

E-learning Managers Training at Universities: Projection, Design and Efficiency Indicators

Nataliia Morze¹, Oksana Buinytska¹, Olena Glazunova², Olena Kuzminska², Galyna Protsenko¹, Iryna Vorotnykova¹

¹ Borys Grinchenko Kyiv University, Kyiv, Ukraine,

(n.morze, o.buinytska, g.protcenko, i.vorotnykova)@kubg.edu.ua

² National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine,

(o-glazunova, o.kuzminska)@nubip.edu.ua

Abstract. The article offers the theoretical-and-methodic aspects and practical experience outcomes of implementing the master's specialization «E-learning management» for the students of pedagogical specialities of the University, which forms professional competences in the field of innovative methods, Web-services 2.0, e-learning expertise, projecting of e-environment, IT-infrastructure management, as well as develops Soft skills. It suggests the solution of the specialists' training, who will have an ability not only to use ICT in their academic activities, but will also master the competences of e-learning. The article features the model of professional competences of e-learning manager, the content of the training program, methods, forms and training tools, efficiency indicators, and outlines the directions of research results dissemination.

Keywords. Competence education, Management of e-learning, Professional competence of e-learning manager, Soft skills, Information educational e-environment.

Key Terms. Educational Process, Information Communication Technology, Educational Process, Teaching Methodology

1 Introduction

Information and communications technologies (ICT) have become an important impact factor on politics, economics, educational and social spheres of any country.

The research results testify to the fact that nowadays the majority of higher educational institutions (HEIs) are implementing e-learning [1]. The Universities have IT-infrastructure [2, 3], e-libraries, e-research centers (e.g., <http://www.oerc.ox.ac.uk/>),

e-environments are being developed [4] the issues of e-learning specialists training, e-sciences, e-democracies, implementation of e-management approach at the university environment are being studied [5].

At the same time, not enough attention is paid to the teachers training regarding the effective e-learning implementation into the educational process with the aim of ensuring quality of education. Future teachers receive an episodic ICT training and training of applying ICT in the educational process.

The topical task of many HEIs is training specialists, who do not only possess professional competences, but also can:

- analyze market offers of accessible information systems and technologies of building and developing the IT-structure and information educational e-environment;
- test, implement and assess IT-technologies for the e-learning system;
- choose forms and tools of presenting educational e-content;
- elaborate instructions as regards the use of electronic resources and e-content;
- organize the educational process based on using information educational e-environment and assess its efficiency;
- effectuate the monitoring of usage and satisfaction of the educational process participants by the components of the information educational e-environment;
- manage the educational process through the usage of resources of information educational e-environment for the provision of high-quality educational services [6], etc.

The solution to the problem of the efficient teacher training towards future professional activities under the conditions of educational process informatization may lie in the implementation of corresponding specialized Master's programs. The aim of the present article is to substantiate and analyze results of the experimental study by means of implementing "E-learning management" into the educational process of Master's specialization, conducted on the basis of Borys Grinchenko Kyiv University.

2 Literature Review

The E-Learning Competency Framework for Teachers and Trainers contains 10 groups of competences, which should be formed for the effective use of ICT [6]. Among them: preparation for the training sessions, students' support, student's progress assessment, learning environment management, participation in the organization of teaching process, management of the personal professional development, communication.

The majority of researchers in the field of e-learning implementation pay attention to the students' training to use IT. For example, Keengwe & Kidd [7] generalize best E-learning practices; Weigel [8] defines in what way the instructor may help the students to develop skills in the sphere of scientific researches, problem solution, critical thinking and knowledge management by means of web-tools for the common work by using virtual spaces, "knowledge rooms", in which the students cooperate.

At the same time the researchers in the sphere of ICT usage in the educational process pay attention to the problem of staff training for the organization of e-learning, including the corporate sector (e.g., <https://www.plotr.co.uk/careers/e-learning-manager/job-description/>). In particular, D. Cardos Vasile and A. Tiron-Tudor [9] defined, that one of the most important competences, that an e-learning manager should master, is the ability to manage the project on e-learning implementation as his continuous activity. Marisa Keramida [10] defines six top skills that e-learning managers should have: general understanding of e-learning functioning; sustention of e-learning in the relevant state in accordance with the tendencies in the field, leadership skills; communicative skills, assets management and resources placement; time management skills. Leadership, interpersonal, technical, presentation skills (soft skills) are defined among the e-learning project managers by the researcher P. Dhondi [11].

3 E-learning Managers Training: Preconditions and Realization

Research hypotheses it was assumed that the introduction of the master specialization "Management of e-learning", which forms the professional competence of future teachers of educational, technical, design, research activities using ICT, improves the quality of teacher training for the education system in conditions of informatization. The main tasks of research:

1. Theoretically substantiate and verify experimentally a model professional competences manager of e-learning.
2. Develop methodological principles of training e-learning managers, based on developed model of competencies (contents, methods, forms and tools).
3. Identify indicators of effectiveness of training future e-learning managers, to develop a system of competency tasks.

