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PEDAGOGICAL FOUNDATIONS OF DEVELOPING CREATIVE THINKING IN STUDENTS BASED ON STEAM AND DIGITAL EDUCATIONAL TECHNOLOGIES

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Abstract. This article examines the issues of developing students' creative thinking through the integration of the STEAM approach and digital educational technologies. The study analyzes pedagogical onditions, interactive methods, and project-based activities that support the formation of crceative thinking in a modern educational environment. Particular attention is paid to the role of digital platforms, simulations, and interdisciplinary STEAM activities in enhancing students' ability to find original solutions to problem situations, think independently, and demonstrate innovative approaches. The research findings indicate that an educational process organized on the basis of STEAM and digital technologies serves as an effective pedagogical tool for fostering students' creative thinking.
Keywords: STEAM education, digital education technologies, Alpha Generation, creative thinking, interdisciplinary integration, project-based learning.

INTRODUCTION

In the 21st century, the education system has undergone profound changes and is developing on the basis of digital technologies and innovative pedagogical approaches. In particular, modern learners referred to as the Alpha generation are growing up in an information technology–rich environment, which indicates that their thinking patterns, interests, and learning styles differ significantly from those of previous generations. Therefore, the formation of creative thinking in Alpha generation students has become one of the key objectives of contemporary education. In this process, the integration of the STEAM educational approach and digital learning technologies emerges as an effective pedagogical foundation [1].

RESEARCH METHODOLOGY AND EMPIRICAL ANALYSIS

Alpha generation students are characterized by their ability to process information rapidly and their preference for learning through visual and interactive materials. Traditional forms of instruction are often insufficiently effective for them, as they require a creative and active learning environment. The STEAM approach activates students' thinking by integrating science, technology, engineering, arts, and mathematics, encouraging them to solve problem situations and develop creative thinking. This approach is particularly relevant as it aligns with the natural interests of Alpha generation students and their adaptation to the digital environment.

Creative thinking in Alpha generation students is manifested in their ability to find unconventional solutions to problems, generate new ideas, and freely express their thoughts. Within the STEAM learning process, these qualities are developed through practical activities. Students independently discover knowledge through experimentation, modeling, designing, and the use of design elements. This process раскрывает their creative potential and contributes to the development of creative thinking.

Digital educational technologies further expand the pedagogical potential of the STEAM approach. Interactive platforms, virtual laboratories, educational applications, and digital resources enable Alpha generation students to acquire knowledge in visual and practical forms. STEAM activities organized in a digital environment satisfy students' needs for independent

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inquiry, experimentation, and testing their own ideas. As a result, the learning process becomes more engaging and meaningful [2].

One of the key pedagogical foundations for developing creative thinking in Alpha generation students is project-based learning. Projects organized on the basis of STEAM and digital technologies introduce students to real-life problems and encourage them to find solutions using interdisciplinary knowledge. During the project process, students develop skills in teamwork, exchanging ideas, and defending their own viewpoints. This, in turn, fosters not only creative thinking but also communicative and social competencies.

RESULTS

The role of the teacher changes significantly in the process of developing creative thinking in Alpha generation students. Instead of acting as a traditional transmitter of knowledge, the teacher assumes the role of a facilitator, consultant, and collaborator. Creating an educational environment that allows students to think freely, not fear mistakes, and experiment is considered a key pedagogical condition. Such an approach increases students' creative activity and strengthens their self-confidence.

The processes of reflection and assessment also play an important role in developing creative thinking among Alpha generation students. Through STEAM and digital educational technologies, students gain opportunities to analyze their own activities, evaluate outcomes, and determine directions for further development. Self-assessment and peer-assessment practices integrate critical and creative thinking skills.

The development of creative thinking in Alpha generation students based on STEAM and digital educational technologies fully corresponds to the needs of modern education. The integration of interdisciplinary content, practical activities, digital environments, and innovative pedagogical conditions enhances students' creative potential and contributes to shaping individuals capable of successful participation in future society. These pedagogical foundations have significant scientific and practical value in improving educational quality and fostering creative thinking in Alpha generation students [3].

