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ICT TOOLS AND TRENDS IN RESEARCH, EDUCATION AND SCIENCE: LOCAL SURVEY

Abstract. The article is considered the global trends in the field of modern ICT tools in research, education and science. It is proposed to examine the level of knowledge and skills scholars, educators in Ukraine about modern ICT tools and trends in research, education and science. For this aim authors have elaborated and implemented the questionnaire for Ukrainian PhD students, young researchers, University teaching staffs and teachers (target group) who needs to use ICT tools in their research and professional activity. The article is includes the analysis and comparing results of the similar research of the EU's scholars and educators. According to this research the authors proposed some ways of improving ICT competencies and research skills of the target group. The authors also offer the ways of improving teaching-learning process in the field of ICT competencies development during the training of future Computer Science teachers in the National Pedagogical Dragomanov University for prevention similar gaps in their future professional activity.

Keywords: ICT tools; ICT trends; MOOC; blended learning; STEM education; dual education; survey

Introduction. Since Ukraine has chosen the path of global and European integration, the development and deepening of contacts with other countries has become of particular importance. Nowadays many Ukrainian scholars, educators understand that expansion of international cooperation is a guarantee of success.

This paper is reviewed Ukrainian education and continuous training in the field of ICT competencies development according to the broadening of the European integration ideas.

Present research is to find out the level of knowledge and skills Ukrainian researchers, University teaching staffs and teachers about the use of the modern innovative learning technologies and ICT tools in research, education and science. These issues appropriate to the Ukrainian National Priorities of the Ministry of Education and Science of Ukraine in the Development of pedagogical education (Erasmus+ Ukraine, 2015).

Research goal is examining the level of knowledge and skills scholars, educators in Ukraine about modern ICT tools and trends in research, education and science. In future this research will consist of development of teaching activities for designing of the Ukrainian ICT competencies framework in accordance with the best European experience. Such activities are focused on the definition of learning courses, new teaching materials, website and distance course creation, and training within the ICT competencies framework according to the EU standards.

Paper is addressed the following questions:

- analysis of global trends in the field of modern ICT tools in research, education and science;
- elaboration the questionnaire for examining the level of knowledge and skills about modern ICT tools and trends in research, education and science;

- analysis and comparing our results with the Kramer's & Bosman's research results (2016) about innovations in scholarly communication. It related to research tools usage of the EU's and scholars and educators;
- consideration of the ways of improving teaching-learning process in the field of ICT competencies development during the training of future Computer Science teachers in the National Pedagogical Dragomanov University.

Hypothesis: taking into account quick development of ICT and educational technologies and tools, on the one hand, and European integration process in Ukraine, on the other hand, authors believe that improving of the activities for designing of the Ukrainian ICT competencies framework according to the best European experience will increase the level of international cooperation and efficiency of Ukrainian education in general.

Research methods. Authors have used the following research methods and tools for our investigation (during 2017):

- questionnaire;
- documents and content analysis;
- analysis of research papers;
- comparing of the research results.

127 Ukrainian researchers, University teaching staffs and teachers took part in this survey. The questionnaire was created during this project which purposed to gain data on the level of knowledge and skills of the Ukrainian scholars and educators about modern ICT tools and trends in research, education and science.

Analysis of the global trends in the field of modern ICT tools in research, education and science. According to the International Trends in Higher Education 2015-2017 years authors highlighted the following questions as:

- 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 STEAM Learning;
- Use Open Educational Resources (OER);
- Use Massive Open Online Courses (MOOCs).

Elaboration and implementation of the survey. Present research based on target group who needs to use ICT tools in their research and professional activity. This target group consisted of 127 Ukrainian PhD students, young researchers, University teaching staffs and teachers.

The online questionnaire was elaborated in Ukrainian using Google Forms for gaining data on the Ukrainian scholars and educators' views and attitudes towards various educational processes in their educational environments, entailing of using ICT in their research and professional activity. We guaranteed participants only anonymized data would be shared.

The questionnaire was open for 3-month period between April 20, 2017 and July 20, 2017. It contained information about modern ICT tools and trends in research, education and science.