Authors' experience regarding the e-learning implementation, taking into account that Borys Grinchenko Kyiv University is the participant of European University Association, and analysis of the international and national experience form the basis for defining the peculiarities of e-learning managers training program, which [1]:

- is based on the world-wide approaches to the specialists training in the field of electronic learning, foresees the award of the corresponding documents to graduates (takes into consideration the experience of specialists training in different countries, in particular, in Poland, Slovakia, Portugal, the Czech republic, Russia, Spain);
- envisages learning of contemporary Internet-services, ways of managing the educational process on their basis, organization of the formal, non-formal and informal learning on the basis of contemporary ICT, implementation of pair, team project activities, defense of the Master's thesis in the form of a Start up;
- is based on competence principles;

- ensures the implementation of fundamentals of adaptive learning, formation of soft skills, and learning approaching the real “production” process.

To objectively define the effect and build a competence-based educational process by using project strategies, a Master’s model – e-learning manager through defining competences and their components [12] – was created:

1. Professional competences (pedagogical activities):
 - (a) Ability to use modern methods and technologies of the learning environment organization and realization, which envisage the use of ICT, on different educational levels in different educational institutions;
 - (b) Readiness to use modern technologies, which envisage the use of ICT, diagnostics and assessment of the educational process quality;
 - (c) Ability to form the educational electronic environment and use their skills in the process of realizing the tasks of innovative educational policy;
 - (d) Ability to supervise the research work of students by means of contemporary ICT;
2. Professional competences (research and development activities):
 - (a) Ability to analyze the results of scientific researches and apply them in the process of solving specific educational and research tasks, including the ICT-based;
 - (b) Readiness to apply individual creative abilities for the unique research tasks solving by applying contemporary ICT;
 - (c) Readiness to independent scientific research by applying cutting edge science methods and ICT;
3. Professional competences (methodical activities)
 - (a) Readiness to the elaboration and realization of models, methods, technologies and means of learning, which envisage the use of ICT, to the outcomes analysis of their usage in educational institutions of different types;
 - (b) Ability to systematization, generalization and distribution of methods experience (national and foreign) and readiness to dissemination realization by means of contemporary ICT;
4. Professional competences (management activities)
 - (a) Readiness to study the state and potential of the managed system and its macro- and microenvironment by means of using the complex of strategic and operational analyses methods, including the ICT-based;
 - (b) Ability to research, project, organize and evaluate the realization of management process through the usage of innovative management technologies, which conform to general and specific regularities of the managed system development and envisage the use of ICT;
 - (c) Ability to organize the team work for the tasks solution of educational institution development, realization of research and development activities by means of contemporary ICT;
 - (d) Readiness to use individual and group technologies of decision making in the educational institution management, based on national and foreign experience by means of contemporary ICT;

5. Professional competences (project activities)

- (a) Readiness to the fulfillment of instructional design of the educational environment, including the electronic one, educational programs and individual educational trajectories by means of contemporary ICT;
- (b) Ability to design forms and methods of education quality control as well as different types of test-and-measurement materials, including the IT-based ones;
- (c) Readiness to design new educational content, technologies and specific methods of learning, which envisage the use of ICT;

6. Specific competences

- (a) Awareness of the ICT role in education and readiness to innovation initiation in the sphere of IT usage in the educational process;
- (b) Ability to use instructional technologies and means in the ICT-saturated educational environment;
- (c) Ability to the selection of effective ICT tools and services for building individual educational trajectories for those who study; affording access to full-value education of different categories, who study, according to their abilities, individual aptitudes and interests; for widening the possibilities of specialization for those, who study;
- (d) Ability to design balanced educational components based on IT-technologies application, conducting experimental approbation, further integration into the educational process;
- (e) Ability to use different approaches of social media in education via social interaction of students and instructors (teachers), understanding the possibilities and skills of social media application for the experience exchange increase among instructors (teachers);
- (f) Understanding the organization concept and managing the educational institution as an organization, that is constantly developing: the staff are constantly acquiring new knowledge and master new ICT, developing their abilities, thus, contributing to the institution success in general;
- (g) Understanding the significance of digital literacy for the society in general and education, in particular;
- (h) Knowledge of tools usage didactics and ICT services in specific subject fields;
- (i) Knowledge of methods of cost estimating for the realization of educational process.

