SCIENTIFIC COMPONENT OF MASTERS ICT COMPETENCE IN MODERN UNIVERSITY

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Abstract: The article is devoted to a systematic approach to the formation of the ICT competency of masters in the modern university: development and approval of corporate standard identify necessary and sufficient conditions for its software, development of tools for the evaluation of the ICT competency formation of masters and mechanisms for the integration of ICT in education system. An example of one of the ways of forming the ICT competence of masters in the process of scientific activity by training on a specially designed course of study, which can serve as an example of open course in informal learning, and system evaluation of their formation through the use of the University e-learning resources.

Keywords: competence, the standard, model of ICT competence, educational electronic environment of the University, e-portfolio of master.

INTRODUCTION

The widespread introduction of information and communication technology (ICT) is a condition of the release of higher education at the level of international standards. This is determined, in particular, that the quality of specialist training of modern university is largely dependent on the ability and willingness to use ICT in order to obtain the necessary knowledge and producing new ones.

The latest technology affect education as it was indicated in the report of New Horizon Report Insists Teachers Use Tech (http://gettingsmart.com/2014/06/new-horizon-report-insists-teachers-use-tech). In particular, the new trends include:

- rethinking of the teachers role - he must be a partner in the learning process;

• desire depth study: in-depth training for students is learning by doing and develop a sense of self-efficacy, the development of critical thinking and effective communication (Fullan 2014).

• focus on open educational resources;

• increased use of mixed (hybrid) learning;

• the use of intuitive technologies;

• rethinking of educational institution - both schools and university.

Integrating ICT in the activities of modern educational institution requires and causes changes in the educational process and scientific research; formation of the ICT competence of teachers, students and researchers; creation of open information learning environments as catalysts to improve the quality of ICT competencies of participants of the educational process of the University in order to develop their skills of XXI century (National Strategy of the Educational Development in Ukraine 2013).

A significant amount of scientific publications are devoted to the issue of higher education informatization (Bykov 2012, Smirnova-Trybulska 2012), the creation of open electronic environments education (Bykov 2010, Morze, Kuzminska, Protsenko 2013), the reorganization of the educational process (Zhaldak 2010, Manako 2013), the use of distance learning technologies (Meyer, Katrina 2014, Dias, Balula 2014). However, in practice there is still a significant gap in the institutional environment of solving their technical problems-ICT alone will not improve performance, but offer opportunities for a large number of new applied technologies.

Issues relating in particular with working off technologies of support acquisition of ICT competency of masters does not lose relevance, since the preparation of masters is increasingly aimed at overcoming the mismatch of model of training future specialists and dynamics of the subject area (in this context ICT); on the needs of the modern labor market, including - the emergence of new professions and Informatization of key business processes within existing; to acquire the skills and ability to make decisions under uncertainty and to effectively use modern ICT for research, including scientific.

The purpose of this article - to offer a systematic approach in shaping the ICT competency of masters and an example of its implementation in the process of science.

Hypothesis of the study, conducted at the Borys Grinchenko Kiev University, is suggested that the formation of the professional level of ICT competence of scientists (masters and postgraduate students), which is a component of professional competency necessary to define appropriate objectives and requirements, establish a system of monitoring and evaluation , which may include corporate standard, evaluation instruments, requirements for environment and the training system.

1. SKILLS FOR FUTURE AND CORPORATE STANDARD OF ICT COMPETENCE OF UNIVERSITY MASTERS.

The results of the Institute for the Future (The Institute for the Future - IFTF) together with the Research Institute of Phoenix (The Phoenix Research Institute) can provide the basic skills of the future, which workers will be required to have in 2020 (Future Work Skills 2011):

- extraordinary thinking;
- social intelligence;
- innovative and adaptive thinking - the ability to think outside the set trajectory;
- Intercultural competence - equally effectively communicate with all business partners and customers, regardless of cultural differences;
- computational thinking;
- the ability to filter out unnecessary information - quickly process and summarize large amounts of data;
- ability to work with modern media;
- knowledge is not limited to their own narrow specialization;
- ability to work remotely.

