

III. E-LEARNING IN THE DEVELOPMENT OF THE KEY COMPETENCES

ICT-COMPETENCE OF UNIVERSITY TEACHERS IN PROFESSIONAL DEVELOPMENT AND SCIENTIFIC ACTIVITY

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***Abstract:** The ongoing development of the higher educational system prompts university professors to use information and communication technologies not only in the educational process, but also in research and professional development, which has become a part of their professional competence. Many higher education institutions are in need of a new generation of skilled staff with high research potential, who are motivated to generate scientific innovation. Competent use of ICT improves pedagogical effect and boosts students creative potential. The paper reveals ways in which university professors use ICTs in their professional development and scientific activities.*

Keywords: ICTs, ICT-competence, university professors, scientific activity, professional development

Aided by the use of new computer technologies the teacher becomes increasingly important in the educational process, guiding students' independent learning, consulting and assisting them. The effectiveness and efficiency of teachers' efforts are reached through fruitful collaboration with students and colleagues, due to teachers' ability to interact in digital environment, to carry out the selection, structuring and evaluation of information required for a wide range of educational needs.

To effectively use information and communication technologies in their work, teachers should know and be able to analyze all existing and emerging e-learning means (electronic textbooks, encyclopaedias, virtual laboratories, integrated learning environment); be able to work with these tools, select the software that

will provide optimal processes of presenting course material and managing their teaching. Compared to traditional technologies, information and communication technologies have significant advantages in scientific activity and professional development because they allow to automate the process of gaining, structuring and applying the course material, owing to the interactivity of many electronic aids; ICTs also permit to access and handle large amounts of information, develop information culture, teach students to find and use different types of information, which is one of the most important skills in the modern world etc.

THE ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Aspects of ICT use in education have been the subject of many scientific publications of leading researchers. In particular, we should mention the papers of Bezpalko V., Zhaldak M., Zimin A., Ershov A., Kozlakova I., Kozyar M., Mashbitsa Yu., Monakhov V., Morze N., Rakov S., Ramskoj Yu., Talyzina N., Shkil M. et al..

Scientific perception of the nature and value of information and communication competence of the teacher in a modern university was carried out in papers of the following scholars: Makarenko A., (Makarenko 2013), Vasilenko S. (Vasilenko, Kirda 2014), Konevshinskaya J. (Konevshinska 2014), Oros B. (Oros 2015), Ovcharuk O., Gurzhiy A. (Ovcharuk, Gurzhiy 2013) et al.

ICT competence is considered as a component of professors' professional competence (Didukh 2012), moreover, it is increasingly seen as a prerequisite for further professional growth (Kuzminska 2012).

It is also stressed that current level of ICT competence is the main barrier to full implementation of ICT technologies in higher education. Here the author argues that professors should not only be competent to use the available ICTs but also become the developers of their own learning aids (Oros 2015).

Thus, Makarenko A. examined the conditions behind the formation of basic ICT competencies of teaching staff in higher educational institutions of Ukraine and concluded that teachers under the age of 40 attained the highest level of ICT competence while in age group 51-60 years and above have the lowest one, due to lack of computer training during basic education (Makarenko 2013). Chernikova L. argues the need to introduce a regional model of formation and development of teachers' ICT competence, which consists of motivation-oriented, organizational, procedural and evaluative-effective components. Vasilenko S. researched into aspects of SMART Notebook software for the management of a learning process in the form of interactive classes and highlighted the main points in favour of the use of SMART Notebook for the creation of monographic teaching resources (Vasilenko, Kirda 2014). Konevshinskaya O. confirmed methodological approaches to the formation of the ICT competence of tutors and to the

determination of its levels for the effective functioning of resource centres within distance learning departments of universities (Konevschinska 2014).

With the utmost importance of ICT competence for professors, it is still crucial to develop adequate standards for it on various levels of educational system (Ovcharuk 2013).

