ANALYSIS OF DEVELOPMENT LEVEL OF THE CERTAIN DIGITAL COMPETENCES OF THE UKRAINIAN EDUCATORS

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Abstract: *The paper examines the analysis of development level of the digital competences of the Ukrainian educators according to the European Framework for the Digital Competence of Educators (DigCompEdu). For this purpose the authors have developed and conducted a survey of the target audience of Ukrainian educators composed of PhD students (in the field of Education), school teachers and University teachers. In accordance with the survey findings, the authors have analysed development level of the certain digital competences of the Ukrainian educators and proposed ways to improve this level.*

Keywords: Digital Competence, Educators, European Framework for the Digital Competence of Educators, DigCompEdu.

INTRODUCTION

Innovative and modernized education and training are key priorities of the Europe 2020 strategy (Joint Report of the Council and the Commission on the implementation of the strategic framework for the European cooperation in education and training (ET 2020), Official Journal C 417/25 of 15.12.2015). Progress towards full integration of digital technologies into Education and Training is still needed not only for many EU countries, but also for Ukraine.

In accordance with the EU Parliament indications on key competences for lifelong learning (Recommendation 2006/962/EC of the EU Parliament and of the Council of 18 December 2006, Official Journal L 394 of 30.12.2006), digital competence is one of 8 key competences that are fundamental for each individual in a knowledge-based society.

According to the EU Framework for the Digital Competence of Educators (JRC SCIENCE FOR POLICY REPORT, Luxembourg: Publications Office of the EU, 2017), Digital Competence can be broadly defined as confident, critical and

creative use of ICTs to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Digital competence provides not only the ability to use digital technologies. It has also become increasingly necessary for the formation of creativity and critical thinking that is so meaningful in the 21st century.

This research presents our investigation of the European Framework for the Digital Competence of Educators (**DigCompEdu**) and development level of the certain Digital Competences of the Ukrainian educators according to **DigCompEdu**.

Research goal. This paper reviews the results of the recently completed study specifying development level of the certain Digital Competences according to the **DigCompEdu**. This attempts to address the following questions:

- analysis of the theoretical backgrounds of the research;
- analysis of the **DigCompEdu**;
- analysis of development level of the Digital Competences of the Ukrainian educators according to the survey conducted;
- consideration of the way to improve development level of the Digital Competences of the Ukrainian educators (from target group) and the future Computer Science teachers in the Dragomanov National Pedagogical University (future educators) according to **DigCompEdu**.

Research methods. The authors have used the following research methods and tools for the investigation (2017-2018):

- questionnaire;
- survey and interview of the Ukrainian educators;
- observation;
- documents and content analysis;
- meeting, conference, seminar, workshop, etc.;
- analysis of research papers.

159 Ukrainian educators have taken part in the present research. The Ukrainian educators from the target group (PhD students (in the field of Education), school teachers and University teachers from different Ukrainian regions) have been involved in this process.

The questionnaire was created during this project which purposed to gain data on development level of the Digital Competences of the Ukrainian educators according to **DigCompEdu**.

1. THE THEORETICAL BACKGROUNDS OF THE RESEARCH

In 2017 the authors have analysed the world trends of using of ICTs in education and scientific research. They include the following: (Learning and Skills for the Digital Era; Strutynska & Umryk, 2017):

- Student mobility and study abroad:
  - Institution-industry partnerships overseas are growing and diversifying;
  - International engagement is increasingly research-focused;
  - National governments increasingly seek to drive internationalization;
- Use of English as a medium of instruction;
- Increasing Use of Blended Learning;
- Increasing Use of Collaborative Learning Approaches;
- Rise of STEM, STEAM and STREAM Learning;
- Use of Open Educational Resources (OER);
- Use of Massive Open Online Courses (MOOCs).

The authors have conducted local prior-research on specifying awareness level of the Ukrainian educators regarding the abovementioned issues. The local survey was open for 6-month period between April 20, 2017 and July 20, 2017. It contained information about the modern ICT tools and trends in research, education and science (Strutynska & Umryk, 2017).

The findings of the local prior-research have shown that the level of knowledge and skills of the target group in regards to the use of the modern innovative learning technologies and ICT tools in research, education and science needs improvement (Strutynska & Umryk, 2017).

Analysis and comparing results of the similar research on the EU's scholars and educators (Kramer & Bosman, 2016) have shown that the EU community uses more innovative and traditional tools in their professional activities.

Similar research results in development of the different EU Frameworks for the Digital Competence: European Framework for the Digital Competence of Educators, Digital Competence Framework for Citizens, European Framework for Digitally-Competent Educational Organisations (https://ec.europa.eu/jrc/en/ digcompedu).

Furthermore, the teaching professions face rapidly changing demands, which require a new, broader and more sophisticated set of competences than before. The ubiquity of the digital devices and applications requires the educators to develop their digital competences (DigCompEdu, 2017).

The European Framework for the Digital Competence of Educators dated 2017 has been used in the research. **DigCompEdu** framework is just for educators at all levels of education, including general and vocational training, special needs education, and non-formal learning contexts.

According to the European Framework for the Digital Competence of Educators (DigCompEdu, 2017), the six **DigCompEdu** areas focus on different aspects of educators' professional activities:

