

IMPLEMENTATION OF CORPORATE STANDARDS OF ICT COMPETENCE – GUARANTEE QUALITATIVE OPEN ELECTRONIC ENVIRONMENT OF THE UNIVERSITY

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***Abstract:** The article is devoted to the design of high-quality electronic environment of the University in the context of European quality standards in the educational space of universities. A key requirement for the creation and development of quality e-environment is the availability of corporate standards developed by the University, including corporate standard of ICT - competence. These corporate standards of ICT competence of lecturers and students are designed and approved by the Borys Grinchenko Kyiv University. Described models and analysis tools for monitoring the levels of ICT competence of participants of educational process, the ways of their improvement. The displayed interdependence is the quality of the educational environment of the modern university and the level of ICT competence of teachers and students.*

Keywords: open e-environment of the university, corporate standard of ICT competence, model of ICT competence, instrument of formation ICT competence, monitoring, the quality of university education

INTRODUCTION

The rapid technological change, new quality modern education society based on high-tech learning tools is characterized by considerable mobility, versatility and solidity. Global science needs scientists who can solve global scientific problems, develop general scientific theory. International labor market requires skilled professionals with a flexible system of knowledge and operational capabilities of their applications in related areas that can quickly adapt to technological change, ready to improve and update their own educational level.

Development of new technologies and methods for innovative educational activities using ICT is the foundation of the international project «IRNet», of which Ukrainian partner is the Borys Grinchenko Kyiv University. In accordance with the work plan BGKU developed and implemented standards for ICT expertise and the tools to analyze and assess the formation of the ICT competence of participants of educational process. This will monitor the level of formation of ICT competence and develop quality university open electronic environment, which is based on competence and student-centered learning approaches to ensure that requests the modern information society on the preparation of competitive specialists.

1. DESIGNING INFORMATION AND EDUCATIONAL ENVIRONMENT OF THE UNIVERSITY

Studying the experience we have built the world's universities is an open environment Borys Grinchenko Kyiv University education priority of which is based on competence and personality-oriented approach. The model of the student oriented educational process is displayed in Figure 1.

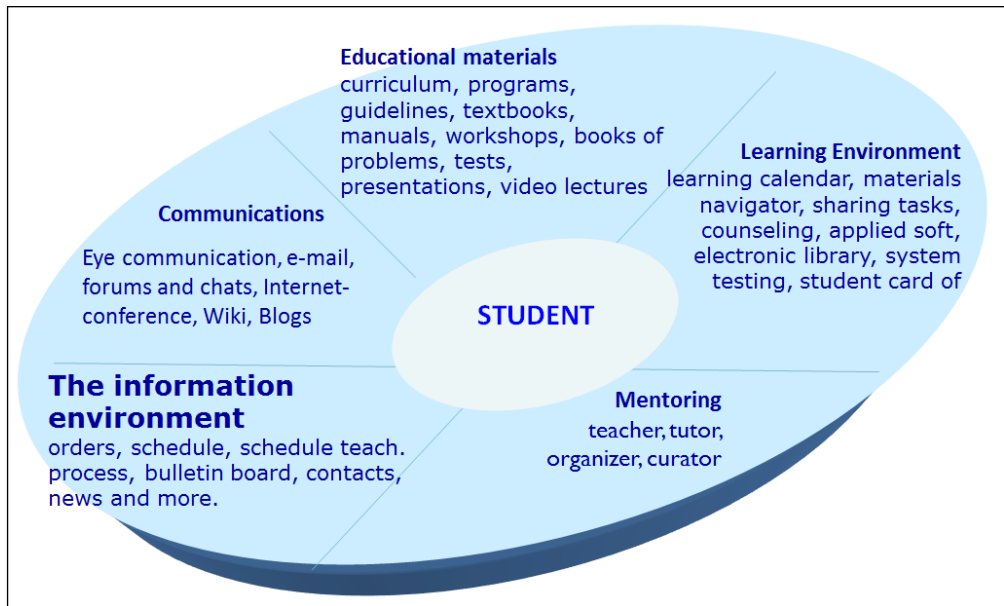


Figure 1. Model of the educational process

Source: Own work

The model of the educational process indicates that the environment is mandatory components to be e-content and e-technology interaction and e-collaboration.

Technologies of e-communication and e-collaboration differ among students, faculty, students and teachers, leaders and students, managers and teachers.

By e-content attribute of e-resources of the University, this can be both open and restricted access.

E-resources include public access:

Name	URL
University webpage	http://kubg.edu.ua/
University in Facebook	https://www.facebook.com/grinchenkouniversity
University in VK	http://vk.com/public24774525
University in Twitter	https://twitter.com/nash_kubg
University in Instagram	http://instagram.com/grinchenkouniversity
Library	http://library.kubg.edu.ua/
E-catalog Web IRBIS	http://ek.kubg.edu.ua/
The e-learning platform with e-learning courses	http://e-learning.kubg.edu.ua/
Institutional Repository	http://elibrary.kubg.edu.ua/
WIKI	http://wiki.kubg.edu.ua/
E-publishing	http://kubg.edu.ua/2012-08-15-10-06-19/180-resursy/2402-elektronni-vydannia.html
Scientific masterworks	http://masters.kubg.edu.ua/
Improving ICT competence of BGKU teachers	http://cikt.kubg.edu.ua/
E-portfolio	http://e-portfolio.kubg.edu.ua/
Single sign on to all e-resources	https://login.kubg.edu.ua

E-resources with limited access:

With limited access (available on the University intranet)	
E-library	http://elib.kubg.edu.ua/
E-testing	http://testing.kubg.edu.ua/
Base qualifying works with an automated check on plagiarism	http://resbase.kubg.edu.ua/

Details of the e-content of e-environment in the Borys Grinchenko Kyiv University can be found on the official portal <http://kubg.edu.ua/>, selecting main page menu «E-environment» (Figure 2).



