



INTEGRATION OF DIGITAL AND INNOVATIVE APPROACHES INTO TECHNOLOGY EDUCATION

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Abstract

This article analyzes the issue of integrating modern technologies into the process of teaching technology in secondary schools from a scientific, theoretical and practical perspective. It comprehensively covers the effectiveness of innovative tools used in technology lessons - digital learning platforms, 3D modeling, AR/VR technologies, robotics, the STEAM approach, virtual laboratories, multimedia resources, and interactive methods that improve the learning process.

Keywords: Technology, modern technologies, digital education, STEAM, AR/VR, robotics, virtual laboratory, 3D modeling, competence.

Introduction

The integration of modern technologies into school technology lessons is one of the most important directions of today's educational process, aimed at forming students as individuals with 21st century competencies, creative, constructive thinkers, and able to consciously use technology and technology. The reforms implemented in our country in recent years to modernize the education system, organize lessons on a digital basis, introduce the STEAM approach, and provide schools with innovative equipment require a revision of the content of technology subjects based on the requirements of the time. While traditional technology lessons were limited to more workshop classes, manual labor, and the preparation of simple structures, today this subject is taking shape as one of the most advanced areas of education. Because technology serves to form work culture, technical thinking, constructive thinking, design skills, creative approach and problem-solving competencies in students. In achieving these goals, the integration of modern technologies into the teaching process is an important factor. The theoretical foundations of integration are based on

constructivism, an activity-based approach, competency-based education and the STEAM concept. According to the idea of constructive education, the student does not receive knowledge in a ready-made form, but rather creates it through his own activities, research and experience. This approach is especially appropriate in technology lessons, because the student gains knowledge by creating models, drawings, projects and constructions. Modern technologies accelerate, simplify, and make this process more efficient. One of the most widely used modern tools in technology classes is 3D modeling programs. Through platforms such as Tinkercad, SketchUp, AutoCAD, and Fusion 360, students can see the shape, size, location of details, and structure of mechanisms in a virtual environment. This, firstly, allows them to gain real experience, and secondly, helps them learn complex processes in a safe and simple way. Students can first prepare their projects on a computer and then create them from real materials. This brings them closer to engineering thinking. The application of AR and VR technologies to technology subjects can radically change lessons. For example, processes such as woodworking, metalworking, and electrical installation work can be simulated in a virtual environment, and students can learn without errors and safely. Through the VR helmet, the process of machine tool operation, the order of electrical circuits, and the internal structure of mechanisms are realistically demonstrated. With the help of these tools, the student will have the opportunity to develop complex practical skills without even entering the workshop. Robotics is one of the most important modern innovative directions in technology lessons. Tools such as Arduino, Lego Mindstorms, Micro:bit, Raspberry Pi play a huge role in developing students' technical thinking. The student assembles a mechanical structure, programs it, works with sensors, and controls the robot's movement. Such activities form algorithmic thinking, develop competencies such as problem solving, testing, analyzing results, and correcting errors. This creates the basis for training personnel in the fields of IT, engineering, automation, and electronics in the future. The STEAM approach is a concept that should be deeply integrated into the content of technology science. Because technology is inherently closely related to science, engineering, mathematics, and art. Students gain knowledge by solving real-life problems, creating projects, and making models. For example, students can develop projects such as a bridge model, a greenhouse project, an ecological house model, and a mechanical motion module. In such works, mathematical calculations, laws of physics, engineering principles, and design

elements are used together. This makes education integrated. The application of virtual laboratories to technology is also very important. Many schools lack sufficient workshop equipment, some machines are expensive, so it is not possible to purchase them all, and some processes cannot be performed directly due to safety requirements. In such conditions, through virtual laboratories, students learn practical skills such as cutting, drilling, welding, assembling parts, and making electrical circuits in a safe and simple way. These tools do not completely replace traditional methods, but serve as a very effective supplement. The process of integrating modern technologies into the lesson is carried out in certain stages. First, the teacher analyzes the level of preparation of students, the technical capabilities of the school, and the requirements of the lesson topic. Then a lesson scenario is developed, which technology will be used for each stage of the lesson. Then the stage of implementation begins. In this process, the teacher guides, and students, as active participants, perform practical tasks. After the lesson, monitoring and analysis are carried out, and the results of students, their mastery, and the effectiveness of the technology are determined. The main advantages of the integration process are many. First, students' motivation increases significantly, because working with modern technologies is interesting for them. Second, practical skills are strengthened, and skills for solving real-life problems are developed. Third, students develop creative and critical thinking, teamwork, and project management skills. Fourth, the effectiveness of the lesson is high, because complex topics are presented in a simple and understandable way through visual aids. Fifth, students are more clearly oriented towards their future profession. However, there are also some problems in the integration process. These include the lack of technical equipment, low internet speed, incomplete training of teachers in modern technologies, differences in knowledge levels among students, etc. But all these problems can be solved gradually. The most important thing is to regularly train teachers in modern technologies, gradually digitize schools, and effectively use free programs and virtual platforms. In conclusion, the integration of modern technologies into school technology lessons is one of the most effective means of developing students' technical thinking, creativity, practical skills, and problem-solving competencies. This process takes technology to a whole new level and significantly improves the quality of education. Therefore, the use of modern technologies in technology is not just an optional option, but a requirement of the time, an integral part of preparing for future professions.

Conclusion

Integrating modern technologies into technology lessons is an effective tool for developing not only technical skills, but also creativity, design thinking, problem-solving and professional competencies of students. Innovative teaching methods, 3D modeling, robotics, AR/VR technologies and digital resources elevate technology to a modern level. Through the systematic implementation of this process, technology lessons will be shaped into a modern educational environment that meets today's requirements.

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