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General Pedagogical ICT Competency as a Content-forming Factor in the Training of a New Teacher

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Abstract

At present teacher training takes place in the conditions of IT integration into education – a large-scale implementation of information and communication technologies (ICT) in the educational process at all levels. This makes topical the problem of forming general pedagogical ICT competency of students majoring in pedagogy, who will have to become teachers of a new type, which requires content and procedural restructuring of higher pedagogical education. The aim of the work is to reveal the potential of general pedagogical ICT competency, consisting of motivational, cognitive, technological, communication-network and reflexive-axiological components, as a content-forming factor in the training of new teachers at university. The research methods used to achieve the aim include theoretical analysis and modeling that have provided for the elaboration of a model to develop students' general pedagogical ICT competency in the process of higher pedagogical education. The resulting model is to be tested in the real education process subject to the proposed conditions.

Key words: General pedagogical ICT competency, information society, IT integration into education, content of higher pedagogical education, content-forming factor

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Introduction

The formation of the information society, analyzed by Bell, Rakitov, Toffler, Webster and others, has led to major transformations in almost all spheres of human activity, changing the way we live, work, spend leisure time, and, the last but not least, study. The modern education paradigm demands professionals working on the development of information culture of younger generations, teachers capable to use ICT in their teaching practice efficiently and responsibly, experts ready to provide for the development of information systems and technical means to support the education process. Thus, the range of professional knowledge, skills, abilities, qualities and characteristics of a modern teacher has been expanded to include *ICT competency* as its indispensable part.

However, the more important and topical this phenomenon is becoming, the more varied definitions and descriptions of it have appeared, which makes it harder to obtain a clear understanding of the concept. Analysis shows that the definition of pedagogical ICT competency proposed by Khenner (2008) is widely shared by the majority of practicing school teachers (Gerasimova, Kaloshina, Sambieva, Jaricheva and many more), and implies a complex set of knowledge and skills gained in the process of studies and self-studies in the field of computer science and ICT, as well as an effective and competent implementation of various ICT tools in teaching activities. It is usually followed by a list of specific components including the activities where the competency above is to be revealed, with a notice emphasizing the open character of this list and the need to revise it and add new components depending on the current technological development of society. Recently, the definitions of pedagogical ICT competency have become more elaborated, simultaneously setting stricter limits to its essence according to the specific character of the subject under research (Zaitseva, 2011; Tarima, 2014).

Thus, based on generalization and analysis of numerous interpretations of pedagogical ICT competency, its essence can be presented as a complex personal characteristic implying: 1) a set of systematic scientific knowledge, skills, abilities, qualities, formed in the process of studying computer science and ICT, necessary to creatively solve social and professional tasks in the conditions of the information society; 2) the ability to navigate in the *information educational environment* (IEE) on the basis of modern ICT tools and readiness to use them competently, effectively and responsibly in teaching activities; 3) conscious motivation for continuous self-improvement in this area as a modern paradigm of information education systems.

The necessity to form teachers' ICT competency is evidently a topical problem in the modern education environment and conditions. This relevance is reflected by the trends and directions of numerous recent studies and research work that focus on such issues as ICT integration into the education process (Kuzovlev, Panyukova, Robert, Starichenko, etc.), general issues of forming ICT competency (Burmakina, Zaytseva, Falin, Khenner, etc.), didactic potential of ICT, cloud and digital technologies (Galkina, Samoilenko, Titova, Trofimova, etc.), creation and organizational-methodical provision of IEE (Bryksina, Vasilchenko, Mashbits, etc.).

Besides, it is worth mentioning the gradual working out of the regulatory framework that is aimed to form pedagogical ICT competency of teachers who are capable and ready to carry out professional activities in the new environment. It is represented by the state program of the Russian Federation "Development of Education" (implementation dates 2018 – 2025), including top-priority projects "Modern digital educational environment of the Russian Federation", "Creating a modern educational environment for schoolchildren" (within which the departmental target program "Russian E-school" operates), the Professional standard of a teacher, Federal State Educational Standards (FSES) of higher and secondary

education, as well as UNESCO ICT competency framework for teachers.