Figure 2. E-resources of BGKU

Source: Own work

For the development of environment quality it is not only university e-resources. Each component of e-resources must be focused on building individual learning paths each student's personal trajectory of each faculty and staff, constantly updated quality content that meets European standards. A key requirement for e-resources is their openness to the global community (Figure 3).

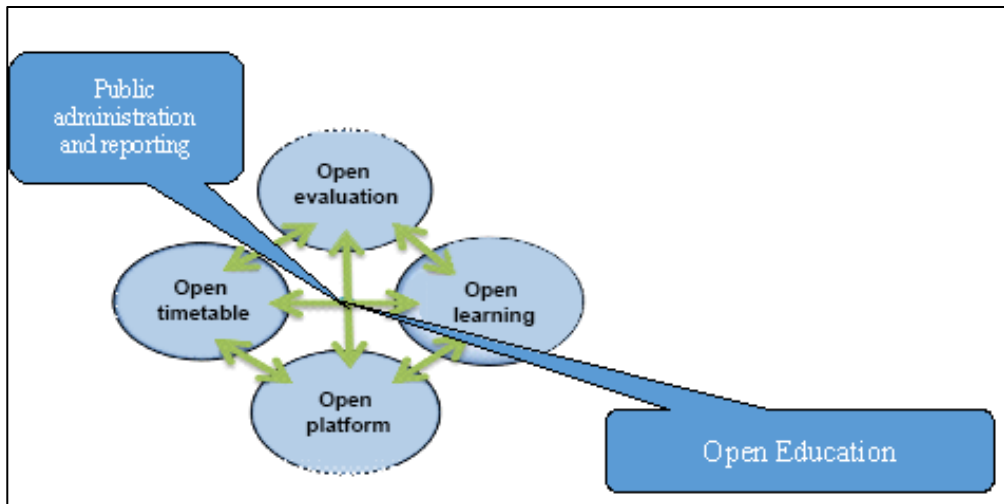


Figure 3. Open e-environment of the University

Source: Own work

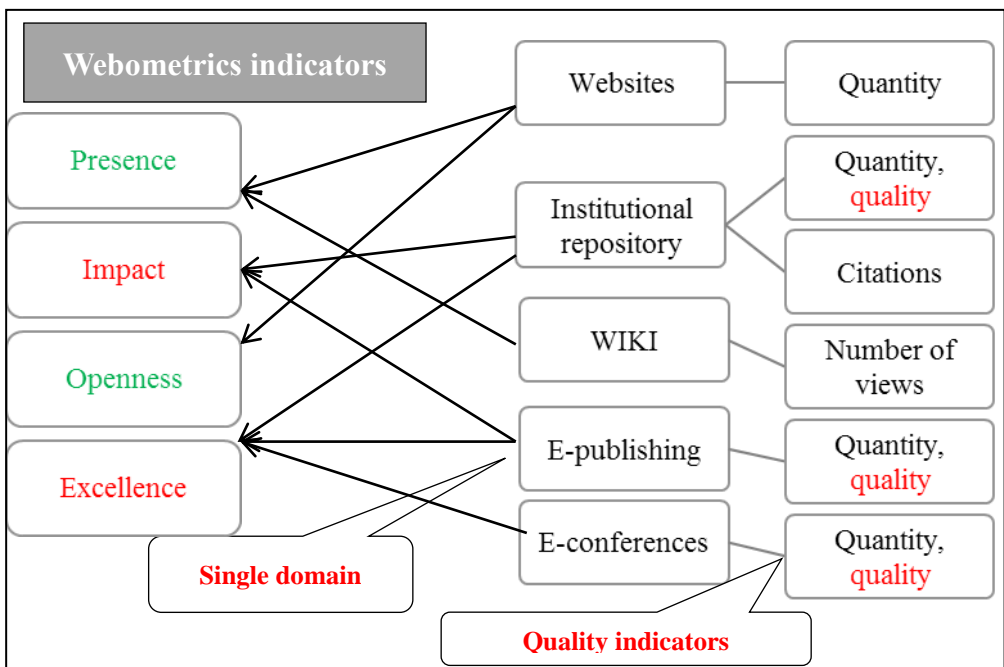


Figure 4. The impact of public resources on the quality of educational activities (Webometrics indicators)

Source: Own work

With open e-resources administration, employers and applicants can analyze the quality of university education and compare it with other universities of the country and the world through the world ranking. For Ukrainian universities, today, the most effective tool for comparative evaluation of quality of educational activities in accordance with generally accepted international criteria is the Webometrics ranking. The impact of public resources is the quality of university education by indicators displayed on the Webometrics ranking in Figure 4.

Assessment of quality e-resources with limited access is based on indicators of internal quality assurance of educational activities of the university. The impact of e-resources, limited access to quality educational activity indicators of BGKU is displayed in Figure 5.

To ensure the development of quality e-environment, we followed the recommendations of the UNESCO European standards of quality higher education framework of ICT competences 2.0, the Law on Higher Education of Ukraine, studied the effects of macro trends. As a result, we have created information-educational environment in the Borys Grinchenko Kyiv University (Figure 6).

The necessary conditions of quality e-environment University has developed and approved corporate standards, as well as development indicators and indicators of internal standards to ensure quality educational activity.

