

# Methodological Approaches to the Formation of Digital Competence Among Students of Pedagogical Universities

Gerova N.V.

*Ryazan State University named after S.A. Esenin, 390000, Ryazan, Russian Federation, Svobody str., 46.  
Corresponding author. Email: nat.gerova@gmail.com*

## ABSTRACT

The article provides an analysis of modern approaches to the education of students in universities. Based on the analysis of system, activity, competence and design approaches, methodological approaches to the formation of digital competence among university students are considered. According to the classification, pedagogical technology is considered in the context of modernizing the existing traditional education system through the activation and intensification of student activities, methodological and didactic improvement of educational material. It has been revealed that the basic provisions of the activity approach are the basis for the development of the methodological system of training in informatics and ICT. The stages of modeling the educational process on informatics and ICT for students of the university are described. Methodical approaches to formation of digital competence in students studying in the direction of pedagogical education are described: structuring of educational material in the form of structural modules with certain content lines and didactic goals; the relationship between basic methods, forms and means of learning for students at different levels of education using ICT and the content of learning; organizing ICT-based learning practices and self-reliance and integrating creative, educational, research and development components into the education process adequately to the development of ICT science and technology. The stages of building a model of organization of the educational process on informatics and ICT for students of the university have been identified.

**Keywords:** *bachelor, informatization of education, master, methods of education, digital competence*

## 1. INTRODUCTION

In the context of informatization of education, pedagogical technology acts as a research tool for updating the content of education, the emergence of innovative methods and technologies of ICT-based education, and the improvement of tools and organizational forms of the educational process, that allows to speak about the improvement of pedagogical technology. Higher education is based on the requirements for the results of the basic educational programs of master's degree and bachelor 's degree, formulated in the form of competences of the graduate, which, in its turn, makes it necessary to develop principles and methodological approaches to the organization of the educational process. Defining the term "approach to learning," it should be noted that the approach, on the one hand, is a worldview category, which reflects the social attitudes of the subjects of learning as carriers of public consciousness, on the other - global and systemic organization and self-organization of the educational process with inclusion of all its components. The approach defines the methods, forms, and techniques of learning.

In the dictionary of terms on general and social pedagogy, the concept of "pedagogical technology" is defined as the continuous and consistent implementation of interrelated

components, the implementation of methods, different states of the pedagogical process and certain actions of its participants - teacher and students [5, p. 116]. It should be noted that pedagogical technology as an activity is aimed at achieving the goal. Besalko V.P. notes that pedagogical technology is a technique of implementing the educational process [2, p. 46]. Determining the purpose of education and training, Yakunin V.A. believes that the purpose indicates the expected result, which by the form of reflection can be presented in the form of perceptual images and models or in the form of verbalized concepts, judgments and conclusions. Following the classification of pedagogical technologies carried out, within the framework of our study we will consider pedagogical technology in the context of modernization of the existing traditional system of education on the basis of activation and intensification of activities of students, Methodological and didactic improvement of educational material.

The aim of the study is to develop methodological approaches to the formation of digital competence among students studying in the direction of pedagogical education.

## 2. RESEARCH METHODOLOGY

At present, the most famous basic approaches to training are systemic (Bogdanov A.A., Drucker P., Simon G., etc.), activity (Vegotsky L.C., Halperin P.J., Davydov V.V., etc.), competence (Baidenko V.I., Bolotov Nostny. V.N., and Z.) Analysis of the directions of the methodology of scientific knowledge in the field of education makes it possible to state that the variety of types of connections between subjects of the educational process requires the identification of common patterns and relationships, revealing the integrity, structure, hierarchy, purpose, development and functioning of the pedagogical system. From the point of view of the system approach, continuous information training of students of humanitarian profiles in the direction of pedagogical education will be considered as a solution of system-meaningful tasks in the subject field of informatics in the implementation of the competence approach in the university.

