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IN THE DIGITAL SPACE: PROGRAMME DESIGN AND CASE IMPLEMENTATION

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Abstract. *This article discusses the structure of higher education teachers' IC competence. A system approach to IC competence formation is offered within the framework of higher education teachers' postgraduate education. A model of postgraduate education programme design is created and an example of its implementation in a course is provided. Based on the results of a completed pilot project in the Borys Grinchenko Kyiv University and within the framework of the international IRNet project (www.irnet.us.edu.pl) the effectiveness of the application of the approaches offered by the authors to teachers' postgraduate education to develop teachers' IC competence was confirmed.*

Keywords: Competence, Higher education institution, Postgraduate education, Pedagogical design

INTRODUCTION

Wide implementation of digital technologies is one of the conditions for higher education to come to the global level. According to European institutions' recommendations the competence approach concept is a basis for meaningful changes in providing correspondence of education with modern market demand

("DeSeCo", 2001). Because of the active use of digital technologies, digital competence (IC competence) is defined as a separate component ("UNESCO ICT Competency Framework for Teachers", 2018) as well as its derivatives including educators' digital competence framework DigCompEdu (Redecker, 2017). At the highest level, IC proficiencies result in innovation, individual transformation, and societal change (Hansen, Postmes, 2012). And digital competence is recognized by EU one of 8 key competences for fulfilling life and work ("DigComp 2.0", 2016).

The field of education requires new approaches and innovative pedagogical, information and communication technologies for lifelong learning. In a report of New Vision for Education ("New Vision for Education", 2016) 16 crucial proficiencies for education in the 21st century were specified for lifelong learning and 21st century skills development, including:

- Basic skills (required for solving everyday tasks) which comprise the following types of "literacy": 1. General, 2. Mathematical, 3. Scientific, 4. Computer,
  5. Financial, 6. Cultural;
- Competences (required for solving complex tasks and challenges), in particular: 7. Critical thinking, 8. Creativity, 9. Communication, 10. Collaboration;
- Personal characteristics (as a means of adaptation to social and technological changes): 11. Curiosity, 12. Initiative, 13. Persistence, 14. Adaptability,
  15. Leadership, 16. Social and cultural literacy and responsibility.

In the conditions of digital transformation (Bounfour, 2016), the educational system in the EU is modified within the framework "EU 2020 Strategy" ("Europe 2020", 2015). Digital teaching and learning are also considered within the framework of the strategic programme "Education and training 2020" ("Council conclusions on a strategic framework for European cooperation in education and training 2020", 2009). The questions of teachers' commitment to increasing their digital competence and methods of the process stimulation are taken into account there.

Therefore, the problem of the education quality supply arises, so that it is correspondent to European standards of teachers' professional competence level increase with the help of postgraduate education system.

The aim of the article is to offer an author's approach to the digital competence formation at the university and an example of its implementation in the process of postgraduate education organization.

1. INNOVATIVE MODEL OF TEACHERS' POSTGRADUATE EDUCATION

Nowadays the profession of higher education teacher is being considerably updated, as today it is not just addition to scientific qualification but functions as an autonomous and meaningfully independent professional unity. In the system of teachers' competences, IC competence is considered as a key one (Figure 1). However, an analysis of postgraduate education programmes discovered that teachers' IC competence formation has not got enough attention at modern higher education institutions.