Among the corporate university standards we highlight:

- Standards for Quality Management System
- Standards for IT and information environment
- Standards of training documentation in an electronic form – Electronic Document Management
- Standards to provide additional education on the basis of DL
- Standards on scientific and methodological materials and tests
- Standards for the training
- Standards for organization of scientific activity
- ICT competence standards of teacher and student
- Standards for e-content and e-learning environment
- Standards for educational technology

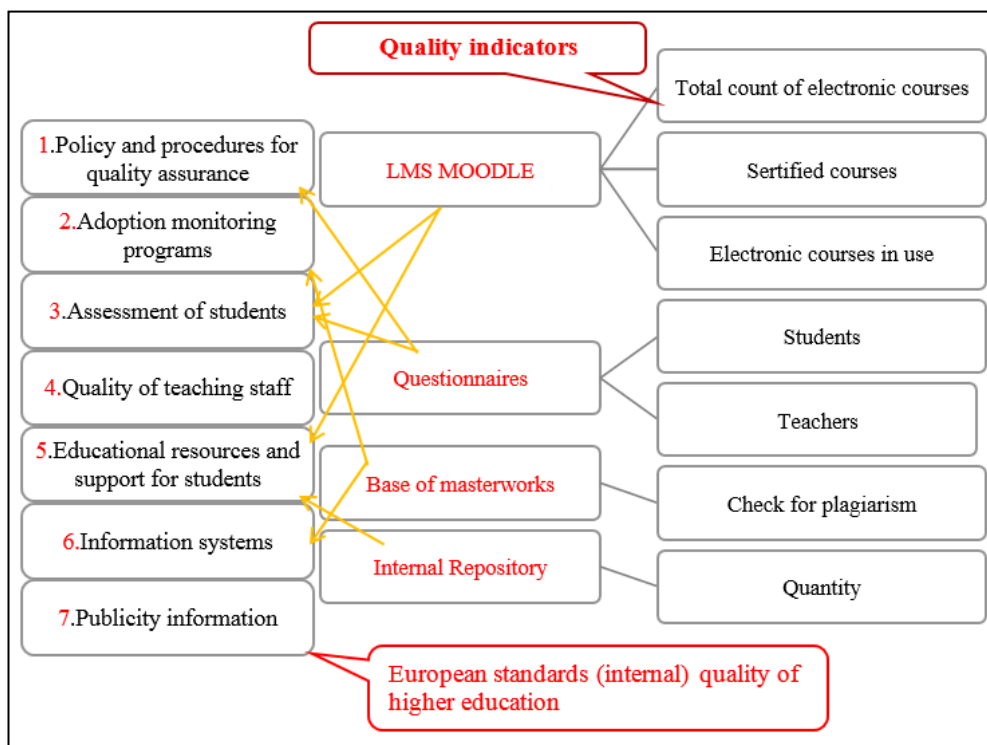


Figure 5. The impact of limited e-resources access to quality educational activities (internal European standards).

Source: Own work

In the Borys Grinchenko Kyiv University developed and approved corporate standards for ICT competencies of all participants in the educational process. The main objectives in this are: the establishment of appropriate models of ICT competencies (students and teachers) determine the levels of development and their respective monitoring instruments forming.

In the scientific literature, ICT competence allocated a separate component. Its interpretation is quite varied (Formation and development of ICT competence of teachers, 2012). We are inclined to the definition given in the State Standard of full secondary education, information and communication competence - the ability of the student (student teacher) to use information and communication technologies and appropriate means to fulfill personal and socially important problems. ICT competence may be divided into key and share competences.

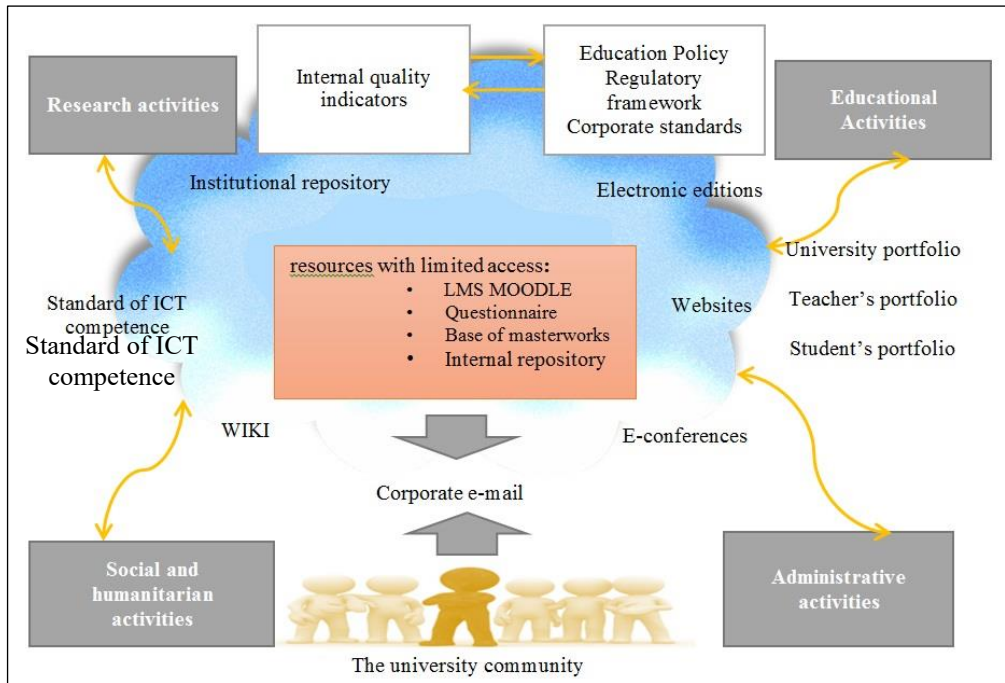


Figure 6. E-environment of BGKU

Source: Own work

Subject ICT competence – the ability of students to apply in a particular life, educational and research situation, including problematic acquired knowledge, abilities, skills, ways of working for the selection of appropriate ICT and use them to search for the required data, analysis, organization transformation, storage and transmission of ethical and legal norms and solve problems of the subject field (On approval of the State Standard of full secondary education, 2011).

Key information and communication competence – the ability to effectively use ICT in teaching, research and daily activities, to address information and professional tasks (On approval of the State Standard of full secondary education, 2011).

In developing the ICT model of competency standards we followed the standards of ICT competencies of UNESCO (Figure 7) which defined the international program UNESCO (ICT Competency Framework for Teachers) (ICT Competency Framework for Teachers, 2011).

