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METHODOLOGICAL BASIS OF USING DIGITAL VISUALIZATION TOOLS IN THE PEDAGOGICAL PROCESS

Latipova Xurshida Abdullayevna

Doctoral student of the Nukus State

Pedagogical Institute named after Ajinyoz

Gmail: 932072202x@gmail.com

ANNOTATSIYA: Mazkur maqolada pedagogik jarayonda raqamli vizualizatsiya vositalaridan foydalanishning metodik asoslari ilmiy jihatdan tahlil qilingan. Raqamli vizualizatsiya vositalarining ta'lim jarayonidagi o'rni, ularning talabalarning bilish faoliyati, mustaqil fikrlashi va ijodiy tafakkurini rivojlantirishdagi ahamiyati yoritilgan.

Kalit so'zlari: Raqamli texnologiyalar, raqamli vizualizatsiya, pedagogik jarayon, vizualizatsiya vositalari, ta'lim samaradorligi, multimedia vositalari, interaktiv ta'lim, pedagogik texnologiya, ijodiy tafakkur, axborot texnologiyalari.

АННОТАЦИЯ: В данной статье научно обоснованы методические основы использования средств цифровой визуализации в педагогическом процессе. Рассмотрена роль средств цифровой визуализации в образовательном процессе, их значение в развитии познавательной активности, самостоятельного мышления и творческого потенциала студентов.

Ключевые слова: Цифровые технологии, цифровая визуализация, педагогический процесс, средства визуализации, эффективность обучения, мультимедийные средства, интерактивное обучение, педагогические технологии, творческое мышление, информационные технологии.

ANNOTATION: This article scientifically substantiates the methodological foundations for the use of digital visualization tools in the pedagogical process. The role of digital visualization tools in the educational process and their importance in developing students' cognitive activity, independent thinking, and creative abilities are analyzed.

Keywords: Digital technologies, digital visualization, pedagogical process, visualization tools, learning effectiveness, multimedia tools, interactive learning, pedagogical technologies, creative thinking, information technologies.

In the context of modern globalization and digital transformation, innovative development of the education system, introduction of advanced information and communication technologies into pedagogical processes is one of the important strategic tasks. As a result of the rapid development of digital technologies, new forms and methods of organizing the educational process have emerged, among which digital visualization tools are of particular importance. Because visual information is perceived by humans faster than textual information [1; 48] and is more effectively stored in long-term memory. Today, increasing the effectiveness of education in the pedagogical process, developing students' independent thinking skills and forming creative thinking are among the urgent problems. In this regard, digital visualization tools activate students' learning activities by presenting educational materials in the form of graphics, diagrams,

infographics, animation, interactive presentations and multimedia, help to easily master complex concepts and increase the efficiency of the cognitive process. Digital visualization tools serve not only as a means of presenting information, but also as an important pedagogical factor that develops students' cognitive activity, forms their analytical, critical and creative thinking skills. Studies show that in the educational process using visual elements, the level of student mastery is significantly higher than in traditional methods [1; 72]. In the Republic of Uzbekistan, the digitization of the education system, the introduction of modern pedagogical technologies and improving the quality of education have been identified as one of the priority areas of state policy. In particular, important regulatory and legal documents have been adopted on the widespread introduction of digital technologies into the educational process, the development of innovative teaching methods and the creation of a digital educational environment. At the same time, the need to scientifically study the methodological foundations of the effective use of digital visualization tools in the pedagogical process, identify their pedagogical capabilities and develop mechanisms for integrating them into the educational process determines the relevance of this topic. Because in the modern educational process, not only the provision of knowledge is of great importance, but also the formation of creative thinking, independent decision-making and innovative approaches in students. This article provides a scientific and theoretical analysis of the methodological foundations of the use of digital visualization tools in the pedagogical process, their pedagogical capabilities and their role in increasing educational efficiency.

In the conditions of a modern information society, the digitization of the education system and the introduction of innovative technologies into the pedagogical process are of great importance. Along with traditional teaching methods, the use of interactive and visual tools based on digital technologies in the educational process is an important factor in increasing the efficiency of students' learning. Scientific research shows that the human brain perceives visual information 60 thousand times faster than textual information, and knowledge obtained with the help of visual materials is more effectively stored in long-term memory. Therefore, the use of digital visualization tools in the pedagogical process is of great importance in increasing students' motivation for learning, activating their cognitive activity and developing creative thinking. Today, digital visualization technologies such as infographics, interactive presentations, animations, virtual laboratories and multimedia tools are widely used in the educational process. These tools allow complex theoretical concepts to be expressed in a clear, understandable and visual form and develop students' independent thinking and analytical skills. The digitization of the education system in the Republic of Uzbekistan, the introduction of modern pedagogical technologies and the formation of an innovative educational environment are defined as one of the priority areas of state policy. The effective use of digital technologies in the educational process, the development of students' intellectual potential and improving the quality of education are among the important tasks. In this regard, the scientific study of the methodological foundations of the use of digital visualization tools in the pedagogical process, the determination of their pedagogical effectiveness and the development of mechanisms for their integration into the educational process are of great scientific and practical importance. This determines the relevance of the topic of this research.