In addition to the general skills and competencies that will be essential to the successful work of a specialist, regardless of industry specialization include (http://sco.lt/5aIy3N): systems thinking, customer focus, interdepartmental communication, knowledge of several languages and different types of cultures, skills management of projects and people - from local groups to communities, the ability to work in a multi-tasking and conditions are constantly changing, thrifty production skills, art skills.

That is why education needs major changes and innovation, in particular relating to the quality and effectiveness of the educational process.

The problem of quality assurance is continuous in Bologna, Turin and Copenhagen processes, appropriate programs activities implemented at the regional, national and sectoral levels, and at the level of individual schools. Currently, one of the most developed quality management systems (QMS) is a system that meets the standards ISO 9000. In particular, the recognition of the effectiveness of implementation of QMS university is its certification in accordance with ISO 9000: 2000 (http://www.kpms.ru/Standart/ISO_Education.htm). But, unlike the strictly regulated procedures implementing and documenting key business processes of the institution and organization of internal audit for compliance with standards ISO (Zaporozhchenko 2011), monitoring and periodic evaluation of educational programs and qualifications, systematic assessment of students' knowledge,

competence of teachers, educational resources, system informing - is the base of European standards and recommendations of European Network for Quality Assurance in Higher Education (ENQA) [http://www.enqa.eu].

Table 1.

Model of ICT competence of master and criteria of its effectiveness

Aspects of activity of Master	Level of acquisition of ICT competence	Signs	Indicators of evaluation of the acquisition of a certain level
Study of ICT	Basic	Basic knowledge and skills	Results of tests for independent verification of levels of basic tools created by the University, and examinations in professional disciplines
		Basic tools	
	Advanced	Improving knowledge and skills	Results of tests for the Microsoft IT Academy; survey to determine the capacity for evaluation of network resources appropriate to the task and the ability to use ICT for teaching, research, and everyday life
		Sophisticated tools	
	Professional	The ability to self-ICT	Number of successfully completed courses for self-study located in external portals, including English; evaluating the quality of the selection of courses and tools for self-education and communication through questionnaires
Educational Activities	Basic	Application of knowledge and skills	Results of studies using ENK in LMS Moodle and Web 2.0 services
	Advanced	Solving problems competency of educational character	The results of the self-study assignments, course projects and the use of ICT for solving and presentation of results; evaluation of the quality of performance and protection undergraduate work; survey of students' satisfaction on the proposed university e-resources
	Professional	Solving problems competency of professional purposes	The results of the course projects, training and pre-diploma practice; evaluation of the quality of performance and protection of bachelor work; questioning students for involvement in improving the educational process by ICT enrichment

Scientific activities	Basic	The use of scientific communication	Results of students questionnaire on the degree of awareness and use of scientific communication: repositories, scientific metric databases, e-libraries, e-journals, as well as opportunities and participate in online conferences
	Advanced	Scientific cooperation	Results of the questionnaire to determine the effectiveness of the use of e-communications, in particular depositary University and the electronic journal for writing essays, coursework and of bachelor work; ability to build e-communication
		The ability of application of e-Science	
	Professional	Presentation of research results in the form of research project	Assessment results (quantitative and qualitative) of student participation in the thematic online conferences and webinars, the ability to create online scientific publications and present research in network
Social and cultural activities	Basic	Knowledge and skills of citizen knowledge society	Results of the questionnaire for understanding the role of social networks and services to represent their ideas, the ability to communicate and establish cooperation with the preservation of their own identity and respect to network members
	Advanced	Solving general tasks competence	Results of participation in social projects of university, evaluation of social activities and observance of network etiquette of students
	Professional	Presentation of the portfolio	The results of the evaluation of portfolio: teaching, research and social activities of student

Source: Own work

ENQA-standards do not contain ready-made solutions, are descriptive (framework) character on the approach to the principles, techniques and methods in the field of quality assurance of education. A major focus is the participation not only of teachers and employers, but also students in the management and evaluation of the educational process. A feature of these standards is the requirement for universities to develop official (legal) regulations: specific plans of the institution (e.g. http://www.univ.kiev.ua/ua/n20101108/), software quality assurance and corporate standards. One such standard is the standard of ICT competence for masters (Table 1) of Borys Grinchenko Kiev University (http://kubg.edu.ua/), which is based on the recommendations of UNESCO (Structure of the ICT Competency of teachers 2013).