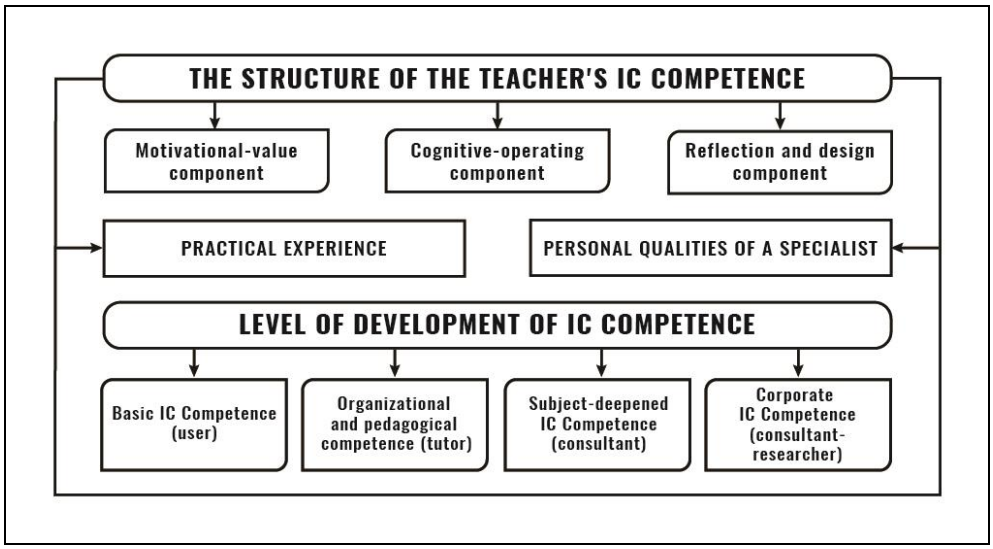

Figure 1. Structure of teacher's IC competence
Source: Own work

Usually teachers undergo postgraduate education to increase their level of professional competences. There are also courses dedicated to gaining technological literacy by teachers (Morze, Kuzminska, Liakh, 2017). However, the shift of emphasis from solving technological preparation tasks (mastering definite instruments and software) to innovative pedagogical technologies (project-based learning, distant and blended learning implementation, mobile learning, flipped learning) are the main tendencies of modern education. However, in most postgraduate education programmes in the sphere of digital technologies there are no modules aimed at moderators and tutors preparation as well as modules which provide training for teachers on pedagogical network interaction organization where a teacher could satisfy their educational needs including those for self-study, collaboration in network communities, teaching style design. Therefore, the content of DigCompEdu (Redecker, 2017) is defined by 3 groups of components which focus on different aspects of educators' professional activities:

Area 1. Professional Engagement: using digital technologies for communication, collaboration and professional development.

Area 2. Digital Resources: sourcing, creating and sharing digital resources.

Area 3. Teaching and Learning: managing and orchestrating the use of digital technologies in teaching and learning.

Area 4. Assessment: using digital technologies and strategies to enhance assessment.

Area 5. Empowering Learners: using digital technologies to enhance inclusion, personalisation and learners' active engagement.

Area 6. Facilitating Learners' Digital Competence: enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving.

One of the indicators for determining the expected learning outcomes of continuing education programmes was considered by the Education Technology Standards for Education and Training ("ISTE", 2016), including the standards for teachers (source: [online] at http://www.iste.org/standards/standards/for-educators).

To provide development of the abovementioned competences from the main trends defined in the report of NMC Horizon 2019 ("Horizon Report Preview. Higher Education Edition", 2019) the following ones were selected: blended learning designs, growing focus on measuring learning, advancing digital equity, rethinking the practice of teaching, increasing demand for digital learning experience and instructional design expertise, advancing cultures of innovation.

The authors of the article have developed a model for postgraduate education programme design in the part on teachers' IT competence (Figure 2).

