ADVANTAGES OF USING 3D TECHNOLOGY IN THE EDUCATIONAL PROCESS

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Abstract. This article analyzed the main advantages of using 3D prototyping machines in education, as well as technological concepts and issues of using 3D technologies in the relevant fields of education. The impact of factors such as levels of cognitive development, infrastructure, technical aspects, users, level of education, types of students on these processes was studied.

Keywords: didactic materials, psychological types, cognitive processes, visual sense, auditory sense, kinetic sense, 3D education, project, 3D model.

3D TEXNOLOGIYALARDAN TA'LIM JARAYONIDA FOYDALANISHNING AFZALLIKLARI

Annotatsiya. Ushbu maqolada ta'limda 3D prototiplash mashinalaridan foydalanishning asosiy afzalliklari, shuningdek, ta'limning tegishli sohalarida 3D texnologiyalardan foydalanishning texnologik tushunchalari va masalalari tahlil qilindi. Kognitiv rivojlanish darajalari, infratuzilma, texnik jihatlar, foydalanuvchilar, ta'lim darajasi, bu jarayonlar bo'yicha turli xil o'zlashtirish darajasiga ega talabalarga ta'siri o'rganildi.

Kalit so'zlar: didaktik materiallar, psixologik tiplar, kognitiv jarayonlar, ko'rish hissi, eshitish hissi, kinetik sezgi, 3D ta'lim, loyiha, 3D model.

ПРЕИМУЩЕСТВА ИСПОЛЬЗОВАНИЯ 3D ТЕХНОЛОГИЙ В ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ

Аннотация. В данной статье проанализированы основные преимущества использования машин 3D-прототипирования в образовании, а также технологические концепции и вопросы использования 3D-технологий в соответствующих областях образования. Изучено влияние на эти процессы таких факторов, как уровень когнитивного развития, инфраструктура, технические аспекты, пользователи, уровень образования, типы учащихся.

Ключевые слова: дидактические материалы, психологические типы, когнитивные процессы, зрительное чувство, слуховое чувство, кинетическое чувство, 3D-образование, проект, 3D-модель.

Introduction. In our society, the use of technology in education and teaching is recognized as an important factor for students to develop and express themselves in the surrounding environment. It should be noted that education today must establish a technological alphabet. In order to understand the possibilities of using 3D technologies in the classroom, we first focus on the importance of didactic material in the classroom and the levels of cognitive development, we try to determine the levels of activity planning with the help of digital technologies.

Material and research methods. All didactic materials should have the following characteristics:

• Arousing and attracting students' interest.

• Encourage interaction during the lesson.

• Explain abstract and complex concepts in concrete form, not just through a screen or blackboard.

• To allow observation of mechanical or physiological properties of various objects and organs.

• Reinforcement of previous knowledge.

• Connecting previously acquired knowledge with new knowledge.

• Provide students with a variety of experiences that facilitate the application of their knowledge in real-life situations.

• Development of creativity.

Depending on the goals determined by the stages of learning, the environment of using the materials also changes. It has been proven in many studies that one sense is better developed in humans than the other and that knowledge acquisition is more effective when this sense is affected.

Below are the types of learners who excel in certain senses.

Visual learners. They think in images. They speak and write quickly because they feel that there is not enough time to say or write everything that is on their mind. They can think of many things at once, but not necessarily in order. They can do many things at once. They must be seen, observed by others, and maintain eye contact with their interlocutors.

Hearing impaired students. The thought process is orderly and sequential. They think of one idea and then move it to make room for the next idea. They speak more slowly than people with a visual advantage. They do one thing at a time. To express themselves, they choose adequate words that reflect what they are thinking as accurately as possible. They need to hear, have others listen to them, and get verbal feedback.

Students with kinetic perception. They are drawn to what they are doing, despite the distractions of the environment. They like to participate in actions and thoughts. They are comfortable in perceiving their inner state, for example, their feelings. They think based on what they feel. They need and expect physical contact with others. For example, pats on the back, handshakes and hugs in the process of stimulation have a stronger effect on them.

Considering these aspects, it is appropriate to use different types of didactic materials in the educational process.

3D printing technology is a growing technology in universities, colleges and high schools. With this technology, the teaching and learning process has changed dramatically. 3D printing is a revolutionary and innovative technology that provides new ways of learning and understanding concepts that are very difficult to explain with traditional methods.[4, P. 483-488.]