Scientists distinguish between special and key ICT - competence. Key information and communication competence - the ability to effectively use ICT in teaching,

research and daily activities to address the informational and professional tasks. Special ICT competence - is regarded as the student's ability to apply in a particular life, education and research situations, including problematic acquired knowledge, skills, methods for the selection of appropriate ICTs and their use for finding the necessary data, analysis, organization, conversion, storage, transfer in compliance with ethical and legal standards and meet the challenges of the subject area (Morze, Buinytska 2014). In this articles we will consider ICT competency of master as a key competency.

To ensure the specified corporate standard ICT competence of Masters at the University must create a system of its formation and provide appropriate conditions for this. One of the ways of forming the ICT competency of masters is their special training. Analysis of the requirements for masters in Ukrainian universities (http://pon.org.ua/socialny-zahyst/studentski-pytannja/414-zatverdzheno-koncepciju-organizaciyi-pidgotovki.html) gives reason to believe that this scientific activity is a generator of new knowledge and the basis for innovative development. However, the current situation with respect to science universities in Ukraine requires a serious rethink: the organization of scientific activity is in poor funding and resources is often formal, scientific activity divorced from teaching and research, and therefore the most modern masters of Ukrainian universities are not able to join the real scientific work. Quite often a training course chosen by the student "Methods of Research" program which provided the use of ICT, is a single that provides training of scientific research including of master. However, the rapid development of ICT leads to the formation of world space online communications, and this must be considered in shaping students' ICT competence, including in the implementation of research activities, because now more scientific institutions and individual scientists are supporting the open access and transfer the scientific communications and resources into the network. That is why we believe that specialized training on the use of online tools (at the level of the course or module) is effective in shaping ICT - competence. But the introduction of such a course for ICT support research activities may result in improvements in other components as systematic acquisition of ICT competencies provides interconnection and interpenetration of different aspects of the masters activity.

On the recommendation of ENQA learning outcomes stated in terms of competencies, so to construction of system of forming ICT competence must precede the definition of competence (Table 2), which is the basis for the acquisition of the professional level of ICT competence: the students acquire baseline already at the end of the first year, and depth - at the end of undergraduate studies (Morze, Buinytska 2014).

Table 2.

Competencies of masters needed to perform research activities

The level of acquisition of ICT competence	Requirements for the outcomes (competences)	Examples of courses that provide the relevant competencies for students
Baseline (1st year undergraduate, tentative)	- Ability to: - to study experience of leading countries in the field of education informatization, the construction of the information society; to collect, analyze, systematize scientific and technical data, synthesize advanced domestic and foreign experience of the identified issues; - use of means of scientific communication to find the desired information: institutional repositories, digital libraries, e-journals, e-conferences, specialized search engines; - handle source research: organize information, make excerpts, abstracts, - organize and categorize received in the course of research data and evaluate their chance; - use the electronic catalog UDC	- Some themes or modules of courses: "I'm a student", "Introduction to the profession", "Library", "Fundamentals of Information Technology", "Information", etc.; - The task for self-study requires to compile a bibliography on the theme, comparative tables or table summarizing etc. - Term papers and projects from different disciplines
Advanced (bachelor)	Ability to: - Present results at scientific seminars, training and research activities based on the use of ICT; To participate in e-conferences and webinars. Skills: Carry out a statistical study	- Some themes or modules of courses: "Information Technology", "Information", etc.; - The task of self-study, for which you need to make a bibliography to the subject, classification scheme of some concepts, presentation,