In this respect we were particularly enriched by the scientific developments of N. Morze (Morze, Kocharian, Varchenko-Trotsenko 2014; Morze, Varchenko-Trotsenko 2014; Morze, Kocharian 2014), dedicated to the analysis of various aspects of information and communication competence of university teachers. In particular, of special importance was the interdependence between quality of educational environment and the level of ICT competence of research-academic staff; besides, the articles discuss the model of corporate standard for ICT competence of research-academic staff, instruments to measure ICT competence of masters and the methods of integration of ICTs into the educational system; the articles also describe in detail the ways to apply webinar-oriented platforms for professors' advanced training.

Among the foreign researchers significant contribution to the development of this aspect was made by the following researchers: K. Denek, B. Siemieniecki, M. Kus, M. Zajac, R. Parzęcki, D Williams, E. Smyrnova-Trybulska (Smyrnova-Trybulska 2007; 2012) et al.

However, despite huge scientific interest in the role of ICTs in modern education there is a trend among scientists to focus attention mainly on advantages and disadvantages of using ICT in teaching students. In this analysis of the role of information and communication technologies in science and further professional development of teachers has not produced such wide discussion, thus we can state the lack of attention of modern researchers to this aspect. All this confirms that the study of existing and potential advantages of ICTs in teacher training gives you the opportunity to discover new perspectives on improving the quality of higher education and the integration of Ukraine into the world scientific and educational environment.

The objectives of the paper. The purpose of the article is to analyze the existing situation in the field of shaping ICT competence of a university teacher and the scope of use of information and communication technologies in the scientific activity and professional development of scientific and teaching staff. For more detailed analysis of this issue we carried out a sociological research to determine the scope of use of information technologies in science, means of integration of scientific and teaching activities, the assessment of teachers' activity in electronic environment, the advantages, problems and motives, slowing the introduction of e-learning technologies in teaching. This study was carried out in the framework of international project «International Research Network for study and development of new tools and methods for advanced pedagogical science in the field of ICT instruments, e-learning and intercultural competences», financed by the European

Commission under the 7th Framework Programme, within the Marie Curie Actions International Research Staff Exchange Scheme. Project participants are universities from Poland, the Netherlands, Portugal, Spain, the Czech Republic, Slovakia, Australia, Ukraine and the Russian Federation. One of the Ukrainian representatives in this project is Dniprodzerzhinsk State Technical University (DSTU).

Selecting DSTU as an object of study is due to the fact that its characteristics represent it as an average university of Ukraine, which allows to apply the research results to a wide range of technical universities of Ukraine.

The sociological study was conducted with the help of a special questionnaire which was suggested to teachers and heads of structural divisions of DSTU in May 2015. The survey involved 53 employees of the University, of which 89% were scientific and teaching staff (59% - associate professors, 26% - teachers, 4% - full professors) and 11% - heads of departments. The results of empirical research allow to make some conclusions about the peculiarities of teachers' use of ICTs in scientific and professional growth.

The hypotheses of the study:

1. Teachers often use special information search systems to find scientific information.
2. The most common way of integrating research and teaching is live presentation in the classroom about current scientific research.
3. Teachers use electronic media to find information useful for professional development.
4. The greatest impact on the introduction of e-learning in teaching is teacher training in the field of ICT and e-learning

Statement of research material. First of all, in our study teachers were given the opportunity to evaluate different aspects of ICT use in their research (Fig. 1). As a result, it was found that the largest number (26.3%) of teachers indicated that they use special information search systems to look for scientific information. Also, a large number of DSTU employees use ICTs in their scientific work to participate in conferences and electronic workshops (22.4%), they use ICTs as well to search for the information and to learn about current developments of foreign and Ukrainian scientists in scientometric and abstract databases (19.2%).

However, it should be noted that teachers use ICT the least in order to maintain their electronic portfolio (1.3%), to manage activities of the scientific community (1.3%), to participate in online research communities and international research networks (1.3%).