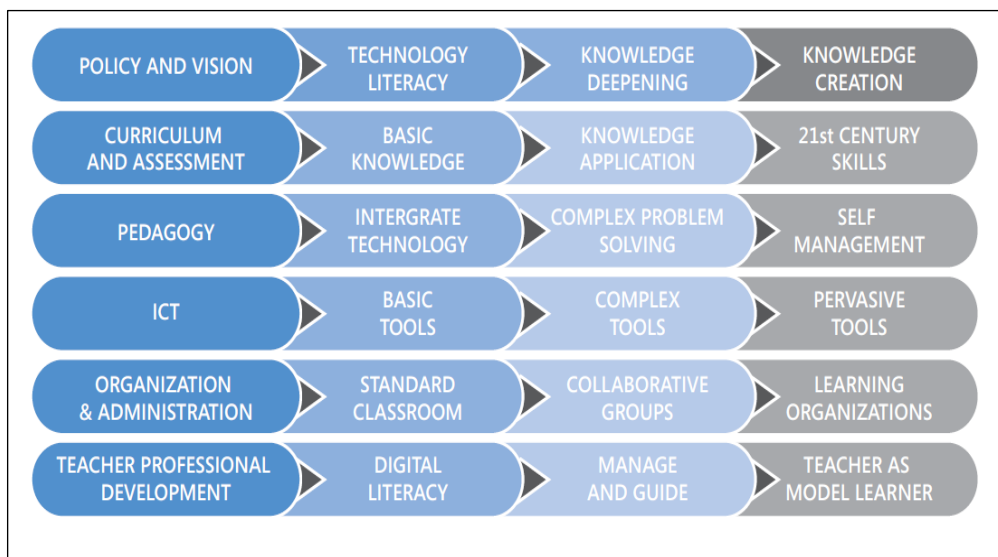


Figure 7. UNESCO: ICT competence Standard

Source: 2013,

<http://iite.unesco.org/pics/publications/en/files/3214726.pdf>

UNESCO recommendations emphasize that for the modern professional is not enough to be technologically literate and be able to shape technological skills. Modern teachers should be able to help students use ICT to successfully cooperate to solve arising problems, develop 21st century skills.

When building a model of ICT competencies of scientific and pedagogical staff member identified three main approaches to teacher activities.

The first approach - «Technological literacy» - the ability to require the teacher to help students use ICT to improve teaching and research.

The second - «Enhancing Knowledge» - requires the ability of teachers to help students learn the content in deep subjects, applying the acquired knowledge to solve complex problems that occur in the world.

Third - «Creating Knowledge» - requires the ability of teachers to help students produce new knowledge and skills that employers need today.

Let us consider the standard model of corporate ICT teacher competency Borys Grinchenko Kyiv University in terms of its main aspects: understanding the role of ICT and their applications in education, research activities, training. Each of specified levels of ICT expertise of the teacher inherent specific knowledge and skills (ICT Competency Framework for Teachers, 2011).

Table 1.

Model of corporate standard of ICT competence of teaching staff

Activity	Technological literacy	Enhancing knowledge	Creating knowledge
Understanding the role of ICT in education and their use	Familiarity with education policy	Understanding educational policy	Innovation in education
ICT	Basic tools	Advanced tools	New technologies
Educational work	Basic knowledge: fragmented ICT use in education	Application of knowledge: systematic use of ICT in education	Skills knowledge of society
Scientific activities	Basic knowledge of scientific communication	The use of scientific knowledge (incl. virtual) electronic communications and scientific cooperation	Skills implementing research projects
Advanced training	ICT literacy: formal training in ICT	Management and direction: informal ICT learning	The teacher as an exemplary student: study on public courses (eg, MOOC)

Source: Own work

For the measurement of formation of knowledge and skills of each of the levels required specialized tools. Such monitoring tools forming ICT teacher's competence is presented in Table 2.

Table 2.

Monitoring Tools of formation ICT teacher's competency

Activity	Technological literacy	Enhancing knowledge	Creating knowledge
Measurement tools: <i>Understanding the role of ICT in</i>	1. Online survey to determine the level of awareness of teachers about the availability of documents on	1. Survey of students for use in the profession of innovative educational policy. 2. The survey of teachers in understanding ways to	1. E-portfolio: availability of information on participation in the group to create new educational development, a

<i>education and their use</i>	<p>education policy at the University or the State and their role in the activities of the university.</p> <p>2. Participation in seminars (full-time or remote) on educational policy of the University.</p>	<p>use innovation in the profession of education policy.</p> <p>3. Survey of students to determine the role of ICT in education and identify requests students to enrich the e-university environment.</p> <p>4. Teacher's e-portfolio: availability of data on participation in some group of educational initiatives.</p>	<p>strategy for ICT and their use.</p>
<p>Measurement tools: <i>ICT</i></p>	<p>1. Tests for independent verification of levels of basic tools (created by the University, IT-Academy).</p> <p>2. Some components of e-learning courses (electronic educational course)</p>	<p>1. Certified electronic educational course, which is a necessary condition for the use of complex ICT tools.</p> <p>2. Teaching materials are based on the use of e-tools</p>	<p>1. Usage of Wiki portal.</p> <p>2. Own blog of the teacher.</p> <p>3. Usage of social networks for education.</p> <p>4. Teacher's e-portfolio.</p>
<p>Measurement tools: <i>Educational Activities</i></p>	<p>1. Survey of students about the quality of fragmented use of ICT.</p> <p>2. E-testing students' educational achievements.</p> <p>3. Availability of electronic course in LMS Moodle.</p> <p>4. Questioning</p>	<p>1. Statistics of usage by students of electronic course, placed on LMS Moodle.</p> <p>2. Links in electronic course on Institutional repository resources.</p> <p>3. Links on open e-resources.</p> <p>4. Links on open learning courses (MOOC).</p> <p>5. E-science publications.</p> <p>6. Survey of students on</p>	<p>1. Creation an open electronic courses (MOOC) and statistics of their members.</p> <p>2. Organization of email communication and collaboration (including educational projects) in soc. networks and on the basis of virtual</p>