	of the results of studies using information technology; - Present the results of research in reports, articles, essays, reports, etc.; - use in scientific work charts, diagrams, tables, bar graphs; - Apply business tools of computer graphics to interpret survey results; - To analyze the results of a study to prepare a presentation	plot, make a report, etc.; - Term papers and projects from different disciplines; - Work of Young Scientists; - Educational seminars and conferences, including online, and webinars: upon completion of the training course of studying a discipline, professional conference of the institution, national professional conferences, etc.; - Final bachelor study
Professional (Master)	Ability to: - Use the methods and technologies of training and research; - Choose of materials for research topic and save the results obtained in the network; - Create scientific publications and publish it in an electronic magazine; - Present the results of research of Masters in e-environment of the university; - Present a portfolio of master-graduate	- Some themes or modules of courses: "Modern Technology", "The methodology of scientific research", etc.; - The task of self-study, for which you need to make a bibliography to the topic, write a research paper or thesis, a short description to the topic, create a blog research, etc.; - Term papers and projects from different disciplines; - Work Society of Young scientists and other university departments; - Educational seminars and conferences, including online, and webinars: upon completion of the training course of studying a discipline, professional conference of the institution, national professional conferences, international projects, etc.; - Final master study and its defense

Source: Own work

At the University for monitoring of the formation of a professional level of research activity of students used the e-portfolio of students and for evaluating - the actual defense of master's work.

It is clear that the formation of the ICT competency of masters occurs during the learning process and in extracurricular time and requires both necessary and sufficient conditions.

The necessary conditions for the formation of ICT competence of Masters in Borys Grinchenko Kiev University are (given only conditions relating to topics of this article):

- Creating an e-learning environment of the University (http://kubg.edu.ua/rusursi.html), acquaintance of all participants of the educational process of its structure and resources;

- The use by the teachers certified e-learning courses, social networking and web 2.0 services;

- Creating personalized e-learning environment of master;

- The creation of e-portfolios of master and his analysis;

- Availability of approved corporate standard ICT competence of masters University;

- Availability of approved design requirements for master's works, which includes regulations of corporate standards as well.

The experience of an experiment on creating of the conditions under which masters of the University acquire ICT-competence are the following sufficient conditions:

- Training and exams in the IT Academy (http://kubg.edu.ua/resursi/rusursi/microsoft-it-academy.html): obtaining certificates, including international standard);

- Solving of competency problems (of educational, research and professional nature) as part of the Rector's control and students' independent work (Morze, Kuzminska 2013);

- The introduction of a special course for Masters "Presentation of science activities of masters by means ICT" (http://wiki.kubg.edu.ua/%D0%9D%D0%B0%D0%B2%D1%87%D0%B0%D0%BD%D0%BD%D1%8F_%D0%BC%D0%B0%D0%B3%D1%96%D1%81 %D1%82%D1%80%D1%96%D0%B2).

2. THE COURSE "PRESENTATION OF SCIENCE ACTIVITIES OF MASTERS BY MEANS OF ICT" IN THE SYSTEM OF FORMATION OF THE PROFESSIONAL LEVEL OF ICT COMPETENCE OF MASTERS

To determine the information needs of the masters of the University and of constructing a system of information support of scientific research and the formation of ICT competence in terms of electronic information-educational environment of the University was conducted an online survey. 136 masters answered the questions (https://docs.google.eom/a/kubg.edu.ua/forms/d/lwNPQpU0bykCxAKBVooy6dWy 9etInOIuzOBNzYGPQLtY/viewanalytics), which can be grouped into two groups: the use of Internet resources in education and everyday life and determine the status and problems of the use of components of an e-university environment (http://kubg.edu.ua/2012-08-15-10 -06-19.html). According to the survey it was found that most students (96%) use the Internet daily, but 64% of network time spent on self-interest, communication with friends, etc. However, 98% of the masters believed that the transfer of training in an electronic form contributes to the efficiency of the educational process and creates the conditions for job search, training and others. 33% of the students prefer to communicate with teachers via e-mail, 24% - in social networks, but 24% believe the most effective is full-time communication. Approximately the same situation with access to educational materials - 49% of the respondents prefer e-mail. Unfortunately, the issues concerning the use of online resources for research (Figure 1), actualized the issue of specialized training and assistance to masters in the use of institutional repositories, e-libraries, scientometric database for implementation requirements of training of masters at modern level.

The basis conditioning preparation of the Master to the implementation of research activities is manufacturability of process. At the top level of abstraction of any educational technology training are the following phases: diagnostic, design, analytical.