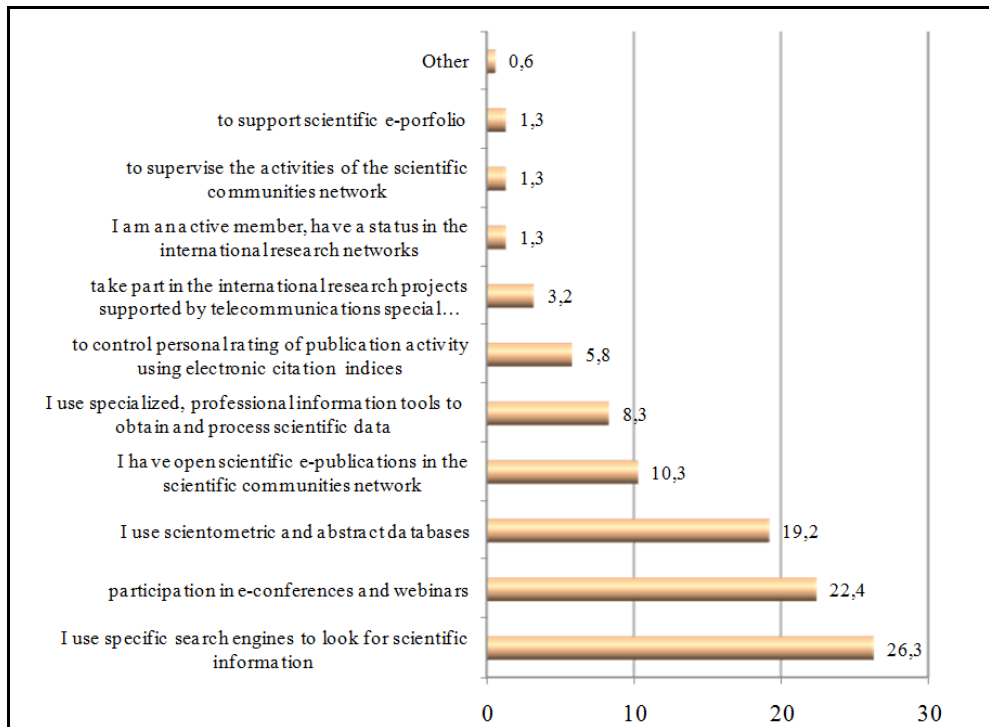


Figure 1. Professors' use of information technologies in research activities (%)

Source: Own work

In 2014, a new law "On Higher Education" was adopted in Ukraine, according to which the scientific component of teachers' obligatory workload grew in amount. Scientific, scientific-technical and innovative activity in higher educational institutions as an integral part of the educational activities and is carried out with the aim of integrating the scientific, educational and manufacturing activity in the higher education system. At the same time the implementation of scientific and technical activities by universities, academies and institutes is mandatory. The subjects of scientific activities are research and academic staff, other employees of educational institutions and students of these higher educational establishments. The main purpose of scientific, scientific-technical and innovative activity is to gain scientific knowledge through research and new developments and use their potential for the creation and implementation of new competitive technologies, types of equipment, materials, etc. to provide innovative development of society, to train future experts of innovative fields (On higher education 2014).

In this regard, it was wise to identify the ways in which teachers can integrate the results of research and teaching activities. As a result it was found that most of the teachers talk about the actual scientific studies during lectures (30.8%). Besides, teachers provide students with references to scientific publications as additional

sources of information (23.9%); together with their students teachers take part in scientific conferences, students' scientific communities and networks (23.1%) and offer students (mostly Master students) tasks, based on materials from scientific databases, open scientific publications and scientific conferences (19, 7%). It is worth considering that only a very small part of professors use their own teaching resource (e-portfolio) - 2.1%.