	<p>teachers in understanding the effectiveness the use of ICT in practice.</p>	<p>teacher satisfaction with the proposed e-resources.</p> <p>7. Evaluation of training programs: a list of recommended resources.</p> <p>8. Availability of certified electronic courses on each disciplines that teacher teaches.</p> <p>9. Assessment of systematic use of electronic course resources: reports on e-dean and electronic gradebook of specific electronic course.</p> <p>10. Availability on the Wiki portal annotations to certified electronic course.</p> <p>11. Assessment of systematic use of resources in the university environment</p>	<p>communication (skype, video conferences, webinars, etc.).</p> <p>3. Joint projects on the Wiki portal.</p> <p>4. Teacher's e-portfolio.</p> <p>5. The use of ICT for administration of the educational process</p>
<p>Measurement tools: <i>Scientific activities</i></p>	<p>1. Survey for teachers awareness on the use of scientific communication: repositories, scientometric databases, e-libraries, e-journals, as well as opportunities and participate in online conferences.</p> <p>2. Number of publication in</p>	<p>1. Number of international publications.</p> <p>2. Number of appearances at international conferences</p>	<p>1. Participation in Intercollegiate and international research projects.</p> <p>2. Teacher's e-portfolio.</p> <p>3. Number of joint international publications with scientists from other universities.</p> <p>4. Citations index in international scientometric databases.</p>

	Institutional repository.		5. Organization and conduct online conferences, seminars.
	3. Citations index in Google Scholar.		
Measurement tools: <i>Advanced teachers training</i>	The certificate of training for ICT	<ol style="list-style-type: none"> 1. E-portfolio. 2. Participation in distance training courses in Ukraine. 3. List of graduated non-formal learning. 	<ol style="list-style-type: none"> 1. E-portfolio. 2. The list of graduated open professional online learning courses (MOOC). 3. Training for colleagues on the use of ICT. 4. Online consultations, conducting webinars out of the experience.

Source: Own work

A key tool for monitoring formation of ICT in teacher competence serves BGKU have developed a system "e-portfolio", which displays all indicators of teacher (<http://e-portfolio.kubg.edu.ua/>). The system allows you to create rating tables and receive a variety of statistical reports as a separate teacher and department (Figure 8).

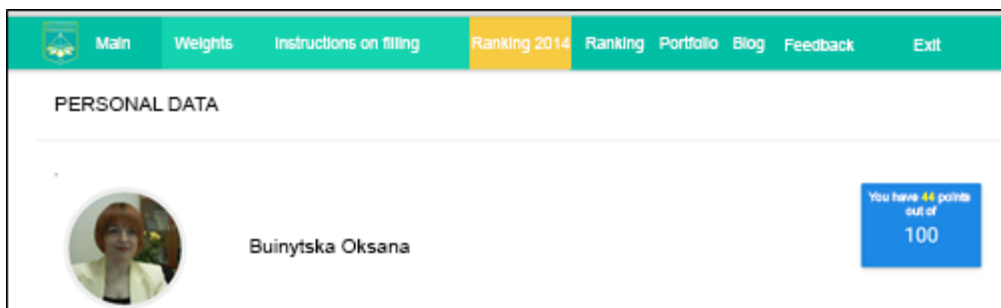


Figure 8: Profile page of teacher's Portfolio

Source: Own work

The profile of the teacher displayed besides personal data, information on major activities: research and development, professional development, teaching activities, scientific school.

E-portfolio provides automatic formation of an open portfolio lecturer at the University wiki portal (Figure 9).

1 PERSONAL DATA

- 1.1 Position, academic status, academic degree
- 1.2 Education
- 1.3 Job
- 1.4 Thesis
- 1.5 Contacts

2 RESEARCH ACTIVITIES

- 2.1 Articles in professional and international publications
- 2.2 Theses and Dissertations
- 2.3 Monographs
- 2.4 Training and educational methodical manuals
- 2.5 Educational programs
- 2.6 Other materials
- 2.7 Profiles in scientometric databases

3 PROFESSIONAL DEVELOPMENT

- 3.1 Participation in international and national projects
- 3.2 Presentations at international conferences and forums
- 3.3 Professional certification
- 3.4 Participation in competitions
- 3.5 Certificate of registration of copyright in works

4 TEACHING

- 4.1 Disciplines
 - 4.1.1 Electronic courses

PERSONAL DATA

Position, academic status, academic degree

Head of IT in Education Laboratory, Associate Professor, PhD [↗](#)

Education

Zatonskyi Kamenets State Pedagogical Institute, 0104 Specialty physics, physics teacher qualifications, Computer Science

Job

- [Borys Grinchenko Kyiv University](#) [↗](#)
- Head of IT in Education Laboratory (since october, 2012)