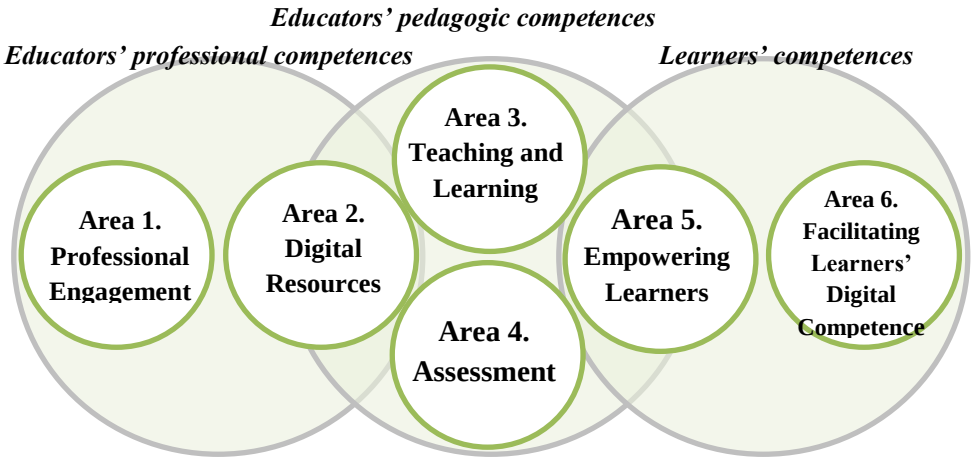

Figure 1. European Framework for the Digital Competence of Educators

Source: Own work based on DigCompEdu (2017, p. 15), https://publications.europa.eu/en/publication-detail/-/publication/fcc33b68-d581-11e7-a5b9-01aa75ed71a1/language-en (accessed on 15 August 2018)

Taking into account similar research (Kramer & Bosman, 2016; Strutynska & Umryk, 2016, 2017) and the **DigCompEdu**, authors have continued the research on specifying development level of certain Digital Competences of the Ukrainian educators.

The authors have analysed the findings of a new survey of the Ukrainian educators according to **DigCompEdu**.

2. ANALYSIS OF THE EUROPEAN FRAMEWORK FOR THE DIGITAL COMPETENCE OF EDUCATORS (DigCompEdu)

DigCompEdu includes three competence groups:

- *Educators' professional competences* (group 1);
- *Educators' pedagogic competences* (group 2);
- *Learners' competences* (group 3).

These 3 groups include six areas with focus on different aspects of the educators' professional activities (see in Fig. 1), (DigCompEdu, 2017).

Professional Engagement (area 1) consists of:

1.1. Organizational communication;

1.2. Professional collaboration;

1.3. Reflective practice;

1.4. Digital Continuous Professional Development.

Digital Resources (area 2) consist of:

2.1. Selecting digital resources;

2.2. Creating and modifying digital resources;

2.3. Managing, protecting and sharing digital resources.

Teaching and Learning (area 3) consist of:

3.1. Teaching;

3.2. Guidance;

3.3. Collaborative learning;

3.4. Self-regulated learning.

Assessment (area 4) consists of:

4.1. Assessment strategies;

4.2. Analysing evidence;

4.3. Feedback and planning.

Empowering Learners (area 5) consist of:

5.1. Accessibility and inclusion;

5.2. Differentiation and personalization;

5.3. Actively engaging learners.

Facilitating Learners' Digital Competence (area 6) consist of:

6.1. Information and media literacy;

6.2. Digital communication and collaboration;

6.3. Digital content creation;

6.4. Responsible use;

6.5. Digital problem solving.

For specifying development level of the certain digital competences of the Ukrainian educators, authors have conducted survey for certain areas according to **DigCompEdu**. It needs to be indicated that the survey has considered competences of the first two groups (group 1 and group 2), which is the part of the core of **DigCompEdu** framework. The last group 3 (*Learners' digital competence*) is captured by the European Digital Competence Framework for Citizens (DigCompEdu, 2017). Because of this, group 3 merits a dedicated area in the **DigCompEdu** framework. (DigCompEdu, 2017). Just due to this, group 3 will be considered in our further research. More details see below in Fig. 3.

The present research based on the target group who needs to improve their Digital Competences. This target group consisted of **159 Ukrainian educators**. As noted in **DigCompEdu** "... the **DigCompEdu** framework is directed towards educators at all levels of education, from early childhood to higher and adult education..." (DigCompEdu, 2017). The research target group consists of the Ukrainian educators: PhD students (in the field of Education), school teachers and University teachers.

The distribution of respondents by educational role is shown in Fig. 2. It is important to note that the largest group of respondents is belonging to Computer Sciences field (68,5% of the participants).

As we can see from Fig. 2 the largest group of respondents is school teachers (63% of the participants – 100 people). The number of University teachers is 55 people (35% of the participants). The smallest group of participants is PhD students in the field of Education (2% of the participants – 4 people).

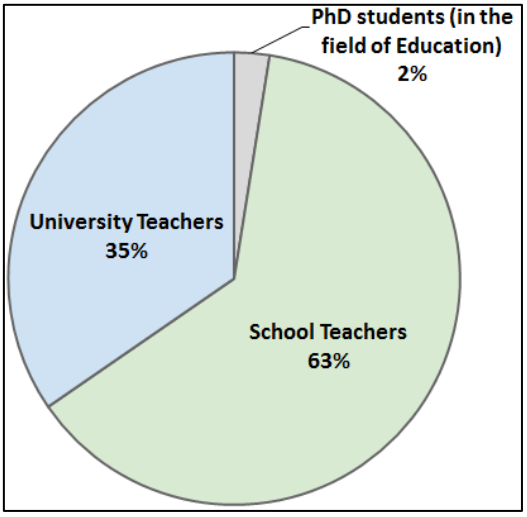

Figure 2. Distribution of respondents by educational role

Source: Own work

The online questionnaire was elaborated in the Ukrainian using Google Forms for gaining data on the Ukrainian educators' views and attitudes towards various

educational processes in some areas according to **DigCompEdu**. We have guaranteed participants only anonymous data would be shared.

The questionnaire was opening for 6-month period between December 20, 2017 and June 20, 2018. It contained information about some areas according to **DigCompEdu**.

The questionnaire consisted of 24 questions related to the Digital Competences group 1 and group 2 (areas 1-4), see in Fig. 3:

- 1 on educational role;
- 8 on area 1 (organizational communication, professional collaboration, digital continuous professional development);
- 3 on area 2 (selecting; creating and modifying; managing, protecting, sharing);
- 9 on area 3 (teaching, guidance, collaborative learning);
- 3 on area 4 (assessment strategies, feedback and planning).