The diagnostic stage shows readiness of masters of 1 year for acquisition the entry-level professional competence and mastery of the master's program, which involves formation of comprehensive, professional and specialized competence, the ability to innovate in the field of IT in education. To identify competencies that meet the basic level of ICT competency of masters the University conducted pilot monitoring (Morze, Buinytska 2014). These competencies that meet the advanced level, can be found at the entrance exam through the portfolio, which includes a description of projects carried out with the use of IT, development of models for solving professional problems, challenges, unusual situations, presentation materials and results of participation in professional conferences, social projects and so on.

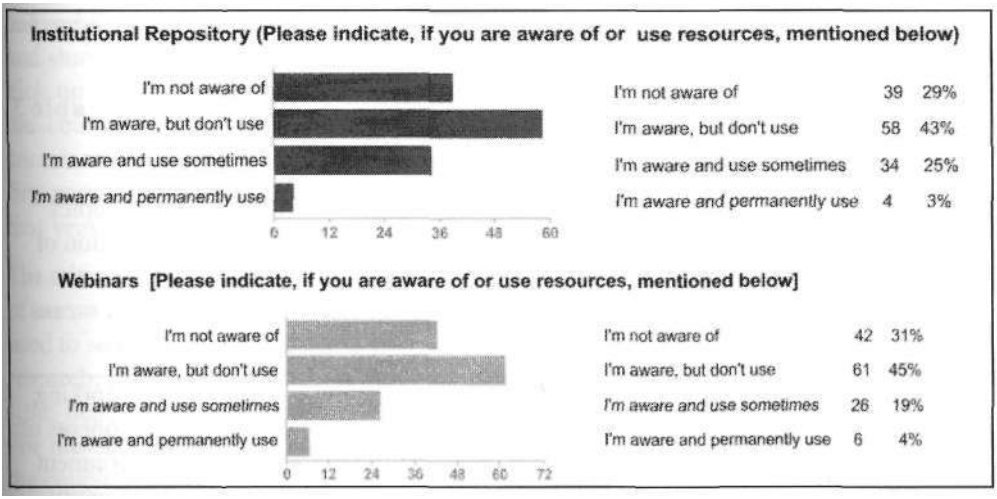

Figure 1. The results of the questionnaire of masters for use of institutional repositories and webinars

Source: Own work

The next stage for acquisition of masters of the professional level of ICT competence in the scientific activity of a preparing of master's thesis is projecting, schematically represented in Table 3. According to the survey of Masters and analysis of training programs was found necessary to develop a special course "Presentation of science activities of masters by means ICT" (Figure 2).

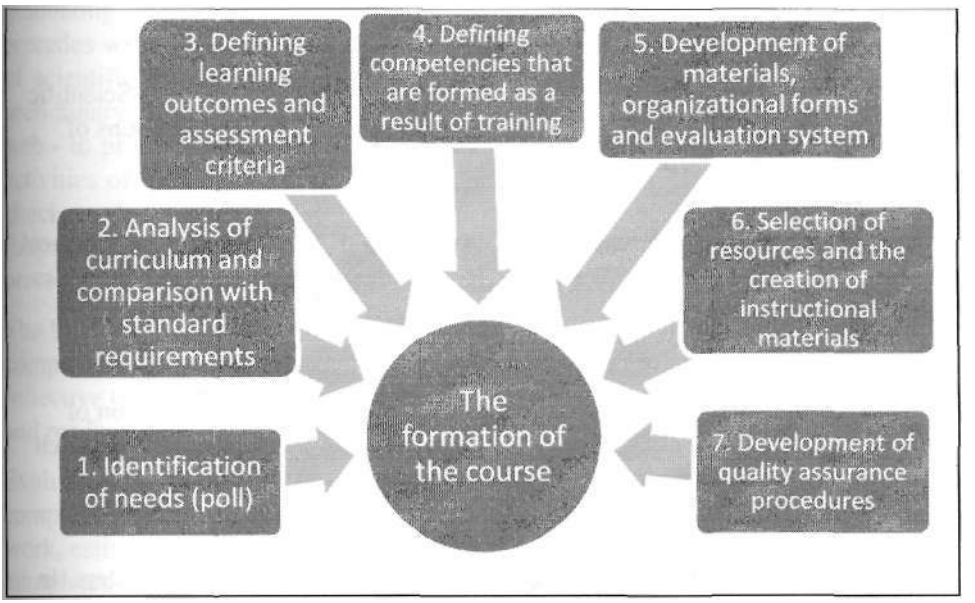

Figure 2. Algorithm of formation of the course "Presentation of science activities of masters by means ICT"

Source: Own work

In developing this course were taken into account the examples of European *practice of the formation of learning outcomes (Alisultanova 2010).*

Table 3.