Formation of professional competences is accomplished on the basis of complex approach, which includes: creation of favorable innovation-oriented educational environment and educational communications support system, improvement of the educational and research-and-development content, as well as the infrastructure of the educational institution. The University (www.kubg.edu.ua) has the above-mentioned preconditions for e-learning managers training:

- the curriculum and working programs of the discipline of this speciality are elaborated on the basis of e-learning manager competences (Fig. 1);
- the researchers who are directly involved in this sphere are invited to teach in line with the program of e-learning managers training;

- the masters are selected by the specialities “High School Pedagogy”, “Primary education”, “Preschool education” to study by the specialization “E-learning management”;
- the hybrid cloud-oriented educational environment is formed, which includes e-courses (EEC – electronic educational courses) on the platform LMS Moodle, corporate accounts in Microsoft and Google clouds, access to tools and services, which are the subject matter [13], in particular, services for the organization of independent and individual work, establishment of educational communication, creation of electronic didactic materials, control and diagnostics of students’ academic progress, tools of organizing independent research activities, common applications and virtual classrooms.

During training the students are offered to master four key disciplines (Table 1). Formation among the students of not only defined professional and specific competences, but also personal characteristics and skills of interpersonal cooperation (soft skills) was carried out based on the embedded model [14]. Teaching by this model does not need any additional resources – soft skills are formed in the process of holding discussions, brainstorming, team work activities, role games, organization of educational and social projects, holding work practice classes and practices in educational institutions, etc.

The structure of the curriculum for the Masters of the speciality “Preschool education”

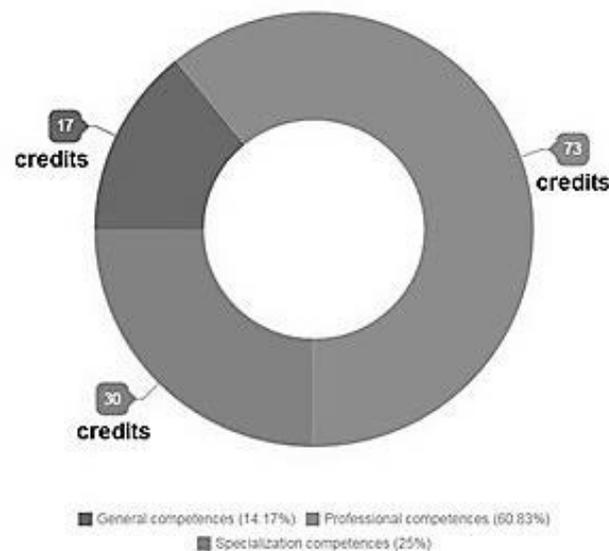


Fig. 1. The structure of the curriculum for the Masters of the speciality “Preschool education” (number of credits) (Source: Own work)

The tentative foundation of e-learning managers training within the framework of mastering the discipline “Electronic learning management” is offered as an electronic educational course (EEC), placed at LMS Moodle (Table 1).

For the critical assessment and processing of the course materials the students may use resources of the platform LMS Moodle, that is: (1) Forum (discussion, recognition of educational problems); (2) Test (achievement tests of the input knowledge of the students and assessment of the intermediate outcomes); (3) File, Hyperlink (visualization, instructions, additional data, etc.); (4) Pages (list of useful resources for studying); (5) Lesson (material learning, self-checks through tests); (6) Tasks (drilling of practical abilities and skills, experimental activities).

For the organization of the team work and establishment of communication not only the resources of centralized platform LMS Moodle (recommended by the University) were used, but also Google Apps cloud services (Fig. 2) and Microsoft Office 365 tools (Borys Grinchenko Kyiv University has corresponding license agreements).

Table 1. Recommended list of subjects of the curriculum of students training by the speciality “E-learning management”

№	Name of the subject / Code (URL-address EEC)	Credits / hours number	Title of the content module
1.	Internetics [15] and applied information technologies in education / DLC.1.01 (http://e-learning.kubg.edu.ua/course/view.php?id=2593)	8/240 (5 year, 1 term)	New information technologies in education Electronic learning as an example of innovation in education Electronic educational resources for the electronic education support Applied information technologies for the organization of educational process Electronic learning in corporate sector
2.	IT-infrastructure management of the educational institution / DLC.1.04 (http://e-learning.kubg.edu.ua/course/view.php?id=2636)	4/120 (5 year, 1-2 terms)	Design of IT-infrastructure Program-and-technological complexes for educational institutions ICT policy and IT-infrastructure of the educational institution Usage of cloud technologies for building IT-infrastructure of educational institutions
3.	Innovative methods, technologies and monitoring of the electronic education quality / DLC.1.02 (http://e-learning.kubg.edu.ua/course/view.php?id=	6/180 (5 year, 2 term, 6 year, 1 term)	Educational policy of the educational institution in the sphere of ICT use Educational technologies and scientific communication Basics of pedagogical design Monitoring and assessment of the electronic education quality Non-formal education and advanced training