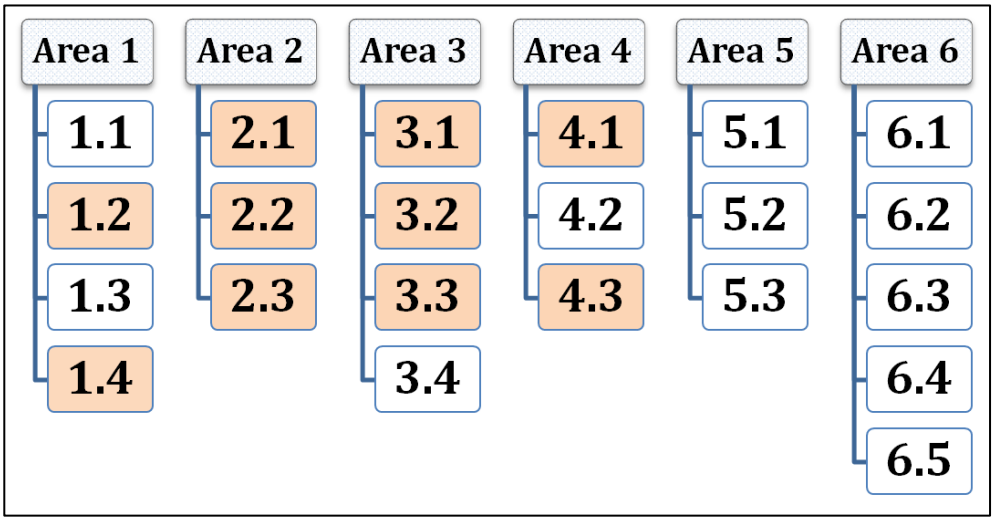

Figure 3. Digital Competences of Educators analysed in the research survey

Source: Own work based on DigCompEdu (2017, p. 16), https://publications.europa.eu/en/publication-detail/-/publication/fcc33b68-d581-11e7-a5b9-01aa75ed71a1/language-en (accessed on 15 August 2018)

3. ANALYSIS OF DEVELOPMENT LEVEL OF THE DIGITAL COMPETENCES OF THE UKRAINIAN EDUCATORS ACCORDING TO THE SURVEY CONDUCTED

We analysed development level of the Digital Competences of the Ukrainian educators according to the **DigCompEdu**. For this purpose the results of survey of certain Digital Competences groups are stated.

The data about development level of the some Digital Competences of the Ukrainian educators are presented in Tables 1-10 and Fig. 4-14 below.

Area 1. ***Professional Engagement***

Digital Competence 1.2. ***Professional collaboration***

Q*.: Which tools do you use for professional collaboration?*

Survey responses on professional collaboration tools usage are shown in Table 1 and in Fig. 4 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 1

Responses distribution on professional collaboration tools usage

Professional collaboration tools	Responses
Trello	10,06%
CoSchedule	0,63%
Podio	1,89%
Virtual boards	37,11%
ICT tools for creating infographics	27,04%
ICT tools for creating mind maps	47,8%
I do not know about any of these tools	30,19%

Source: Own work

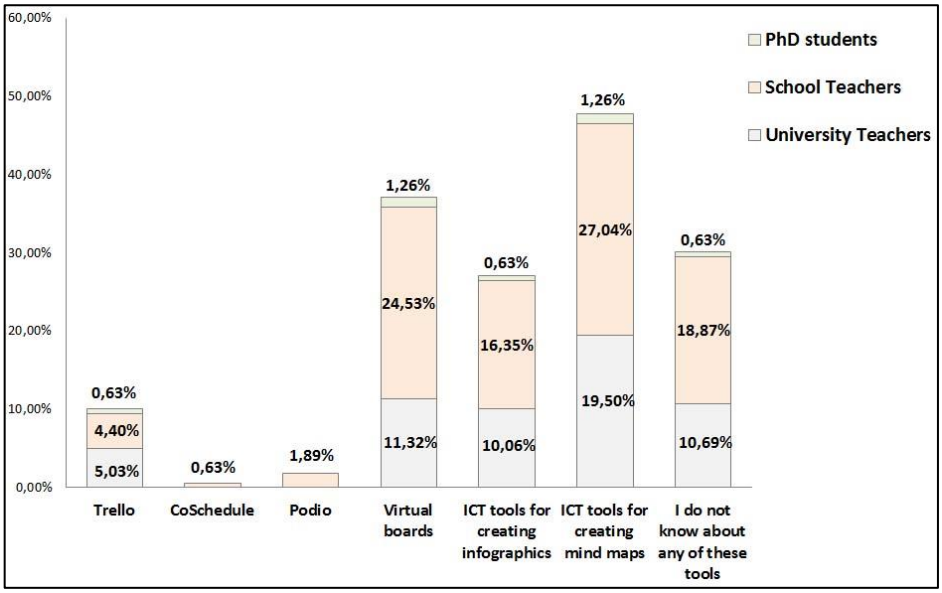

Figure 4. Survey responses on professional collaboration tools usage

Source: Own work

Digital Competence 1.4. ***Digital continuous professional development***

Q*.: Which digital sources and resources do you use to improve your own skills?*

Survey responses on usage of digital sources and resources are shown in Table 2 and in Fig. 5 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 2

Responses distribution on usage of digital sources and resources

Digital sources and resources	Responses
MOOC	48,43%
Thematic channels on YouTube	82,39%
Webinars	52,2%
TED	22,01%
Thematic blogs	27,04%
Social Networks Thematic Groups	48,43%

Digital sources and resources	Responses
Other Open Educational Resources	32,08%
Educational Resources of mobile applications	52,83%

