

## INFORMATION TECHNOLOGIES IN THE FORMATION OF PROFESSIONAL COMPETENCE OF FUTURE TEACHERS

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**Abstract:** The article aims to consider the requirements for the IT competence of the future teacher. The study analyzes the connection between the general user, general pedagogical, and subject-pedagogical components of IT competence with the teacher's key, basic and special competencies. The stages of the formation of IT competence components in the preparation of future teachers, targets, content, methods, and forms of implementation of each stage are described. The professional competence of a teacher includes key, basic and special competencies. Key competencies are necessary for any professional activity; they are associated with the success of the individual. Basic competencies should reflect a modern understanding of professional activity's main tasks, and the key ones should show ways to solve them. Special competencies implement basic and key ones in relation to the specifics of a particular specialist's professional-pedagogical activity. Preparing a teacher for the use of informatization and information technologies contributes to the formation of all types of professional competence.

**Keywords:** Information Technology, IT competence, Professional activity, Teacher competence, Training of future specialists.

### 1 Introduction

In the context of the development of the information society, one of the most important tasks facing higher education is the training of specialists who have not only mastered the necessary amount of knowledge, skills, and abilities but also have developed abilities to solve non-standard problems, are adaptable to the conditions of a rapidly changing environment and increasing flow of information [12].

Suppose professional training is considered a process of professional development, mastering future professional activity experience. In that case, we can say that a competent specialist is directed to the future, foresees changes, is focused on independent education.

It is the graduate's professional competence that is the main result of the university's activities, which determines its competitiveness. An important feature of a person's professional competence is that competence is realized in the present but is focused on the future [1].

### 2 Literature Review

The teacher's professional competence is defined as the teacher's possession of the necessary amount of knowledge, skills, and abilities that determine the formation of his pedagogical activity, pedagogical communication, and the teacher's personality as a bearer of certain values, ideals, and pedagogical consciousness.

The key competencies include information competence, which is based on the universal ability to work with different sources of information and provides pre-professional and social mobility of a person. The content of the universal skills that are part of information competence changes, in accordance with the age, characteristics of a person, and depends on the range of vital tasks to be solved. Firstly, its improvement is associated with the expansion of information sources, and secondly, with the expansion of skills in their use. At the same time, the student's

information competence and the teacher's information competence are separated [22].

The informational competence of a student is understood as a generalized ability to work with the information presented in various forms, which is the basis for building a life plan [19]. And the information competence of a teacher is characterized by the ability to search, analyze and use the information to build a professional career. At the same time, a career is understood not only as a promotion through job levels but also as a person realizing himself and his capabilities at work.

In the professional competence of a teacher, there are:

- A common part, invariant for a variety of professions [2];
- The basic part, which is invariant for the teaching profession as a whole [23];
- A special part that reflects the specifics of the subject area of a particular specialist.

Many authors adhere to this approach, offering, for example, the following blocks of competencies [8, 10, 13]:

- Social and personal, general professional, special;
- General cultural, methodological, subject-oriented;
- Key, general professional, special;
- Key, basic, special.

The structure of a teacher's professional competence in pedagogical theory was developed by scientists who described this competence at the key, basic and special levels. In their opinion, the components of key competence are common, and they are necessary for any professional activity, are associated with the success of an individual in a rapidly changing world, acquire special significance, and are manifested, first of all, in the ability to solve professional problems based on the use of information, communications, and also socially-legal foundations of individual behavior in civil society.

Basic competence, as the authors point out, reflects the specifics of the teacher's professional activity. It is necessary to build the teacher's professional activity in the context of the education system requirements and allows solving professional-pedagogical problems [9].

Special competence, in turn, reflects the specifics of a specific subject or supra-subject area of a teacher's professional activity, implements basic and key competencies in the field of a subject in relation to the specifics of a particular teacher's professional activity [32].

Such a structure of the teacher's professional competence makes it possible to understand the place and role of the three components of IT competence presented in the teacher's professional standard. Thus, the general user component of the teacher's professional competence refers to the level of key competence and determines the requirements for the teacher, including knowledge, skills, and abilities to work with software and hardware of IT tools, using information resources, databases, and the Internet, interaction in electronic communications systems [17].

### 3 Materials and Methods

The general pedagogical component, which describes the requirements for the teacher, determines the integral readiness for the implementation of professional-pedagogical tasks using IT tools and refers to the level of basic competence. In turn, the subject-pedagogical component, the requirements for which in the teacher's professional standard are disclosed, taking into account the specifics of the studied sciences, refers to the level of special competence [11].