The choice of training methods represents the key component of educational process providing the interconnected activity training and studying, directed to achieve the goal of education, upbringing and personal development. Thus, the main provisions of the activity approach (improvement of the goals, objectives and content of training, development of didactic principles, methods, forms, means of training and monitoring of educational activities) are the basis for the development of a methodological system of training in informatics and ICT. The need to use new, relevant approaches to solving educational problems is based on systemicity, partnership, integrability [8, p. 231-232]. Among the specific principles of the activity approach we will highlight the main principles that are implemented when students study informatics and ICT: openness of joint activities of the student and the teacher; taking into account leading future professional and educational activities; enriching, enhancing and deepening the student's personality as a future professional; identification by the teacher of priorities, content, order and prospects for further education of students; high motivation; methodological and didactic improvement of educational material; any kinds of activity; cooperation in the organization and management of various activities.

In the organization of the educational process, the main focus is on the results of the education of students ready to apply scientific knowledge in practice, as well as the independent search for professionally significant and scientific information. As a promising direction of updating education in the field of training of future specialists, many foreign and domestic scientists [3, 4, 11, 12, etc.] consider a competent approach. The implementation of a competency approach in education implies a comprehensive mastery of student's knowledge and skills. From foreign researchers point of view, a professional competence is considered an ability to perform activities in a timely manner, in-depth knowledge or effectiveness of actions [10, 11, 12, etc.]. Thus, some researchers highlight a list of key competencies that graduates of educational institutions should possess: the

ability to learn for life; social and civil competences; ability to communicate in mother tongue and foreign language; the meaning of initiative and entrepreneurship, as well as the ability to live in a multicultural world; mathematical competence and basic competence in science and technology [12, p. 32]. The above-mentioned competencies allow a graduate of a European educational institution to start professional activities or continue his studies. Russian scientists define professional competence as a property, quality or condition of a specialist, characterizing his mental, physical and spiritual compliance with the requirements and needs of a certain specialty, profession, specialization, occupied or performed official position, standards of qualification [1, p. 134]. For the Russian educational system, the introduction of a competent approach requires improvement in the methodological aspect, which is manifested in the change in the purpose, methods and forms of education of students; Ways to acquire professional skills and knowledge; Assessment of the nature of the student's activity and the quality of his training, interaction with the teacher; Attitudes to education and learning outcomes. At the same time, special attention is paid to the independent work of students, which is based on didactic principles: unity of independent (out-of-school) and educational (audit) activities of students; training individualization differentiations; professional orientation; The possible difficulty of tasks, taking into account the time of their completion; Consistency, systematization and continuity of organization of independent work; Students creative activism and consciousness. When organizing independent activities, the student develops his own style in the formulation of the goal and the solution of the set tasks, develops an algorithm for the implementation of actions, analyzes, systematizes and summarizes the obtained results, draws certain conclusions.

The formation of motivation for cognitive activity among students is carried out in the process of carrying out tasks on informatics and ICT taking into account the profile training, the construction of an individual trajectory of self-realization and self-improvement of the future teacher and is manifested in the understanding of the importance and usefulness of expanding the outlook and erudition. Student activities using ICT tools always result in a creative product with direct learning of ways, methods, techniques, approaches and style of efficient work. The main ways of assessing the formed information competences are the creation of portfolio, reflection and results of training, which were obtained during the period of study at the university, including various types of practice provided for in the curriculum. The use of the rating method of assessment and monitoring of student achievements influences the organization of the educational process in the university: takes into account student's activity, his participation in research work, in competitions of pedagogical skills, scientific conferences, seminars, etc. At the same time, relations based on joint creative activity are built between the student and the teacher.

