

# An Improved Methodology For Developing The Professional And Creative Competence Of Future Technology Teachers Based On Multimedia Tools

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**Abstract:** This article presents an improved methodology for developing the professional and creative competence of future technology teachers through the use of multimedia tools. The study analyzes the current state of the professional training process of future technology teachers in higher education institutions and substantiates the pedagogical potential of multimedia technologies. Pedagogical conditions aimed at fostering professional and creative competence are identified, and an improved methodological model as well as digitized educational and methodological support are described. Furthermore, the effectiveness of developing students' professional and creative competence through organizing classes in descriptive geometry and engineering graphics using multimedia tools is analyzed based on the results of pedagogical experimental research. The findings confirm the practical effectiveness of the proposed methodology.

**Keywords:** Multimedia tools, professional and creative competence, technology education, future teacher, methodology, innovative education.

**Introduction:** The modern education system places significant emphasis on shaping students' professional preparedness and creative potential. In the process of teaching technology subjects, the professional and creative competence of future teachers is considered a key factor determining the quality of education. Professional and creative competence is a combination of a teacher's theoretical knowledge, practical skills, creative thinking, and readiness for innovative activity, which ensures effective performance in pedagogical and technological processes [1].

In recent years, multimedia tools have been recognized as an important means of improving the quality of education. Videos, animations, virtual laboratories, and interactive presentations allow future teachers to deepen their theoretical knowledge, develop practical skills, and enhance creative thinking. Therefore, the systematic integration of multimedia tools is considered a primary approach to effectively developing the professional and creative competence of future technology teachers [2].

In the context of educational reforms in Uzbekistan and the growing demand for effective use of information and communication technologies in higher education, an improved methodology for developing professional and creative competence based on multimedia is of significant scientific and practical importance. This article outlines the main principles, structural stages, and practical effectiveness of the proposed methodology.

## LITERATURE ANALYSIS

The issue of developing the professional and creative competence of future technology teachers is one of the topics receiving significant attention in contemporary pedagogical research. In recent years, not only in Uzbekistan but also internationally, numerous studies have been conducted on effectively organizing the educational process through the use of multimedia tools and information and communication technologies [ ].

For example, G. J. Shamsiev (2020) highlighted the

practical significance of multimedia tools in teaching technology subjects, as well as their effectiveness in developing students' theoretical knowledge and practical skills. M. P. Prensky (2001) analyzed the characteristics of digital-age learners and emphasized the importance of using multimedia and interactive educational tools for modernizing the pedagogical process [4].

Normative documents and methodological guidelines adopted in the education sector of the Republic of Uzbekistan, particularly the "Concept for the Development of Higher Education" (2019) and methodological recommendations for the implementation of innovative technologies developed by the Ministry of Education, define modern approaches for developing the professional and creative competence of future teachers [5,6]. In addition, pedagogical experiments conducted by S. K. Karimov (2022) confirmed that the integration of multimedia tools can effectively enhance students' creative and practical skills [5].

It should be noted that existing studies provide extensive explanations regarding the pedagogical potential of multimedia tools and their role in shaping the professional and creative competence of future technology teachers. However, the systematic coverage of the methodological model and digitized educational and methodological support has not yet been sufficiently developed. Therefore, the present article aims to fill this gap.

## **METHODOLOGY**

This article is aimed at determining the effectiveness of multimedia tools in developing the professional and creative competence of future technology teachers. The study employed theoretical analysis, experimental research, surveys, and observation methods.

Classes were organized using multimedia tools, and students' theoretical knowledge and practical skills were assessed. In this way, the practical effectiveness of the proposed methodological model was tested.

## **RESULTS**

The results of this study clearly demonstrated the effectiveness of using multimedia tools in developing the professional and creative competence of future technology teachers. The analysis conducted through a comparison between the experimental and control

groups yielded the following findings:

### **1. Deepening Theoretical Knowledge and International Experience**

In the experimental group, revisiting theoretical materials using multimedia tools (presentations, video lessons, and animations) helped students better understand complex technological concepts. This finding aligns with global research:

- Scientific studies conducted in the United States have shown that the use of multimedia content improves higher education students' comprehension of complex theoretical concepts by 30–40%<sup>1</sup>.
- In European Union countries, interactive lessons have been reported to positively impact students' knowledge in mathematics and technical subjects<sup>2</sup>.