	2682)		Team project
4.	Design and expertise of high technology information educational environment / DLC.1.03 (http://e-learning.kubg.edu.ua/course/view.php?id=2683)	6/180 (5 year, 2 term, 6 year, 1 term)	The notion of electronic information educational environment (IEE). IEE design of HEI. Design of IT-infrastructure and IEE components. Design of management procedures and processes of using IEE. Design of IEE quality assessment system in HEI
5.	Work practice (by the specialization) / PP.1.01	4,5/135	Program and outcomes (https://goo.gl/TXp8Rn)
6.	Qualification examination by the specialization / BA.1.01	1,5/45	

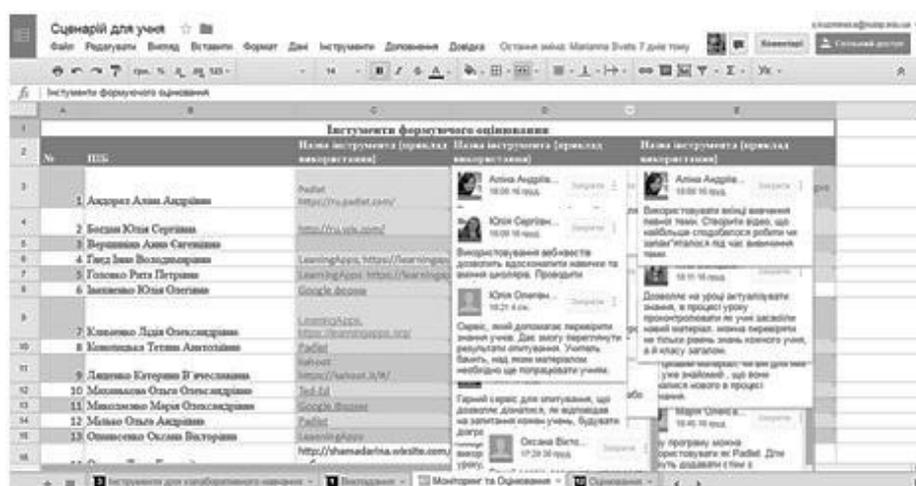


Fig. 2. The example of collaborative work of students using google-docs (Source: Own work)

At the same time the offered tools do not restrict the students, as the use of other social services allows the students to widen their personal educational environment and enrich it in the process of carrying out their research activities [16]. Selection of tools and services by the students was effectuated independently, based on the aim of educational activities and taking into account Pedagogy Wheel [17], also based on Top 200 Tools for Learning 2016 (<http://c4lpt.co.uk/top100tools/>) and the assessment of the selected services expediency was carried out by the SAMR-model [18].

For monitoring of the training level and students' readiness to study the disciplines of the mentioned specialization at the stage of input testing we defined basic knowledge, abilities and skills of working with office applications. Correction was

conducted during the term by way of additional training at Microsoft Imagine Academy, as well as providing additional training regarding the implementation of ICT into the pedagogical activities (Teaching with Technology Microsoft Imagine Academy). The students independently defined tasks and trajectory of non-formal education in MOOC [19].

The Masters had a chance “to check” the formation of professional and specific competences and soft skills during their working practice at the educational institutions. In particular, the tasks of practical preparation foresaw the ability to apply the acquired aptitudes and skills on information education expertise, preparation of recommendations on the improvement of ICT-policy of the educational institution, provision of recommended practices regarding the use of contemporary information technologies and services for the organization of pedagogical activities, etc. (<https://goo.gl/TXp8Rn>). The methods of survey and observation were applied for conducting reflection and monitoring of the formation of the above-mentioned competences of students.

The assessment of acquisition by the students of cognitive and communicative skills in the process of mastering the disciplines of specialization (Table 1) was effectuated by means of solving competence-based tasks, developing individual (e.g., compiling an e-textbook for the students, <https://goo.gl/z9sALC>) and team (e.g., creation of the knowledge map on the defined topic, <https://www.mindmeister.com/774227568?t=G9wXy1HfVL>) projects.

The technology of carrying out such projects foresaw specific stages activities, as a result of which the students developed communicative, interpersonal, leadership skills, skills of working in the team, and time management skills.

4 Approaches to the Creation of Competence Tasks for Conducting Attestation

Compilation of complex competence tasks, which combine knowledge and activity components [20], should comprise the following stages: content description of the problematic situation, backed by the earlier mastered knowledge or personal students' experience; formulation of demands, that define the primary and limit conditions of educational activities process; criteria elaboration of effective realization of the task fulfillment stages and outcomes of the activities; assistance in the form of a question, assignment or an exercise, aimed at the concretization of the described situation content, specification of the formulated demands, basic knowledge actualization and activation of associative and cause-and-effect ties, necessary for the search of ways of its solution; elaboration of instructions regarding the qualitative fulfillment of certain tasks (Fig. 3).

