PEDAGOGICAL SCIENCES

FORMATİON OF SKİLLS SPECİFİC TO THE SUBJECT OF İNFORMATİON CULTURE AND TECHNOLOGİCAL LİTERACY İN STUDENTS OF GENERAL EDUCATİON SCHOOLS

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Abstract

The article shows that intellectual and creative activity of everyone living in the "Techno-democratic-information society" becomes a paramount requirement, and for this it is desirable for every member of this society to rise to the level of a subject of intellectual skills, they must have information culture and technological literacy.

The research paper presents the characteristics of "Education 4.0" in terms of the formation of intellectual skills (skills specific to the subject of information culture and technological literacy) in education, and the groups of skills in question formulated on a certain logical basis in this system.

The article draws attention to the fact that the tasks are designed on the principle of modeling the structure of various intellectual skills. As students complete them, they acquire intellectual skills such as determining the purpose of their work, systematizing educational material from this point of view, independently collecting material, etc.

The work focuses on the didactic principles that are necessary for the selection and systematization of tasks to be applied and the organization of students' activities on them, in order to form the skills (intellectual skills) specific to the subject of information culture and technological literacy.

Keywords: intellectual skills; metacognition; metacognitive skills; creative thinking; idea; task; interactive learning; psychological support; facilitator; motivation; reflection.

Relevance of the topic: In modern times, to succeed, it is not enough to just be able to read and write, have knowledge of mathematics and natural sciences, and more competences are required. The characteristics of the 21st century require that a person develop the necessary qualities for creative activity (decision-making, problem-solving, independent learning, cooperation, teamwork, evaluating different approaches, putting forward new ideas, taking initiative, etc.) to live and advance in a rapidly changing, developing world. This creates conditions for sustainability for the future development of society. Everyone living in a “techno-democratic-information society” must engage in intellectual, creative activity. For this, a person must rise to the level of skills (intellectual skills) specific to the subject of information culture and technological literacy. Therefore, it is necessary to determine the optimal ways to acquire intellectual skills and regulate the environment that includes adequate ways. However, the methodological system for solving the problem in question has not been developed on a sufficiently scientific basis. Therefore, we assert the relevance of the research on the topic of "Formation of skills specific to the subject of information culture and technological literacy among students in secondary schools."

The purpose of the study is to identify the directions of pedagogical influence aimed at the formation of information culture and technological literacy skills in students in the process of implementing general education; it is taken into account that: an idea is an important value; the world of human activity is always based on an idea; everyone takes steps to check the adequacy of the results of their activities to the idea they consider acceptable.

Methodological basis of the research: In the process of conducting the research, L. Bertalanfi's "Idea of System Analysis" [2;8] was used (an idea whose meaning is explained as an attempt to study the properties of an object based on the properties of its parts). The "System-structural approach", which has been formed as an important branch of dialectics and has risen to the level of its alternative, empirical, empirical-theoretical and theoretical methods of scientific cognition, the internal relationships of the forms of scientific cognition, and various pedagogical and psychological research generalizations were used as a methodological basis.

Interpretation of generalizations from research materials: It is undeniable that education, which is a process of sharing human experience, has developed in stages as a product of social practice (especially pedagogical science) by incorporating the characteristics of industrial revolutions. In the era of the IV industrial revolution, an education system that can form a creative, innovative and globally competitive generation is required, and currently the impact of the aforementioned revolution on the educational process and the issue of "education of the future" are being discussed on various platforms and the necessary steps are being taken accordingly.[11], [12; 92-97].

The Fourth Industrial Revolution has different implications for different areas of our lives. From this perspective, there are both opportunities and challenges

for education. The use of different technologies such as IoT, 3D printing, quantum computing, artificial intelligence, etc. allows for more efficient information transfer and the development of a new “educational framework”. [9;288], [14; 78-94].