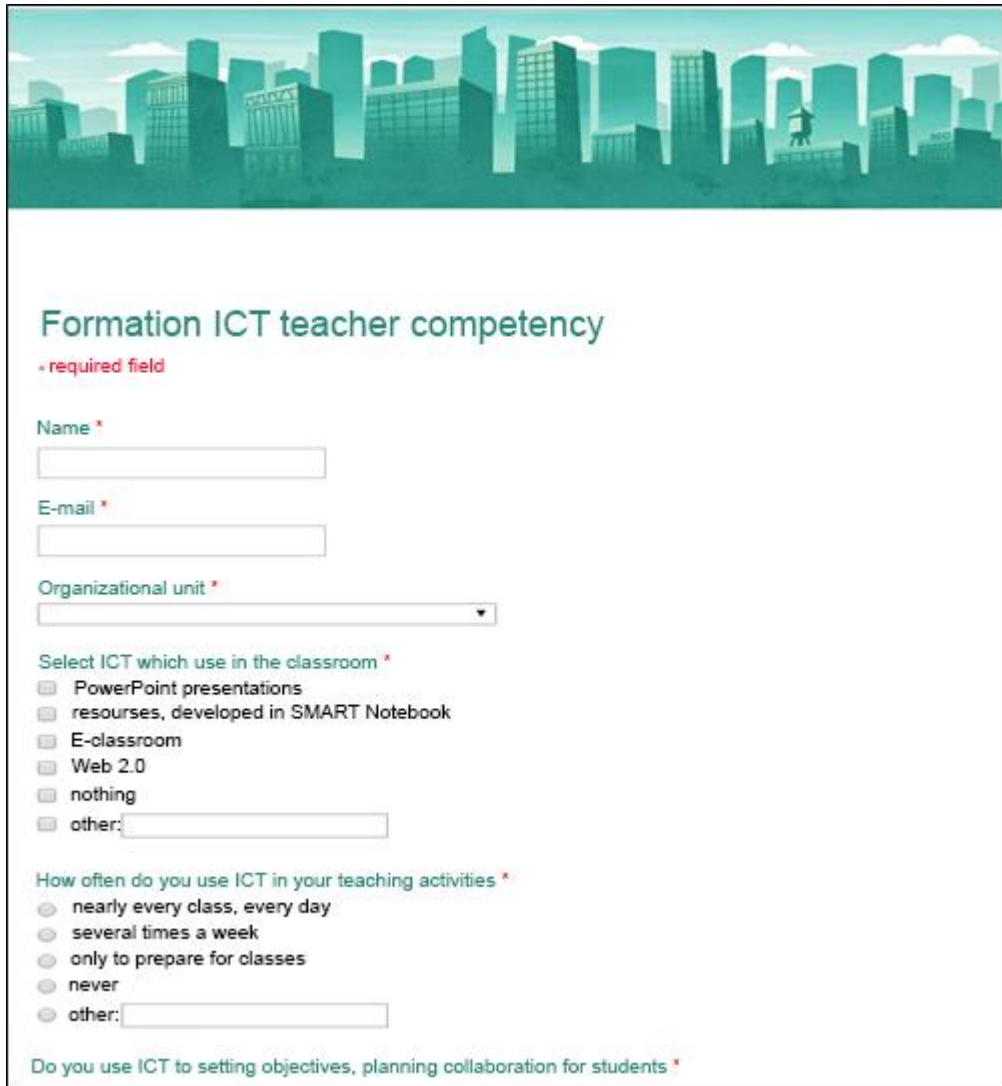


Figure 9. Automatically generated profile of employee at the University wiki portal

Source: Own work

To determine the level of formation ICT teacher competency was developed Google form «Formation ICT teacher competency» (Figure 10).



The image shows a Google Form titled "Formation ICT teacher competency". The form is set against a teal background with a city skyline illustration. The title is in a large, bold, teal font. Below the title, there is a red asterisk and the text "required field". The form contains several sections:

- Name ***: A text input field.
- E-mail ***: A text input field.
- Organizational unit ***: A dropdown menu.
- Select ICT which use in the classroom ***: A list of checkboxes with the following options:
 - PowerPoint presentations
 - resources, developed in SMART Notebook
 - E-classroom
 - Web 2.0
 - nothing
 - other:
- How often do you use ICT in your teaching activities ***: A list of radio buttons with the following options:
 - nearly every class, every day
 - several times a week
 - only to prepare for classes
 - never
 - other:
- Do you use ICT to setting objectives, planning collaboration for students ***: A text input field.

Figure 10. Questionnaire for teacher formation of ICT competence

Source: Own work

The results of the survey among university teachers (152 respondents), 64% reported using ICT in almost every class. Conducted survey made it possible to learn more about the problems that arise in teachers while working with established e-resources, their feasibility and use, allowing us to meet the needs of teachers to organize and

conduct relevant trainings, seminars, bar Camp under the "Advanced training scientific and pedagogical staff on ICT" (Figure 11).