Source: Own work

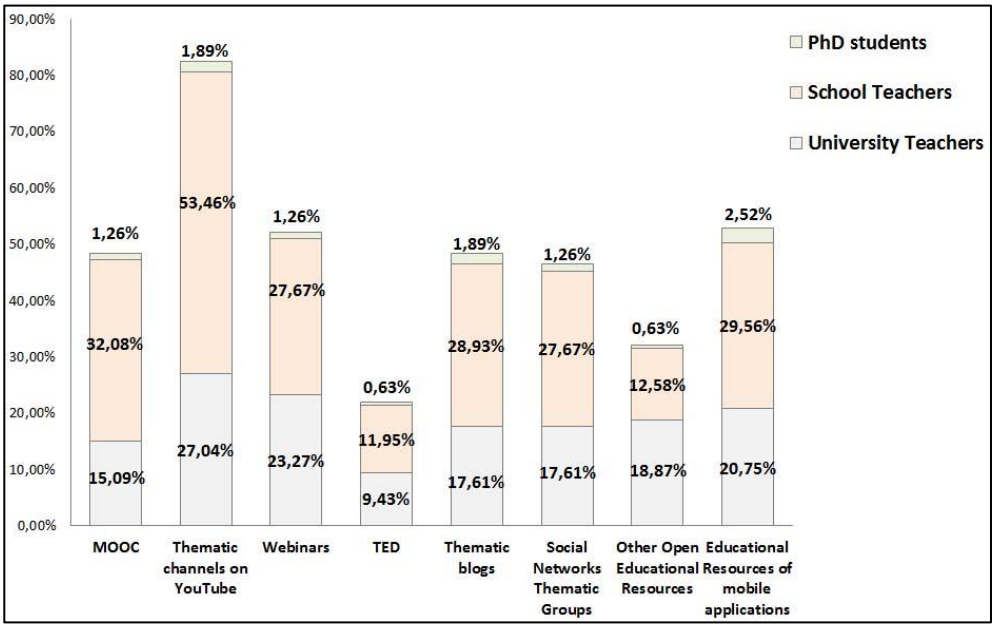

Figure 5. Survey responses on usage of digital sources and resources

Source: Own work

***Q**.: Which MOOC platforms do you use for continuous professional development?*

Survey responses on MOOC platforms usage are shown in Table 3 and in Fig. 6 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 3

Responses distribution on MOOC platforms usage

MOOC platforms	Responses
Coursera	35,85%
edX	17,61%

MOOC platforms	Responses
Udacity	6,29%
KhanAcademy	22,64%
CanvasNetwork	5,03%
FutureLearn	4,4%
FUN	5,66%
Prometheus	48,43%
I do not have an account on any of above mentioned platforms	27,04%

Source: Own work

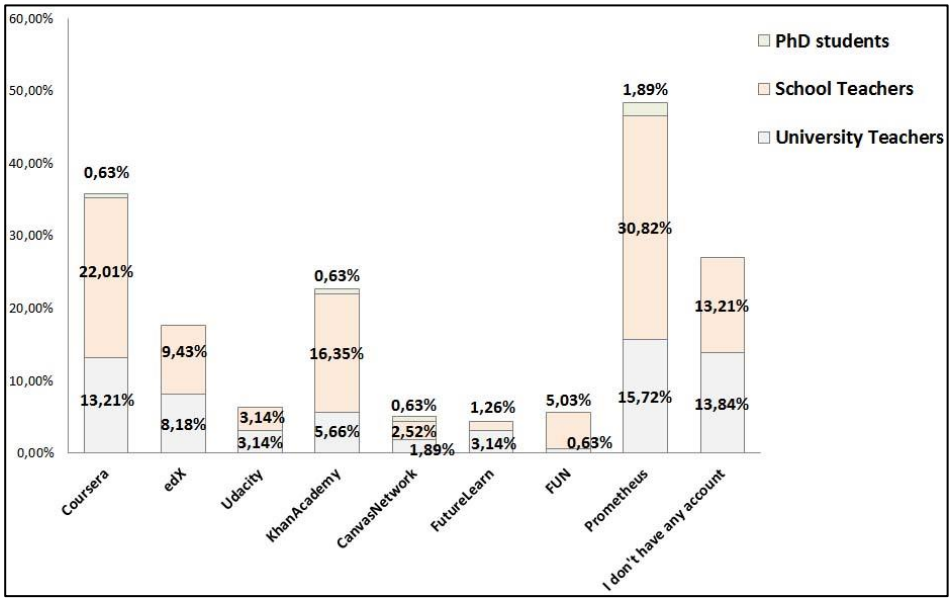

Figure 6. Survey responses on MOOC platforms usage

Source: Own work

Analysis of the MOOC platforms usage is shown that most respondents (48,43% of the participants) prefer using Prometheus (http://prometheus.org.ua). Prometheus is a Ukrainian project for developing MOOCs (Strutynska & Umryk, 2016, p. 302). One of the reasons of using this provider by Ukrainian educators is because all courses are in Ukrainian.

Area 2. ***Digital Resources***

Digital Competence 2.1. ***Selecting digital resources***

Q*.: Which scientometric databases do you use to identify, assess and select digital resources for teaching and learning?*

Survey responses on scientometric databases usage to identify, assess and select digital resources are shown in Table 4 and in Fig. 7 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 4

Responses distribution on scientometric databases usage to identify, assess and select digital resources for teaching and learning

Scientometric databases	Responses
Google Scholar	67,92%
Web of Science	47,17%
Scopus	42,14%
Mendeley	5,03%
WorldCat	10,69%
Polska Bibliografia Naukowa	1,89%
Universal Impact Factor	11,32%
Research Bible	1,89%
Ukrainian scientific journals	37,11%
ERIH PLUS	1,89%
Socioindex	3,77%
Eurasian Scientific Journal Index	2,52%
Index Copernicus	27,67%
I do not know about any scientometric databases	20,13%