According to the analysis carried out by Starichenko (2015), Titova and Samoilenko (2017), as well as our research into the structure of teachers' ICT competency, it should be interpreted as having the following three constituent parts, namely *general user, general pedagogical and subject-related pedagogical ICT competency*. Judging by the requirements of the Professional standard of a teacher and FSES of higher and secondary education, general user ICT competency of students must be formed during the stage of secondary education, because it represents an instrumental foundation on which regulative, communicational and cognitive universal learning activities are built. It follows, then, that during the subsequent teacher training on the tertiary level the gradual forming of ICT competency should be continued in the framework of general pedagogical context that would eventually become the basis for the development of subject-related pedagogical ICT competency of future teachers.

As the authors see it, structuring the contents of *general pedagogical ICT competency* enables to single out certain reference points that lay the foundation for the subsequent assessment of its level achieved by students. Thus, taking into account the specific nature of the concept under consideration, the structure of general pedagogical ICT competency can be represented by *motivational, cognitive, technological, communication-network and reflexive-axiological components*. These components are closely interrelated and interdependent, each of them influences the other ones; their formation, enrichment of characteristics and properties occurs in the interaction of the parts of the whole system. To form them systematically requires continuous and persistent work based on the teacher-student interaction, where students gain the necessary experience. This means, among other things, the appropriate *contents* of the training program that opens up opportunities for students' creative problem solving, decision making, applying their knowledge and skills in the context of large-scale ICT integration into the educational process.

The developed general pedagogical ICT competency enables a teacher to participate in the process of IT integration in education, solving the topical problems of working out new teaching techniques with the use of ICT, activating school children learning, helping them in building up their individual educational routes and personal e-learning environments, organizing pedagogical interaction, monitoring learning outcomes and so on. It implies knowing and implementing the latest achievements in the theory and practice of modern ICT tools in education to maximize the efficiency of the learning process.

All these reasons pertain to the topicality of issues connected with the development of general pedagogical ICT competency, as well as implications it brings along as *a content-forming factor* in the teacher training process.

Methodology

The research was conducted using the following methods: source study and analysis, observation and study of the work experience of tertiary educational institutions, content analysis of their curricular and syllabi, generalization of concepts and ideas regarding the process and results of forming students' general pedagogical ICT competency, modeling of the above named process.

Results

1. Framework

As is commonly known, at present IT integration into social and educational environment provides plenty of opportunities for the innovative education process. Within a rich digital environment

modern students have a wealth of educational resources enabling them to study at their own pace, and in their own time. Besides, new ICT tools offer necessary support and information, reference materials, meaningful practice, as well as tasks, activities, checklists and tests for self-assessment, for reviewing and monitoring own progress. Among the implications for a teacher, new digital tools such as an interactive whiteboard, animations and simulations, and so on, can enhance teaching experience in the classroom; expand the possibilities to create “customized” tasks, activities and materials for learners of different levels and abilities. But all these opportunities will be wasted in case a teacher lacks ICT competency, which draws attention to the problem of forming it on the level necessary and sufficient to navigate in the IEE on the basis of modern ICT tools and to use them competently, effectively and responsibly in teaching activities. Hence, a model has been elaborated to form students’ general pedagogical ICT competency.

2. Model

2.1. Aim

The *aim* of the process is defined as a consciously determined representation of the anticipated result. This crucial element of the model is based on theoretical analysis and research and represents the formation of general pedagogical ICT competency during the teacher training on the tertiary level.

2.2. Approaches and principles

Theoretical and methodological foundations of the model are competence (Zimnyaya, Tatur, Khutorskoy, Shadrikov, etc.), system and activity (Vygotsky, Kraevsky, Leontyev, Lomov, Yudin, etc.), personality oriented (Bondarevskaya, Klarin, Rubinstein, Serikov, etc.), technological (Bespalko, Polat, Selevko, Slastenin, etc.) approaches. These approaches define both the overall orientation of the modeled process and the nature of agent-agent and agent-object relationships. They lay the foundations on which pedagogical reality will be transformed.

