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THE EFFECTIVENESS OF USING PEDAGOGICAL SOFTWARE TOOLS IN TEACHING INFORMATICS

Mamasodiqiva Saidaxon Soyibjon qizi
PhD, v. b. dots Matematika va Informatika kafedrasi o'qituvchisi
Andijon davlat pedagogika instituti,

Mamasoliyeva Nargiza Sotiboldi qizi
Matematika va Informatika yo‘nalishi 4- kurs talabasi
Andijon davlat pedagogika instituti

Abstract:
This thesis analyzes the theoretical foundations, practical significance, and effectiveness of using pedagogical software tools in the process of teaching informatics. In modern education, software tools based on information and communication technologies enhance students’ cognitive activity, help develop independent learning skills, and enable the individualization of the learning process. The results of the study show that the use of pedagogical software tools is an important factor in improving the quality of education.

Keywords: Informatics education, pedagogical software tools, interactive technologies, e-learning, digital resources, teaching methodology.

Introduction

In recent years, the rapid development of digital technologies in all сферы of society has had a significant impact on the education system. In particular, modernizing the teaching process in general education schools and higher education institutions, developing students’ digital competencies, and improving the quality of education are considered among the most urgent tasks. In this regard, the effective use of pedagogical software tools in teaching informatics is of great scientific and practical importance. According to scientific research, traditional teaching methods are not always able to fully ensure students’ cognitive activity, especially when mastering complex algorithmic and logical concepts, where certain difficulties arise. At the same time, the ongoing digital transformation and the implementation of national strategies such as the “Digital Uzbekistan – 2030” initiative further emphasize the importance of integrating modern technologies into the educational process.

Pedagogical software tools provide opportunities to present educational materials in a visual, interactive, and flexible format, thereby helping to take into account students' individual characteristics. As a result, the effectiveness of knowledge acquisition increases, and students' independent thinking skills are developed. Today, electronic textbooks, multimedia tools, virtual laboratories, distance learning platforms, and automated testing systems are widely used in the education system. These tools play an important role not only in strengthening theoretical knowledge but also in developing practical skills. In particular, through interactive programs, students gain the opportunity to model complex processes, conduct experiments, and analyze results. Moreover, the analysis of international experience and scientific sources shows that teaching approaches based on information and communication technologies significantly improve students' learning outcomes. For example, in lessons where interactive and multimedia educational tools are used, an increase in student engagement and higher knowledge retention rates compared to traditional methods has been observed. This scientifically substantiates the effectiveness of pedagogical software tools.

However, the use of pedagogical software tools is not limited only to technical capabilities. Their effective implementation directly depends on the teacher's methodological preparedness, digital literacy, and ability to organize the lesson properly. Therefore, along with the introduction of modern software tools in teaching informatics, the development of teachers' professional competencies is also of great importance. Based on the above, studying the theoretical foundations of using pedagogical software tools in teaching informatics, determining their practical effectiveness, and developing mechanisms for their implementation in the educational process are considered urgent scientific issues.

Methodology

In this study, a комплекс approach was applied to determine the effectiveness of using pedagogical software tools in teaching informatics, combining both theoretical and practical methods. The methodological foundation of the research is based on modern approaches aimed at systematic analysis of the educational process, the application of pedagogical technologies, and the evaluation of teaching effectiveness. At the initial stage of the research, scientific and pedagogical literature, regulatory and legal documents, as well as advanced foreign and local experiences were analyzed. Through this analysis, the role of pedagogical software tools in teaching informatics, their types, and their didactic capabilities were clarified. Additionally, the effectiveness of electronic resources and interactive platforms used in the