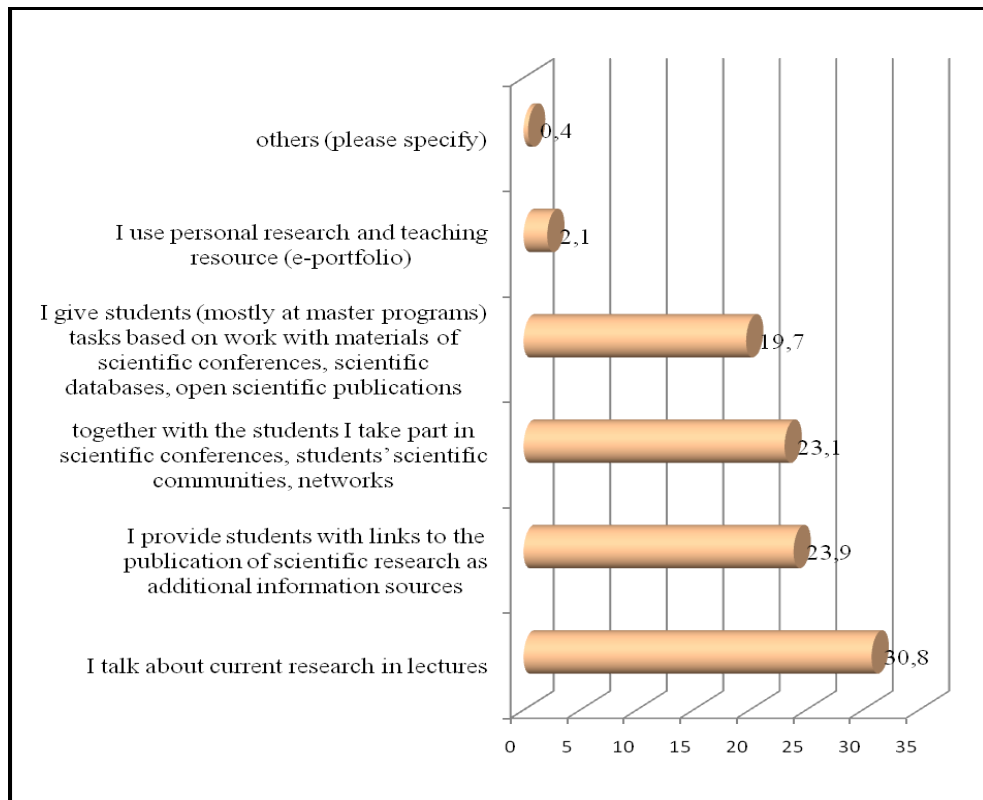


Figure 2. Ways of combining research and teaching activities (%)

Source: Own work

In this connection we should pay special attention to the use of electronic portfolios by modern Ukrainian scientists and educators. The results of the study show that DSTU professors do not attach much importance to this issue, compared to leading universities. In our opinion, it is determined, above all, by the lack of university regulations and rules about their creation and further management. The portfolio enables students and university leaders to evaluate the professionalism and efficiency of teachers' work during the attestation of academic staff. At the same time, electronic portfolio is a significant support for teachers when they independently analyze, summarize and structure results of their work, besides, when they objectively assess their capabilities and plan actions to overcome the difficulties and achieve better results.

The **main advantage of the portfolio is the ability** to demonstrate in open access mode to all the interested the most significant results of practical activities to assess professional competence. These results are:

- teaching activities and its methodological support (developed e-learning courses, teaching and learning materials, curricula);
- supporting creative and athletic achievements of students (participation in competitions and contests);
- professional development (advanced training, international creative and sporting activities, registration of copyright, grants, awards, scholarships);
- scientific publications (monographs, articles in the Scopus' database, articles in specialized journals, scientometric and open databases, textbooks, manuals, articles in collections of conference materials and other publications);
- citation index of open publications (bibliographical indices, h-index, i10-index);
- participation in international and national research projects;
- scientific school (Morze, Varchenko-Trotsenko 2014).

Thus, a professional electronic portfolio can be a professional asset for teachers, especially when it is well-made and serves many users' purposes. Portfolio is an open proof of what exactly the professor is working on, what his professional and scientific achievements are, which becomes relevant during attestation and expert review of professor's contribution during the awarding of academic rank or competitive selection.

The validity of such an interpretation is confirmed by universities employees, assessing their own actions in an electronic environment, aimed at professional development and further training. The analysis of hierarchical distribution of responses (Figure 3) allowed to state that the creation and improvement of individual professional portfolio as a factor of influence on professional development takes only the second place in popularity (only 13.7% of respondents), with a considerable gap from the first place – where 47.1% of the respondents opted for the search of information, useful for professional development.

From this we can conclude that not all teachers understand the significance and the importance of creating and maintaining a professional portfolio in electronic form, and those who understand it consider it highly labor-intensive and time-consuming, the time for the development of a portfolio could more rationally be used to prepare for the classroom training with students, to get new relevant information in libraries and on the Internet, to write scientific articles and for further professional development of teachers.