The search for new methodological approaches to learning aimed at the formation of creative and critical thinking among students, their intellectual and moral development, the ability to work with various types of information, has led to the development of various methods aimed at the development and further improvement of independent thinking among students. The method of projects as a pedagogical technology involves a combination of search, research and problem methods that are inherently creative. In general, the project (lat. projectus - put forward) means the realization of some intention to achieve the set goal. As far as the education system is concerned, it is a way to achieve didactic learning goals by developing a detailed algorithm of an existing problem to produce a practical result [7, p. 199]. From the point of view of achieving the goal and objectives of training, the method of projects is aimed at developing a new educational product, systematizing the acquired knowledge, at the same time students perform research, cognitive, design or other work on a given topic individually or by groups within the allocated period of time. In general, the method of projects is a set of actions of students in a certain sequence, various techniques and means to achieve the set goal, designed in the form of a final product and its fixation in a sign form (alphanumeric text, graphic image, active model, volume layout, etc.).

According to J. Dewey, one of the problems in learning is finding a way to maintain a certain balance between the formal and informal, purposeful and spontaneous components of the educational process. At the same time, the process of formation of social attitudes of the individual is not influenced by acquisition of special intellectual skills and various information, but affects the understanding of everyday life experience, which takes place in the process of training in the necessary and sufficient degree. The use of the project method in the training of informatics and ICT gives students the opportunity to independently acquire knowledge and skills in the process of solving practical problems or problems, through the integration of knowledge from various subject areas, promotes the development of critical and creative thinking, motivation for cognitive activity, forms skills in the field of structuring the acquired knowledge and information, etc.

The application of the project method allows to implement a continuous learning process and purposefully develop project thinking in students. A project can act as a complement to a traditional audit system if it is exclusive, or apply in supplementary education if it is interprocessed or out-of-standard. Educational activity of students is realized during various events, for example, a system of regional, All-Russian and international reviews, conferences and competitions, stimulates and motivates students to demonstrate the results of their scientific research and achievements.

In higher education institutions, the project activities of students, combined with traditional teaching methods such as course and final qualification work, occupy a special place. Students acquire the necessary skills of systemic and critical thinking through independent decision-making

and manifestation of their own initiative. Implementation of student's project activity is based on carrying out independent research, awareness of relevance, practical significance and value of the project results, development of the student's abilities in solving the assigned tasks, formation of mutual assistance and establishment of relations between students. The work on the project is carried out in stages: identification of relevance, definition of the goal of the study and tasks for its achievement; if necessary, hypothesizing; choice of methods of a research; the distribution of responsibilities among educational actors; data collection, collation and analysis; Summarizing the results and drafting the results; drawing conclusions and, where appropriate, raising new research issues; reflex (analysis of successes and errors). The evaluation of the project is carried out by a teacher, a group of students or external experts on the following criteria: relevance and significance of the selected topic; the necessary and sufficient depth of disclosure of the topic; the use of knowledge from other subject areas; correctness of processing of obtained results and methods of research used; activity of each participant; the ability to draw conclusions and conclusions in a reasoned manner; aesthetics of the project results design; ability to correctly and competently answer opponents questions.

The scientific base of research in the field of programmed training is the work of native scientists (Besalko V.P., Talyzina N.F., Tikhonov I.I., etc.), in which the main goal is to optimize the management of the educational process, at the same time, in order to increase the level of efficiency of material absorption, the supply of portions of information is built and structured consistently (linearly). The use of programmed training technology implies the implementation of a certain algorithm: the formulation of a topic, the definition of the purpose and tasks of training, the selection of content, which is then given a strict logical structure, choice of forms, means and methods of training, identification of the characteristics of students (age, level of education, educational skills, etc.), development of the student's educational activity algorithm. The taxonomy of learning objectives, which is based on a sequence of learning levels, allows the teacher to facilitate the planning of the learning process and the development of evaluation procedures [9]. Depending on the results of the monitoring, the educational material for the self-work of the students may have more complex branched structures and provide the student with a choice in acquiring new knowledge and skills. The programmed learning model is based on the following basic principles: dividing the teaching material into small, logically structured and closely related parts; individualization of content and learning rates; strengthening and increasing the level of motivation of students (implementation of the activity approach); empirical verification (check) of tasks for compliance to psychological and age features of students; immediate evaluation of each student response. Implementation of the method of programmed training contributes to the activation of educational activities of students, is mandatory to learn and pass each step of the program, the activity of each student is individual.