The integration of STEAM and digital educational technologies in developing creative thinking ensures a learner-centered educational process. Representatives of the Alpha generation are distinguished by their individual interests, rapid thinking, and adaptability to technology. Therefore, educational content should be organized in close connection with students' personal experiences, interests, and needs. STEAM- and digitally based lessons allow students to choose activities aligned with their interests, approach problems from multiple perspectives, and propose individual creative solutions.

Visual and multimodal learning materials have particular pedagogical significance in developing creative thinking. Alpha generation students perceive information more quickly and effectively through visual images, animation, and interactive tools. Graphic models, simulations, and digital design tasks created through digital educational technologies enrich STEAM content and expand students' imagination. In this process, students become active participants in knowledge creation rather than passive recipients of ready-made information.

One of the important aspects of developing creative thinking in STEAM and digital environments is fostering a positive attitude toward mistakes. In traditional education, errors are often viewed negatively, whereas in the creative process, mistakes can serve as sources of new ideas and solutions. During STEAM projects and digital experiments, students are given opportunities to test ideas, make mistakes, and analyze them. This helps them develop creative thinking without fear of risk and strengthens their self-confidence [4].

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STEAM activities organized through digital educational technologies also contribute to the development of metacognitive skills in Alpha generation students. Learners become aware of their own thinking processes, can explain how they arrived at solutions, and evaluate their own performance. This process is closely linked to creative thinking and helps students consciously manage their thinking strategies. A metacognitive approach ensures deeper and more well-founded creative ideas.

In addition, STEAM- and digitally based activities support the development of future competencies in Alpha generation students. Creative thinking, critical thinking, problem-solving, and digital literacy develop in an integrated manner. These competencies ensure students' success not only in the educational process but also in their future professional and social activities.

As a result, a pedagogical process organized on the basis of STEAM and digital educational technologies enables the systematic, conscious, and sustainable development of creative thinking in Alpha generation students. This approach serves as an important pedagogical factor in shaping learners as creative and innovative individuals who meet the demands of modern society.

The effectiveness of STEAM and digital educational technologies in developing creative thinking among Alpha generation students is closely related to the flexibility of the learning environment. A flexible educational environment allows students to learn at an individual pace, select tasks aligned with their interests, and demonstrate their creative potential. Within the STEAM approach, offering tasks of varying levels through digital platforms and gradually increasing complexity helps maintain students' intellectual engagement and positively influences the development of creative thinking [5].

Deepening interdisciplinary coherence is an important pedagogical factor in developing creative thinking. Within STEAM education, subjects are not merely combined mechanically but are integrated around a unified problem-based context. For example, digital design projects that integrate technology and art, or modeling tasks based on mathematics and engineering, foster complex thinking skills in students. Such activities encourage Alpha generation learners to approach problems from different perspectives and propose unconventional solutions.

CONCLUSION AND DISCUSSION

An educational process organized on the basis of STEAM and digital educational technologies creates an effective pedagogical environment for developing creative thinking in Alpha generation students. Interdisciplinary integration, practical activities, and the use of digital resources activate students' creative potential and promote independent and critical thinking. The teacher's guiding role and the systematic organization of reflection and assessment processes increase students' self-confidence. As a result, this approach plays a significant role in modern education by shaping Alpha generation students as creative and innovative individuals.

References:

1. Azizxo‘jayev N.N. Pedagogik texnologiyalar va pedagogik mahorat. – Toshkent: TDPU nashriyoti, 2018. – 220 b.
2. Muslimov N.A., Usmonboyeva M.H., Sayfurov D.M. Kasbiy kompetentlik asoslari. – Toshkent: Fan va texnologiya, 2017. – 256 b.
3. Yo‘ldoshev J.G., Yo‘ldosheva G.Yu. Innovatsion ta’lim texnologiyalari. – Toshkent: Iqtisod-moliya, 2019. – 184 b.
4. Xodjayev B.X. Oliy ta’limda kompetensiyaviy yondashuv. – Toshkent: Fan, 2020. – 198 b.