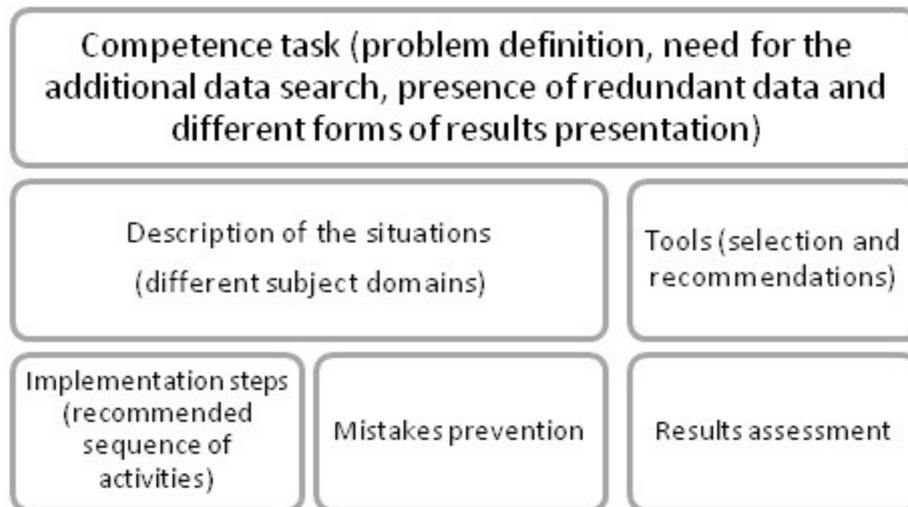


Fig. 3. The model of the complex competence task university (Source: Own work)

The problem-solving tasks of such a kind aim at conscious acquisition of knowledge and skills to form the strategy of solving complex competence tasks, to plan the process of solving, to monitor its accuracy and efficiency, to detect and correct mistakes. Depending on the level of generalization, such tasks may be subdivided into subject, group (in which pair-work or team-work is expected), interdisciplinary and fundamental ones. Under such conditions the students display their intellectual activity and independence both in the process of problem-solving tasks and in assessing (self-assessment, peer assessment) intellectual tasks and display ability to goal-setting, assessment, effective action and reflection.

To form such tasks the use of training practice taxonomy by B. Bloom will be expedient; such tasks are implemented by means of specially selected class assignments in accordance with 6 categories of learning goals: knowledge, comprehension, use, analysis, synthesis, assessment; organization of students' activities; ICT selection and use (e.g., <https://bloomstechtaxonomy.wikispaces.com/Bloom%27s+Digital+Taxonomy>).

It's important to take into consideration, that life competences should be also formed, namely: technological, communicative, readiness to use information resources, self-education, problem solving and social interaction [21] as well as soft skills. As for the latter one, the degree of skills acquisition from the category soft skills presents a problem for monitoring, checking and visual demonstration. Therefore, the authors used the model of professional activity of e-learning manager while selecting the content component of competence tasks. Thereby the students have a possibility to use different behavior models, integrally understand their personal and common interests, set priorities and make choices.

The example of a competence task, suggested for the final attestation, may be seen below.

Case (fundamental discipline “Innovative methods, technologies and monitoring of electronic learning”). The educational institution, in which you are having work practice, has just been awarded the access license to *G-Suit (Google Apps for Education)* and you are to participate in the organization of advanced training for teachers of this educational institution on the issue of effective ICT use in the educational/bringing-up process.

You conducted a survey among teachers (educators) to define the level of ICT-competence and their readiness to ICT implementation (according to UNESCO estimates, <http://iite.unesco.org/pics/publications/ru/files/3214694.pdf>) (Table 2.)

Table 2. Current state of ICT-competence and readiness of teaching staff to implement ICT

Category (number)	Generation (according to theory of generations)	ICT-Competence (according to UNESCO estimates, http://iite.unesco.org/pics/publications/ru/files/3214694.pdf)	Readiness to ICT implementation (based on survey results)
1. (3)	Baby boomers generation	-	Low
2. (3)	Generation X	ICT use	High
3. (4)	Generation X	Knowledge acquisition	Low
4. (2)	Generation Y	Knowledge creation	High

Design a curriculum of advanced training for these two categories of teachers, taking into account the peculiarities of the obtained project task. You need to:

- Formulate the goal and tasks, aims (specific, comprehensive and attainable);
- Define, which categories of students you are going to work with in the first place and ground your choice;
- Design a curriculum of advanced training: services and tasks forms of conducting the training (classroom, distance learning), recommended MOOC and communities for experience exchange.

Submit your result in a form of a structured text. Elaborate the structure of the document yourself.

Analysis of realization conditions (fundamental discipline “Management of the IT-infrastructure at the educational institution”): state the minimum content and characteristics of the equipment necessary for the effective use of ICT at the educational institution. Substantiate your suggestion.