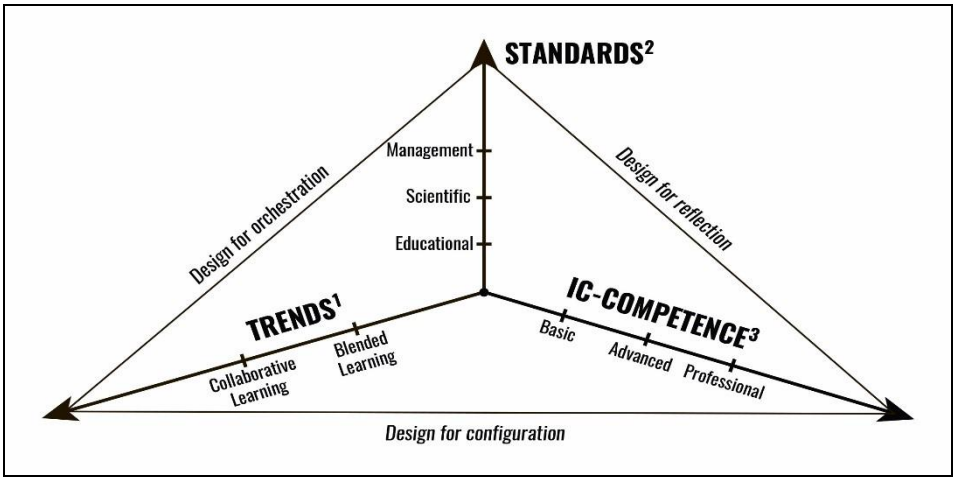

Figure 2. Model of teachers' postgraduate education programme design
Source: Own work

To define content modules of the postgraduate education programme it is offered to define:

(1) Educational trends and innovations ("Horizon Report Preview", 2019, "NMC Horizon Report", 2017). Using the NMC Horizon Report data it is possible to define trends which are currently important for an educational institution, make adjustments, carry out forward planning;

(2) The Standards and Guidelines for Quality Assurance in the European Higher Education Area ("ENQA", 2012). In the standard of ENQA (European Association for Quality Assurance in Higher Education) the following indicators are defined: teaching (educational process, pedagogical activity); academic staff; educational programmes; facilities and resources, informational educational environment; education management; scientific research etc. It is possible to use corporate standards developed by a higher education institution on the basis of European recommendations, for example, a corporate standard scientific work of the university employees (http://kubg.edu.ua/informatsiya/naukovtsyam/dokumenti.html);

(3) *Competence level* ("UNESCO ICT Competency Framework for Teachers", 2018, Redecker, 2017). In our opinion an advantage should be given to corporate standards of ICT competence.

Learning *forward-oriented* design for learning in technology-enhanced classrooms is based on several processes (Susan, 2016, Dimitriadis, Goodyear, 2013):

(1) *Design for configuration* – anticipating what students and other agents might configure to suit their specific needs, and preparing or equipping the design for such possible customization or modification (Figure 2).

(2) *Design for orchestration* – providing support for the teacher's work at learn time (Figure 2).

(3) *Design for reflection* – ensuring that actionable data is gathered at learn time, to inform system evaluation (Figure 2).

(4) *Design for re-design* – designing originally with re-design in mind – with built-in support and flexibility so that re-design may be performed as easily and fluently as possible. It is carried out on the basis of a teacher's attending certain modules or courses.

A system of postgraduate education can consist of both topical workshops (webinars) and separate modules or courses. Notably, a required condition is cumulative system of postgraduate education in continuous education system (Morze, Kuzminska, Liakh, 2017) that provides regular renewal of its content (Design for re-design) according to the level of both digital technologies and modern educational technologies development.

2. PEDAGOGICAL DESIGN OF COURSES AND AN EXAMPLE OF ITS IMPLEMENTATION

The ADDIE model was chosen as a model of pedagogical design of courses (modules, workshops) of postgraduate education system according to defined categories of learners and capability of e-environment. The ADDIE model is a framework that lists generic processes that instructional designers and training developers use. It represents a descriptive guideline for building effective training and performance support tools in five phases: Analysis, Design, Development, Implementation, Evaluation (Durak, Ataizi, 2016).

The analysis of the results of educational and scientific work of Borys Grinchenko Kyiv University teachers in 2016-2017 defined a need in design of the course "Development of educational, scientific collaboration and project management of ICT tools" (http://e-learning.kubg.edu.ua/course/view.php?id=2879). This course:

- covers major aspects of collaboration arrangement in education, evaluation and utilization for ICT tools in scientific communication, collaboration, scientific projects and research elaboration;
- meets current demand of the university on presenting the institution in scientific space (including creating profiles in scientific metric databases and scientific networks) and formation of project offers for scientific research realization both on local and international level that enables arrangement of joint scientific research in collaboration with leading European Union institutions;
- contributes to the formation of teachers' level of IC competence which corresponds to the *consultant-researcher level* (Figure 1) in the field of scientific work and project management (*Standards*, Figure 2) by means of collaborative learning experience enrichment (*Trends*, Figure 2).

