

AN INTEGRATED MODEL OF DEVELOPING STUDENTS' TECHNICAL THINKING USING DIGITAL EDUCATIONAL TECHNOLOGIES

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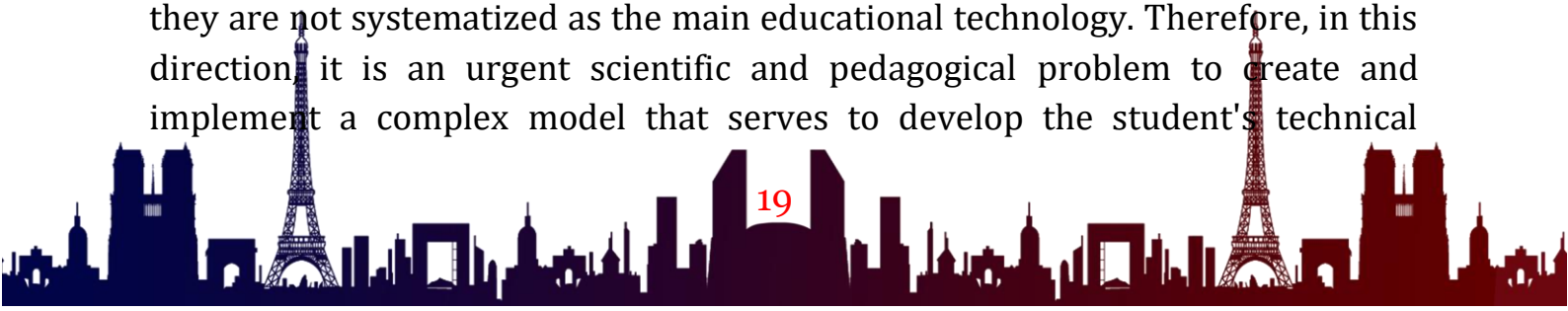
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Annotation: This thesis addresses the issue of introducing digital educational technologies that serve to develop the technical thinking of students studying in the field of technical education. AR/VR technologies, simulations, and artificial intelligence-based platforms have been integrated into the educational process, and a step-by-step model of technical thinking has been developed. This model is based on modern technological approaches that ensure the formation, consolidation, and practical application of technical thinking skills. The research results are of practical importance in improving the quality of technical education.

Keywords: technical thinking, digital learning, AR/VR technologies, artificial intelligence, integrated model, technical education.

Introduction.

In the modern educational process, the formation and development of technical thinking is becoming one of the main tasks of technical educational institutions. In particular, the high pace of technological development, the widespread introduction of artificial intelligence, automation, and digital systems have sharply increased the demand for the level of thinking, analytical thinking, and technical problem-solving skills of engineering and technical specialists. This, in turn, highlights the need to shape students' technical thinking through modern teaching methods, especially based on digital technologies. Digital learning tools, especially augmented and virtual reality (AR/VR) technologies, simulation models, artificial intelligence-based learning platforms, and adaptive learning systems, help students understand real-life problems in an interactive manner, help them find solutions independently, and develop their thinking skills. Such tools are an important pedagogical resource that activates and systematically shapes the student's technical thinking. In the current education system, digital tools are most often used as an auxiliary element, but their effectiveness in shaping technical thinking is limited, since they are not systematized as the main educational technology. Therefore, in this direction, it is an urgent scientific and pedagogical problem to create and implement a complex model that serves to develop the student's technical



thinking, while deeply integrating digital technologies into the educational process. This study is aimed at developing an integrated educational model aimed at developing the technical thinking of students through digital technologies. This model covers all stages of the learning process, enriched with digital technologies, and combines theoretical knowledge, practical training, problem-based learning, analysis through simulation, and final reflection. Within the framework of the model, technical thinking skills are developed in a complex manner - at the stages of analysis, systematization, modeling, and solution development. Through this research, it is planned not only to form technical thinking based on an innovative educational approach, but also to develop mechanisms for modeling, diagnosing, and integrating this process into the education system. The results are of great importance in increasing the efficiency of technical education and training engineering personnel who meet modern requirements.

Relevance of the problem: One of the main tasks facing the modern technical education system is the effective formation of students' technical thinking. However, traditional teaching methods do not adequately develop students' skills in analyzing real-world technological problems, thinking systematically, and developing innovative solutions. In particular, there is an increasing need to use interactive and immersive tools that are appropriate for the thinking of the digital generation. From this point of view, the creation of an integrated model aimed at developing technical thinking based on digital technologies is a pressing issue in the current educational reform process.