Source: Own work

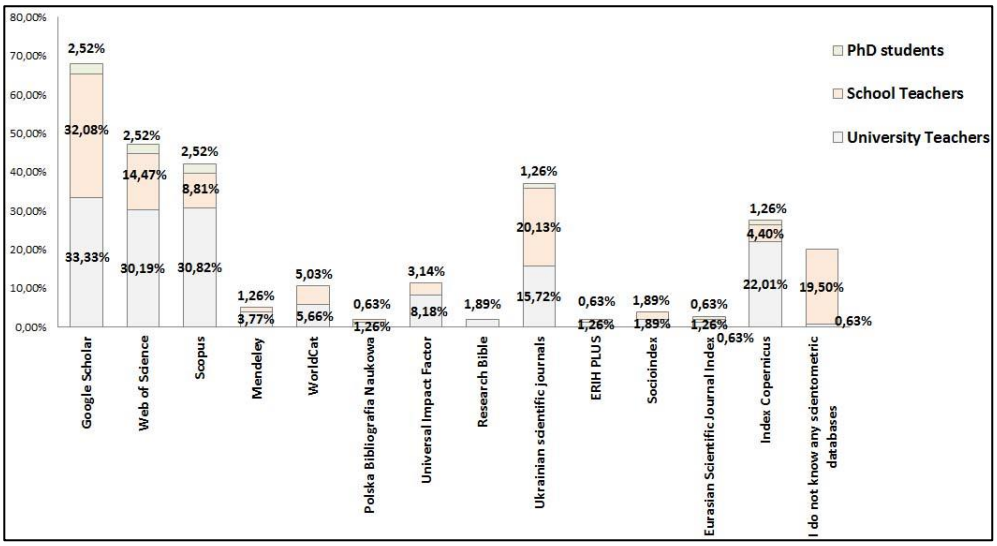

Figure 7. Survey responses on scientometric databases usage to identify, assess and select digital resources for teaching and learning

Source: Own work

Digital Competence 2.2. ***Creating and modifying digital resources***

Q*.: Which scientific portals do you use for creating and modifying digital resources?*

Survey responses on scientific portals usage for creating and modifying digital resources are shown in Table 5 and in Fig. 8 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 5

Responses distribution on scientific portals usage for creating and modifying digital resources

Scientific portals	Responses
Google Scholar	69,81%
Web of Science	13,84%
Scopus	11,95%
ResearchGate	5,66%
ORCID	23,27%
Mendeley	0,63%

Scientific portals	Responses
Academia.edu	10,69%
ResearchID	6,92%
MyScienceWork	0%
ERIH PLUS	0%
I do not have an account on any portal	23,9%
I do not know about any portal	6,92%

Source: Own work

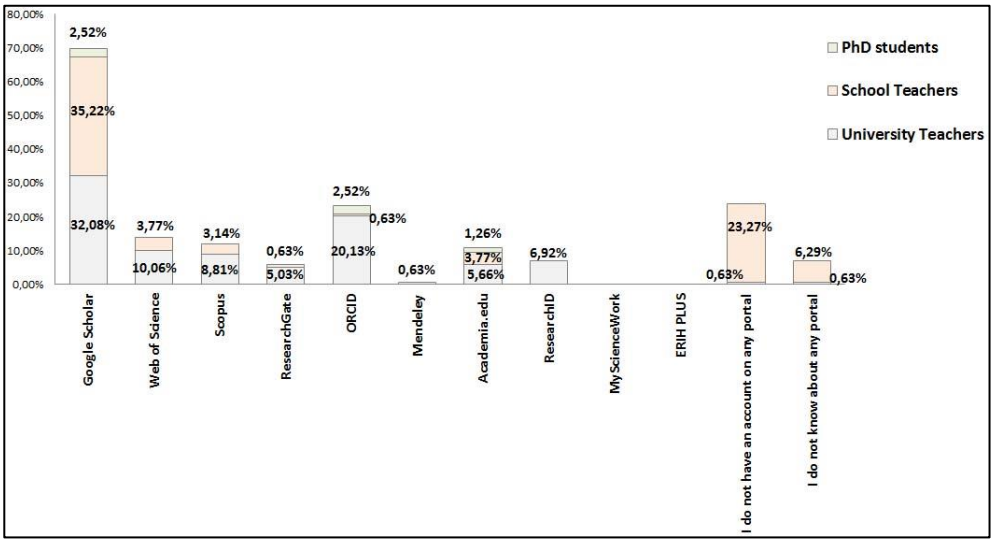

Figure 8. Survey responses on scientific portals usage for creating and modifying digital resources

Source: Own work

As we can see from Table 4-5 and Fig. 7-8 Ukrainian educators use Google Scholar to identify, assess, select, create and modify digital resources the most. This may be due to the fact that Google Scholar is the most popular scientometric databases in Ukraine.

Digital Competence 2.3. ***Managing, protecting and sharing digital resources***

Q*.: Which tools/sites do you use to share your digital resources?*

Survey responses on usage of tools/sites for sharing own digital resources are shown in Table 6 and in Fig. 9 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 6

Responses distribution on usage of tools/sites for sharing own digital resources

Tools/sites	Responses
Google Drive	78,62%
OneDrive	42,77%
Facebook	64,78%
F1000Research	0%
F1000Workspace	0%
ORCID	14,47%
ResearchGate	5,03%
ScienceOpen	2,52%
Slideshare	13,21%
Prezi	28,3%
I do not use any of these tools	4,4%