Pedagogical principles determine the basic requirements for the education process, its content, forms and methods. In the proposed model they include: 1) goal-setting, 2) integration, 3) content-related personalization, 4) teacher facilitation, 5) support for personality self-development and self-improvement.

The goal-setting principle (1) means that all the agents of the education process (teaching staff and students) have a clear idea of what should be achieved both at every stage and as a result. Acceptance of the aim is crucial on the part of students because it becomes a powerful source of intrinsic motivation for their further activities which has been proved to be the most effective kind of motivation. Moreover, a clearly defined goal represents a stimulating reference point to guide a person on the way to achieve meaningful results.

By the integration principle (2) we mean an integrative approach to the skills to be mastered by students, to the content of the subjects they study (including integrated courses), to different kinds of activities they perform as well as to inventory, organizational and human resources in general. Furthermore, the concept of integration can be applied to the general pedagogical ICT competency to be formed, because on the one hand, it integrates motivational, cognitive, technological, communication-network and reflexive-axiological components, and on the other hand, it is an integrative part of teachers’ professional competency and culture.

Interpreting the principle of content-related personalization (3), it is necessary to take into account different levels of general user ICT competency acquired by each student on finishing secondary school, their individual needs, interests and experiences that would define the scope of tools and technologies to be

included into their personal educational route. Besides, an important prerequisite of successful and meaningful learning is performing individual, “customized” projects, tasks and activities that prevent any chance of plagiarism, copying somebody else’s works or results, thus ensuring their full independence or autonomy.

The principle of teacher facilitation (4) has several implications for the modeled process. First and foremost, it maximizes the efficiency of the process through the collaborative style of teacher-student communication and interaction based on unconditional positive perception and non-judgement treatment of students’ personality, empathy and support. Secondly, there is a clear dependency between university teaching staff’s own competency in using ICT for teaching purposes and the results of their facilitation in improving the level of students’ knowledge and skills. An experienced teacher-facilitator will guide and help in planning, organizing, performing, analyzing and correcting students’ activity when necessary.

A major requirement for the process of forming students’ general pedagogical ICT competency is certainly the principle of support for personality self-development and self-improvement (5). Personality enrichment via building up cognitive abilities and needs, stimulating creativity through inspirational goal-setting, delegating authority, providing the opportunity to define personal educational routes for each student but at the same time promoting student-student and teacher-student collaboration – all of these contribute to the utmost aim of any education system, namely personal development of students.

2.3. Content

It should be noted that the content of the educational process is obviously connected with the content of the competencies being formed. Proceeding from the components of the general pedagogical ICT competency, the content part of the proposed model comprises the following objectives relevant for competency formation: knowledge of education technologies based on ICT use, the basics of creating and applying digital educational resources and materials, their kinds, standards and formats, as well as principles of their assessment and selection; didactic potential of cloud computing, e-learning, m-learning and Web 2.0 services; the basics of creating web-based learning programs, their types and structure, of developing a web-project, a web-quest, a web-portfolio, a wiki; principles of setting up and maintaining modern electronic learning environments and so on. To the core of the content also belong the issues related to computer testing techniques, methods and materials; monitoring and assessing learner progress with the help of appropriate software; using ICT to provide feedback and organize discussion in or outside the classroom (webinars, forums, blogs, video conferencing, Skype, etc.). Students must know the purposes and capabilities of application software packages to design and organize the education process, use ICT tools both for achieving educational goals and for professional self-development.

Following the logic of the gradual development of future teachers’ professional ICT competency (from general user through general pedagogical to subject-oriented), it is obvious that the emphasis on the target competency (general pedagogical) should be placed within the 1st and 2nd years of teacher training at university. According to the current FSESs, the only course of the curriculum whose content specifically focuses on its acquisition is “Information Technologies” studied in the second year by all students majoring in different areas of pedagogy. The content of the course should have a modular structure including specific sets of knowledge and skills to be mastered, but open in character, providing an opportunity for the teaching staff to introduce necessary changes depending on the results of entry tests that may uncover particular learning objectives. Here we mean mixed-ability groups of students, where some of them may lack the necessary level of general user ICT competency at the start.