learning process was examined. At the practical stage, experimental pedagogical work was organized. The experiment was conducted in a general education institution, where students were divided into two groups: control and experimental groups. In the control group, lessons were conducted mainly using traditional methods, while in the experimental group, pedagogical software tools were widely applied. In particular, electronic textbooks, multimedia presentations, interactive exercises, automated testing systems, and simulation programs were used during the experiment. During the study, the observation method was used to continuously monitor students' activity in the classroom, the speed of task completion, and the level of independent work. At the same time, students' knowledge levels were assessed through tests and контроль tasks, and the obtained results were statistically compared. Both qualitative and quantitative indicators were used in analyzing the results. In addition, survey and interview methods were employed to study students' attitudes toward pedagogical software tools, their level of interest, and the impact on their learning process. The collected data were generalized, and the effectiveness of using pedagogical software tools was evaluated on a scientific basis. This set of methods ensured the reliability of the research results and made it possible to comprehensively reveal the advantages of using pedagogical software tools in teaching informatics. The results of the conducted pedagogical experimental work demonstrated that the use of pedagogical software tools in teaching informatics is highly effective. During the study, students' knowledge levels, learning outcomes, and classroom activity in both the experimental and control groups were regularly measured. The findings showed that students in the experimental group, where pedagogical software tools were applied, achieved significantly higher learning outcomes. In particular, the indicators for understanding complex topics and completing practical tasks were higher in the experimental group compared to the control group taught through traditional methods. Interactive lessons, multimedia tools, and automated testing systems contributed to faster and more effective knowledge acquisition. At the same time, students' engagement during lessons increased, and they became more inclined to solve problem situations independently. The research results also revealed positive changes in students' independent learning skills. Through the use of pedagogical software tools, students developed the ability to search for information, analyze it, and use it effectively. Survey results further indicated that the majority of students found lessons organized with interactive and digital tools to be more engaging and easier to understand.

The analysis of the obtained results once again confirms the important role and significance of pedagogical software tools in the educational process. First of all,

these tools enable the visualization of the teaching process, which helps students more easily understand complex theoretical concepts. This is particularly important in informatics, especially when studying algorithms, programming fundamentals, and logical structures. In addition, pedagogical software tools make it possible to implement a differentiated approach by taking into account students' individual characteristics. As each student completes tasks appropriate to their level of knowledge, the effectiveness of learning increases. This serves as one of the effective mechanisms for the individualization of the educational process. The results also showed that the use of interactive and multimedia tools increases students' motivation. Students become active participants in the learning process rather than passive listeners. This, in turn, enhances the effectiveness of teaching based on a constructivist approach and leads to deeper knowledge acquisition. However, the analysis also revealed certain challenges. In particular, the level of technical equipment is not the same across all educational institutions, and some teachers' digital competencies are not sufficiently developed, which hinders the full use of pedagogical software tools. Therefore, it is necessary to improve teachers' qualifications in this area, develop modern software tools, and widely implement them in the education system. Overall, the results of the study indicate that the use of pedagogical software tools in teaching informatics is an effective means not only of improving students' knowledge levels but also of developing their independent thinking, analytical abilities, and problem-solving skills. The results of this study scientifically substantiate that the use of pedagogical software tools in teaching informatics is an important factor in improving the effectiveness of education. The conducted experimental work showed that lessons organized on the basis of modern digital and interactive tools significantly increase students' level of knowledge acquisition, enhance their cognitive activity, and develop independent learning skills. The study also revealed that pedagogical software tools not only help to effectively organize the learning process but also enable its individualization and implementation based on a differentiated approach. As a result, it becomes possible to create a learning environment tailored to each student's level of knowledge, interests, and pace of learning, which is one of the key conditions for improving the quality of education. At the same time, the use of pedagogical software tools contributes to the development of important competencies such as logical thinking, problem-solving, information searching, and analytical skills. This is particularly significant in informatics, where the formation of algorithmic thinking and practical skills plays a central role. However, the findings also indicate that the effective use of pedagogical software tools depends not only on technological availability but also

directly on teachers' professional training, digital competence, and methodological approach. Therefore, along with introducing modern software tools into the education system, it is essential to improve teachers' qualifications and prepare them to work with innovative technologies. In conclusion, the use of pedagogical software tools in teaching informatics is a key factor in enhancing the effectiveness of the educational process, deepening students' knowledge and skills, and preparing them for life in a modern information society. Expanding research in this area, developing innovative pedagogical technologies, and implementing them in practice remain important tasks for the future.

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