

METHODS FOR IMPROVING THE DESIGN-CONSTRUCTION COMPETENCIES OF FUTURE TECHNOLOGY TEACHERS WITH THE HELP OF SOFTWARE LEARNING TOOLS

<https://doi.org/10.5281/zenodo.15184484>

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Abstract

This article analyzes the issues of developing the design and construction competencies of future technology teachers with the help of software learning tools. The increasing complexity of modern technological processes requires teachers to develop not only pedagogical skills but also construction competencies. The article highlights the importance of using digital programs, modeling technologies, and virtual environments in shaping design competencies. Additionally, based on advanced foreign and local research, innovative approaches and methods are analyzed.

Keywords

design skills, digital technologies, technology teachers, modeling, virtual environment, innovative approach, engineering design, educational process, STEM education, pedagogical technologies.

Аннотация.

В данной статье анализируются вопросы развития проектировочных и конструкторских компетенций будущих учителей технологии с помощью программных средств обучения. Усложнение современных технологических процессов требует от педагогов развития не только педагогических, но и конструкторских навыков. В статье освещается важность использования цифровых программ, технологий моделирования и виртуальных сред для формирования проектировочных компетенций. Также на основе передовых зарубежных и местных исследований анализируются инновационные подходы и методы.

Ключевые слова

конструкторские навыки, цифровые технологии, преподаватели технологии, моделирование, виртуальная среда, инновационный подход, инженерный дизайн, образовательный процесс, STEM-образование, педагогические технологии.

Annotatsiya.

Ushbu maqolada dasturiy ta'lim vositalari yordamida bo'lajak texnologiya fani o'qituvchilarining konstruktorlik kompetensiyalarini rivojlantirish masalalari tahlil qilinadi. Zamonaviy texnologik jarayonlarning murakkablashuvi o'qituvchilarning nafaqat pedagogik, balki konstruktorlik ko'nikmalarini ham rivojlantirishni talab etmoqda. Maqolada konstruktorlik kompetentligini shakllantirishda raqamli dasturlar, modellashtirish texnologiyalari va virtual muhitlardan foydalanishning ahamiyati yoritiladi. Shuningdek, ilg'or xorijiy va mahalliy tadqiqotlarga tayangan holda, innovatsion yondashuvlar hamda metodlar tahlil qilinadi.

Kalit so'zlar

konstruktorlik malakasi, raqamli texnologiyalar, texnologiya o'qituvchilari, modellashtirish, virtual muhit, innovatsion yondashuv, muhandislik dizayni, o'quv jarayoni, STEM-ta'lim, pedagogik texnologiyalar.

Introduction. The development of the construction skills of technology teachers is one of the most urgent issues today. This is because the need to form not only theoretical knowledge but also practical competencies in the educational process is increasing. The digital learning environment is an integral part of the modern pedagogical process and plays an important role in preparing future general education school teachers at higher education institutions. In particular, effectively utilizing the opportunities of the digital learning environment is of great importance in shaping the professional qualities of technology teachers.

In the educational process, it is appropriate to improve the professional readiness of future teachers by shaping pedagogical conditions, modernizing teaching technologies, and enhancing the influence of the digital learning environment. Pedagogical conditions contribute to the effectiveness of the educational process and are one of the necessary factors for the development of teachers' professional competencies.

This research analyzes the pedagogical conditions for shaping the professional qualities of future "Technology" teachers in the digital learning environment. The relevance of the study lies in the fact that, as a result of the digitalization of education, the demands placed on pedagogical activities are changing, which, in turn, requires the introduction of new methods and approaches. The content of pedagogical conditions, their role in the educational process, and their impact on shaping the professional qualities of future teachers are considered both scientifically-theoretically and practically. Additionally, directions for developing

educational-professional activities in the digital learning environment and recommendations for improving the educational process are developed.

Literature analysis. Various scholars have conducted research on the development of construction competencies. In Dewey's theory of constructivism, it is emphasized that acquiring knowledge through practical activities in the educational process is essential. Vygotsky, on the other hand, in his social learning theory, demonstrated that students learn more effectively when working together. These approaches serve as important methodological foundations for shaping the construction competencies of technology teachers.

There are also modern studies on enhancing the construction skills of technology teachers using digital technologies. Mishra analyzed the role of digital technologies in engineering education and demonstrated the effectiveness of 3D modeling tools. Smith compared various approaches to teacher training using digital technologies and identified their advantages. His research showed that the use of digital tools positively influences the development of design and engineering skills in teachers.

Uzbek scholars have also conducted research in this field. Qodirov, in his book *Digital Technologies and Education Quality*, emphasized the important role of technology in improving the educational process. Turg'unov demonstrated the effectiveness of methods aimed at developing the construction competencies of technology teachers in his research. Karimov studied the role of digital technologies in STEM education and proved their contribution to the development of engineering thinking. Safarov conducted research on *Professional Development of Teachers in the Digital Learning Environment* and showed that professional skills can be enhanced through online platforms.

Materials and Methods. In the research process, digital technologies, virtual simulators, and programs related to technology education teachers were analyzed. 3D modeling software (AutoCAD, SolidWorks), Arduino platforms, digital drawing tools, and online resources were chosen as the main research objects.

Methods. Empirical and theoretical analysis methods were used in the research. The effectiveness of increasing students' engineering skills through experimental teaching methods was evaluated. The opinions of the students were also analyzed using questionnaires, observations, and interviews.