Learners of the course, teachers who have at least basic level of IC competence according to the corporate standard of the university took the course distantly.

Collaborative learning has been studied extensively in educational research and found to be an effective distance learning strategy. Using own experience as a background and correspondence to personal educational requirements (in this case it was scientific communication arrangement and self-presentation as a scientist online) are the most effective baselines, the Community of Inquiry (COI) model was used on the stage of the course design process ("The Community of Inquiry", 2012) as its foundation. Each aspect of course design — *Social, Cognitive, and Teaching Presence* — can be considered and planned but must be interwoven when the course is taught (Kincannon, 2012).

As the implementation of COI models requires utilization of Wikis, Mashups like syndicated Personal learning environments, on the course development stage

LMS was used for creating an approximate action plan and development of IC competence (Figure 3). Self-study tasks are descriptions of real cases (for example, creation of a profile in ResearchGate and search for partners, consultants etc.) whose realization in social networks or the university wiki-portal requires a definite amount of preparation. For this purpose the following resources are used: LMS Moodle, communication tools (*Skype, Meet, Hangouts*), collaboration tools (*One Drive, Google Drive, OneNote*), international scientometric databases (*Web of Science, Scopus, EBSCO, Google Scholar*). And in order to provide assessment of learners' achievements in the course it is important to develop tests which ensure adequate quality according to the teachers' level (Kuzminska, Mazorchuk, 2016).

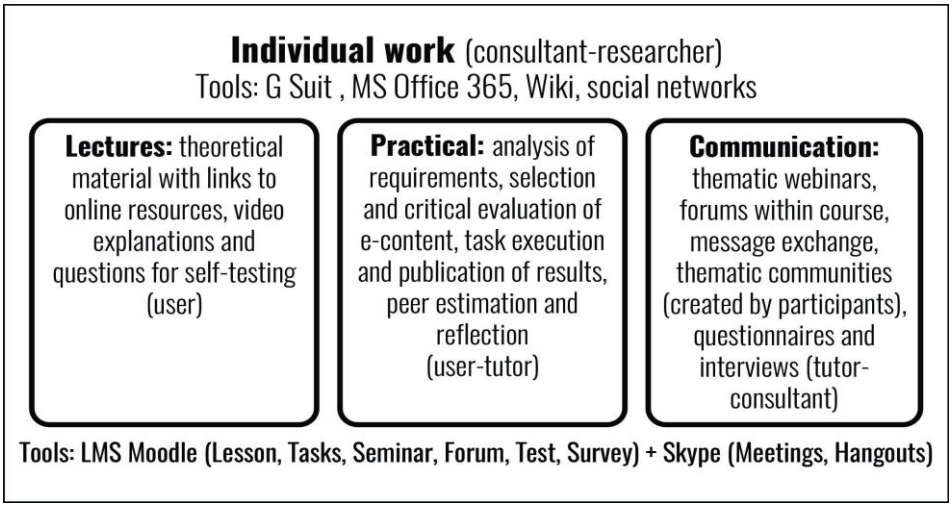

Figure 3. Structural model of acquiring competences through learning activities completion
Source: Own work

The implementation of the electronic course *"Development of educational, scientific collaboration and project management of ICT tools"* was carried out during 2017 at the Borys Grinchenko Kyiv University. 40 teachers took part in the testing of the course; 26 of them (group 1) were studying during 4 weeks with a carefully planned schedule and group activities. The content of the course, the training methods and the received result are provided in the article (Morze, Kuzminska, Liakh, 2017). The second group of participants (14 university teachers) was studying with flexible schedule taking into account their personal abilities. The difference between the groups was that collaboration of the first group of students was moderated by a course tutor and had a planned schedule.