The aim of this work is to scientifically substantiate the methodological foundations of the use of digital visualization tools in the pedagogical process and to identify their potential for improving students' cognitive activity, creative thinking and educational effectiveness.

The following tasks are planned to be implemented:

- Analysis of the pedagogical essence and scientific and theoretical foundations of digital visualization tools;

- Identification of the types and capabilities of digital visualization tools used in the pedagogical process;

- Study of the impact of digital visualization tools on students' cognitive activity and creative thinking;

- Development of effective methods for using digital visualization tools in the educational process;

- Development of scientific and methodological recommendations for the use of digital visualization tools in the pedagogical process [5; 39].

Pedagogical essence of digital visualization tools

Digital visualization tools are a set of modern digital technologies that serve to present educational information through graphics, diagrams, tables, animations, infographics, multimedia and interactive forms. These tools, by expressing information in a visual form, increase the clarity of educational material, concretize abstract concepts, and activate students' cognitive activity. From a pedagogical point of view, the visualization process is based on the psychological characteristics of a person. According to research, a person perceives the main part of the information he receives from the external environment through vision. Therefore, presenting educational materials in a visual form helps students to assimilate knowledge faster [1; 52] and remember it for a long time. Digital visualization tools are not only a means of conveying information in the educational process, but also an important pedagogical factor that develops students' independent thinking, forms their analytical and creative abilities. Educational information presented through visual materials attracts students' attention, increases their interest in the educational process, and increases their motivation.

Digital visualization tools used in the pedagogical process are manifested in various forms. These include:

• multimedia presentations (PowerPoint, Prezi, etc.);

• infographics;

• interactive diagrams and graphs;

• animations and video materials;

• virtual laboratories;

• electronic textbooks and interactive platforms.[2; 52]

These tools allow you to present educational material in a systematic, understandable and visual form. Visualization tools are especially important in explaining complex processes, abstract concepts and theoretical knowledge. The presentation of educational materials in a visual, auditory and interactive form using multimedia tools [1; 89] allows students to perceive information through several sensory organs. This increases the effectiveness of knowledge acquisition and serves to organize the educational process more effectively.

The use of digital visualization tools in the pedagogical process is based on certain methodological principles. These principles are as follows:

1. The principle of visuality.

According to this principle, the presentation of educational materials in a visual form helps students to effectively master knowledge. Visual elements increase the clarity of educational material and create the opportunity to systematically master knowledge.

2. The principle of systematization and consistency.

Digital visualization tools allow you to present educational materials in a systematic and logical sequence. This helps students perceive knowledge holistically.

3. The principle of activity.

Interactive visual tools ensure the active participation of students in the learning process. By working with visual materials, students develop the skills of independent thinking, analysis and drawing conclusions[4; 51].

4. The principle of an individual approach.

Digital visualization tools allow you to take into account the individual learning capabilities of each student. Students can learn educational materials at their own pace. The use of digital visualization tools significantly increases the effectiveness of education. Visual materials increase students' understanding of the educational material, enhance their memory and develop independent thinking skills. Digital visualization tools also play an important role in developing students' creative thinking. Through visual materials, students have the opportunity to generate new ideas, analyze problems and develop innovative solutions. The use of digital visualization tools in the modern educational process makes the pedagogical process more effective, interesting and interactive. This increases students' interest in learning and improves the quality of education. In the context of the digitalization of the modern education system, the use of digital visualization tools in the pedagogical process is one of the important factors in increasing the effectiveness of education. Digital visualization tools, by presenting educational materials in a visual, interactive and understandable form, help students effectively acquire knowledge, activate their cognitive activity and increase their interest in the educational process. The results of the study show that the use of digital visualization tools not only increases the level of knowledge of students, but also develops their independent thinking, analysis and creative approach skills[3; 88]. The systematic and consistent presentation of educational information using visual materials allows students to understand the educational material more deeply and retain it in long-term memory. Also, the use of digital visualization tools in the pedagogical process serves to effectively implement the principles of demonstrativeness, systematicity, activity and individual approach to teaching. This is of great importance in improving the quality of the educational process, developing the intellectual potential of students and forming modern competencies. In conclusion, the use of digital visualization tools in the pedagogical process is an important methodological tool for increasing educational efficiency, developing students' creative thinking and organizing the educational process based on modern requirements. Therefore, one of the important tasks is the widespread introduction of digital visualization tools into the educational process, improving their methodological foundations and developing scientifically based recommendations for their effective use.

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