The questionnaire included 22 questions divided on three groups:

- 2 on research role and research discipline;
- 5 on research tools usage (including on support of Open Science);

– 15 on using modern tools and trends in research, education and science (MOOCs, blended learning, STEM learning, dual education).

The respondents' distribution by research role is shown in Fig. 1:

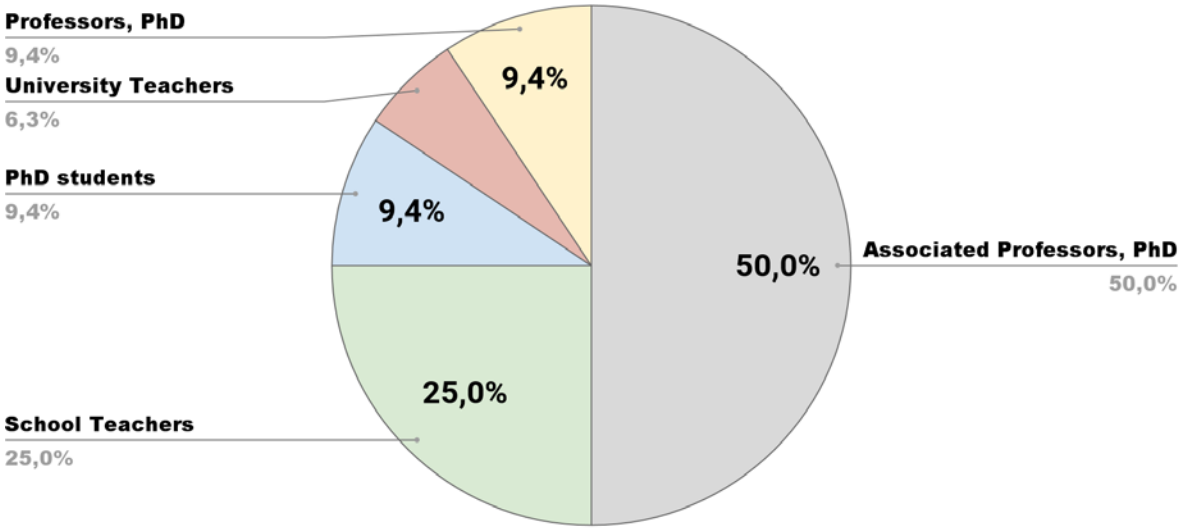

Fig. 1. Respondents' distribution by research role
Source: Own work

It is important to note that largest group of respondents are belonging to Computer Sciences and IT-related fields (68,8% of the participants). Survey responses by research discipline(s) are shown in Table 1 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 1
Responses distribution by research discipline(s)

Research discipline(s)	Responses
Computer Sciences	68,8%
Mathematics	21,9%
Natural Sciences (Physics, Life Sciences)	6,3%
Engineering & Technology	9,4%
Social Sciences	12,5%
Economics	12,5%
Philology	9,4%
Pedagogical Sciences	9,4%

Source: Own work

Analysis of the research tools usage by target group have shown that most respondents (75% of the participants) prefer using Google Scholar scientific portal for sharing papers, asking and answering questions, and finding collaborators. One of the reasons of this is because Ukrainian researchers can use Ukrainian version of the Google Scholar. Part of the

respondents don't have registration on any proposed scientific portals at all (21,9% of the participants). The data about some research tools usage are presented in Tables 2-3 and Fig. 2-3 below.

***Q**.: What kind of scientific portal do you use and have an account?*

Survey responses on scientific portals usage are shown in Table 2 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 2

Responses distribution on scientific portals usage

Scientific portal	Responses
Google Scholar	75%
ResearchGate	21,9%
ORCID	34,4%
Mendeley	3,1%
Academia.edu	12,5%
ResearchID	12,5%
Don't have any accounts	21,9%

Source: Own work

Survey responses on scientific portals usage distributed by research role are shown in Fig. 2 (multiple answers are possible, that's why the total responses can be more than 100%):

