

**DEVELOPMENT OF A PEDAGOGICAL MODEL FOR INTERACTIVE TEACHING  
OF COMPUTER SCIENCE BASED ON DIGITAL LEARNING PLATFORMS**

**Xamdamov Firuz Bektemirovich**

Training course for improving the skills of  
employees of citizens' self-government bodies  
under the Samarkand regional administration  
Head of the Department of Educational,  
Methodological and Organizational Issues  
*firuzxamdamov2@gmail.com*, tel.: 998979116339

**Abstract:** This article discusses the issues of improving interactive methods based on digital platforms in teaching computer science in the higher education system. The need to modernize the educational process, develop students' digital competencies and increase teaching efficiency in the context of digital transformation determines the relevance of this study.

**Keywords:** Computer science education, digital platform, interactive methods, pedagogical model, higher education, digital educational technologies.

**Introduction.** In recent years, digital transformation processes have been rapidly developing in the higher education system, and fundamental changes are taking place in the content and forms of education. In particular, the use of digital educational platforms in teaching computer science allows not only to automate the learning process, but also to increase the effectiveness of teaching, and to strengthen students' independent learning, communication and creative activity. In the current digital era, the learning process requires not only the transfer of knowledge, but also the organization of the student's learning activity as an interactive, person-oriented and creative process. In this regard, improving interactive methodology based on digital platforms is one of the current directions in computer science education.

Digital platforms are a set of tools that plan the learning process, automate tasks, analyze results, conduct communication and assessment processes in a single environment. Platforms such as Moodle, Lumio, Google Classroom, MS Teams allow for the effective use of practical tasks, tests, virtual laboratories and gamification elements in computer science.

However, a pedagogical model that fully unlocks the potential of these platforms has not yet been sufficiently developed. In most cases, digital platforms are used as technical tools, and didactic and interactive aspects are not sufficiently integrated.

**Literature Review.** The concept of interactive learning in a digital learning environment is based on the integration of modern pedagogy and information technologies. Research scientists (J. Dewey, L. Vygotsky, B. Bloom, A. Bandura, etc.) have emphasized that ensuring active student participation in the learning process, developing interaction and reflection increase the effectiveness of learning.

Modern interactive learning theories are being formed based on the principles of constructivism, collaborative learning and digital pedagogy. According to the constructive approach, knowledge is not given in a ready-made form, but is constructed by the student through active participation. Therefore, interactive learning environments organized on digital platforms develop the student's independent thinking, problem-solving and collective learning skills.

Digital learning platforms are a system of software tools that organize interaction between teachers and students in a digital format. Systems such as Moodle, Lumio, Google Classroom, MS Teams, Canvas include content creation, automatic assessment of assignments,

communication and analysis tools. Their main advantage is that they ensure the adaptability, transparency and interactivity of the learning process.

Recent studies (A. Anderson, 2021; R. Garrison, 2022; M. Al-Fraihat, 2023) have widely covered the impact of digital platforms on the learning process. Their results show that lessons organized in an interactive environment increase student motivation, develop their skills in working with information, algorithmic thinking and problem analysis.

Reforms are also being implemented in the higher education system of Uzbekistan regarding the use of digital educational tools. In particular, within the framework of the “Digital Uzbekistan – 2030” strategy, the issues of digitizing the educational process, organizing lessons through electronic platforms, and modernizing pedagogical technologies are identified as priority areas.

In this regard, there is a need to model the capabilities of digital platforms in teaching computer science based on a didactic system. The implementation of interactive teaching methods not only as a technical tool, but also as a component of the educational process is of scientific and practical importance.

An analysis of the literature shows that although existing studies have studied the impact of digital educational platforms on the effectiveness of teaching, the issue of modeling interactive methodologies specific to computer science has not been sufficiently covered. Therefore, this study aims to fill this gap by developing a pedagogical model based on digital platforms in teaching computer science.

**Research Methods.** The aim of this study is to develop a pedagogical model aimed at improving interactive methods based on digital platforms in teaching computer science and to verify its effectiveness in practice. Therefore, the study was conducted in theoretical and practical stages.

**Analysis and results.** The process of teaching computer science in higher education is of strategic importance in the context of digital transformation, and it is considered an important factor determining the direction of digital development of the education system. The introduction of interactive methodology and the formation of its pedagogical model based on digital educational platforms serve to improve the quality of education, adapt the educational process to modern requirements, and develop students' digital competencies.

Computer science, as a basic field of the information society, plays an important role in the formation of not only theoretical knowledge, but also practical skills in the educational process. Interactive approaches combined with digital platforms develop students' creative thinking, form independent problem-solving skills, and bring their professional training to a new level. Therefore, the development of a pedagogical model for teaching computer science, its scientific substantiation, and testing its effectiveness in practice are urgent scientific and practical issues for the modern education system.