In this research we reviewed the influence of COI model application on the quality of postgraduate education of teacher-tutors (Figure 1) based on the results of the two groups' participants survey with the help of Community of Inquiry

Survey Instrument (Arbaugh, 2008). The questions are combined according to three factors of influence: Teaching Presence, Social Presence, Cognitive Presence. Every question was evaluated on a five-point scale: 1- strongly disagree, 2-disagree, 3-neutral, 4 -agree, 5 - strongly agree. For each factor average values were calculated. Because the survey data have a normal distribution, the Student's T distribution was used to assess the significance of various mean values.

On the basis of statistical data processing (Table 1) an assumption can be made that the offered case of the COI model utilization obtained a positive appraisal. For the degree of variance f = 38 (n=40) critical value of Student t-test t_{score}= 2.024 (with the level of significance $\alpha = 0.05$). The difference is statistically significant only in the case of evaluation of Social Presence factor which can be explained by different conditions of completing the course by different groups. Synchronized in time collaboration (reinforces Social Presence) is more productive for achieving professionally meaningful result (in our case involving colleagues into the projects, search for journals for publication of own research etc.).

Table 1.

Results of Self-efficacy student COI model

Factor	1(26)	II (14)	Student t-test level (t)	Difference (t_{score}-t)
Teaching Presence	4.67±0.05	4.55±0.11	0.74	1.284
Social Presence	4.17±0.11	3.64±0.13	3.11	-1.086
Cognitive Presence	4.47±0.09	4.46±0.14	1.84	1.964

Source: Own work

3. THE PRACTICE PREVALENCE: INTERNATIONAL EXPERIENCE

A similar course (module) was implemented for postgraduate education of an international team within the framework of IRNet project (www.irnet.us.edu.pl) that was carried out during 2018 by a team of international tutors (Figure 4).

80 teachers from 6 European universities (in Poland, the Czech Republic, Slovakia, Portugal, the Netherlands, Spain) and 4 non-European universities (in Australia, Ukraine, Russia) were involved in the learning process. Notably, the first group (30 teachers) were participants of the project who studied simultaneously, that is, their collaboration was moderated by the course tutor and had a planned schedule (similar to the first group of the pilot project that was carried out at Borys Grinchenko Kyiv University). The second group (50 people) consisted of teachers who registered on the MOOC by themselves.

As learning on the courses *"Development of educational, scientific collaboration and project management of ICT tools"* http://e-learning.kubg.edu.ua/course/view.php?id=2879) and *ICT-tools for e-learning* (https://el.us.edu.pl/irnet/course/view.php?id=2) was conducted using the same methodology, the analysis of the participants' reflection about the quality of postgraduate education by an authorial technique was carried out similarly with the help of *Community of Inquiry Survey Instrument*. For the degree of variance f = 78 (n=80) critical value of Student t-test t_{score}= 1.991 (with the level of significance α = 0.05).