Source: Own work

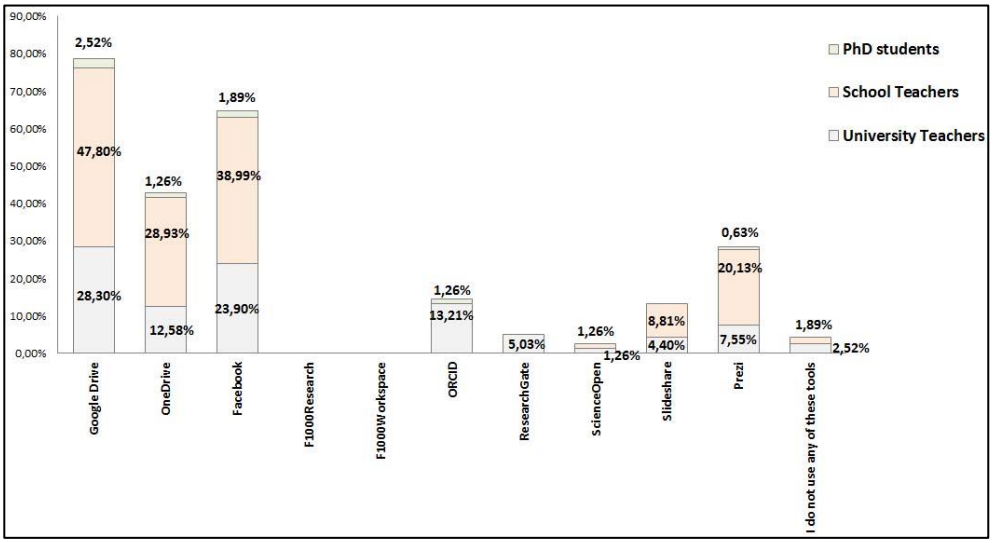

Figure 9. Survey responses on usage of tools/sites for sharing own digital resources

Source: Own work

The biggest group of respondents is University or school Computer Sciences teachers. As our Informatics curriculum at school is included of studying Google services that's why the Google Drive are used the most for sharing digital resources.

Besides the next large group of responses belongs to Facebook. This may be due to the fact that Facebook is a popular social network among students.

Area 3. ***Teaching and Learning***

Digital Competence 3.1. ***Teaching***

Q*.: Which innovative approaches do you use in your professional activity?*

Survey responses on innovative approaches usage in own professional activity are shown in Table 7 and in Fig. 10 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 7

Responses distribution on innovative approaches usage in own professional activity

Innovative approaches	Responses
Distance learning or its elements	66,67%
Blended learning or its elements	53,46%
MOOC or its elements	33,96%
Mobile or its elements	32,08%
STEM / STEAM	20,75%
Gamification of learning	20,13%
Social Networks	57,86%
I do not use any of these technologies	5,66%
I do not know about any of these technologies	0,63%

Source: Own work

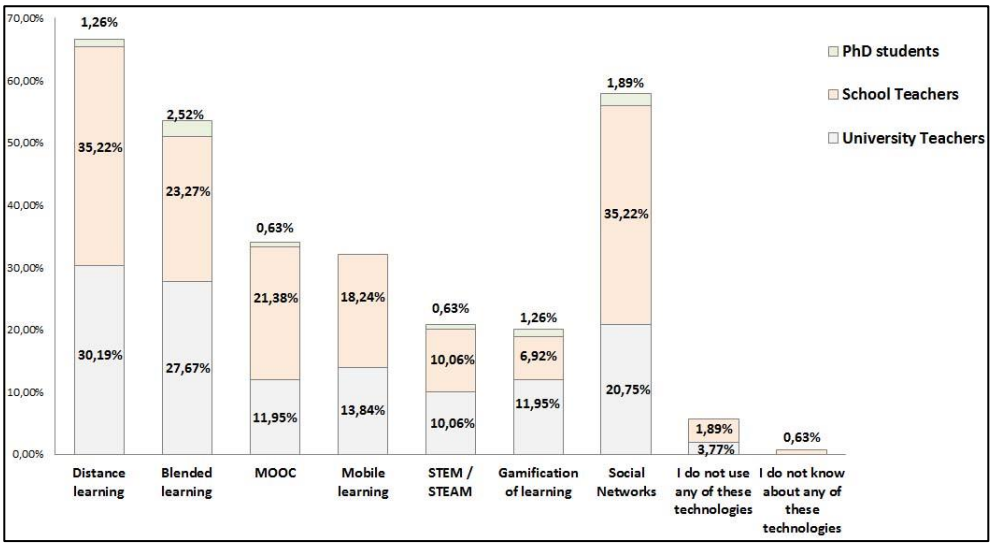

Figure 10. Survey responses on innovative approaches usage in own professional activity

Source: Own work

As we can see from Table 7 and Fig. 10 a lot of respondents use distance and blended learning or its elements. This may be due to the fact that large group of respondents relates with Computer Sciences field.

Digital Competence 3.2. *Guidance*

***Q**.: Which ICT tools, digital technologies and services do you use in your professional activity?*

Survey responses on usage of ICT tools, digital technologies and services in own professional activity are shown in Table 8 and in Fig. 11 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 8

Responses distribution on usage of ICT tools, digital technologies and services in own professional activity

ICT tools, digital technologies and services	Responses
Webinars and appropriate ICT tools	37,11%
Virtual boards and appropriate ICT tools	30,82%
ICT tools for survey and testing	62,26%

ICT tools, digital technologies and services	Responses
Mind maps and appropriate ICT tools	47,8%
Infographics and appropriate ICT tools	23,27%
ICT tools for creating e-books	19,5%
Word cloud and appropriate ICT tools	12,58%
Google Classroom	25,79%
I do not use any of these ICT tools	14,47%
I do know about any of these ICT tools	3,77%