The students, who completed competence tasks during their qualification examination, assessed the development of their personal professional competences in the pedagogical, research-and-development, methodical, project activities, alongside with the specific competences by the 4-point grading scale from 0 to 4 (<https://goo.gl/5nGiw4>). Simultaneously with them the same competences, achieved by the students, were assessed by their teachers. As a result the students’ self-assessment and teachers’ assessment were drawn to the mid-value, presented in Fig. 4.

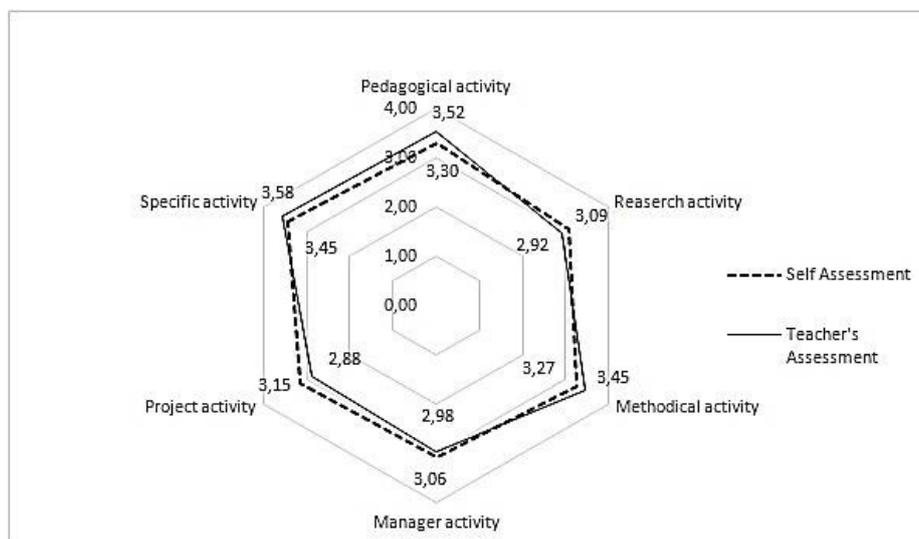


Fig. 4. Level of the students' mastery of professional competences (self-assessment and teacher's assessment) (Source: Own work)

The next check of statistic hypothesis about the equation of universe mean in the totality of two results by each type of competences (self-assessment and instructors' assessment) testified, that all totalities are distributed by the normal law of distribution. For each pair of universe mean the experimental value of Student's criterion meaning was calculated (e.g., for the group of competences on pedagogical activity $T=1.07$, $T_{cr}=1.96$ for the given degree of freedom 64 and $p \leq 0.01$, $T < T_{cr}$ and doesn't get into critical region). On the basis of carried out calculations the hypothesis about the equality of two universe means was established.

Accordingly, we should underline students' self-assessment adequacy concerning their mastery of acquired competences. Assessment results, on the one hand, gave an opportunity to analyze, which competences were employed in solving a competence assignment, and, on the other hand, demonstrated the level of students' mastery of different types of competences. It allows to modify the training in the process of studying academic disciplines by the speciality, for example, to pay attention to the formation of research-and-development competences, managerial competences, which are of crucial importance for the future e-learning managers, who should not only create and correctly use ICT in the e-learning from the methodical perspective, but also organize the process of e-learning, study the efficiency of implementing innovative methods into the teaching and learning process.

5 Training Outcomes by the Speciality

The pedagogical experiment on the implementation of a new specialization "E-learning management" for Master's specialities "Primary education", "Preschool edu-

“High School Pedagogy” was held at Borys Grinchenko Kyiv University. Prior to the beginning of their studies by the speciality “E-learning management” the students assessed their computer technologies skills according to 9 groups; the assessment also took place after training (Fig. 5).

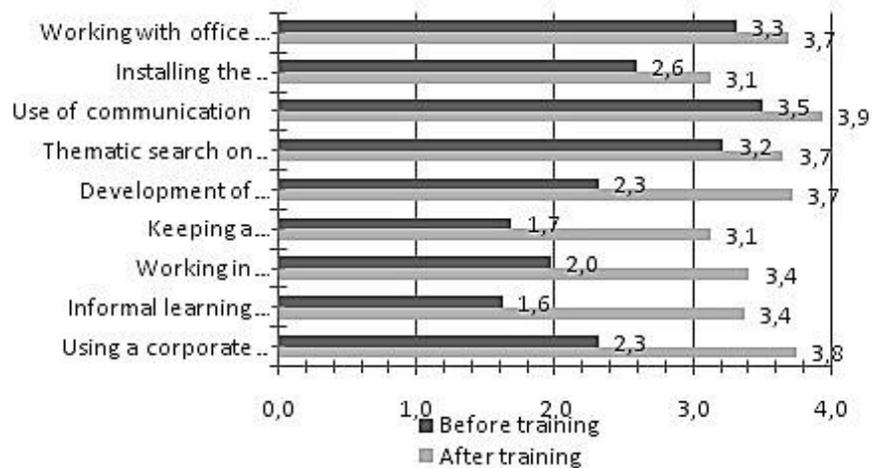


Fig. 5. Chart of students' computer technologies skills before and after training (Source: Own work)