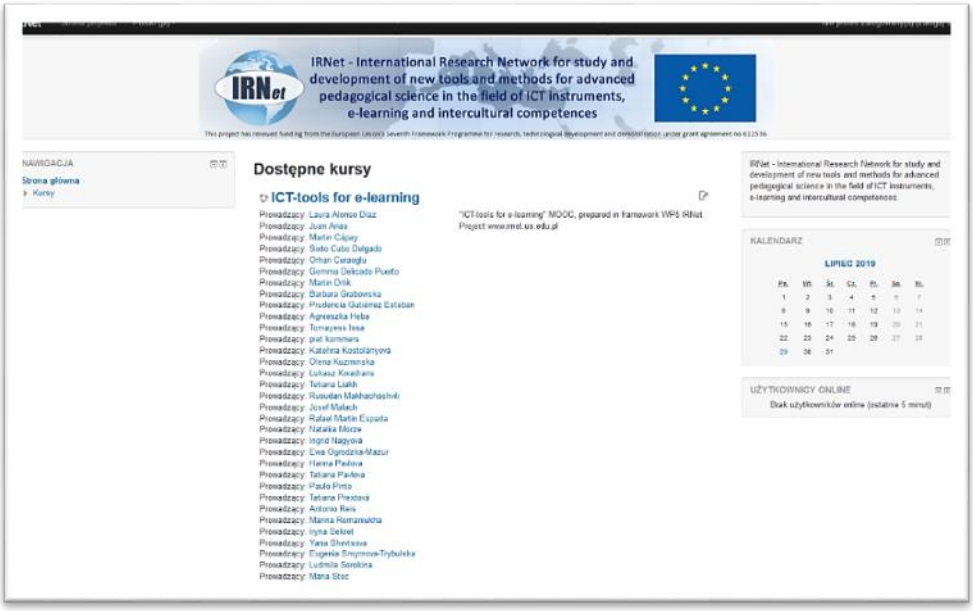

Figure 4. Description of the course on ICT-tools for e-learning (https://el.us.edu.pl/irnet/course/view.php?id=2)
Source: Own work

The COI model utilization obtained a positive appraisal (Table 2) for the course *ICT-tools for e-learning.* A statistically significant difference is observed in the case of evaluation of Social Presence factor (p=0.005135, p<0.05) similar to a Ukrainian pilot project (Table 1), which confirms the efficiency of synchronized in time collaboration (reinforces Social Presence) for achieving professionally meaningful result. However, unlike the pilot project there was also a difference in the case of Cognitive Presence factor (p=0.006026, p<0.05) which can be explained by a different level of the teachers' preparation to learn in the MOOC. The teachers of the second group (registered by themselves on the course) did not check their level of IC competence in advance and did not confirm being informed on the trends and the standards correspondence (Figure 2). In-depth interviews that were conducted with the participants of the course confirmed the assumption and discovered lack of motivation

of the second group, whereas the participants of the project had a strong motivation for learning as it contributed to the project tasks fulfillment and recognition of its participants (Smyrnova-Trybulska, Morze, Kuzminska, 2019).

Table 2.

Results of Self-efficacy COI model of international students

Factor	1(30)	II (50)	Student t-test level (t)	Difference (t_{score}-t)
Teaching Presence	4.75±0.08	4.63±0.11	0.88	1.111
Social Presence	4.68±0.10	4.23±0.12	**2.88**	-0.889
Cognitive Presence	4.64±0.09	4.26±0.10	**2.82**	-0.829

Source: Own work

The obtained results will be taken into account when planning training in the framework of the following projects. One of these projects is project "One university - Many possibilities. Integrated programme within the framework of the POWER Programme of Ministry of Science and Higher Education, Poland, intended for academic staff and student communities of the University of Silesia. One of the tasks and modules of the project is E-LEARNING Training "Advanced ICT tools and methods for didactic activities: Moodle, Gamification, Digital Storytelling, Project-Based Learning, Inquiry-based learning, Flipped Classroom" (20 hours).

CONCLUSIONS

Lifelong learning which is a necessary condition for successful fulfillment of the modern individual in the conditions of a university is implemented through the system of teachers' postgraduate education. ICT competence is a key one in the system of professional competences of an academic teacher.

Development of ICT competence and skills of the 21st century in the process of postgraduate education is provided on condition that:

- An authorial design model of postgraduate education courses system is used;
- Using forward-oriented design for courses;
- Organizing distant learning by creating a COI researchers community;

– Monitoring of effectiveness of the utilization of offered approaches under permanent supervision.

Leading characteristics of teachers' learning success using the offered model rely on their own learning and professional experience, social presence and possibility of collaboration with others.

Positive self-evaluation dynamics of academics of Borys Grinchenko Kyiv University after fulfillment of the electronic course *"Development of educational, scientific collaboration and project management of ICT tools"* and after finishing similar module in MOOC "*ICT-tools for e-learning*" by the international team of teachers demonstrate the effectiveness of the authors' model and methodology of its fulfilment, and it can be recommended for implementation in teachers' postgraduate education system of higher education institutions.

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