However, the lack of teamwork, as well as the inability to algorithmize some educational materials (perception of musical work, poetry, etc.), can be attributed to the disadvantages of this method of learning.

An important method of scientific knowledge is to model many processes and phenomena of environmental reality. The modeling method is actively used both in technical research and in other subject areas, including the educational sphere. The use of the modeling method in pedagogical theory provides an opportunity to obtain not only a model of structure, but also a model of the object's behavior, efficiency of simulated system functioning, and functional connections between its elements.

The specifics of the problem-modular training method use are based on the unity of the principles of system quantization, problem and modularity and include the target component, special methods of designing the content of training, a system of tasks and exercises, the design of didactic materials, a rating system for monitoring and evaluating educational achievements. The layout of the training elements that are part of the problem module can be represented as a flowchart or tree. Block diagrams are presented in the form of semantic networks, graphs, etc. The tree is a cognitive-graphical element of the presentation of educational material and according to the structure can be similar to the block diagram, performing the function of generalizing the content of the problem module. The use of the problem-module training method ensures: integration and systematization of training elements into a single whole; variability of problem module structure; a variety of forms and methods of learning; individualization of educational process; flexible learning technology aimed at building the competence of learners; effective system of knowledge acquisition by trainee's assessment and rating control.

### **3. RESEARCH METHODOLOGY**

According to the modern educational paradigm, continuous information training of students will be considered as an integration system ensuring integrity, compatibility and organization of various forms, methods and systems of education at all levels of higher education, as well as continuity and complexity in the field of methodological support adoption.

Currently, the university's educational process uses a combination of different teaching methods together with other didactic systems. Based on system, activity, competence and design approaches, we will present methodological approaches to the formation of digital competence among university students. Educational material is presented in the form of structural modules with certain substantive lines and didactic objectives of students' education depending on the direction of students' training in bachelor's and master's degree programs. The content of the education ensures that the basic methods, forms and means of teaching students at different levels of education are interlinked using ICT. The organization of training practices and independent work on the basis of

ICT implements the inclusion in the educational process of components of creative, educational, research and research activities adequate to the development of scientific and technological progress in the field of ICT.

In the context of our study, to build a model of the organization of the educational process on informatics and ICT for university students we will highlight the following stages:

1. Defining the purpose of the student's education in informatics and ICT and describing the characteristics of his or her future ICT-based professional activities;
2. A description of the information activities content and professionally significant personal characteristics that contribute to development and self-development;
3. Adaptation of the theoretical base by means of compression of the content of the invariant component of basic training in informatics and ICT, while preserving the structure of the subject area;
4. Definition of the list of information competences and types of educational activities, in the course of which students form and develop certain interests and needs, motives, skills, knowledge and experience of information interaction and information activities;
5. Distribution of educational material by types of tasks for solving tasks of different types, theoretical development, models creation of studied phenomena, objects, situations, etc.;
6. Creation of requirements to the system of tasks, which will allow to form in students correct algorithms of carrying out a certain type of activity;
7. Distribution of tasks for various organizational forms of training (practical and laboratory exercises, lectures, independent work, etc.);
8. Organization of teacher's consultations according to the schedule;
9. Creating the ideal student model of and familiarizing the audience with it in order to motivate cognitive interest in the subject;
10. Synthesis and analysis of obtained results for correction of educational process.

In the course of studying at the university, the student accumulates pedagogical experience in carrying out future professional activities during classroom and out-of-school classes. In carrying out various types of educational activities, students, together with learning new knowledge, accumulate experience in explaining the material, learn methodological approaches to the organization of the educational process, technology for testing and evaluating the performance of education, that is, gain professional experience. The mastery and application of ICT by students in the future profession is directly related to the practice of their application during university studies.