Currently, there is a system called the "Techno-democratic-information society" that makes people stronger. Members of the "Techno-democratic-information society" must have information culture and technological literacy, otherwise they will not be able to assert themselves as active and creative members of the society in question.

Providing all members with adequate and sufficient information and providing high-level information services is a special feature of the society in question.

The information society, unlike the industrial society, is a more intellectual society and creates conditions for the highly educated, skilled, determined, and comprehensive development of people. The main characteristics of the information society are: mass satisfaction of information needs in society; information economy in society; high level of information needs of society members; high information culture in society, expansion of open information networks for society members; prospects for the formation and development of a single information environment; information security for society members; level of globalization and integration, etc.

Information culture is the knowledge, intellectual skills, and habits necessary for a person to adapt to the information society. The role of the computer network in the formation of information culture is great.

Information culture: is the ability to use information resources and information communication tools of society; is the application of advanced achievements in the field of informatization and the development of information technology tools in society; is the ability to obtain and transmit information using modern technical means and methods, computer technologies.

Technological literacy–the ability of people to use various digital technologies, analyze data, and operate safely in a digital environment. “This skill is not limited to using a computer and the internet, but also includes: 1) Adhering to digital safety and cybersecurity rules; 2) Working with artificial intelligence and automation; 3) Digital analytics and data processing skills; 4) Using cloud technologies; 5) Quickly adapting to new technologies”[5]

Technological literacy includes the ability to use information and communication technologies. Digital education allows people to participate independently in social life. In addition, the reality of digital education and the digital revolution requires fundamental changes in the forms and methods of moral education, leading to the emergence of digital skills as the most important skills. [16;58-64]

Developing digital skills is essential to ensure that they can engage safely and effectively with digital technologies in the future. Education systems need to take a comprehensive and integrated approach, supporting all learners to develop the skills to be active and ethical users of digital technologies.[17; 57-79]

In order to ensure accessibility to digital technologies, students are provided with devices that they can use at school and at home, or BYOD (Bring Your Own Device) strategies are used. A number of steps can be taken to develop digital skills, such as updating the curriculum, developing “learning frameworks”, involving educators in training, and developing digital educational resources. [15]

Digitally empowered learners can learn with peers from around the world and develop solutions to problems as a team. There is no doubt that developing learners’ digital skills will enable them to participate more actively in society as digital citizens in the future. [15], [17; 57-79]

In order for students to demonstrate their skills and abilities in new areas emerging under the influence of the Fourth Industrial Revolution, it is necessary to implement fundamental changes in technology and the curricula of the subjects taught. By reviewing the curricula of the subjects formed on the basis of chemistry, biology, physics, etc., which are considered "basic sciences" in the new curricula, more attention should be paid to the teaching of computer science subjects, which play a key role in the formation of the Fourth Industrial Revolution literacy. Naturally, more attention should be paid to the teaching of the subjects in question. [20; 432-466]

Due to the rapid development of technology, the knowledge and skills that students acquire during their education are outdated by the time they graduate. In order to help develop and shape the use of today's fastest-growing technologies in scientific and technical education, it is necessary to train students and prepare them for the digital environment. Adapting to a rapidly changing environment will make it necessary for students to stay in touch with educational institutions even after graduation, providing both workers with updated skills and young students (and faculty) with a new direction related to the rapidly changing realities of the industrial and corporate sectors.[18; 25-30], [19; 579-592]

In our modern era, parameters such as relevance, practicality, effectiveness, and sustainability are the indicators of the quality of an educational program, while the indicators of its success are the quality of acquisition by learners and the extent to which learners can effectively use what they have acquired for their personal, social, cognitive, psychological, and emotional development. [3; 5].It is worth emphasizing that the expected paradigmatic changes in the education system and the implementation of global education reform have been further accelerated by the influence of the Fourth Industrial Revolution.[21; 147-171]. In the era of the Fourth Industrial Revolution, education must have the potential to develop society, complex and dialectical opportunities. Educational institutions must achieve that students acquire digital and technological literacy (digital and technological literacy) - intellectual skills, in addition to acquiring knowledge. [10]