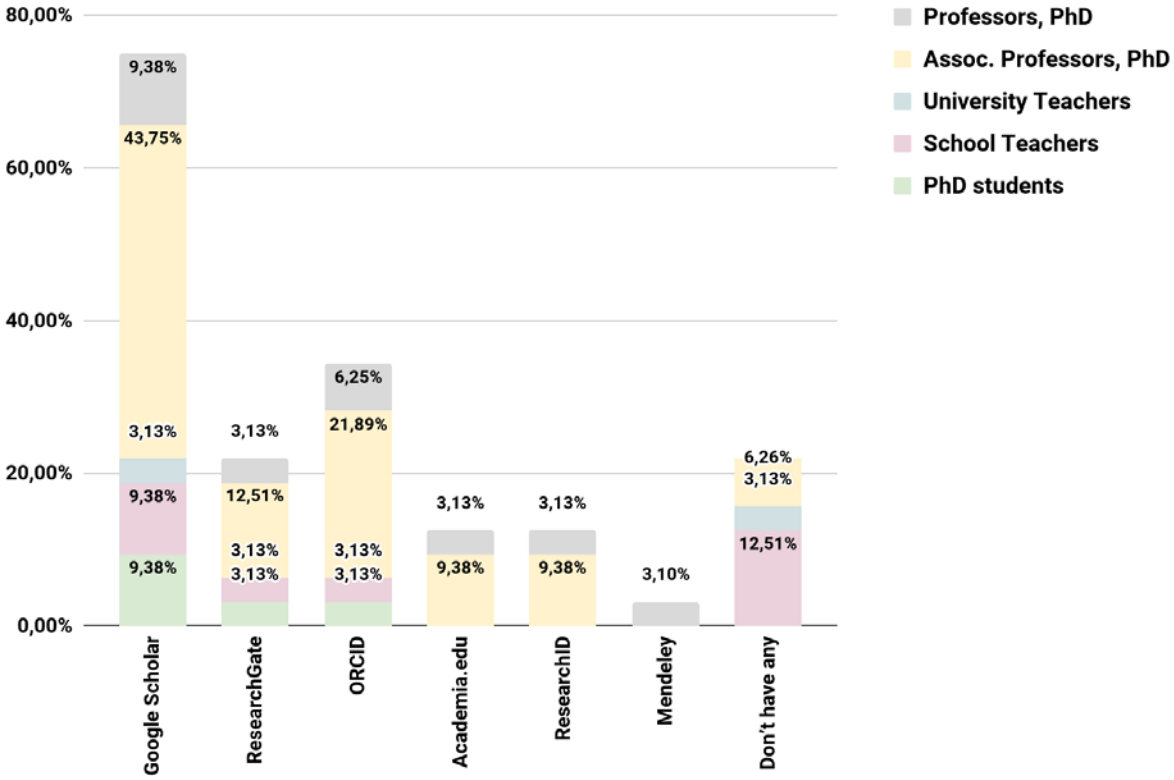

Fig. 2. Survey responses on scientific portals usage distributed by research role

Source: Own work

***Q**.: What kind of tools do you use for collaboration and sharing your research?*

Survey responses on using tools for collaboration and sharing research are shown in Table 3 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 3

Responses distribution on using tools for collaboration and sharing research

Tools for collaboration and sharing research	Responses
Google Drive	65,6%
OneDrive	25%
Facebook	53,1%
ORCID	25%
ResearchGate	9,4%
Slideshare	15,6%
Prezi	25%
Other tools	9,3%
Don't have any tools	21,9%

Source: Own work

Survey responses on using tools for collaboration and sharing research distributed by research role are shown in Fig. 3 (multiple answers are possible, that's why the total responses can be more than 100%):