The hypothesis about the equation of universe mean in the totality of two results was calculated based on Student's criterion. The absolute mid-value in the first totality (before training) constitutes 2,50 points (by the 4-point grading scale from 0 to 4), and in the second totality (after training) it constitutes 3,53 points. The calculated experimental mean of Student's criterion is $T=5.1$, $T_{cr}=1,96$ (the given degree of freedom is 64). $T > T_{cr}$ gets into the critical region. Thus, the hypothesis about the equation of universe mean is rejected. Accordingly, we may state the increase of the level of students' computer technologies skills mastery by more than 25%. The students made a considerable progress in mastering ICT-competences necessary for their professional activities. We should lay emphasis on their ability to keep a blog, develop didactic e-materials, work in professional on-line networks, select innovative learning methods, evaluate e-resources and e-content, think critically, etc.

We conducted a students' survey to define which learning methods, forms and technologies contributed to their progress; results are shown in chart (Fig. 6). Preference was given to the opportunity to receive a tutorial from lecturers, followed by their own practice, project work and tasks. In their commentaries the students noted, that practically-oriented and project tasks belonged to the most effective methods of the development of their professional competences.

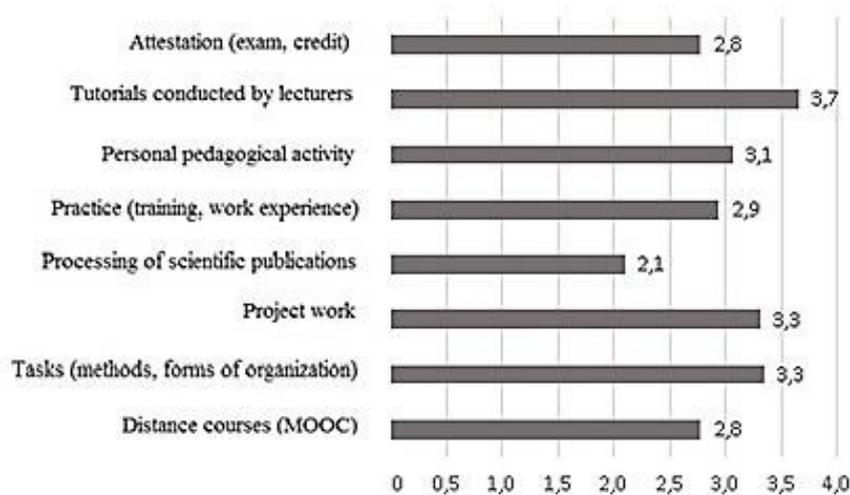


Fig. 6. Assessment chart of forms and methods of working with students during training
(Source: Own work)

The reflection on completing the course by the speciality “E-learning management”, in the process of which the students were offered competence tasks and methods of their solution, testify to the considerable increase of students’ skills, which are referred to the category “soft skills”:

- ability to manage their time, set goals, set priorities – by 23%;
- ability to use contemporary ICT for solving problems and set tasks – by 35%;
- communicative abilities, team work – by 25%;
- leadership skills – by 18%;
- ability to present their ideas and outcomes – by 21%;
- project management skills – by 28%;
- cognitive skills, creative thinking – by 16 %

6 Conclusions

Analysis of the research results testifies to the significant effect of the implemented speciality “E-learning management” within the framework of Masters’ training by the specialities “Preschool education”, “Primary education” and “High School Pedagogy”.

The competence model for the specialization “E-learning management” is elaborated, and its components are defined in the pedagogical, research-and-development, methodical and project activities.

The level of mastering professional competences within the period of training increased by more than 25%, and the mid-value by the 4-point grading scale is 3,22 points. Practically-oriented and project tasks proved to be the most effective methods

of learning for this speciality. Results of the work experience and qualification examination, which were held based on competence tasks, give us an opportunity to draw a conclusion about the qualitative Masters' training as for their professional activity at educational institutions. The students demonstrated thorough understanding of the tasks, knew how to use necessary tools and services, teaching methods, and recognized the principles of information educational environment structure, IT-infrastructure of the educational institution. These results confirm the hypothesis of research.

Best practices of implementing the specialization "E-learning management" is worth spreading to all pedagogical specialities, which will enable more intense implementation of innovative technologies in preschool institutions, secondary schools and higher educational institutions.