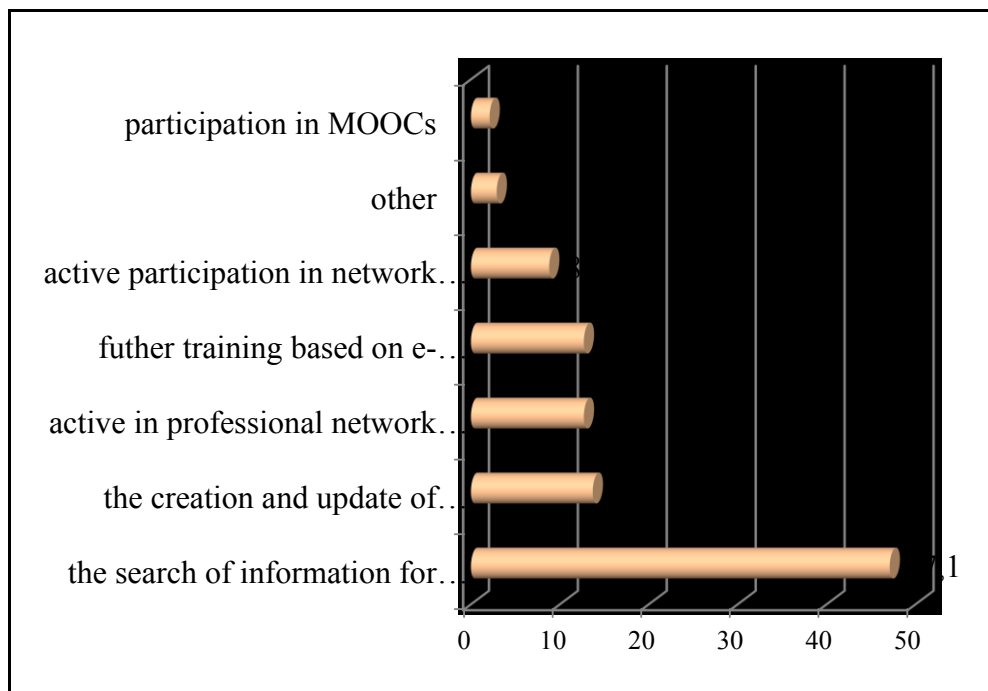


Figure 3. Evaluation of online activities for professional growth and further training (in %)

Source: Own work

As can be seen from Fig. 3, 12.7% of our respondents feel comfortable using e-learning for further training and the same number of respondents actively participate as observers in online discussions and debates, 25.4% in sum. At the same time, participation in massive open online courses rightly occupies the last place in the ranking of the respondents - only 2.1%. In our opinion this is due to the specifics of Ukraine: Ukrainian professors simultaneously wish to improve their professional skills from the comfort of home, where they can access information in the Internet and at the same time many required courses remain inaccessible for them due to their high cost and professors' poor knowledge of the English language. An important impetus to fill the vacuum in the knowledge of English among teachers was the adoption of new regulations on awarding scientific degrees in August 2015.

It ruled that to assign the title of professor and associate professor a candidate should have a certificate in accordance with Pan-European guidelines for language education (at B2 level or above) or qualification documents associated with the use of the English language.

Our objective was also to see how the processes in the information environment influence the implementation of e-learning in teaching and almost one third of the

teachers evaluated very positively, namely with 5 out of 5 points, the training on ICTs and e-learning for teachers (Table 1).

Although the comparative analysis of positive (4 and 5 points) and negative (points 1 and 2) evaluation showed that negative evaluation is slightly higher on the whole (43.4%) than the positive one (39.6%). Many researchers attribute this to the age characteristics of the teaching staff and the need to develop a special program on computer literacy for elder professors.

At the same time it may result both from low level of computer training, and from poor technical conditions for the use of internet resources in teaching. It should be noted that in Ukraine in general and in the city of Dniprodzerzhinsk in particular, there is a successful program to support the competitiveness of workers on the labor market for vouchers obtained in

Table 1.