In experiments conducted within higher education institutions in Uzbekistan, students who studied theoretical material using multimedia tools also demonstrated significantly higher results on theoretical tests compared to those taught using traditional methods.

### **2. Development of Practical Skills: Global and National Context**

In practical classes, multimedia tools (virtual laboratories, CAD systems, interactive simulations) were found to be effective in reinforcing students' practical skills:

- In technological universities in Canada, students' success rates in completing practical tasks increased by 25–35% through interactive simulations<sup>3</sup>.
- At universities in South Korea, virtual laboratories significantly enhanced students' practical skills in mechanical systems<sup>4</sup>.

The results from the experimental group indicate that, even in the context of Uzbekistan, students taught using multimedia tools achieved substantially higher outcomes in practical exercises compared to those in traditional teaching settings.

### **3. Development of Creative and Innovative Approaches**

Multimedia tools have also proven to be effective in fostering students' creative thinking and innovative approaches:

- Pedagogical studies in Finland emphasized that project-based activities using multimedia increased students' creative thinking by 20–30%<sup>5</sup>.

- In Singapore, interactive simulations enabled students to demonstrate strong creative potential in developing strategies for solving complex problems<sup>6</sup>.

In pedagogical practice in Uzbekistan, it was also observed that students' ability to independently find solutions and their creative approaches were enhanced, which, in turn, contributes to the development of the professional and creative competence of future technology teachers.

#### **4. Pedagogical Effectiveness and Comparison**

The comparison between the experimental and control groups showed that students taught using multimedia tools demonstrated significantly higher levels of professional and creative competence. This observation has been confirmed not only in Uzbekistan but also in international higher education experiences:

- At leading universities in the United States and Europe, lessons enriched with multimedia were found to enhance students' motivation and practical skills<sup>7</sup>.

- In China and Japan, when interactive pedagogical technologies were implemented on a large scale, students achieved higher results compared to traditional learning models<sup>8</sup>.

#### **DISCUSSION**

The results of the study demonstrated the high effectiveness of the improved methodology aimed at developing the professional and creative competence of future technology teachers through multimedia tools. The findings confirm the didactic potential of multimedia technologies in professional education.

It was found that systematic and purposeful use of multimedia tools not only deepens future teachers' theoretical knowledge but also develops their practical readiness, creative thinking, and innovative approaches. In particular, the use of visual and interactive tools in descriptive geometry and engineering graphics significantly enhanced students' spatial thinking and their ability to approach problem situations creatively.

The results of the study are consistent with both international and national research, practically confirming the effectiveness of multimedia-based

educational technologies in developing professional competencies within the context of higher education in Uzbekistan. A key aspect of the proposed methodology is the use of multimedia tools as a pedagogical mechanism specifically aimed at fostering professional and creative competence. Overall, the discussion demonstrates that the improved methodology developed on the basis of multimedia tools is an effective and promising pedagogical solution for enhancing the professional and creative competence of future technology teachers, and its implementation in educational practice is both feasible and advisable.

#### **CONCLUSION**

This study was aimed at determining the theoretical and practical effectiveness of an improved methodology for developing the professional and creative competence of future technology teachers based on multimedia tools. The results of the research demonstrated that the systematic and purposeful integration of multimedia technologies into the educational process significantly enhances the professional readiness of future teachers.

Pedagogical experiments confirmed that multimedia tools (video lessons, animations, virtual laboratories, and interactive simulations) are effective in deepening students' theoretical knowledge, developing practical skills, and fostering creative and innovative thinking. In particular, organizing lessons in descriptive geometry and engineering graphics using multimedia strengthened students' spatial thinking and preparedness for professional activities. The developed methodological model and identified pedagogical conditions contributed to the comprehensive development of future teachers' professional and creative competence. The results of experimental and control groups showed that students taught using multimedia demonstrated higher levels of professional and creative competence compared to those taught using traditional methods.

Overall, the proposed methodology is practically effective in the context of higher education in Uzbekistan and contributes to improving the system for training future technology teachers as well as developing a digital learning environment.

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