Masters activity, required competencies and ICT support

Block number	*Activities of masters* in conducting research and writing *of the master's work*	*Competencies* that are formed as a result of activities	*Course topics* «Presentation of science activities of masters by means ICT»
1 Definition of the research topic and the necessary tools	Independent study of masters in determination of subject study and mastery of the conceptual apparatus of the domain	Competence with respect of research activities	Theme 1 Working with components of the e-environment of the University Theme 2 Using Google Apps
	Discussion of trends and research stages	General scientific competence	
2 Conducting research	Independent study of masters in conducting research master	Project competence	Theme 3 Selection of materials on research
	Presentation of interim results, discussion group	Communicative competence	Topic 4: Scientific publications of masters
3 Presentation of research results	Presenting research and defense of master's thesis	Professional competences	Topic 5: Placement of masters articles in e-university environment Theme 6 Presentation of scientific research and its results

Source: Own work

The first block is carried out mainly in the form of interviews with masters. In its framework are defined areas of research and emerging individual educational path. Interviews are conducted on graduating department or by individual counseling, online as well. In this block, significant problems and concepts of the subject area of master study can be summarized by manager or responsible person in the form of

online lectures, webinar or forum. In addition, in a joint discussion with the teacher and student determined the plan of study and IT facilities to be used (in some cases pick up or learn the basics) to perform a master study. In the latter in assistance is the course "Presentation of science activities of masters by means ICT", which contains 6 topics and carried out in two sessions: the first appropriate conduct in the first semester for Masters of first year, the second - in the second semester of the first year or the first semester of the second.

The second block (Table. 3) provides for independent work students with the studies of its own research and conducting, selection of information technologies that are used to solve professional tasks in a particular subject area and as a tool for scientific research. Independent work of students is carried out under the guidance of teachers - the heads of master works, which provides counseling and ongoing monitoring. For the efficiency of ICT support and acquisition of competences, masters can use the course material "Presentation of science activities of masters by means ICT" that is located in the university environment, get expert advice of education informatization lab (http://kubg.edu. ua/struktura/pidrozdili/ndl-informatizatsiji-osviti/pro-pidrozdil.html). In this unit significant role played by formation of informational educational environment of the university, including electronic library, tools for access via the Internet to the teaching materials of its education programs, and so on. Note that the course materials "Presenting science master ICT" are posted on the wiki portal of University (http://wiki.kubg.edu.ua/).

In the third block within an individual or collective self-study students spend on graduating department prior protection of master works. Previous protection precedes writing (alone or in collaboration with the supervisor) and the publication of scientific articles of masters (http://masters.kubg.edu.ua/). The purpose of the preliminary protection following the submission of the results of research on the web - to promote professional and specialized competencies specific to the science activities of masters. Protection of master's thesis at the University prior obligatory check for plagiarism and placement work in repositories (http://resbase.kubg.edu.ua/), and the protection is accompanied by a computer presentation and is subject to (optional) discussion on the web.

The final stage of preparation of masters for acquisition of professional level of ICT competence is the analytical phase, which includes external (by expert) and reflective (by students) assess the level of acquisition by alumni the ICT competence and readiness for professional activity with extensive use of IT tools to support it.

Evaluation is carried out on accumulative schemes and should include: current and complete student achievement in the performance and protection of the master's work, estimated the e-graduate portfolio of masters, which contains a description of completed projects, including networking, practice reports, reviews by external experts, certificates results obtained by distance learning, theses conferences etc. Self-achievement of masters, which is manifested in the analysis of the results obtained at the end of the course of study and implementation of master studies

necessary to correct material and enriching professional experience of teachers and researchers. Thus, the results of the final survey of masters (conducted at the end of the course "Presentation of science activities of masters by means ICT"), 96% find it timely and suggested materials and forms of work such that will help better present the results own educational activities (Figure 3). In addition, 71% of the masters noted the benefits of using components of the e-environment to improve the quality of university training; 69% - knowledge and skills for writing research papers and registration of bibliography; 73% - instructions and access to scientific metric database for qualitative analysis of studies of the problem; 56% - use wiki portal of the University to work on the course material and the organization of community of practice.

