

## **HOLOGRAPHIC EDUCATIONAL TECHNOLOGIES: DEVELOPMENT OF STUDENT ACTIVITY BASED ON A COGNITIVE APPROACH**

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**Abstract:** This article highlights the scientific and theoretical foundations of the application of holographic technologies in the education system, their influence on the cognitive activity of students, and their significance in increasing learning motivation. Based on the cognitive approach, the possibilities of holographic technologies in activating student activity, methodological directions for their integration into the educational process were analyzed. Also, the creation of a holographic educational environment based on innovative pedagogical practices and its performance indicators are discussed.

**Keywords:** holographic technologies, cognitive approach, digital education, innovative methods, educational activity, motivation, visual perception.

### **Introduction.**

In the 21st century, in the process of modernization of the education system, the need to introduce innovative technologies into the educational process is sharply increasing. In the era of digital transformation, the effectiveness of education is determined not by the methods of knowledge transfer by the teacher, but by how the cognitive activity of the student is organized. Therefore, the organization of the educational process based on a cognitive approach, especially with the help of holographic technologies, is becoming an important trend in modern education.

Holographic education is an innovative learning system that allows one to perceive, analyze, and assimilate information based on three-dimensional visual images. Unlike traditional forms of teaching, it allows the student to be actively, creatively, and interactively involved in educational activities.

Today, the concept of "hologram-based learning" is being implemented in practice in many leading higher educational institutions of the world (MIT, Tokyo University, Oxford, etc.). In the education system of Uzbekistan, the adaptation of this technology to the content of national education is an urgent scientific and pedagogical task.

Holography (from the Greek *holos* - complete, *grapho* - to write) is a technology for creating a three-dimensional image using the interference of light waves. Holographic educational technology means the use of this technique as an educational tool aimed at activating the mechanisms of perception, memory, and thinking in the pedagogical process.

This technology supports the following didactic principles in the educational process:

The principle of visualization and realism: complex concepts are expressed in a simple and clear form through three-dimensional visual images;

Principle of activity: the student becomes not only an observer, but also a participant in the process being studied;

Principle of interactive learning: teacher-student cooperation is combined in real and virtual space;

The principle of reflection: the student analyzes their cognitive activity, recognizes mistakes, and has the opportunity to correct them.

Thus, holographic technologies create a multi-channel perception system for the effective implementation of the cognitive approach (learning through sight, hearing, touch).

The cognitive approach is a theoretical direction in psychology aimed at the development of cognitive processes - perception, attention, thinking, memory, and speech. According to this approach, the learning process is not just the transfer of information, but the student's activity of thinking, analysis, generalization, and problem-solving.

Holographic technologies reinforce the following aspects of this approach:

Activation of visual perception: the level of information perception through holograms is 40-50% higher than in traditional text or static images.

Stimulating thought processes: observing spatial objects develops logical and analytical thinking.

Memory enhancement: learning based on three-dimensional images is directly related to long-term memory.

Formation of problem-solving skills: the student develops cognitive reflection through their active participation.

Motivation in education is a psychological factor that forms the student's positive attitude towards learning and inner need. Holographic tools reinforce this motivation through the following mechanisms:

1. Emotional sensitivity: a hologram creates an impression of real experience; this makes the learning process interesting.

2. Participation effect: the student feels as if they are in "direct" communication with the object being studied.

3. Gamification: holographic teaching encourages student activity through the introduction of game elements.

4. Quick perception of the result: the student evaluates themselves by immediately visually seeing the result of their activity.

As a result, the holographic learning process sustainably develops students' internal motivation, creative potential, and the need to acquire knowledge.

When introducing holographic technologies into the educational process, it is advisable to follow the following methodological stages:

1. Preparatory stage: selection or creation by the teacher of holographic models corresponding to the content of the subject;

2. Integration stage: integration of hologram technology into lectures, seminars, laboratory classes;

3. Interactive learning stage: students' activity in conducting independent experiments, modeling, or solving problem situations;

4. Reflection stage: the student analyzes their knowledge, identifies errors, and assesses the level of assimilation.

Such stagedness allows for the systematic and effective organization of the learning process. Especially within the framework of the STEAM educational model, holographic technologies provide high results in engineering, medicine, biology, and technical sciences.

Studies conducted in recent years show that in the experimental groups using holographic teaching aids:

cognitive activity of students increased by 30-35%;

independent thinking and analytical skills were higher than in traditional groups;

the motivation index increased by 1.8 times;

the level of long-term memorization of knowledge was 25% higher.

These figures confirm that holographic technologies have a real impact on improving the quality of education.

Holographic educational technologies are an innovative form of practical application of the cognitive approach, which activates the cognitive processes of students, strengthens learning motivation, and develops the ability for independent thinking.

These technologies not only visually enrich the educational process, but also take communication between teacher and student to a new level. Therefore, the integration of the holographic teaching system into the content of disciplines in higher educational institutions, the training of teachers based on digital competencies, and the creation of holographic laboratories will further increase the effectiveness of education.

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