References

1. Gaebel, M., Kupriyanova, V., Morais, R., Colucci, E.: E-learning in European Higher Education Institutions: European University Association. Results of a mapping survey conducted in october-december 2013. http://www.eua.be/Libraries/publication/e-learning_survey (2014)
2. Bykov, V. Y.: ICT-outsourcing and new functions of ICT departments of educational and scientific institutions (in Ukrainian): Information Technologies and Learning Tools, vol. 4(30), pp. 135-152. <http://journal.iitta.gov.ua/index.php/itlt/article/view/717/529> (2012)
3. Spivakovskiy, O. V., Vinnyk, M. O., Tarasich, Y. H.: University ICT infrastructure construction: problems and solutions (in Ukrainian): Information Technologies and Learning Tools, vol. 1 (39), pp. 99–116. <http://journal.iitta.gov.ua/index.php/itlt/article/view/996> (2014)
4. Morze, N., Kuzminska, O., Protsenko, G.: Public Information Environment of a Modern University: ICT in Education, Research and Industrial Applications: Integration, Harmonization and Knowledge Transfer. CEUR Workshop Proceedings, pp. 264–272. <http://ceur-ws.org/Vol-1000/ICTERI-2013-p-264-272.pdf> (2013)
5. Muzhir, Al-Ani: E-University Environment Based on E-management: International Journal of Computational Engineering Research, vol. 05(04), pp. 1-6. https://www.researchgate.net/profile/Muzhir_Al-Ani/publication/275462223_E-University_Environment_Based_on_E-management/links/553cb6fd0cf29b5ee4b8aa06.pdf (2015)
6. The eLearning Competency Framework for Teachers and Trainers, European Institute of E-Learning, <http://www.eife-l.org/competencies/ttframework> (2010)
7. Keengwe, J., Kidd, T.: Towards best practices in online learning and teaching in higher education: Journal of Online Learning and Teaching, vol. 6(2), 533 p. (2010)
8. Weigel, V.: Deep Learning for a Digital Age: Technology's Untapped Potential To Enrich Higher Education: Jossey-Bass, 169 p. <https://eric.ed.gov/?id=ED457787> (2002)
9. Cardos, Vasile D., Tiron-Tudor, A.: Managerial skills of an e-learning manager: Annals of Faculty of Economics, Vol. 4 (1), pp. 135-140. <http://EconPapers.repec.org/RePEc:ora:journl:v:4:y:2009:i:1:p:135-140> (2009)
10. Keramida, M.: Top 6 Skills Of An Outstanding eLearning Project Manager. <https://elearningindustry.com/top-6-skills-outstanding-elearning-project-manager> (2016)

11. Dhondi, P.: Skills of a Successful E-learning Project Manager. <http://blog.commlabindia.com/elearning-design/skills-of-elearning-project-manager> (2014)
12. Morze, N., Balyk, N., Smirnova-Trybulska, E.: The analysis of foreign and domestic training programs for managers of e-learning EDUKACJA HUMANISTYCZNA: Pedagogium, Vol. 2 (31), pp. 123-138. <http://wshtwp.pl/eh-2014-2/> (2014)
13. Glazunova, O., Voloshyna, T.: Hybrid Cloud-Oriented Educational Environment for Training Future IT Specialists: Information and Communication Technologies in Education, Research, and Industrial Applications, Communications in Computer and Information Science, Vol. 1614, pp. 157-167. http://ceur-ws.org/Vol-1614/paper_64.pdf (2016)
14. Saravanan, V.: Sustainable Employability Skills for Engineering Professionals: The Indian Review of World Literature in English, vol. 5 (2), pp. 1-9. <https://pdfs.semanticscholar.org/9cb6/e933fef43504a7eee78e3bafb82da6e33d53.pdf> (2009)
15. Geoffrey, C. F.: From computational science to Internetics: Integration of science with computer science. Mathematics and Computers in Simulation. vol. 54, Issues 4–5, pp 295–306 (2000)
16. Morze, N., Kuzminska, O.: Organization of independent work of students in the context the formation of research competence (in Russian). International electronic journal "Educational Technology & Society" [online]. vol. 16, № 1, pp 516–526. http://ifets.ieee.org/russian/depository/v16_i1/pdf/8.pdf (2013)
17. Carrington, A.: The Padagogy wheel – it's not about the apps, it's about the pedagogy. <http://www.teachthought.com/critical-thinking/blooms-taxonomy/the-padagogy-wheel/> (2015)
18. Resources to support the SAMR Model. <http://www.schrockguide.net/samr.html> (2013)
19. Kuzminska, O., Mykhailova, N.: Teachers as students: practical advice on choosing MOOC: Computer science and information technology in schools (in Ukrainian), vol. 5-6 (58), pp. 45-55 (2015)
20. Morze, N., Barna, O., Kuzminska, O., Vember, V.: Formation of ICT competences through the system of competency tasks: from idea to practical implementation: Publishing house Studio-Noa, pp. 221-237 (2015)
21. Yermakov, I.: The phenomenon of competence directed education: School: Information and methodical journal (in Russian)., vol. 12, pp. 5-7 (2006)