Source: Own work

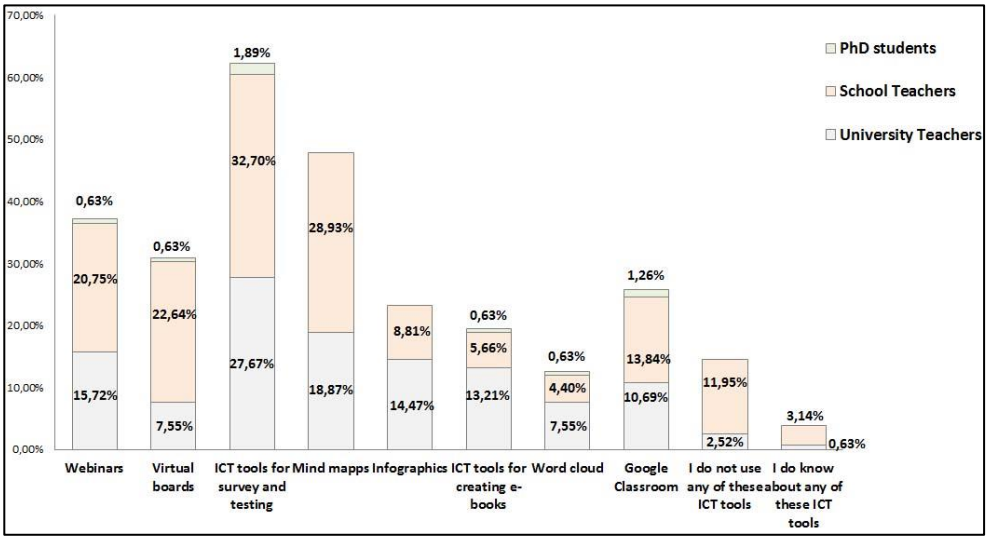

Figure 11. Survey responses on usage of ICT tools, digital technologies and services in own professional activity

Source: Own work

As we can see from Table 8 and Fig. 11 Ukrainian educators use ICT tools for survey and testing the most. That's why they need to improve present Digital Competence for further using ICT tools, digital technologies and services in their own professional activity.

Digital Competence 3.3 *Collaborative learning*

***Q**.: Do you think it is necessary to use digital technologies to foster and enhance learner collaboration?*

Survey responses on usage of the digital technologies to foster and enhance learner collaboration are shown in Fig. 12:

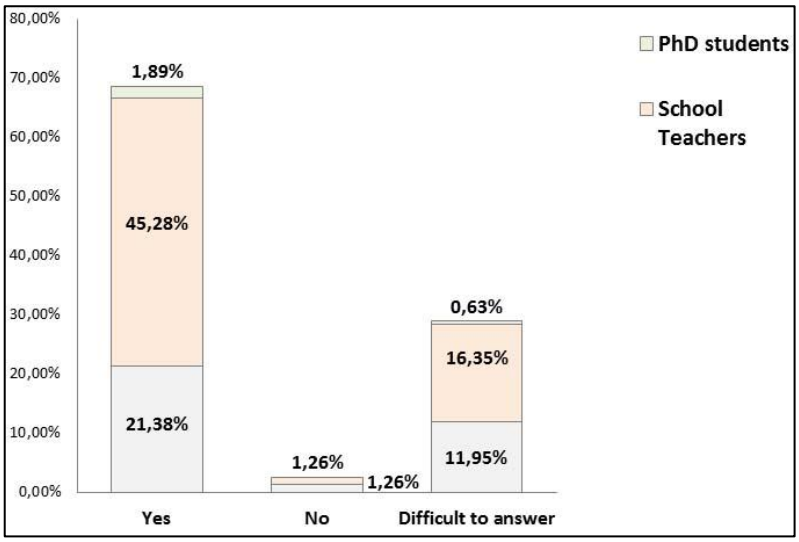

Figure 12. Survey responses on usage of ICT tools, digital technologies and services in own professional activity

Source: Own work

Large part of responses "*Difficult to answer*" may be due to the fact that respondents don't know about digital technologies to foster and enhance learner collaboration.

Area 4. *Assessment*

Digital Competence 4.1. *Assessment strategies*

***Q**.: Which ICT tools and digital technologies do you use in your professional activity for survey and testing?*

Survey responses on usage of ICT tools, digital technologies and services for survey and testing are shown in Table 9 and in Fig. 13 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 9

Responses distribution on usage of ICT tools, digital technologies and services for survey and testing

ICT tools, digital technologies and services for survey and testing	Responses
Google Form	76,1%
Kahoot	28,3%
Socrative	1,89%
Quizworks	2,52%
Gnowledge	0%
Monkey Survey	5,03%
ICT tools built into distance learning platforms	36,48%
I do not use any ICT tools for survey and testing	13,21%
I do not know about any of these ICT tools	2,52%

Source: Own work

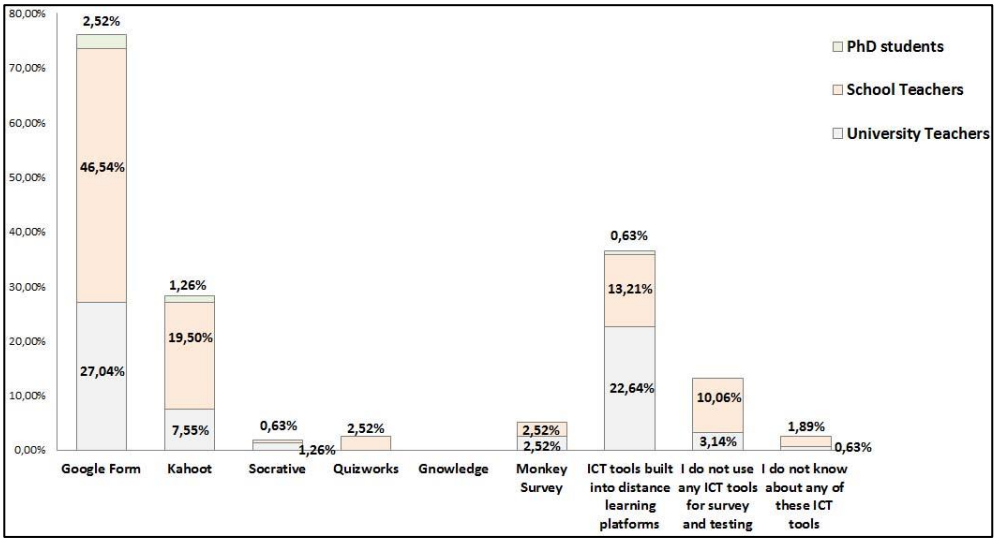

Figure 13. Survey responses on usage of ICT tools, digital technologies and services for survey and testing

Source: Own work

As we can see from Table 9 and Fig. 13 Ukrainian educators use Google Form for survey and testing the most. The reason of this fact is explained above.