Under these circumstances it is extremely important to include the issues of ICT application into the content of other university courses and school placement, paying attention not only to students' knowledge and skills, but also to specific values, motives, emotions and activities related to forming their general pedagogical ICT competency as a complex personal characteristic. That could be done within the framework of most courses of the basic part of the curriculum, e.g. "Foreign Language", "History", "Philosophy", "Pedagogy", "Psychology", and "Basics of Data Processing", though it requires certain changes in their content.

Proceeding from the idea that any competency is to be formed and assessed through action, these courses should cover, among other things, the following objectives: to develop interactive learning materials, to design a distance learning Moodle-based course, to select and analyze a variety of educational Internet resources, to work out digital testing materials, to create an educational comic and/or video, podcast, etc. The most significant element of the content part of the modeled process, however, is creating an educational website with an appropriate resource package.

2.4. Assessment criteria

The criteria used for the assessment of students' general pedagogical ICT competency should guide the assessors in fixing the student's activity state, giving information about the nature of the activity, the motives, features and attitude to it. Thus, in our opinion, it is appropriate to assess the level of the competency in question according to the following criteria: *gnostic*, *creative-praxeological*, and *axiological-conceptual*. The gnostic criterion includes such indicators as knowledge of the basics of computer science and its interpretation in studying ICT; knowledge of hardware and software ICT tools in education. The creative-praxeological criterion should be interpreted through the following indicators: appropriate and varied use of ICT and Internet technology for updating the content and organization of teaching and learning; creative development of digital education-purpose resources and materials. As for the axiological-conceptual criterion, it implies students' intrinsic motives to study and use ICT based on value reference points as well as self-analysis and reflection of the informational activity results. The framework of the article limits the description scope of diagnostic procedures and techniques where the leading role belongs to the results of project work, portfolio and website materials.

2.5. Conditions

To achieve the desired aim of the modeled process most effectively, a set of pedagogical conditions has been worked out.

1) The first condition is *a full-fledged use of e-learning, multimedia, distance learning, and cloud computing technology*. These technologies and tools help in creating a modern IEE, which is achieved not on the declaration level, but only when they are integrated to the full extent, becoming the basis for the teacher training process and stimulating students to pro-active participation in it.

2) The second condition is *co-development and participatory creation of educational and didactic materials that form general pedagogical ICT competency in the IEE*. This condition proceeds from the assumption "learning by doing" that is seen as particularly important for future teachers and their professional development. Besides, it is a necessary step in achieving student autonomy. Furthermore, student-teacher cooperation can be a source of disclosing new meanings, ways and means of teaching activities for both parties, thus enriching their cognitive, emotional and axiological spheres.

3) The third condition is *autonomous creation of an educational-purpose website*. This is

interpreted as a dynamic personal representation in the Internet educational environment for would-be teachers. The requirement for autonomy and creativity associated with students' higher-level productive skills is particularly challenging as it implies producing own ideas, sharing achievements and results, using a range of hypertext and interactive tools, engaging in educational experimentation and innovation. It also demands developed abilities to analyze, summarize, classify, reflect, assess, etc.

Successful performance of the conditions above combined with the optimum configuration of approaches, principles, teaching methods, organization provisions, and student-teacher interaction will ensure effective training of would-be teachers and formation of their general pedagogical ICT competency as a solid foundation for further mastering the subject-oriented part.

Discussion

The research conducted into the theory and practice of forming future teachers' general pedagogical ICT competency has revealed several disputable issues.

