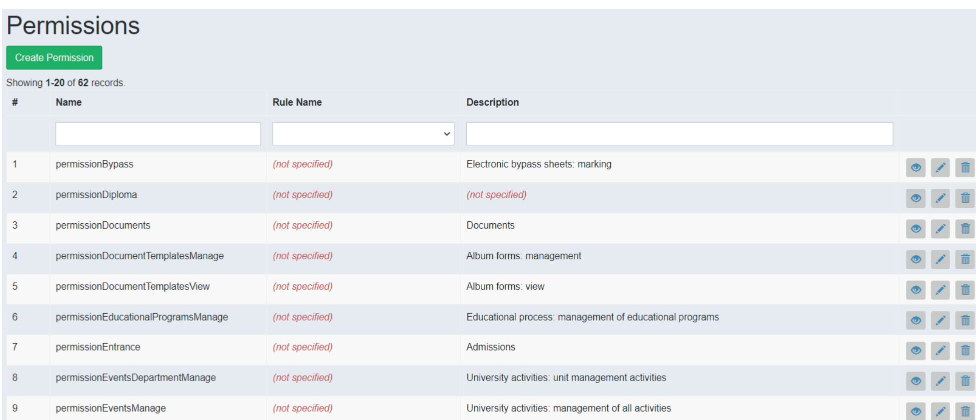
Based on the role of "Teacher", the role of "Head of the Department" is created, which has some additional features. For the role of "Head of the Department" the following opportunities are provided: to control the conduct of classes in distance form by teachers of the department, view the list of links to videoconferences of teachers of the department and connect to videoconferences, view and mark students in electronic emails, list of students who have registered for the only entrance professional exam, formation of curricula and work plans, distribution of study load, uploading qualification works to the repository, creation of hourly payroll records, creation of timesheets for teaching and support staff, review of consolidated test and examination information

The next role in the hierarchy is "Dean of the Faculty". This role additionally provides for the possibility of forming lists of academic groups, reviewing information on tuition and payment for living in dormitories by higher education seekers, performing settlement and eviction of faculty students from the dormitory. Instead, for this role, some of the opportunities inherited from the "Head of Department" are limited. In particular, the role of the "Dean of the Faculty" provides only the possibility of reviewing for: workload, initial and work plans, a repository of qualifying works, timesheets, timesheets of teaching, and support staff. This is since the listed information is created and updated by the departments, and the dean of the faculty has a controlling function.

The role of “Dean of the Faculty” is followed by the role of “Rector and Vice-Rectors”. Each role provides access to information only about the relevant structural unit and its subordinate structural units. For example, the “Head of the Department” has access to the formation (creation, editing, modification, and deletion) of curricula of educational programs implemented by the relevant department. The “Dean of the Faculty” has access (limited to one operation – review) to all curricula of educational programs that are implemented by each department of the faculty. The role of “Rector and Vice-Rectors” is associated with the root structural unit “Institution of Higher Education”, and this gives access to the data of all structural units to users to whom this role is assigned.

Based on the role of “Employee”, the roles of heads of structural units of the university are created. For example, “Dormitory Commandant”, “Employee of the Planning and Finance Department and Accounting”, “Portal Administrator”, “Head of the Training and Methodological Department”, “Head of the Personnel Department”, etc. These roles are assigned certain separate access rights to individual modules, which are directly related to the activities of the relevant structural unit.

In a higher education institution, there is often a need to provide some, often somewhat limited, access to deputy heads of departments. For example, the role of “Deputy Head of the Department” can be created based on the role of “Head of the Department” by restricting certain rights. Similarly, based on the role of “Dean of the Faculty”, the role of “Deputy Dean of the Faculty” can be created, which has limited rights. Closely related to role management is the section on “Rights Management” (see Figure 12), which can also be seen in the distribution diagram (see Figure 11).


Permissions

Create Permission

Showing 1-20 of 62 records.

#	Name	Rule Name	Description
1	permissionBypass	(not specified)	Electronic bypass sheets: marking
2	permissionDiploma	(not specified)	(not specified)
3	permissionDocuments	(not specified)	Documents
4	permissionDocumentTemplatesManage	(not specified)	Album forms: management
5	permissionDocumentTemplatesView	(not specified)	Album forms: view
6	permissionEducationalProgramsManage	(not specified)	Educational process: management of educational programs
7	permissionEntrance	(not specified)	Admissions
8	permissionEventsDepartmentManage	(not specified)	University activities: unit management activities
9	permissionEventsManage	(not specified)	University activities: management of all activities

Figure 12. Rights Management

Source: Own work.

The sections “Rule Management”, “Route Management” are auxiliary in the work of the administrator. The “Menu Management” section allows you to set the parent menu sections.

CONCLUSION

The use of the approaches described above to identify, authenticate and authorize participants in the educational process does not guarantee the observance of academic integrity, in particular, when higher education students go through the procedures of knowledge assessment and certification. Therefore, it is proposed to conduct all forms of control using videoconferencing, which will make it possible to verify the identity of the applicant for higher education.

Implementation of the proposed approach to the identification, authentication, and authorization of participants in the educational process in the model of digital educational environment of higher educational institution, will ensure compliance with academic integrity and increase the degree of verification of learning outcomes.

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