In connection with Industry 4.0, we would not be wrong to say that “innovation has begun to dominate

education systems". Educational institutions will have to see innovation not only as a means of ensuring increased global competitiveness under the influence of globalization, but also as one of the main parts of the education system. In accordance with the requirements of the times, the teaching of new technologies will be accepted as one of the main needs on a logical basis. "Lifelong learning" will be the main motto of the education system. Naturally, the content of education should also take into account the skills of the 21st century: in addition to knowledge, the development of abilities and skills such as complex problem solving, critical thinking, creativity, leadership, digital literacy, emotional intelligence, global citizenship, cooperation, discussion, judgment and decision-making will also be accepted as the main learning outcomes.

Education 4.0 should serve the formation of skills (intellectual skills) that help learners develop in accordance with changes in society. Education 4.0 aims to prepare individuals to be creative and innovative. Education should adapt to the environment in which learners live and provide them with a reliable and successful future. This new system uses "smart" school management systems, learning management programs, communication tools and teaching and learning tools. [13; 238-254]. In the Education 4.0 approach, it has been determined that, going beyond constructivist education systems and Bloom's taxonomy, an environment-based learning process will be applied, focusing on the formation and development of intellectual skills, especially based on the following directions: 1) 3R (Recalling, Relating, Refining) regulating understanding; 2) 3I (Inquiring, Interacting, Interpreting) that encourages research; 3) 3P (Participating, Processing, Presenting) that is based on drawing conclusions.[22; 92-98], [23; 40-45]

Education 4.0, which provides an effective environment for the formation of skills specific to the subject of information culture and technological literacy in students, has the following characteristics: 1) Learning regardless of time and place (lifelong learning, e-learning, etc.); 2) The opportunity to receive personalized education according to the skills and abilities of students; 3) Taking into account the suggestions of students when preparing the curriculum; 4) Predominance of project-based learning; 5) Formation of students' ability to conduct analysis on large-scale data (Big Data); 6) Assessment of students' knowledge in the process of applying them to projects; 7) Becoming a part of the education system of developing new technologies, etc. [11-12]

In the era of the Fourth Industrial Revolution, "smart" educational tools and resources should enable individuals to acquire more advanced experience, knowledge, and skills, and to reveal their innovative perspectives.

The way of forming intellectual cognitive skills in education is adequate to the merits of innovative teaching applied in our modern era.

Scientific sources indicate that in the process of implementing general education, the student (student) must acquire the necessary intellectual skills to realize his intellectual qualities and purposefully regulate cognitive activity. Intellectual skills are numerous. Taking into account the research of NA Menchinskaya in this area, intellectual skills can be divided into the following groups: 1. General intellectual skills (planning, working with books, self-control); 2. Intellectual skills necessary for the organization of mental activity (distinguishing the main idea in the text, dividing the text into parts according to its meaning, comparing events, etc.); 3. Specific intellectual skills (they reflect the characteristics of this or that subject, for example, graphic skills). Another classification of intellectual skills, authored by I. Unt, is as follows: 1. Skills related to the perception of educational material (reading, observation, listening skills); 2. Ability to perform logical operations with educational material (attribution of what is important, comparison, ability to draw conclusions, etc.); 3. Creative skills (ability to build a composition, etc.) [1; 60].

The main function of the skills inherent in the subject of information culture and technological literacy is related to the exteriorization of intellectual operations (mental activity is considered external, practical activity is considered internal, and mental activity is considered external - transformation into something external): the content of cognitive activity is conditioned by intellectual operations, and their realization in the process of activity directly depends on the level of intellectual skills [1; 60], [7; 174].

In school practice, the psychology of cognitive activity has not been studied enough, and although students are interested in the characteristics of their memory or thinking, their interests have not been satisfied. In modern American psychology, this issue has been brought into the spotlight and studied as a metacognitive system. It has been established that as children develop, certain ideas about cognitive processes are formed in them and they begin to regulate their mental activity.