One of the problems is connected with the rapid development of technology that can make part of the education content obsolete before students majoring in pedagogy even have a chance to practice what they have learnt and apply it in teaching activities. The coming changes in platform paradigms could be an example here. It is about the gradual "coming of age" of the Third Platform concept that is based on the so-called four pillars: social technology, mobile devices, cloud services, and analytics (big data), implying among other notions the emerging "internet of things". The concept is currently under development mostly for enterprise application, but it seems inevitable to have consequences for the sphere of education, too; some of which may be impossible to foresee. It requires from educators to keep alert and to make own professional development an on-going process. This requirement refers not only to those working at ICT-related departments, but to the teaching staff of the entire tertiary institution.

Another disputable issue appears to be the approach to ICT integration into the sphere of education. The need to adapt education and training to the digital age is stated on both international and national levels, as exemplified by the European Commission reports "E-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs" (2007) and "E-Skills for Jobs in Europe: Measuring Progress and Moving Ahead" (2014); Decree of the President of the Russian Federation (RF) "On the Strategy to Develop Information Society in the Russian Federation, 2017-2030", Resolution of the Government of the RF of 26.12. 2017 №1642 "On Establishing State Programme of the Russian Federation "Development of Education", etc. It is recommended to further develop and refine curricula to embed ICT use within all segments of the education process. Moreover, it is considered advisable to move the focus from mere ICT user skills to creative ICT applications for real-world challenges.

Though the regulatory framework has been established, the process is still in its infancy in Russia. Our research studies show that not long ago school teachers admitted that the most significant factor to their use of ICT was an easy access to them. Lately, however, the emphasis has shifted from the inventory issues to the ways and means that could ensure successful outcomes. Digital tools and technologies have become ubiquitous, especially with the abundance of various mobile devices providing easy and cheap Internet access. But younger generations who may be more advanced in their use of technology than their teachers show different attitudes to personal versus educational uses of ICT and the Internet. It appears that social media are mostly used away from the classroom to communicate, listen to music, watch videos, or play games, but not for educational purposes. As for more sophisticated Web 2.0 activities (e.g. producing and publishing their own content for wider consumption) or sharing successful learning experiences, the

majority seemed to be more reluctant.

The following concern arises when looking into the issue of ICT professionalism. Preparing in-service teachers and would-be teachers to benefit from ICT use and media literacy appears to be about more than mere technical skills. It is the pedagogical side of the problem that should be taken care of. When technology in the classroom is used just for the sake of using it or because it is modern, “fashionable” or trendy, it often denotes no meaningful experience is gained. For instance, learners usually appear to enjoy using tablets or PCs in class, but a closer look suggests that sometimes what they are doing with technology happens to be mindless or repetitive, or not related to the stated learning goals. That is why the content part is so important to overcome the lack of meaningful experiences and make ICT use more instructive. This refers to both students’ own learning at university and their teaching practices during school placement.

Not to be omitted is the problem of responsible web use related to the areas where help is needed to deal with such issues as cyber bullying, IT security, identity theft and the like. When drawing up the IT course program for pedagogy students, educators from ICT-related departments seem to be more focused on the hard skills and technical knowledge that students have to acquire, than on critical thinking, rules of safe networking, reflection practices and so on. Taking into account the limited amount of academic hours in the current curriculum allocated for “Information Technology”, it seems advisable to include these issues into the content of other basic courses, e.g. “Psychology” and “Pedagogy”, thus working on the motivational, cognitive, and reflexive-axiological components of students’ general pedagogical ICT competency according to the principle of integration.

Conclusion

The formation of general pedagogical ICT competency is a topical problem which has not yet received a system-integrated solution in the theory and practice of higher education pedagogy. The attempt to solve the problem is connected with the new content of the higher pedagogical education curriculum, giving students the opportunity to implement an individual educational route, to indulge in educational, research and project activities in an open information educational environment and to gain experience in teaching activities in the context of IT integration and information society. This requires certain organizational and methodological optimization of the educational process in a pedagogical university, the development of a “roadmap” that takes into account both new educational content (with the possibility of introducing new courses / disciplines into the curriculum) and a phased technology of its development while mobilizing the entire teaching staff and not only those of ICT-related departments.

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