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THE PEDAGOGICAL MECHANISMS OF DEVELOPING THE TECHNICAL CREATIVITY OF FUTURE PRIMARY SCHOOL TEACHERS BASED ON STEAM EDUCATION

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Abstract: This paper examines how STEAM education influences and enhances the technical creativity of future primary school teachers during their professional training. It provides a scholarly rationale for the core pedagogical environments needed to foster engineering mindset, creative thinking, and technical design capacities in university students. Furthermore, the author outlines actionable methodological guidance aimed at strengthening the readiness of pre-service teachers to implement innovation in their future classrooms.

Keywords: STEAM education, technical creativity, primary school teacher, pedagogical conditions, interdisciplinary integration, engineering mindset, project-based learning.

INTRODUCTION

In the current era of digital economy and rapid technological shifts, modern educational systems face a pressing challenge: preparing creative educators who can deliver both fundamental knowledge and practical competencies to the next generation. The primary school teacher serves as the foundational link, shaping a child's initial technical outlook and logical reasoning. Consequently, higher pedagogical institutions must deliberately nurture technical creativity among pre-service teachers. Within this context, the STEAM (Science, Technology, Engineering, Art, Mathematics) approach emerges as a vital tool that bridges multiple disciplines and establishes an innovative learning environment.

MAIN BODY

Shaping the technical creativity of future primary school teachers based on STEAM technology is a complex pedagogical process, requiring the creation of the following significant pedagogical conditions:

Modeling an interdisciplinary integrative-innovative environment. In forming technical creativity, interdisciplinary integration is not simply about combining topics, but rather shaping a unified technical picture of the world within the student. The synthesis of mathematics (precise calculation), natural sciences (analogy of biological systems), and art (aesthetics) with technology in primary education stimulates the student's design activities. For instance, studying elements of bionics involves applying a methodology that transfers natural forms into technical models. Through this process, the student learns to perceive a technical object not merely as a mechanism, but as a complex system intertwined with nature and society.

Project-based learning and "Maker" culture. Within the STEAM context, the project method shifts students from the status of a "learner" to that of a "creator-researcher." Under this methodology, students work on targeted, problem-oriented projects (such as a "Smart School Model" or "Ecological Transportation"). The core pedagogical condition of project-based learning

dictates that the final outcome must manifest as a tangible or digital product. This process reinforces systematic troubleshooting and algorithmic thinking skills in future teachers.

Establishing a platform for creative-technological laboratories (MakerSpace). The availability of specialized "creative workshops" for technical creativity within a higher education institution constitutes a fundamental pedagogical condition. Unlike traditional classrooms, these laboratories are equipped with high-tech gear (3D printers, electronic construction kits, robotics sets) alongside traditional hand tools. In this environment, students gain the opportunity to bring their ideas to a prototype level without fearing mistakes. A co-working framework creates a solid foundation for students to exchange mutual experiences and engage in creative collaborations.

Heuristic and problem-based situation management technology. The most powerful driver for activating technical creativity is the introduction of artificial "engineering challenges" into the pedagogical process. Students are not given ready-made solutions or pre-drawn blueprints; instead, ultimate goals and technical constraints are established. For example: "Using the provided resources, design a lifting mechanism that consumes the minimum amount of energy." Under such conditions, the student is forced to independently recall physical principles and evaluate multiple options to select the most optimal one, which cultivates their capacity to make unconventional decisions.

BENEFITS OF THE STEAM APPROACH

The STEAM framework systemizes the technical creativity of future educators across three primary domains:

1. **Mathematical Competence:** Applying theoretical formulas to ensure the structural stability of real-world objects (utilizing measurements, proportions, and scaling).
2. **Design Thinking (Art):** Balancing the ergonomics and user-friendliness of an object, thereby merging aesthetics with functionality.
3. **Systems Engineering:** Breaking down complex operations into smaller components and reassembling them to build an entirely new, innovative system.

CONCLUSION

To conclude, leveraging the STEAM approach to shape the technical creativity of future primary school teachers is not just a passing methodological trend; it represents a strategic shift in modern education. The pedagogical conditions detailed above—ranging from cross-disciplinary integration and project work to maker laboratories and problem-based tasks—form a sturdy foundation for preparing future teachers for innovative roles. Integrating this approach into university settings guarantees the graduation of competent professionals capable of inspiring technical mindsets in young school children.

REFERENCES:

1. Mirziyoyev Sh.M. "Yangi O‘zbekiston strategiyasi". – Toshkent: "O‘zbekiston" nashriyoti, 2021.
2. Yo‘ldashev J.G‘., Usmonov S.A. "Zamonaviy pedagogik texnologiyalarni amaliyotga joriy qilish". – Toshkent: "Fan va texnologiya", 2008.
3. Muslimov N.A. "Kasb ta’limi o‘qituvchilarini kasbiy shakllantirishning nazariy-metodik asoslari": Ped. fan. dok. ... diss. – Toshkent, 2007.
4. Yakubov J.J. "STEAM ta’lim texnologiyasi: muammo va yechimlar". – Toshkent: "Pedagogika" jurnali, 2020, №4.
5. Sharipov Sh.S. "O‘quvchilar ixtirochilik ijodkorligining pedagogik shart-sharoitlari". – Toshkent: Fan, 2007.

6. Xodjayev B.X. "Umumiy pedagogika nazariyasi va amaliyoti". – Toshkent: "Sano-standart", 2017.
7. Yakubova M. "Boshlang‘ich sinf darslarida integratsiyalashgan ta’limni tashkil etish metodikasi". – Toshkent, 2021.
8. Reshetnikov V.G. "STEAM-obrazovanie: sovremennыy podxod v podgotovke budushix uchiteley". // Molodoy uchenыy. – 2019. – № 25.
9. Bybee R. W. "The Case for STEM Education: Challenges and Opportunities". – NSTA Press, 2013.
10. Yakman G. "STEAM Education: an overview of creating a model of integrative education". – Virginia Tech, 2008.