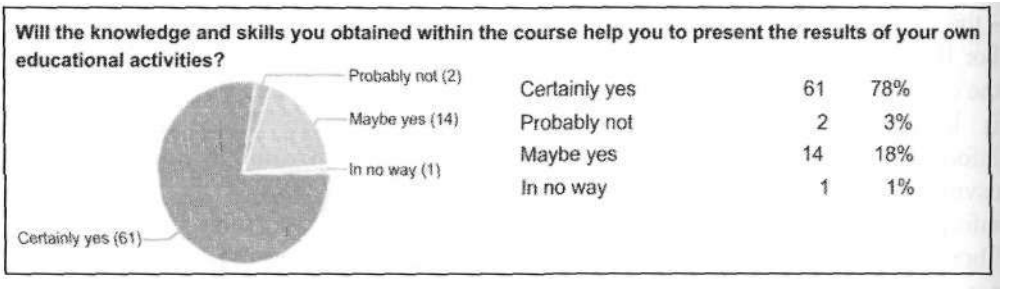

Figure 3. Reflection Learning Courses «Presentation of science activities of masters by means ICT»

Source: Own work

CONCLUSIONS

The analysis of relevance and approaches to the formation of ICT competence of masters of Borys Grinchenko Kiev University, development models and technologies of its implementation, as well as conducting the corresponding experiment leads to formulate the following conclusions and generalizations:

1. To provide quality modern education it is advisable to combine the use of QMS ISO standards and European standards and recommendations ENQA. To adapt ENQA standards for specific university needs to develop and adopt regulations and standards.

2. Modernization of the structure, content and organization of education on the basis of competence-based approach, the development of research and innovation in education, improving the quality of education on the basis of innovation; informatization of education, improvement of library and information resource providing education and science are the priority areas of Education of Ukraine, because the development of standard ICT competence of masters University defines specific Results of training.

3. To implement an effective training system for masters is necessary to analyze requirements for training masters (standard ICT competence) to determine the information needs of masters (questionnaires, surveys) to develop criteria for evaluation of specific activities and create e-resources to ensure compliance.

4. Use of ICT in the implementation of research activities (such as conducting research by the master) requires additional training masters. One way is to develop a special course and conduct of its several sessions according to the stages of the master's study.

5. Creating and using experimental course "Presentation of science activities of masters by means ICT" has proven its effectiveness in the preparation and defense of master study, as evidenced by student reflection and increasing quality of preparation their works.

Further studies are required to supplement the course "Presentation of science activities of masters by means ICT" by additional modules that can be used depending on the needs of students and the profession. These include, for example, ICT in support of conducting of experimental master studies (such instruments vary according to specialty and specialization masters) and the use of e-portfolio of for employment and establishment of contacts, including scientific ones.

Replication course "Presentation of science activities of masters by means ICT" - training in NUBiP Ukraine (http://agrowiki.nubip.edu.ua/), provides grounds for the spread of the experiment to other universities through the definition of information needs and training requests ICT- support of science activities of master and creation an open-distance course (MOOC).

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REFERENCES

Alisultanova, E.D., 2010: *Competence-based approach in engineering education: a monograph.* The Academy of Natural Sciences, ISBN 978-5-91327-123-5, [online] at http://www.monographies.ru/114-3789 (accessed 20 July 2014).

Bykov, V.U., 2010: *Open learning environment and modern networking tools of open education.* Scientific journal of the National pedagogical Dragomanov university. Series 2, Computer-oriented training system: compilation / Ministry of Education and Science of Ukraine, National pedagogical Dragomanov university. - K. : Publisher of National pedagogical Dragomanov university,

2010. - Issue 9 (16). - P. 9-16, [online] at http://enpuir.npu.edu.ua/handle/123456789/703 (accessed 20 July 2014).