It is worth emphasizing that self-monitoring, self-regulation, and self-assessment are metacognitive skills, which are related but distinct concepts. It is a person's awareness and understanding of their own cognitive processes. Self-monitoring involves observing and following their actions, behaviors, and cognitive processes during a task. Here, the learner does not try to control themselves, judge, or evaluate their own performance. They simply collect information about their performance by observing themselves. The main components of this process are: observation; awareness; feedback. Self-regulation is the ability of a person to monitor and manage their cognition, emotional state, and behavior to achieve a goal. The main components of this process are: goal setting; planning; emotional regulation; adaptation. Self-assessment is the ability to judge or evaluate their own performance or learning. The main components of this process are: evaluation; reflection (3;50).

Flavell has studied and described in detail some of the functions of metacognition. Among them are the following: 1. Problem formulation and identification of possible solutions; 2. Knowing which cognitive processes are necessary to solve a task; 3. Activating cognitive rules and methods; 4. Confidence in the capabilities of thinking; 5. Attempting to solve tasks more efficiently.

These functions are interconnected. The first function is conditioned by the formation of ideas about the goals of the activity in children. As they grow older, they learn to apply known methods to various situations. Gradually, students form ideas about cognitive processes. They understand that in order to remember the material, it is necessary to listen carefully to the teacher, and to remember in order to remember. When the student's ideas about these psychological processes are clear, he activates attention in one case, and memory in another, depending on the nature of the task. In this process, his competence gradually increases: he looks for new ways to solve the problem. When the student believes in the possibilities of his thinking, he does not shy away from difficulties, even if he fails, he thinks and tries to solve the problem. In this process, his attitude towards himself also changes. He solves the task not in a hurry, not in a hasty, headlong manner, but in efficient ways [1; 60].

According to P.Massen, C.Kenger, C.Kogan and A.Houston, the mentioned functions develop to one degree or another in all children. However, the level of their development is significantly influenced by the upbringing conditions. [7;192]. They should be developed by all means. The relevance of the issue should be clearly understood from a scientific-methodological aspect and systematic work should be carried out in this area at school.

A system of special tasks is applied to form skills specific to the subject of information culture and technological literacy in students. These tasks are designed on the principle of modeling the structure of various intellectual skills. As students complete them, they acquire intellectual skills such as determining the purpose of their work, systematizing educational material in this regard, independently collecting material, writing an essay, etc. From the point of view of the principle of developmental training, this method is considered effective. However, in order to use it purposefully, the system and content of intellectual skills in classes and subjects must be thoroughly developed.

According to our subjective understanding, by creatively using the curriculum model currently being applied in secondary schools (which is conditioned by the teacher's scientific and theoretical training and pedagogical mastery), it is possible to form a system of tasks that also aims to develop skills (intellectual skills) specific to the subject of information culture and technological literacy in students.

In the preparation of tasks for active learning aimed at general, specific learning outcomes and performance indicators, the hierarchy of thinking types is established from simple to complex in the following order: logical thinking - critical thinking - creative thinking. The operations of thinking provide the basis for determining its type. This factor can also be used in the management of learning.

Tasks and their system: should be consistent with the purpose of the lesson and aimed at solving the research problem set (according to the type of thinking, information sources, form of presenting results, etc.); should be appropriate to the age, knowledge and intellectual level, abilities and interests of students, and should be differentiated; should be based on the state program and national values; should be relevant, related to real life and students' experiences; should be interesting, attractive, and encourage discovery; should be clearly stated; should contain clear and open questions.