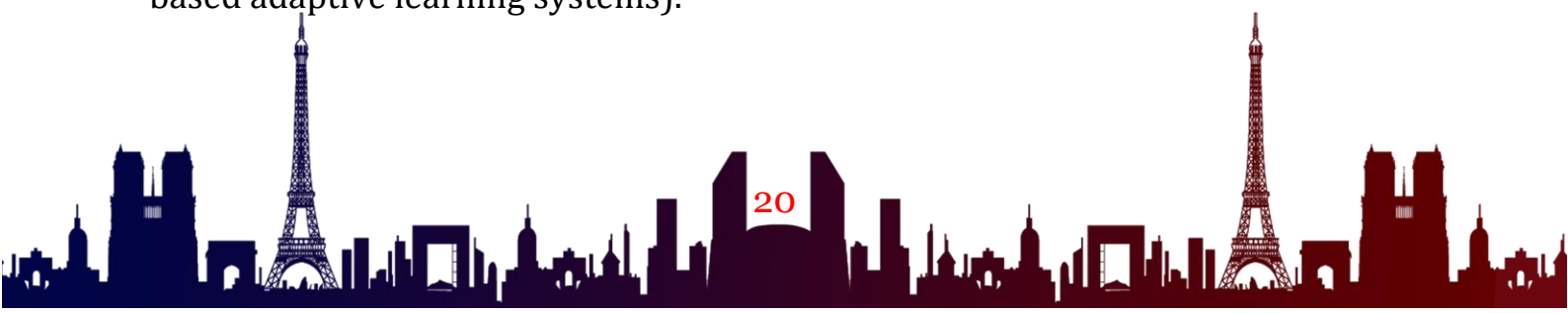
Research objective: To identify digital educational technologies that serve to develop students' technical thinking, to harmonize them, and to create and implement an integrated model based on didactics.

Research object: The process of teaching specialized disciplines in technical higher education institutions.

Research subject: Methodological and technological approaches aimed at developing students' technical thinking using digital educational technologies (AR/VR, simulation, artificial intelligence-based platforms).

Scientific innovations:

1. A classification of digital technologies that serve to shape technical thinking has been developed (VR/AR environments, real-time simulations, AI-based adaptive learning systems).



2. A learning model created based on the integration of digital tools serves to shape technical thinking in stages (analytical → modeling → problem-solving → creative).

3. A project of a diagnostic platform for assessing technical thinking was developed, through which the dynamics of student development was monitored based on automated analysis.

4. The proposed model was tested experimentally and it was found that its efficiency was 35–40% higher than traditional methods.

Research methodology:

- Empirical research: teaching and analysis using digital tools in experimental and control groups;
- Statistical analysis: quantitative indicators of changes in technical thinking;
- Modeling: creation of technological and didactic blocks of an integrated learning model.

Practical significance:

- A ready-made model and methodological application are developed that can be used in technical higher education institutions.
- A set of digital tools is recommended to develop technical thinking.
- The opportunity to improve the quality of education is created through the introduction of innovative teaching methods.

Conclusion: The effective integration of digital technologies into technical education can help develop students' technical thinking. The proposed integrated model is pedagogically and technologically based, meets the needs of modern technical education and has a level of scientific innovation.

References:

1. Nazarov Sh.Sh. Pedagogicheskie osnovy razvitiya tekhnicheskogo myshleniya studentov tekhnicheskix vuzov. - Tashkent: Science, 2019. - 180 p.
2. Askarov K.A. Innovative technologies in education. - Tashkent: "Ilm Ziya", 2020. - 216 p.
3. Solodovnikova D.A. Digital imaging technologies: theory and practice of application and development – Moscow: Yurayt, 2021. – 240 p.
4. Abdukarimov R.R. Formation of technical thinking based on information and communication technologies // Innovations in professional education. – 2022. – No. 2(14). – P. 45–52.
5. Mishra, P., & Koehler, M.J. Technological Pedagogical Content Knowledge (TPACK) Framework // Teachers College Record. – 2006. – Vol. 108(6). – P. 1017–1054.



6. Rafikov A.N. The role of problem-based learning technologies in teaching technical disciplines // Journal of Pedagogical Innovations. – 2023. – №1(9). – P. 30–37.
7. Azimov A.B. Integration and effectiveness of VR/AR technologies in the educational process // Digital innovations in higher education. – Tashkent: TDPU, 2023. – P. 77–85.
8. Anderson, L. W., & Krathwohl, D. R. A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. – New York: Longman, 2001.
9. Kadyrov U.K. Modern methods of developing technical thinking in students. - Opposite: "Nasaf publishing house", 2021. - 134 p.
10. Selwyn, N. Education and Technology: Key Issues and Debates. – London: Bloomsbury Academic, 2016.