Bykov, V.J., 2012: *Innovative tools and future directions of information education.* Scientific Papers of the Third International Scientific Conference " ICT in modern education: experience, problems and prospects ". - Lviv: Lviv State University of Life Safety, 2012. - P. 14-26, [online] at http://ubgd.lviv.ua/konferenc/kon_ikt/plen_zasid/Bukov.pdf (accessed 20 July 2014).

Dias, S.B. and Diniz, J.A., 2014: *Towards An Enhanced Learning Management System For Blended Learning In Higher Education Incorporating Distinct Learners' Profiles.* Journal Of Educational Technology & Society 17.1 (2014): 307-319.Academic Search Premier. Web. 23 June 2014, [online] at http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=94937820&lang=ru&site=ehost-live (accessed 20 July 2014).

Fullan, M., Langworthy, M., 2014: How New Pedagogies Find Deep Learning, [online] at http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.RichSeam_web.pdf (accessed 20 July 2014).

Manako, A.F., 2013: *The approach to the construction of a formalized description of information systems for education and learning.* International electronic journal "Educational Technology & Society"-2013. - V. 16. - №. 1. - P. 536-547, [online] at http://ifets.ieee.org/russian/depository/vl6_il/html/10.htm (accessed 20 July 2014).

Meyer, K.A., Quality in Distance Education: Focus on On-Line Learning. ASHE-ERIC Higher Education Report. Jossey-Bass Higher and Adult Education Series, http://repositorio.ub.edu.ar:8080/xmlui/handle/123456789/2126 (accessed 20 July 2014).

Morze, N., Kuzminska, O., Protsenko, G., 2013: *Public Information Environment of a Modern University.* ICT in Education, Research and Industrial Applications: Integration, Harmonization and Knowledge Transfer, CEUR Workshop Proceedings, Vol-1000 ISSN 1613-0073. - P. 264-272, [online] at http://ceur-ws.org/Vol-1000/ICTERI-2013-p-264-272.pdf (accessed 20 July 2014).

Morze, N., Kuzminska, O., 2013: *Organization of independent work of students in the context of the formation of research competence.* International electronic journal "Educational Technology & Society " - 2013. V. 16. - №1. - P.516-526. - ISSN 1436-4522, [online] at http://ifets.ieee.org/russian/depository/vl 6_i 1/pdf78.pdf (accessed 20 July 2014).

Morze, N., Buinytska, O., 2014: *Corporate Standard of ICT Competence of Masters.* Information Technology in Education: Scientific Journal, vol 19. - Kherson: KSU (2014).- P. 9 - 21.

Smirnova-Tribulskaya, E.N., 2012: *Some aspects of the informatization of higher education in several central European countries.* Scientific journal of the National pedagogical Dragomanov university. Series 2. Computer-oriented training system: compilation of scientific papers / Redrada. - K.: National pedagogical Dragomanov university., 2012. - № 1 3 (20). - P. 53-66, [online] at http://enpuir.npu.edu.ua/handle/123456789/3399 (accessed 20 July 2014).

Zaporozhchenko, U.G., 2011: *International standards in the scope of information - communication learning tools.* K: Actual problems of sociology, psychology, pedagogy, 2011. - № 1 3. - P. 198-204.

Zhaldak, M.I., 2010: *Computer-oriented training system - the establishment and development.* Scientific journal of the National pedagogical Dragomanov university. — 2010. — № 9 (16). — P. 3-9.

Future Work Skills 2020, 2011, http://www.iftf.org/futureworkskills/ (accessed 20 July 2014).

National Strategy of the Educational Development in Ukraine for the period till 2021, 2013, [online] at http://zakon4.rada.gov.ua/laws/show/344/2013 (accessed 20 July 2014).

Structure of the ICT Competency of teachers. UNESCO Recommendation, 2013, [online] at http://iite.unesco.org/pics/publications/ru/files/3214694.pdf (accessed 20 July 2014).

Ten years on from the Budapest Open Access Initiative: setting the default to open, 2012, [online] at http://www.budapestopenaccessinitiative.org/boai-10-recommendations (accessed 20 July 2014).