The presented correspondence of the components of IT competence to the general structure of the teacher's professional competence allows us to describe the stages of the formation of the teacher's competence in the process of training future teachers. According to the theory of the key, basic and special competencies of the teacher, their formation and development are realized in the logic of three stages:

- The first stage is the formation and development of key competence;
- The second stage – "immersion" of the student in professional tasks, the development of ways to solve which contributes to the formation and development of basic competence based on the key one;
- The third stage – the formation and development of special competence through the "projection" of inextricably linked basic and a key to the academic subject's specifics [3].

#### 4 Results

The introduction of the concept of information competence is associated with the active use of the competence-based approach in education [24]. The composition of information competence includes generalized, universal skills that have the property of broad transfer. These are the skills that students can use in solving a wide range of problems, not only within one subject but also in lessons in other subjects and in a variety of practical activities. This type of skill includes, for example, the following:

- The ability to understand tasks in different formulations;
- To find the required information according to the given characteristics;
- Compose a story based on a picture, diagram, table, video;
- draw up a diagram, table, video script according to the text;
- To determine to whom the information is addressed, what is its hidden meaning;
- To argue their statements;
- Find errors in the information received, correct them, isolate the main thing, etc. [14].

Information competence allows for effective information exchange, provided by the formation of a number of information skills:

- Evaluating the usefulness and truth of the information received;
- Selection of personally significant information, search for the necessary information, including the methods of its processing;
- Communication and language skills (perception and transmission);
- Informational and psychological self-defense [31].

Information competence assumes that a person uses universal means of informatization and information technologies when solving problems that he sets to achieve his activities' goals [4]. However, the teacher uses informatization tools and information technologies in their professional activities, not only on the basis of universal skills. The ability to use informatization means and information technology is manifested in all pedagogical abilities [33]. This means that to solve professional-pedagogical problems, a teacher needs to attract these means and technologies based on primary and special competencies.

Therefore, the preparation of a teacher for the use of informatization and information technologies in professional activity cannot be reduced only to the formation of key information competence but should be associated with the formation of basic and special competencies [29].

#### 5 Discussion

The logic of the pedagogical training process means that in terms of the formation of the teacher's IT competence, the following stages must be distinguished:

##### 5.1 The Stage of Formation of General User IT Competence

At this stage, students studying in the areas of training future teachers should develop knowledge, skills, and personal attitudes to work with modern digital devices (computers, laptops, mobile digital devices, cameras, camcorders, document cameras, printers, multimedia projectors, etc.) [16]; use of information resources, databases, local and global computer networks (search, retrieval, viewing of information, its use for compiling text and composite media documents); interaction in the information environment (exchange of information using a variety of communication means, communication in an open information environment, joint work to create common products using specialized network tools); ensuring information security and compliance with health regulations.

##### 5.2 The Stage of Formation of General Pedagogical IT Competence

This stage, related to the level of formation and development of a teacher's basic competence, should be implemented based on the "immersion" of students as future teachers in the context of solving professional-pedagogical problems associated with the use of IT tools. There are five groups of tasks, the experience of solving which characterizes the basic part of the teacher's professional competence:

- To "see" the child (student) in the educational process;
- To build an educational process focused on achieving the goals of a specific level of education;
- To establish interaction with other subjects of the educational process, partners of the school;
- To create and use educational environment (school space) for pedagogical purposes;
- To design and implement professional self-education [21].

Each of these groups of tasks allows us to describe the components of preparing a future teacher for professional activity using IT tools. Thus, the *first group* ("seeing" a student in the educational process) determines the need to study the technologies of psychological and pedagogical diagnostics of students using IT tools, determine their personal characteristics through the analysis of their activities in an open information environment, assess the educational achievements of students based on an electronic portfolio [25].

The *second group* (to build an educational process focused on achieving the goals of a specific stage of education) sets two fairly autonomous directions for the formation of general pedagogical IT competence of a teacher – the study of methods of designing an educational process using IT tools (designing the content and stages of the educational process using specialized and universal IT tools), as well as mastering the methods of direct training technologies (presentation of new material, organization of students' work, knowledge testing, etc. using IT tools) [15].

The *third group* (to establish interaction with other subjects of the educational process, school partners) leads to the need to train future teachers in the use of IT tools for preparing and conducting speeches, searching for and establishing communication with partners in a networked telecommunications environment, developing their own Internet resources, allowing them to present themselves and projects for other network participants [30].