Digital Competence 4.3. ***Feedback and planning***

***Q**.: Do you consider MOOCs as effective and needed technologies for feedback and planning?*

Survey responses on usage MOOCs as effective and needed technologies for feedback and planning are shown in Table 10 and Fig. 14 (scale from 1 – ineffective to 10 – effective and very needed):

Table 10

Responses distribution on usage MOOCs as effective and needed technologies for feedback and planning

Scale	Responses
1	1,88%
2	1,26%
3	3,14%
4	4,4%
5	15,09%
6	13,21%
7	18,24%
8	16,35%
9	15,72%
10	11,32%

Source: Own work

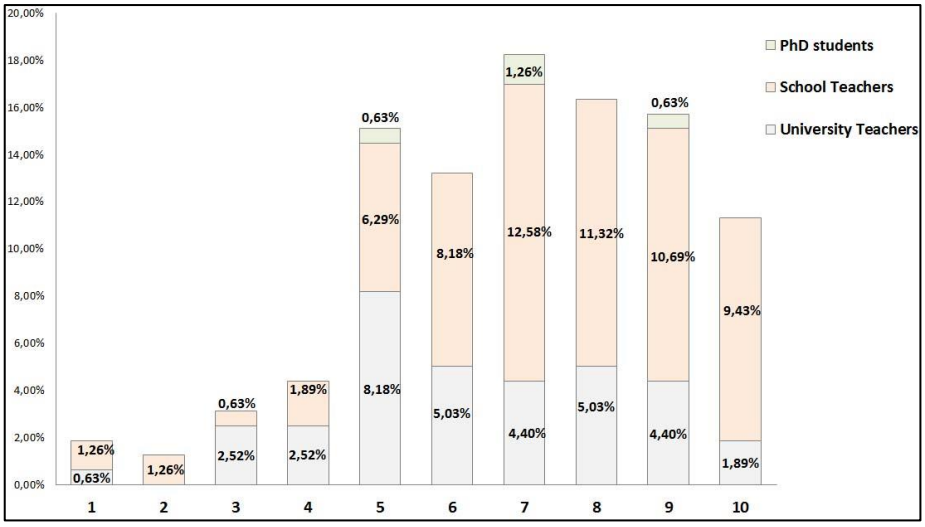

Figure 14. Survey responses on usage MOOCs as effective and needed technologies for feedback and planning *Source: Own work*

As we can see from Table 10 and Fig. 14 Ukrainian educators are ready to use technologies for feedback and planning. In our further research, we are planning to outline the ways how to improve their Digital Competences.

On the one hand, finding of the survey conducted shows that the Ukrainian educators need improvement of the development level of their Digital Competences. From the other hand, the survey's results also show that Ukrainian educators are ready to use digital resources, modern ICT tools and trends in their professional activity.

4. DISCUSSION

So, this paper addresses the following questions: analysis of development level of certain digital competences of the Ukrainian educators.

Last research question about the ways of increasing the development level of the Digital Competences according to **DigCompEdu** requires more details explanation.

Based on the research conducted, the authors could propose ways to improve development level of the digital competences according to **DigCompEdu** for different groups to the Ukrainian educators:

a. Make the Ukrainian educators aware of the EU Standards and Guidelines on Digital Competence Framework for Educators (for all the groups of the Ukrainian educators).

b. Increase of the awareness of the EU Digital Competence framework for educators:

- for PhD students (in the field of Education) – improve level of development level of the Digital Competences by updating of curriculum.

In 2017-2018, specially for Master students of Faculty of Informatics of the Dragomanov National Pedagogical University (future Computer Science Teachers), curriculum has been updated in accordance with the modern requirements to use of the digital resources, modern ICT tools and trends in their future professional activity. And the next update of the curriculum is planned for the bachelor students this year. Thus, the issue of the future educators concerning development of the digital competences will be resolved in accordance with **DigCompEdu**.

- for school teachers – level of development level of the digital competences by preparing and conducting of the seminars on work with ICT tools and digital resources. The next step is to create appropriated online courses.
- for University teachers – level of development level of the Digital Competences by encouraging them to take part in summer schools of

academic development, conference and international projects related with Digital Competences.

c. create questionnaire for target groups of the Ukrainian educators for self-assessment in the digital competence according to basic materials from **DigCompEdu**.

Also it needs more detailed examination of hypothesis of research about group 3 (Learners' digital competence) and unresearched elements of the abovementioned group 1 and group 2.

The authors plan the following activities in their further research on the development level of Digital Competences of Ukrainian educators:

- analysis of progression model "…linked to the six proficiency levels used by the Common European Framework of Reference for Languages (CEFR), ranging from A1 to C2…" (DigCompEdu, 2017, p. 28-29);
- preparation of survey for specifying development level of the certain Digital Competences according to proficiency levels of the progression model (from A1 to C2);
- development of the methods for improvement of the proficiency level of Digital Competence for each group of Ukrainian educators.

5. CONCLUSIONS

According to The European Commission's science and knowledge of service learning and skills are key contributors to the society and economy. As modern societies and economies are changing due to, amongst others, globalization and technological progress, a fundamental transformation of education and training throughout Europe is required to deliver the knowledge and skills needed for growth, employment and participation in the society. The teaching professions face rapidly changing demands, which require a new, broader and more sophisticated set of competences than before. The ubiquity of digital devices and applications, in particular, requires educators to develop their digital competence.

Improvement of development level of the Digital Competences is a new important trend in the modern education. This is the transformation of the educational process inside and outside of the educational institutions.

Findings of the conducted survey of the Ukrainian educators have shown the insufficient development level of their Digital Competences. However, the Ukrainian educators are ready to use digital resources, modern ICT tools and trends in their professional activity.

Our future work is to elaborate a new survey for the Ukrainian educators. In future experiments, we will study their proficiency level of the Digital Competences

(from A1 to C2). Also it is planned to consider ways of development of the Digital Competences level for group 3 (*Learners' competences*).

Continuation of the experimental process is a key issue for improving pedagogical education in Ukraine in general.

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