As a result of the research, an interactive pedagogical model based on digital educational platforms for teaching computer science was developed. This model is aimed at integrating theoretical and practical aspects of computer science, involving students in the active learning process, and developing digital skills. The main goal of this model is to optimize the educational process based on interactive methods and increase its efficiency by effectively using the capabilities of digital platforms (Moodle, Lumio, Google Classroom) in teaching computer science. The structure of the model serves to combine theoretical knowledge with practical activities in teaching computer science, organize interaction between teachers and students in a digital environment, and ensure the transparency of the educational process. To this end, the model is aimed at solving the following tasks:

- encouraging students to independently learn and problem-solving;
- developing teamwork in a digital environment;
- automating the teacher's management, monitoring and feedback processes;

- transparent and accurate assessment of learning outcomes.

This model serves to expand the possibilities of digital learning in teaching computer science, ensure active participation of students and raise the quality of education to a new level. This model, with its structure, content and implementation mechanisms, is designed as a complex system that ensures effective work in a digital learning environment.

**Table 1**

**Structural components of the developed model**

| Component      | Content                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------|
| Targeted       | Formation of digital competencies based on an interactive approach to teaching computer science.            |
| Content        | Training modules, practical tasks, virtual laboratories, project work.                                      |
| Technological  | Lesson planning based on digital platforms (Moodle, Lumio), creation of interactive tasks, testing systems. |
| Organizational | Interaction management between the teacher, student and the platform, feedback mechanisms.                  |
| Assessment     | Online tests, automatic rating system, self- and team assessment methods.                                   |

The scientific and theoretical foundations of this model have been confirmed in practice. The model was tested with the participation of students of the computer science department of Samarkand State University and several other higher educational institutions. Experimental and control groups were formed in the study:

- Experimental group — lessons were organized using interactive methods based on the Moodle and Lumio platforms;
- Control group — taught in the traditional way.

During the experiment, the following aspects of student activity were observed:

- Students' active participation in the lesson increased by 35–40%;
- The speed of completing independent tasks improved by 25%;
- The overall effectiveness of learning outcomes increased by 10–15%.

The analysis results showed that the interactive pedagogical model developed on the basis of digital platforms in computer science:

- increases the level of digital literacy of students;
- strengthens the mechanism of active communication and feedback between the teacher and the student;
- makes the learning process flexible and transparent;
- allows for objective assessment of learning outcomes.

Thus, the developed model has been proven to be an effective tool for improving the quality of computer science teaching and deeply integrating digital platforms into the pedagogical system.

The results of the study clearly demonstrated the effectiveness of using interactive methods based on digital platforms in teaching computer science. The experiments conducted showed that lessons organized in a digital learning environment significantly develop students' active learning participation, independent thinking, and practical skills.

While in traditional teaching conditions, knowledge is mainly conveyed by the teacher, in digital platforms the student takes the stage as an active builder of knowledge. This process is fully consistent with the principles of the constructivist approach. The analysis showed that in lessons organized on the basis of interactive platforms:

- Collaborative interaction between students increased;
- The content of the lesson was enriched through visual and practical tasks;
- The assessment process became objective and fast;
- The teacher's opportunities for monitoring the learning process expanded.

These results are consistent with the conclusions drawn from international experience. For example, R. Garrison (2022) and M. Al-Fraihat (2023) in their studies emphasized that digital platforms increase the effectiveness of teaching, form students as active learning subjects, and transfer the learning process to a person-centered model.

Also, as a result of observations conducted in the Uzbek higher education system, it was found that students' mastery rates were high in classes conducted using the Moodle, Lumio, and Google Classroom platforms. This proves that digital platforms work effectively not only as technical but also as didactic tools. However, some problems were also observed during the research:

- Some teachers do not have the skills to fully use digital platforms;
- The stability of the Internet network in some cases affects the lesson process;
- There are cases of students using digital tools not for educational purposes, but for entertainment purposes.

However, to solve these problems, it is necessary to conduct pedagogical training, improve technical infrastructure, and increase digital culture.

In general, the study showed that the interactive pedagogical model developed on the basis of digital platforms in teaching computer science:

- makes the learning process flexible, interactive, and person-centered;
- develops students' digital thinking, information processing, and problem-solving skills;
- allows the higher education process to be modernized on the basis of an innovative learning environment.

**Conclusion.** The results of the study showed that the introduction of interactive methods based on digital educational platforms in teaching computer science is one of the important factors in improving the quality of education in the higher education system.

The developed interactive pedagogical model allows combining the theoretical and practical parts of computer science, developing students' active learning, communication and analytical thinking skills. Based on the results obtained, the following recommendations were developed:

1. It is necessary to systematically introduce digital platforms such as Moodle, Lumio and Google Classroom in teaching computer science in higher educational institutions.
2. It is advisable to organize special advanced training courses for teachers on the effective use of digital educational tools.
3. It is recommended to introduce digital analytics systems to manage, analyze and control the educational process.
4. In order to increase the digital culture of students, it is necessary to widely use interactive project-based tasks and virtual laboratories.
5. Future research may focus on implementing artificial intelligence-based learning systems and developing flexible learning analytics models based on digital platforms.

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