The *fourth group* (to create and use an educational environment for pedagogical purposes) defines a wide range of issues of professional-pedagogical training related to the search, development, assessment, selection, and use of digital educational resources, the use of specialized information systems for the field of education management, the creation and use of Internet resources for remote support of trainees [26].

The *fifth group* of tasks (to design and carry out professional self-education) in the aspect of their solution using IT means determines the need for a student of a pedagogical university to study a wide range of professionally oriented Internet resources, participate in the activities of professional Internet communities already at the stage of pedagogical training, gain experience in professional training based on the application of distance learning technologies and e-learning [5].

As we can see, the stage of formation of general pedagogical IT competence is directly related to the preparation of future teachers to solve professional-pedagogical problems. This, in turn, means that such training at this stage is fully professional-pedagogical.

### 5.3 The Stage of Formation of Subject-Pedagogical IT Competence

At this stage, basic and special competencies of the teacher, as well as the requirements of the professional standard of the teacher, there should be an expansion and deepening of the formed knowledge, skills, and personal attitudes of future teachers, taking into account the specifics of the subject of professional-pedagogical activity using IT tools [17]. In this regard, the professional standard describes in detail the elements of IT competence related to teachers' professional competence of natural and mathematical sciences, geography, biology, history, social science, etc. These components largely reflect the specifics of the use of information technologies in certain sciences, activities the teacher is asked to solve professional-pedagogical, and specific tasks of specific scientific areas.

*How is the described three-stage model of the formation of professional IT competence implemented in the preparation of future teachers?*

The first stage (the formation of general user IT competence) is based on the student's existing knowledge, skills, and personal attitudes, obtained during the school period. It is implemented through the academic preparation of a pedagogical university student in computer science disciplines in the basic part of the main professional educational programs ("Information Technologies," etc.) [27].

The second stage (the formation of general pedagogical IT competence) is the stage of professional-pedagogical training, which in this case can be implemented within the framework of the disciplines of informatization of education ("Information technology in education", etc.), as well as educational practices that involve modeling the solution of professional-pedagogical tasks using IT tools [6].

A distinctive feature of this stage, according to the theory of contextual learning, should be the use of teaching technologies in the form of quasi-professional activity, when the conditions, content, and dynamics of professional activity are modeled in the student audience and in the language of educational information, the subject, social and psychological content of the real professional work of a specialist is recreated, the holistic context of his activities [19]. Basically, the use of such technologies is possible in the case when the training of students is aimed not so much at mastering information technologies applicable in education, as at preparing the future teacher in the field of solving professional-pedagogical problems in the aspect of using IT tools.

The third stage (the formation of subject-pedagogical IT competence) refers to the variable part of the main professional educational programs, reflecting teacher training specifics in a particular subject [28]. This means that the formation of subject-pedagogical IT competence can be carried out within the framework of disciplines of subject methods and subject disciplines (including special courses on the use of information technology tools in certain sciences) and industrial practices research work, training final qualifying work.

### 6 Conclusion

Preparing a teacher to use informatization and information technologies contributes to forming his key, basic and special professional competence. Professional competence is manifested in the teacher's ability to solve organizational, constructive, and communicative tasks of pedagogical activity. The development of pedagogical abilities consistently brings the teacher to the operational, tactical, and strategic levels of professional activity regulation [27]. The ability to use informatization and information technologies in solving problems of future teachers' professional activity should also be manifested at different levels of regulation, and their development should take place according to the logic of the formation of professional competence [20].

The formation of a teacher's IT competence is a part of professional-pedagogical training [7]. The process of the formation of this competence is deeply integrated with the stages of the formation of a teacher, the formation of his key, basic and special competencies. At the same time, however, a high level of IT competencies is achievable only if special IT training courses are included in the structure of the main professional educational programs, and changes are made to the content, methods, and forms of subject and methodological training, the organization of practical and scientific research work of future teachers.

The success of solving the last designated task, most likely, will be associated with changes in training at first, the "academic" stage of the formation of IT competence [18]. At this stage, it is necessary to study commonly used technologies applicable in the work of a teacher and technologies that are in demand by students for the successful development of the subject and methodological disciplines. Such a principle, however, which sets the logic of "double reflection" of IT competence in the professional competence of a teacher, requires a particular check, which can become the subject of unique methodological research in the field of informatization of pedagogical education.

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