Results. In higher education institutions, creating a digital environment for the preparation of future general education school teachers is of great importance. The improvement of professional qualities of future technology teachers in a digital education environment is dependent on pedagogical conditions. First, we will focus on the concept of pedagogical conditions. In pedagogical literature and scientific

research, the following ideas are expressed about pedagogical conditions. Pedagogical conditions are the conditions for organizing the educational process through the use of teaching technologies, methods, forms, tools, and approaches. Pedagogical conditions are components of a pedagogical system that describe the impact of internal and external factors. Pedagogical conditions involve the step-by-step organization of the educational quality by advancing planned goals. In all three cases, there is interdependence, and they complement each other. Within the scope of our research, we concluded that teaching tools, forms, methods, technologies, and approaches must be applied in the digital education environment, considering the internal and external factors affecting the formation of key professional qualities in future technology teachers. Therefore, we understand pedagogical conditions as the aggregate of pedagogical actions that influence the nature of educational activities. Pedagogical conditions unify the normative-legal aspects of the educational process in the modern digitalized educational environment. Based on the above analyses, we can conclude that the pedagogical conditions for the formation of key professional qualities of future technology teachers in a digitalized educational environment are a targeted complex of measures aimed at organizing the professional activities of educational process participants.

The first condition for shaping key professional qualities of future “Technology” teachers in the digital education environment is the development of educational goals for working in a digital education environment. The study of key educational documents (curriculum, subject programs, modules) and the completion of practical training and scientific research are part of the students' professional activity.

Then, the purpose of professional activity is determined. Through educational goals, requirements for key professional qualities of future technology teachers working in a digital education environment are formulated. Achieving these goals can be accomplished by solving the following tasks:

- Developing pedagogical techniques.
- Planning and analyzing digital education activities.
- Activating the educational process.
- The need for digital education work even after graduation from higher education institutions.
- Continuous improvement of professional skills in the digital education environment.
- Teaching self-assessment skills.

The development of an informational model for shaping the key professional qualities of future technology teachers in a digital education environment can be considered. Methodological approaches are necessary in developing such a model. In scientific pedagogical literature, the goals and content of professional activities are elaborated based on competency and professional activity-based approaches. The professional-activity approach clarifies the resources, conditions, and actions in the professional activities of future technology teachers in the digitalized educational environment. The competency-based approach identifies the methods, research tools, and analysis and synthesis techniques to develop the capabilities of future technology teachers in a digitalized educational environment.

Discussion. In the digital education environment, the organizational forms of education play a significant role. In the field of "Technology Education," lectures, seminars, laboratory work, independent work, scientific research, practical training, and extra-curricular activities are essential forms of activities. When conducting these activities, selecting appropriate group work, small group work, pair work, and individual work is critical.

We will now focus on how to organize these activities in a digitalized education environment:

- **Online Lectures:** Online lectures provide an opportunity to increase the volume of theoretical learning material, involve professors from other universities, adjust lecture times, and present presentations and illustrations. Lectures can be posted as video files on platforms.

- **Seminars, Practical Classes, and Laboratory Work:** Online courses, training sessions, webinars, and virtual laboratories create the possibility to conduct seminars and practical training in an online format. Virtual stands can also be used for laboratory work to help students visualize complex technological objects and processes.

- **Independent Work:** Independent work is when students complete tasks remotely with methodological assistance. Tasks can be completed independently without the teacher's help. To increase student activity in independent work, the following teaching methods and forms are required:

- Introduction of online education via Moodle platform.
- Use of social media (Telegram, Instagram, Facebook).
- Online surveys (audio, tests).
- Interactive work with graphics and tables.
- Working with educational websites.

Scientific Research Projects are an essential part of developing initial skills. Developing scientific research skills occurs through activities like:

- Scientific conferences, seminars, and discussion sessions.
- Collaborative project work in small groups, laboratory work, and group scientific research.

Teaching methods in a digitalized education environment require modifications in the structure of the educational process. The use of digital technologies in teaching elevates the quality of education. The development of key professional qualities for future technology teachers in a digital education environment can be implemented through project-based, problem-based, active, electronic, and distance learning technologies.

The purpose and content of educational and professional activities in the digital environment are based on the following principles:

- **Scientific approach:** Establishing a connection between educational subjects and scientific theories.
- **Educational methodology:** Teaching future technology teachers the technologies and methods of digital education in the pedagogical environment.

The third condition for shaping key professional qualities in future technology teachers in a digital education environment is evaluating their development. Based on initial research, we identified several issues in the educational process, and corrective measures were introduced. During the experiments, we conducted ongoing assessments of the progress in shaping the key professional qualities of future technology teachers in the digital education environment.

Thus, we identified three pedagogical conditions:

1. **Designing the goals and content of professional activities for future technology teachers.**
2. **Organizing the actions of teachers and students.**
3. **Evaluating the results of shaping key professional qualities.**

These pedagogical conditions ensure the effectiveness of the educational process and contribute to the development of the key professional qualities of future technology teachers. The educational process is enriched with online lectures, seminars, webinars, consultations, courses, and training sessions.

Our research has demonstrated the relevance of shaping key professional qualities for future technology teachers in the digitalized educational environment, highlighting the importance of a complex approach to pedagogical theory and practice.

In our opinion, the key professional qualities needed to work in the digitalized educational environment are a set of qualities necessary for educators to carry out their professional activities.

Conclusion. Digital technologies play a crucial role in shaping and developing the design skills of future technology teachers. The results of the research indicate that modern digital tools, including 3D modeling software, virtual laboratories, and engineering design platforms, can effectively facilitate the professional preparation of teachers.

The use of innovative approaches and interactive methods in the educational process not only deepens theoretical knowledge but also helps to form practical skills. By taking into account pedagogical conditions and didactic principles, integrating digital technologies into the educational process enhances its effectiveness.

The use of digital tools in preparing future teachers in line with modern demands and standards is of great significance. This, in turn, creates vast opportunities for improving education quality, supporting the professional development of teachers, and shaping their design thinking skills.

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