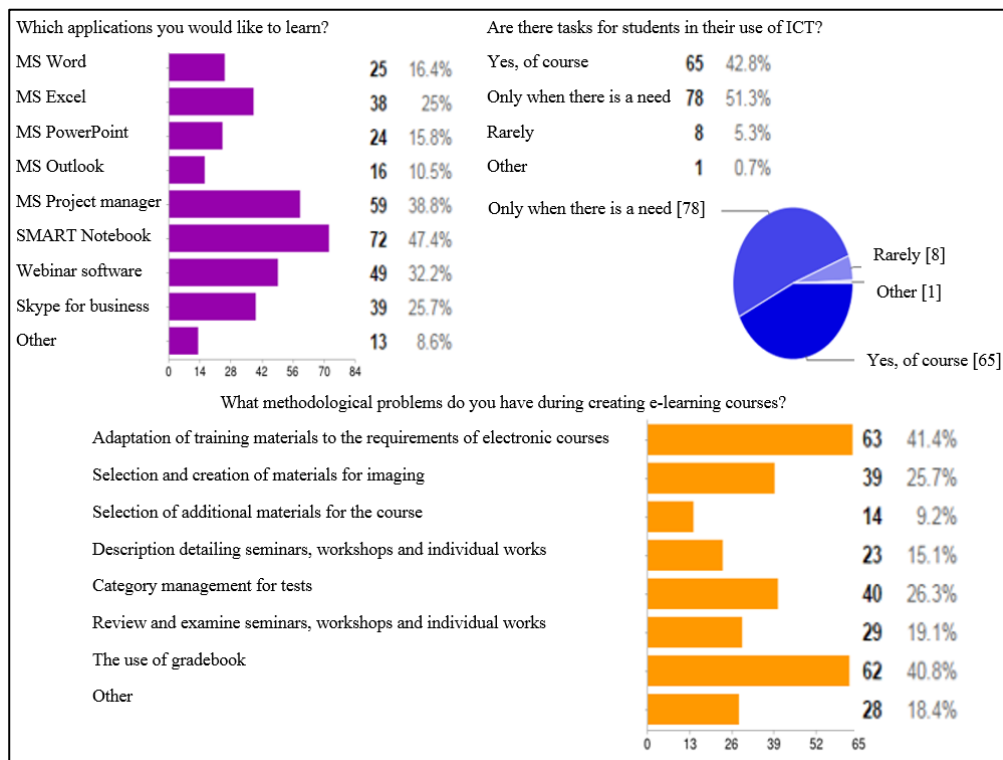


Figure 11. Results of the survey of teacher formation ICT competence

Source: Own work

For the preparation of modern specialist that would meet the requirements of the labor market, and allow university graduate to find employment and be successful in the modern information society for students Borys Grinchenko Kyiv University developed and approved a corporate standard ICT competence degree, which laid the basis for standards UNESCO (Structure of ICT competency of teachers. Recommendations of UNESCO 2011).

With the formation of student ICT competencies conditionally distinguish three main levels:

- base (1st level, corresponding 1st bachelor year);
- advanced (2nd level, corresponding 4th bachelor year, or early education in magistracy);
- professional (3rd level, 2nd master year).

Formation of basic and advanced levels assigned to the department of computer science and information technology department and mathematical disciplines. With the formation of the professional level of ICT competence the responsibility of graduating university departments.

Each of certain specified levels of inherent knowledge, understanding, skills, judgment. In describing the knowledge and skills to baseline in detail, we will not stop, because it is clear that it should be basic knowledge and skills. On this basis, the knowledge and skills that are unique to students at the advanced level. Based on the advanced level, respectively, generated knowledge and skills inherent to students for professional level (Morze, Buinytska 2014).

Thus, for the professional level of the basic requirements are: ownership principles of operation of the computer and computer equipment; ability to organize access to the information resources of a global network; ability to independently study proprietary software educational and professional guidance; knowledge and understanding and the use of cloud technologies; ability to establish, build and test applications on PCs; possession of professional software packages; knowledge of the organization and conduct of TV and video conferencing, webinars.

Training activities characterized involving professional level in international distance learning courses; the ability to use the Internet to find professional courses in education to implement informal training; Advice on the use of ICT in professional activities; possession methodology creating websites, blogs professional direction.

To implement the scientific activities of the same level we distinguish the ability to use methods and technologies of training and research; the ability of the materials chosen research topic and save the results obtained in the network; the ability to create a scientific publication and place it in an electronic journal; ability to present research results in the Masters is a university environment; ability to present own portfolio.

Social and humanitarian activities for the professional level of inherent ability to conduct seminars on integrating ICT in professional activities; developing and conducting training courses on basic computer skills and ICT.

Each level of ICT competence formation of the student has its own monitoring tools. It may be, TEST software, sets competency tasks, master work, complying with the requirements, developed a personal portfolio and the student's educational environment, etc.

Division of monitoring tools of formation of the ICT competencies presented on Figure 12.

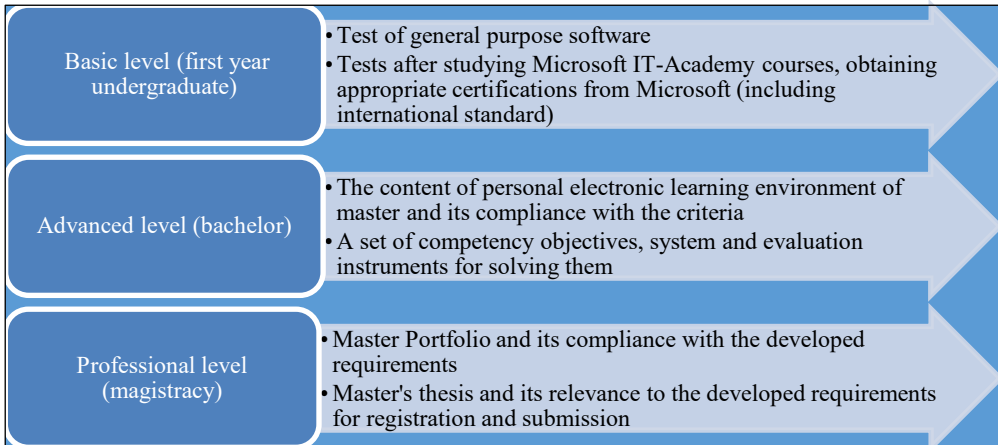


Figure 12. Monitoring Tools of formation of the student's ICT competence

Source: Own work based on Author, MORZE Nataliia, BUINYTSKA Oksana, 2014

In order to test the developed tools were tested the basic level of ICT competencies of students in the Borys Grinchenko Kyiv University.

The computer questionnaire was responded by 885 1 year students (out of 1360 students enrolled at the University), representing 65% and 253 5th year students (out of 475 people), which accounts for 53%.

When checking the baseline formation of ICT competencies tested: knowledge and ability to use personal computers and computer networks; knowledge, understanding and ability to use computer programs (different OS (operating system), work with files, start the program, use the help system OS and other programs to work with files, word processor, image editor, means for preparing presentations, tools for preparation of publications, spreadsheet, antivirus programs, archiving and other programs); knowledge and ability to use basic services for the Internet (e-mail, information retrieval systems, teleconferencing); knowledge and ability to use technology Web services and Web 2.0 - 3.0 for solving educational problems; the ability to use electronic information and educational environment of the University; use of teaching tools created through ICT.

The test, which consisted of 100 questions, was divided into four main sections:

- The study of ICT;
- ICT in training activities;
- ICT in research activities;
- ICT in social and humanitarian activities.

Students had to answer 50 questions that were selected randomly, automated (20 questions - studying ICT, 10 questions - ICT in the educational activity, 10 questions - ICT research activities, 10 questions - ICT in social and humanitarian activities).