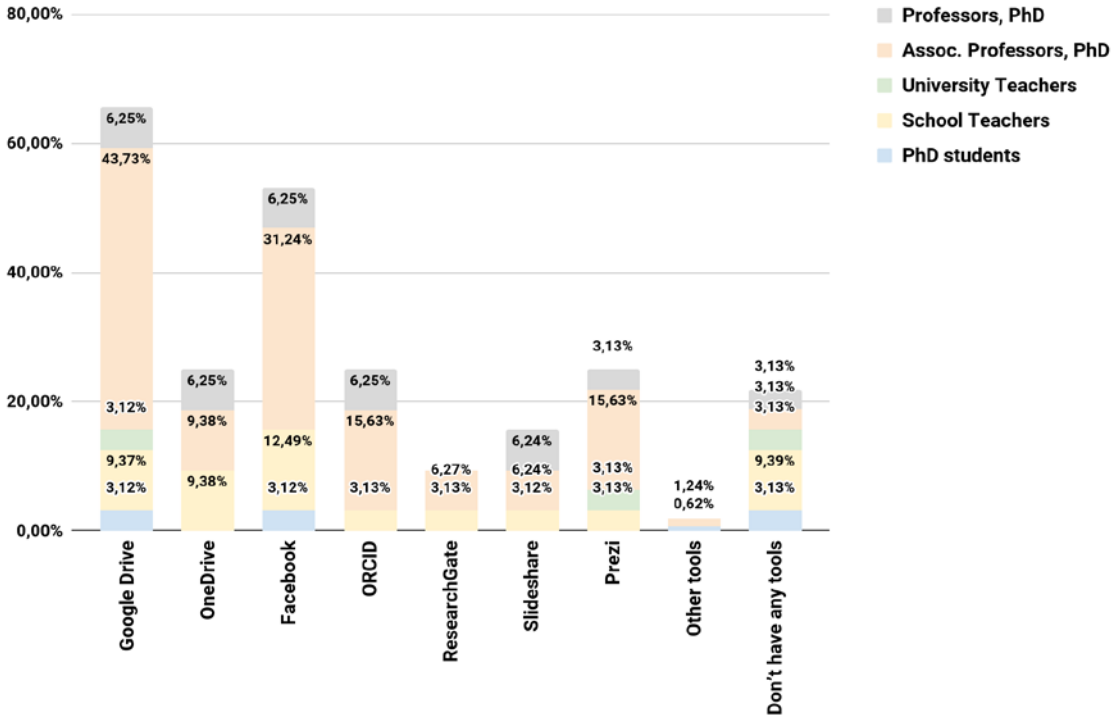

Fig. 3. Survey responses on using tools for collaboration and sharing research distributed by research role
Source: Own work

As we can see from Table 2-3 and Fig. 2-3 Ukrainian scholars and educators use Google tools the most. That's why they need to improve their knowledge and skills of using other tools for inclusion to global and European scientific environment.

The questions about using modern tools and trends in research, education and science we divided on four subgroups:

– MOOCs;
– blended learning;
– STEM education;
– dual education.

The data about using some modern tools and trends in research, education and science by Ukrainian scholarly and education community are presented in Tables 4 and Fig. 4-7 below.

Q*.: Do you use MOOCs in your professional activity?*

Survey responses on MOOCs usage are shown in Fig. 4:

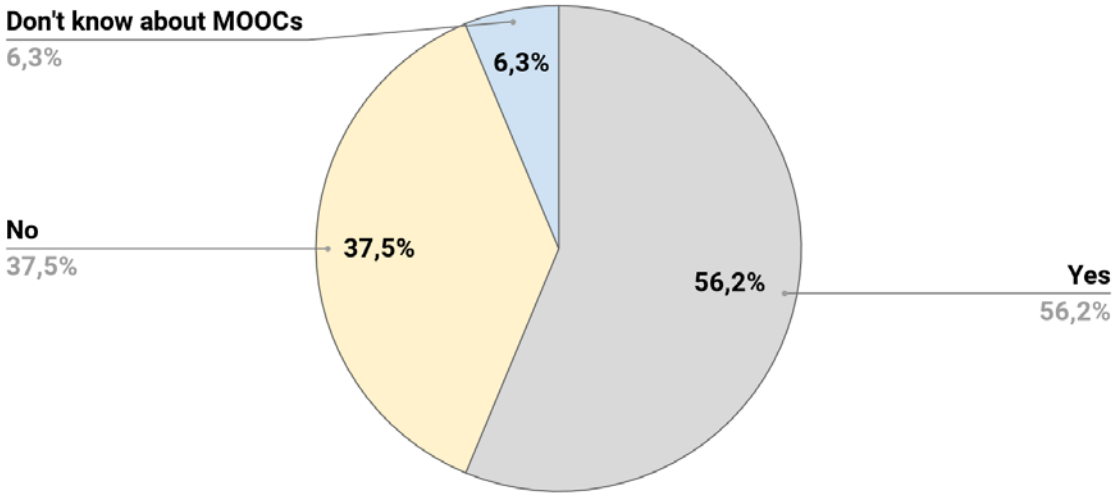

Fig. 4. Survey responses on MOOCs usage
Source: Own work

As we can see from Fig. 4 half of Ukrainian scholars and educators use MOOCs. They use MOOCs such ways as (multiple answers are possible, that's why the total responses can be more than 100%):

– improving own knowledge and skills (94,44%);
– the use in their professional educational activity (68,21%);
– elaboration own MOOCs (18,95%);
– by other reasons (2,11%).

Analysis of the use MOOCs distributed by providers has shown that most respondents (40,6% of the participants) prefer using Prometheus provider (http://prometheus.org.ua). Prometheus is Ukrainian project for developing of MOOCs (Strutynska & Umryk, 2016, p. 302). One of the reasons of using this provider by Ukrainian scholars and educators is because all courses are in Ukrainian (Strutynska & Umryk, 2017, pp. 160-161).

Survey responses distribution by using MOOCs providers are shown in Table 4 (multiple answers are possible, that's why the total responses can be more than 100%):

Table 4
Responses distribution by using MOOCs providers

Tools for collaboration and sharing research	Responses
Coursera	31,3%
edX	12,5%
KhanAcademy	18,8%
CanvasNetwork	6,3%
FutureLearn	12,5%
FUN	12,5%
Prometheus	**40,6%**
Other	3,1%
Don’t use any providers	34,4%

Source: Own work

***Q**.: What kind of blended learning models do you use in your professional activity?*

Survey responses on blended learning models usage are shown in Fig. 5:

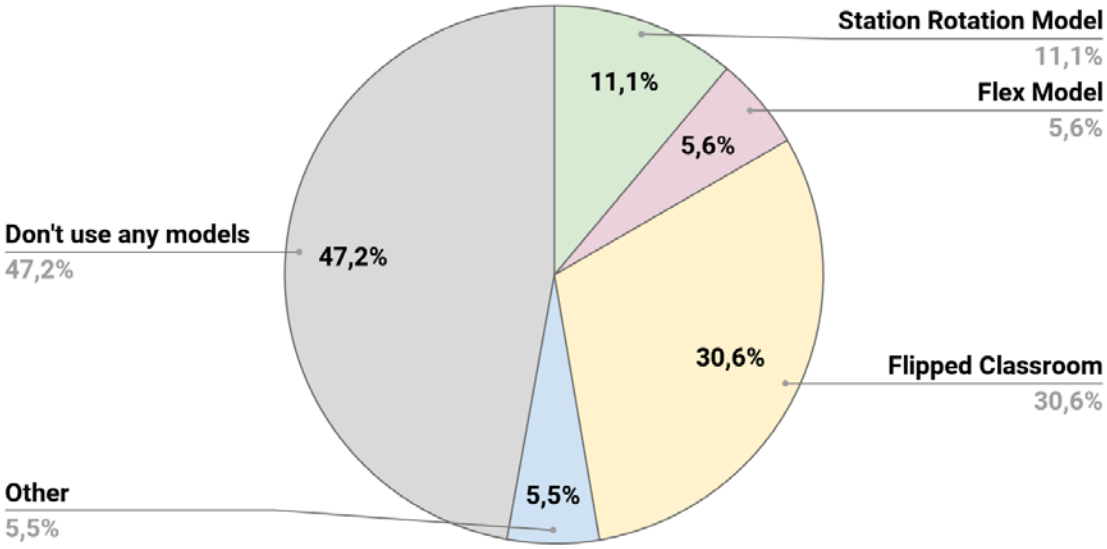

Fig. 5. Survey responses on blended learning models usage
Source: Own work

Analysis on blended learning models usage has shown that most respondents don’t use any models (47,2% of the participants). This may be for various reasons. In particular, it’s because 43,8% of all respondents from target group don’t know about this trend.