The influence of processes in the information environment on the implementation of e-learning in teaching (in %)

Effects in the information environment	Mark				
	1	2	3	4	5
Teacher training in ICTs and e-learning	20,8	22,6	17	7,5	32,1
The fact, that other professors widely use distance learning instruments and e-learning tools	15,1	24,5	30,2	11,3	18,9
It is a common practice in the university to evaluate professors' performance and their use of distance learning techniques	28,4	18,7	30,2	9,4	13,3
I can see the results, that I can not obtain without the use of these technologies	22,7	18,7	9,4	20,8	28,4

Source: Own work

the territorial bodies of the State employment service. The program provides a one-time free training in ICT for people with higher or vocational education, aged 45 and above till retirement, whose insured service within the institution is 15 years and more. Every year this program is becoming increasingly popular among teachers of Dneprodzerzhinsk State Technical University. This program has been around for three years and if in 2013 the retraining course in Software Engineering

attracted only 5 employees of the University, according to data for 2015 the same program already has 14 students. Nevertheless, the question of a more differentiated approach to such training and more profound training on the use of ICTs in pedagogical activity is still relevant. All this proves that the academic staff of higher education sector acknowledge the usefulness and the need in continuous improvement of their knowledge in the field of ICTs, which will enable them to proudly meet current challenges from the information environment to their professional activities.

All the above mentioned is confirmed by further analysis of Table 1, as most teachers do see results that cannot be obtained without the use of ICTs. It is exactly this effect that gained the biggest amount of positive feedback (49,2%), while the negative one gained only 41.4%. The medium feedback (mark 3) was given by professors to the effect that other professors are widely using distance learning technologies and e-learning instruments (30.2%) and the common practice in the university to evaluate professors' performance and their use of distance learning techniques (30.2%).

It should be noted that in modern conditions the formation of ICT competence of teachers is an urgent problem, since it is exactly teachers' proactive approach to their duties that helps prepare students to live in a modern society, thoroughly permeated by information technology. Creative teachers seeking to keep pace with the times, should explore the possibilities of ICT use and implementation in their practice, guide their students in this world of new technologies and shape their information literacy. The teachers, skilfully and effectively dealing with technology and information, have different, new way of thinking, fundamentally different approaches to the assessment of emerging problems, to management of their own work, and a more up-to-date approach to teaching students. Due to constant increase and acceleration of the information flow teachers need to keep track of innovation in all spheres of public life and stay in touch with students to update the content of education and to ensure the rapid exchange of information between the participants in the educational process. All this can not be done without the use of ICT in the process of learning. This teacher does not only constitute, promote and educate students, but with the introduction of new technologies he has a powerful incentive for self-education, professional growth and creative development.

CONCLUSIONS

Thus, the analysis in this study showed that necessary conditions for effective and systematic improvement of teachers' ICT competence are motivation (both internal and external), the need and the willingness of the teacher to conduct classes using ICT, recognized transfer of theoretical knowledge and developed skills into

practical teaching. ICT competence of modern teachers is one of the most important indicators of their professional performance and at the same time a prerequisite for further improvement of their professional competence, which prompts the development of in-service ICT-enhanced advanced training of modern teachers.

As a result of verification of the main hypotheses they have been confirmed.

1. The majority of teachers most often use special information search systems of scientific data for their research work - 26.3% of respondents.
2. The most common way of integrating research and teaching is a story in the classroom about the current research. This is evidenced by 31% of the surveyed teachers.
3. Most of the teachers (in our research - 47%) use electronic media to find information, useful for professional development.
4. Teacher training in the field of ICT and e-learning has the greatest impact on the introduction of e-learning in teaching which is confirmed by 39.6% of teachers.

Prospects for further research. In connection with the above, the authors of this work see prospects for further scientific research on the problems of formation and improvement of teachers' ICT competence in the theoretical-methodological and scientific-expert provision of relevant processes of updating legal, organizational and motivational components, and in further research on the development and implementation of distance learning system and enhancing ICT competences of teachers and students.