The formation of a system of tasks is only part of the work aimed at developing students' intellectual skills in the learning process. One of the important issues is to achieve the formation of cognitive activity of students when working on tasks and its (continuous) maintenance throughout the entire process. It should be noted that four main mechanisms of learning-centered learning, in other words, active (interactive) learning (the main goal of this process is research), lead to the formation and maintenance of cognitive activity during the lesson. These are the following: Creating a problem situation (the student is presented with a problem and is directed to solve it, which results in cognitive activity); The student's role as a researcher, the teacher as a facilitator (during active (interactive) learning, the student should stand in the position of a subject, be an equal participant in this process, he should independently acquire knowledge during research); The need for dialogue and cooperation (active (interactive) learning is carried out in a dialogical, collaborative environment). Psychological support: respect and trust (The means of maintaining students' cognitive activity is their psychological support, which is possible thanks to the teacher's benevolent attitude, respect and trust towards students, and confidence in their abilities) [8; 49-50]. .

It is possible for a student to act in the position of a researcher when the content of the training material, the form of action of the tools and methods (in the training process, the content of the training material, tools and methods take precedence over the content in terms of the organizational form) are in accordance with the research process. The organizational form of training organized in accordance with the research process has a unique structure (the structure of the active lesson resembles the stages of the research process).

This form, called active learning, includes the following stages:

1. Motivation stage (posing a problem, putting forward hypotheses); 2. Research stage (searching for facts to test hypotheses); 3. Information exchange stage (presentation of the obtained data); 4. Information discussion and organization stage (discussion of the obtained data, correlation of various facts, their systematization); 5. Generalization and conclusion stage (generalizations, comparison of results with hypotheses and conclusion on their confirmation or refutation, answer to the research question); 6. Productive (creative) application stage (application in new conditions, solution of practical problems); 7. Evaluation or reflection stage (evaluation of activity, mastering the rules of learning, reflection in consciousness of the already completed process, one of the main mechanisms that allows analyzing and understanding all stages of knowledge acquisition)

[4; 646-652].

In selecting and systematizing tasks to be applied in order to form skills specific to the subject of information culture and technological literacy in students, and organizing students' activities on them, the following principles should be kept in focus: completeness of the learning process; creation of equal opportunities in learning; student-centeredness; development-orientedness; stimulation of activity; creation of a supportive environment.

Scientific novelty of the study: The idea of the directions of pedagogical influence aimed at the formation of skills specific to the subject of information culture and technological literacy in students in the process of implementing general education has been identified.

Theoretical significance of the study: The research on the presented topic has a specific function in directing further scientific activity for a broad study of theoretical and practical ways to solve the problem of creating conditions for sustainability for the future development of society.

Practical significance of the study: In the real pedagogical process, practical educators have the opportunity to benefit from the idea of the directions of pedagogical influence of information culture and technological literacy skills on students in their activities.

Conclusion: 1. Intellectual and creative activity of everyone living in the "techno-democratic-information society" becomes a paramount requirement, and for this, it is necessary for each member of this society to rise to the level of a subject of information culture and technological literacy; 2. The presence of information culture and technological literacy in each member of the society formed in accordance with the calls of the IV industrial revolution is a desirable quality; 3. The education system adequate to the "techno-democratic-information society" has taken its place in scientific sources and pedagogical practice under the term "Education 4.0" and has been interpreted as a superstructure on logical grounds; 4. "Education 4.0", which exhibits an effective environment for the formation of intellectual skills, has specific characteristics, and it is possible to divide the intellectual skills that need to be formed in this system into groups on a certain logical basis; 5. In general education schools, a system of special tasks is applied to form skills (intellectual skills) specific to the subject of information culture and technological literacy in students, and it is advisable to compile these tasks based on the principle of modeling the structure of various intellectual skills; 6. In selecting and systematizing tasks to be applied for the purpose of forming intellectual skills and organizing students' activities on them, the following principles should be kept in focus: 1) Completeness of the educational process; 2) Creation of equal opportunities in education; 3) Student orientation; 4) Development orientation; 5) Stimulation of activity; 6) Creation of a supportive environment.

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