***Q**.: Do you think it is necessary to implement STEM education into Ukrainian schools?*

Survey responses on STEM education usage are shown in Fig. 6:

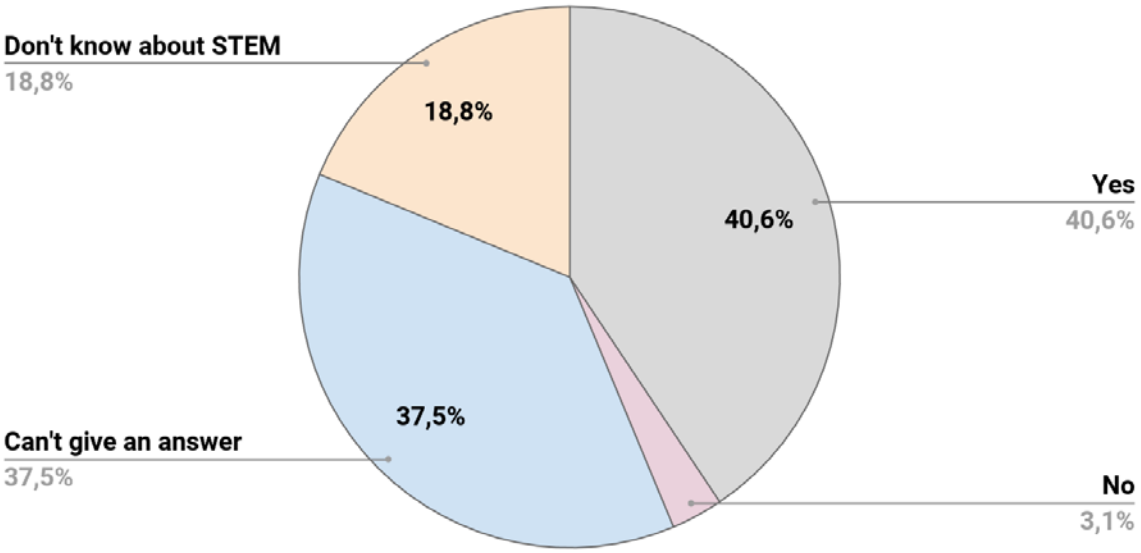

Fig. 6. Survey responses on STEM education usage in Ukrainian schools
Source: Own work

Analysis on these data has shown that probably most respondents don't have enough information about STEM education, because 18,8% of the participants don't know about STEM and 37,5% can't give an answer this question (56,3% total).

One of the most important questions for future Higher Education development in this questionnaire was one about dual education. Dual education is a combination of theory in Higher Education Institution and practice at the enterprise. This trend is one of the top priorities for Ukrainian students and enterprises.

***Q**.: Do you think it is necessary to implement dual education into Ukrainian Higher Education Institution (HEI)?*

Survey responses on dual education usage are shown in Fig. 7:

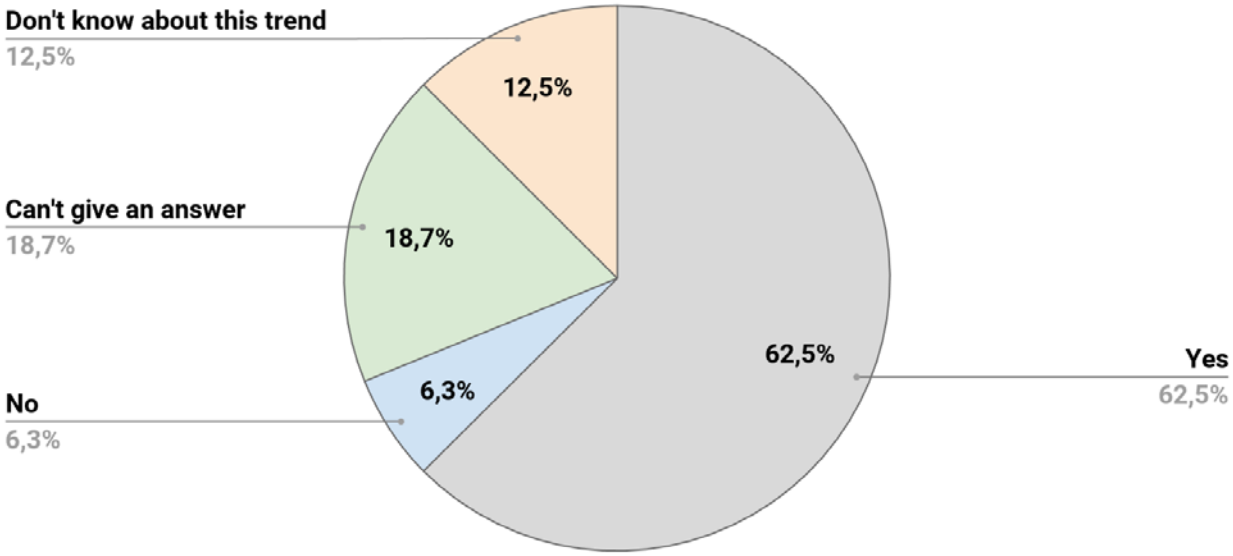

Fig. 7. Survey responses on dual education usage in Ukrainian HEI
Source: Own work

As we can see from Fig. 7 most respondents support of implementation of dual education in learning process of HEI in Ukraine. Nowadays this process is also supported by Ministry of Education and Science of Ukraine.

***Q**.: What is the ratio of traditional (face-to-face learning) and computer-based learning (distance, online, blended learning, etc.) you think is optimal for the learning process?*

This question was open question. The most popular answers are following:
- ratio of 30% face-to-face learning to 70% computer-based learning;
- ratio of 40% to 60%;
- ratio of 50% to 50%;
- ratio of 60% to 40%;
- ratio of 70% to 30%.

It is seen that Ukrainian scholars and educators are ready to use modern ICT tools and trends in their professional activity.

Analysis and comparing results of the similar research of the EU's scholars and educators (Kramer & Bosman, 2016) have shown that EU community uses more innovative and traditional tools in their professional activities. Authors believe that update of the methodological approaches to the retraining Ukrainian scholars and educators will increase their level of knowledge and skills about the use of the modern innovative learning technologies and ICT tools in research in general.

Conclusions and future work. The level of knowledge and skills of target group about the use of the modern innovative learning technologies and ICT tools in research, education and science need improving according to the questionnaire results.

Basing on the experience gained in this research and on the feedback received from target group, authors are planning a scenario for the next ways of improving the level of knowledge and skills of Ukrainian scholars and educators about modern ICT tools and trends in research, education and science:
- analysis and adaptation of the best European practices about the use of the modern innovative learning technologies and ICT tools in research, education and science for training Ukrainian researchers, University teaching staffs, teachers, PhD students and students;
- create new academic course(s), website(s) and distance learning course(s) about the use of the modern innovative learning technologies and ICT tools in research, education and science according to the EU experience for Ukrainian researchers, University teaching staffs, teachers, PhD students and students;
- inclusion of some units into the existing university courses for implementation of the best European practices of the ICT competencies development in Ukraine;
- elaboration of interactive resources and tools (teaching materials, website and distance learning course) in the above mentioned field for universities in Ukraine;
- design of new methodology for shaping and developing of the ICT competencies framework according to the EU standards for the target groups in Ukraine.

The authors also offer to improve teaching-learning process in the field of ICT competencies development during the training of future Computer Science teachers in the National Pedagogical Dragomanov University for prevention similar gaps in their future professional activity.

We also suggest increasing the level of knowledge and skills of Ukrainian researchers, University teaching staffs and teachers about the use of the modern ICT research tools for interdisciplinary cooperation between Ukrainian and EU Universities.

Our future work is to adapt present survey for Ukrainian students, in particular future teachers. In future experiments, we will study their level of knowledge and skills about the use of the modern innovative learning technologies and ICT tools in research, education and science. Continue the experimentation process is a key issue for improving of pedagogical education in Ukraine in general.

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