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REFERENCES

- Didukh L.I., 2012: *Information-communication competence of a professor. Problems and prospects of training for humanitarian-technical elite*. Coll.of scient. papers. Ed. by Tovazhniankiy L.L., Romanovskiy O.G. Kharkiv, NTU "HTU", 2012, Iss. 32-33 (36-37), P.152-161
- Konevschinska, O.E. 2014: *Formation of ICT-competence of tutors within resource centres of distance learning. Information technologies and means of education*, 2014, Vol. 42, Iss. 4, P. 20-32, [online] at

- http://www.nbuv.gov.ua/UJRN/ITZN_2014_42_4_4, (accessed 20 May 2016)
[In Ukrainian]
- Kuzminska O.G., 2014: *ICT-competence of a professor in a contemporary university. Scientific researches and their practical application*. Modern state and ways of development. SWorld 1-12 October 2014. [online] at <http://www.sworld.com.ua/konfer36/409.pdf>, (accessed 30 May 2016) [In Ukrainian]
- Makarenko, A.Yu., 2013: *Personnel aspects on the problem of formation of professors' ICT-competence*. Scientific treasury of the Donetsk education, 2013, № 1, P. 82 – 89, [online] at http://www.nbuv.gov.ua/UJRN/Nsod_2013_1_22, (accessed 1 April 2016)
- Morze N.V., Kocharian A.B., Varchenko-Trotsenko L.O., 2014: *Webinars as a means of improving professors' excellence*. Informatics and information technologies in educational institutions, 2014, Vol. 42, Iss. 4, P. 118-130. [online] at http://www.nbuv.gov.ua/UJRN/ITZN_2014_42_4_13, (accessed 20 May 2016)
- Morze, N.V., Kocharian, A.B., 2014: *Model of standard for the ICT-competence of university professors in view of improving the quality of education*. Information technologies and means of education, 2014, Vol. 43, Iss. 5, P. 27-39. [online] at http://www.nbuv.gov.ua/UJRN/ITZN_2014_43_5_5. (accessed 20 May 2016) [In Ukrainian]
- Morze, N.V., Varchenko-Trotsenko L.O., 2014: *E-portfolio as an instrument of measuring the results of modern university professors' academic performance*. Information technologies and means of education, 2014, № 5, P.36-41. [In Ukrainian]
- "On higher education": the law of Ukraine from 01.07.2014 No 1556-VII. - [online] at <http://www.zakon0.rada.gov.ua/laws/show/1556-18>, (accessed 14 April 2016) [In Ukrainian]
- Oros, V., 2015: *The formation of professors' ICT-competence in the context of life-long learning*. New Pedagogical thought, 2015, №26, P. 204-206. [online] at http://www.nbuv.gov.ua/UJRN/Npd_2015_2_50. (accessed 5 June 2016) [In Ukrainian]
- Ovcharuk O.V., 2016: *Information-communication competence as a subject of discussion: international approaches*. Computer in family and in school, 2013, №7, P.3-6. [online] at http://nbuv.gov.ua/UJRN/komp_2013_7_2, (accessed 14 April 2016) [In Ukrainian]
- Ovcharuk, O.V., Gurzhiy, A.M., 2013: *Polemic issues of information-communication competence: international approaches and Ukrainian prospects*. Information technologies in education. Collection of scientific papers. Iss. 15, Kherson, KSU, 2013, P. 38-42. [In Ukrainian]

- Smyrnova-Trybulska, E.N., 2007: *Bases of formation of information competences of teachers in the field of distance learning*. Monograph, Kherson: Ailant, 2007, 704 p. [In Russian]
- Smyrnova-Trybulska, E.N., 2012: *Some aspects of informatization of higher education in a number of central European countries*. Scientific herald of NPU named after M.P. Dragomanov. Ser. №2. Computer-oriented educational systems: Coll. of scient. papers. Ed. board. K., NPU named after M.P. Dragomanov, 2012, № 13 (20), P. 53-66. [online] at <http://www.enpui.npu.edu.ua/handle/123456789/3399>, (accessed 14 April 2016)
- Vasilenko, S.V., Kirida, A.V., 2014: *Smart Notebook as a means to develop research competence*. Information technologies and means of teaching, 2014, Vol. 41, Iss. 3, P. 142-150 [online] at http://www.nbu.gov.ua/UJRN/ITZN_2014_41_3_15, (accessed 20 April 2016) [In Ukrainian]