The aim of training students studying in the field of pedagogical education in the implementation of a competent approach is to create effective conditions for the formation of digital competences, ways of carrying out creative activities, the development of critical thinking, the ability to search independently and structure knowledge based on ICT. While studying at the university, students acquire individual and interdisciplinary experience as well

as group skills. The acquisition of individual experience includes in the definition of training tasks, formation of one's own judgments, deepening one's knowledge in a specific subject area, development of abilities to overcome problems, initiative and activity. Students gain interdisciplinary experience in the process of integrating knowledge from different sources and scientific fields and forming abilities to analyze facts and problems from different angles. The ability to study and work in groups, the acquisition of skills of cooperation in decision-making, the development of leadership qualities, tactics and diplomacy contribute to the acquisition of skills of students to work in groups. The ability to present the results of his work and discuss it in a group, improve skills of arguing logically in discussion, to develop skills of information perception on hearing ensures formation of communication and personal self-awareness in evaluation of performed work skills.

Consider methodological approaches to the formation of digital competence in students of humanitarian profiles in the direction of pedagogical education. In relation to the content of the subject area, methodological approaches can implement monopoly (classes on the topic, module, one discipline) and intercontinental (integration of knowledge of subject disciplines and informatics) communication. The choice of methodological approaches is determined by the types of activities: game, role; creative; research; information or fact-finding; applied or praktiko-focused. At the same time, coordination of student activities can be both hidden when the teacher is a participant of joint work, and open when the teacher acts as an organizer. Depending on the number of participants, projects are divided into group, pair and individual projects. By duration: short-term (from one to several classes); medium-term (week to one month); long-term (one to several months).

Students studying under bachelor's and master's degree programs in the direction of pedagogical education have pedagogical activity as part of the future professional activity. One of the requirements for professional pedagogical activity is the social and professional position of the teacher, which is a system of intellectual, will and emotional-evaluation relations to the profession. The teacher's activity is determined by his ability to interpret professionally significant information from a pedagogical point of view to improve the educational process, as well as the development and self-improvement of the teacher and trainees. In a generalized form, the main requirements for the personality of a modern teacher are: professional competence, intelligence, competitiveness, spirituality. In the context of the development of the digital society, the teacher is subject to additional requirements in the field: the formation of a creative personality; mastering innovative learning and education technologies; integration of knowledge, practical abilities, skills and experience from various subject domains when using ICT. Regardless of the training profile, already at the level of higher education, students acquire knowledge, skills and experience in using ICT tools, which ensures that the future teacher is ready to work in a single information environment; ICT-based teaching of subjects.

Conditions for the formation of digital competence among students studying in the field of pedagogical education are:

1. Ensuring the advance nature of training; development and adaptation of methodological systems of education in informatics and ICT depending on the student's training profile;
2. The use of modern ICT tools in student learning;
3. Analytical and expert assessment of the quality of digital educational resources;
4. Use of the educational digital resource of the Internet in the educational and independent work of students;
5. Use, design and development of e-learning resources in humanitarian disciplines through software tools;
6. Organization of information interaction on the basis of local and global networks;
7. Management of the educational process using information and methodological automation tools;
8. Organization of control activities in the study of disciplines on the basis of digital systems of testing and control of student knowledge;
9. Development of creative potential of the student necessary for further self-study, self-development and self-realization.

#### **4. CONCLUSION**

Based on system, activity, competence, design and other approaches, methodological approaches to the formation of digital competence among students have been developed. The main purpose of training students of humanitarian profiles is to develop the following professional qualities among graduates of the university: ability to master new techniques, methods and means in the organization of future professional and educational activities on the basis of ICT; willingness to interact with the application of ICT; develop and incorporate new organizational forms of ICT-based learning into the educational process. The content of the education ensures that the basic methods, forms and means of teaching students at different levels of education are interlinked using ICT. The organization of training practices and independent work on the basis of ICT implements the inclusion in the educational process of creative, educational, research and research activities components which are adequate to the development of scientific and technological progress in the field of ICT. Self-operation of students using ICT means involves mastering certain intellectual skills of analysis, synthesis, comparison, forecasting, thought experimentation, and is designed to form skills to work with different sources of information.

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