3D printers are widely used in education.

In chemistry: 3D structures, molecules, organic bonding, construction of elements.

In Biology: Cell Structure.

In geography: designing models, maps. [5, P. 939-942]

In mathematics: Creating a presentation of geometric objects, shapes.

In history: Design of historical objects, design of fossils and monuments,

In sports education: the plan of a sports game, a sample of sports equipment.

In Musical Education: Musical Instrument Design.

In preschool educational institutions: educational facilities, educational manuals.

In engineering: design drawing samples.

In architecture: Building design, drawing

In Marketing: Product sample, diagram, 3D graphics

In Fashion Technology: Material Design for Apparel,

Result and analysis. Using 3D technology in the educational process offers numerous advantages that can enhance teaching and learning experiences. Here are some of the key advantages of 3D printers in education, research and development:

• It provides practical information to the participants.

• The plan of the object helps to understand the actual object.

• They can use this modern printing technology to teach architecture, visual arts, physics or chemistry.

• This 3D printing technology gives students a complete understanding of objects and structures.

• Prototype design helps students understand the topic.

• Students can use this technology to give physical appearance to their visual and imaginative information and projects.

• Enhanced Visualization: 3D technology allows students to visualize complex concepts and subjects more effectively. It provides a realistic and interactive representation of objects, structures, and phenomena, enabling students to explore and understand them from different angles. This can greatly contribute to their comprehension and retention of information [3].

• Engaging and Interactive Learning: 3D technology creates an immersive and engaging learning environment. It captures students' attention and stimulates their curiosity, making learning more enjoyable and interactive. Students can actively participate in virtual simulations and manipulations, leading to a deeper understanding of the subject matter.

• Hands-on Experiences: 3D technology enables students to have hands-on experiences, even with abstract or inaccessible concepts. They can interact with virtual objects, conduct virtual experiments, and manipulate models for a more

practical understanding of the topic. This promotes active learning and problem-solving skills development.

• Multisensory Learning: 3D technology engages multiple senses, such as sight and sound, which enhances the learning experience. By incorporating audio and visual elements, it provides a multisensory approach that caters to different learning styles and preferences. This can improve information retention and overall learning outcomes [2].

• Real-world Contextualization: 3D technology allows educators to bring real-world scenarios into the classroom. Students can explore historical sites, visit distant locations, or examine complex biological structures without leaving their seats. This contextualization provides a deeper understanding and fosters connections between theoretical knowledge and practical applications.

• Collaborative Learning: 3D technology facilitates collaborative learning experiences. Students can work together on virtual projects, share ideas, and collaborate on problem-solving tasks. This promotes teamwork, communication skills, and peer-to-peer learning.

• Accessible Learning: With advancements in technology, 3D educational content can be accessed through various devices like computers, tablets, or virtual reality headsets. This flexibility allows students to access 3D resources both in the classroom and remotely, expanding access to quality educational materials [6].

• Time and Cost Efficiency: VR and simulation-based learning can be more time and cost-effective compared to traditional experimental setups. It eliminates the need for physical resources, reduces setup time, and allows students to repeat experiments or simulations as needed, optimizing learning outcomes [7, P. 18-25].

• Access to Inaccessible or Expensive Resources: Virtual reality simulations enable access to locations, experiences, or resources that may otherwise be difficult, expensive, or impossible to reach. Students can explore historical landmarks, travel through space, or dive into the depths of the ocean, expanding their learning possibilities [1].

• Collaboration and Remote Learning: 3D simulations can support collaboration among students and educators, even when they are physically distant. VR platforms allow for real-time interaction, communication, and shared experiences, enabling students to work together on projects, experiments, or simulations regardless of their geographic location [5, P. 939-942].

It is important to note that successful integration of 3D technology in education requires proper planning, training for educators, and access to appropriate resources. Additionally, research is crucial to ensure the effectiveness and pedagogical benefits of using 3D technology in specific educational contexts.

Overall, the use of 3D technology in education holds great promise for creating engaging, interactive, and meaningful learning experiences that can enhance students' understanding and knowledge retention.

Conclusion. Research shows that the use of 3D technologies helps to organize cognitive development more effectively with the help of visual and kinetic senses of students.

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