The maximum number of points that the students could gain was 50, minimum - 0. Depending on the number of points, there was defined the formation level 1 (basic) of ICT competence, namely:

- high – 45-50 points;
- sufficient – 35-44 points;
- satisfactory – 25-34 points;
- low – 15-24 points;
- null – 0-14 points.

The same task as the students were asked to perform 1 year (bachelor) and 5th year students (masters, specialists) in order to create the initial formation of ideas about the basic level of ICT competencies of University students.

Average score for the monitored University Bachelor's Degree students of 1 year of training is 31,4. Average score test result for the 5th year students of the University is 33,6.

According to the monitoring results 54.4% 1 year students who participated in the testing, with a satisfactory level of development of ICT competence, 32.4% of students - sufficient, 10.6% - low, 1.8% of students - not formed ICT-competence, only 0.8% of students have a high level.

According to the monitoring results we see that 55.7% of 5th year students, who just received a bachelor's degree have sufficient ICT competencies formation and 33.2% of students - satisfactory. Only 8.3% of students have a low level and 1.8% of students not formed ICT competence. The high level have only 1% of 5th year students of the University.

In order to enhance formation of ICT competence Masters offered to students in January-February 2015 to receive training in the IT Academy at no cost (two courses with arbitrary applications and one office - the use of technology); seize all opportunities corporate e-mail and related services free of charge; open master course "Presenting research masters using ICT", which is available on the wiki portal University; master the use of e-learning university.

In order to provide students with quality educational services necessary to amend the job training programs prepare students of educational level "bachelor" discipline "Information technology education", in particular to update training material, provide study of courses of IT Academy (Microsoft) got the corresponding certificates; require the teaching faculty of informatics and of information technology and mathematical subjects undergo distance learning in the IT Academy

(Microsoft) got the corresponding certificates; teachers of the course "Introduction to" the study section V "I am in the information environment University" pay special attention to all students perform tasks for independent work, placed in an open course at the University wiki portal www.wiki.kubg.edu.ua; teachers of the course "Modern information and communication technologies in education (social pedagogy, history, psychology, etc., depending on specialty)" to make changes to the course and provide compulsory study module "Presenting research masters using ICT" materials to which is available on the wiki portal University www.wiki.kubg.edu.ua.

These recommendations are nothing like the necessary conditions for the formation of the ICT competencies for students who participated in the monitoring. In general, the necessary conditions for the formation of ICT competencies include: the use of certified teacher's courses and social networks and Web 2.0 services; electronic course monitor the quality and effectiveness of their use; creation of personal electronic learning environment of the student; creation of e-Portfolios of student and its analysis; requirements for professional competence of masters, which includes ICT competence. This in turn is qualitatively created a public information and educational environment of the university.

CONCLUSION

One way to create an electronic information and educational environment of the University is to develop corporate standards, create a personal learning environment for students and teachers. An important condition for the effective functioning of electronic information and educational environment is to transform it into a public system by the interaction with the labor market, providing students with more control over the educational process by participating in its planning and evaluation of quality, implementation of self-control and self-esteem. Privacy is a public environment in this case will be a means of strengthening the subjective position of students in teaching, increase the level of formation ICT competence as a teacher and student. The presence of public information and educational environment of the university is a necessary condition of formation the ICT competencies of students, which improves the efficiency and quality of the learning process.

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REFERENCES

- Buinytska, O., and Hrytseliak, B., The student in the information and educational environment of the modern university. Information technologies and learning tools. 2013, 36(4): 66-83. ISSN 2076-8184.
- Formation and development of ICT competence of teachers. [online]. [http://wiki.ciit.zp.ua/index.php/Формування_та_розвиток_ІКТ-компетентності_педагогів_\(in_Ukrainian\)](http://wiki.ciit.zp.ua/index.php/Формування_та_розвиток_ІКТ-компетентності_педагогів_(in_Ukrainian))
- I am student*: educational tutorial. (Section V. Create a smart university - our strategic objectives). [edited by OGNEVIUK, Victor] – 4th edition with changes. Kyiv: BGKU, 2014. 278 p. ISBN 978-966-7548-84-1.
- ICT Competency Framework for Teachers* [online]. Available from: <http://iite.unesco.org/pics/publications/en/files/3214726.pdf>
- Morze, N., and Buinytska, O., and Kocharian, A., Competency oriented education: quality measurement [edited by OGNEVIUK, Victor and Liudmyla Khoruzha] (*Section II. ICT competence of teachers and students as a way to formation of information educational environment of the University, p. 151-196*): Collective monograph. Kyiv: BGKU, 2015. 368 p. ISBN 978-617-658-011-9.
- Morze, N., Buinytska, O., Corporate Standard of ICT competence of masters. *Informational Technologies in Education*. 2014, vol. 19, 9-21. ISSN 1998-6939.
- Morze, N., Kuzminska, O., Protsenko, G., Public Information Environment of a Modern University [online]. *ICT in Education, Research and Industrial Applications: Integration, Harmonization and Knowledge Transfer. ICTERI 2013*, vol.1000, 264-272. Available from: <http://ceur-ws.org/Vol-1000/ICTERI-2013-p-264-272.pdf>. ISSN 1613-0073.
- On approval of the State Standard of full secondary education. *Decision of Cabinet of Ministers of Ukraine №1392 from 23 november 2011*. [online]. Available from: [http://zakon2.rada.gov.ua/laws/show/1392-2011-п_\(in_Ukrainian\)](http://zakon2.rada.gov.ua/laws/show/1392-2011-п_(in_Ukrainian))
- Structure of ICT competency of teachers. Recommendations of UNESCO. 2011. 100 p.
- Zakharchenko, V., and Kalashnikova, S., and Lugovyi, V., *National educational glossary: higher education / 2nd edition*. Kyiv: Pleiady, 2014, 100 p. ISBN 978-966-2432-22-0.