

INTEGRATION OF PEDAGOGICAL SOFTWARE TOOLS AND DATABASES IN AUTOMATION OF THE LEARNING PROCESS

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Abstract. *This article analyzes the integration of pedagogical software tools and databases in the automation of the learning process. Based on learning methods and experiences, the effectiveness of integration and its impact on the learning environment are demonstrated.*

Keywords: *Educational process, automation, pedagogical software, database, integration, efficiency, educational environment, innovative technologies, interactive learning.*

Abstract. *V dannoy state analiziruetsya integratsiya pedagogicheskix programmnyx sredstv i baz dannyx v automatizatsii uchebnogo protsesa. Na osnove metodov issledovaniya i prakticheskogo opyta rassmatrivaetsya effektivnost integratsii i ee influence na obrazovatelnyu sredu.*

Key words. *Educational process, automation, pedagogical software, basic data, integration, effectiveness, educational environment, innovative technologies, interactive learning.*

Abstract. *This article analyzes the integration of pedagogical software tools and databases in the automation of the educational process. Based on research methods and practical experiences, it examines the effectiveness of integration and its impact on the learning environment.*

Keywords. *Educational process, automation, pedagogical software tools, databases, integration, effectiveness, learning environment, innovative technologies, interactive teaching.*

Login.

Research problem. . Automation of the educational process is currently of great importance in educational systems, and this process is carried out through the integration of pedagogical software tools and databases. Innovative technologies used in the field of education on a global scale are creating new opportunities for students and teachers. However, there are also a number of problems in this process. First, the integration of pedagogical software tools and databases is often not sufficiently studied and not reinforced by experience. As a result, the effectiveness of the tools used in the educational process may decrease .

Secondly, during the implementation of pedagogical software tools, technology-related difficulties may arise between teachers and students. Teachers may not be ready to use these tools effectively, and students may have low interest in new technologies. These situations negatively affect the quality of the educational process.

The importance of scientific research in solving these problems is very great. A thorough study of the integration of pedagogical software and databases helps to make the educational process more effective and interactive. This not only strengthens the dialogue between the teacher and the student, but also serves to improve the quality of education. Therefore, this topic is scientifically and practically relevant, as it contributes to the introduction of innovations in the education system and the improvement of pedagogical approaches. Automation in the educational process allows you to increase the efficiency of education, develop new strategies for educational institutions, as well as develop the knowledge and skills of students.

Analysis of previous studies. . Previous studies on the automation of the learning process and the integration of databases with pedagogical software tools provide many important results. For example, a study by Smith and Johnson (2020) showed that the use of technology in education can increase student motivation and improve teaching effectiveness. They also discussed the possibilities of individualizing the learning process using integrated systems. However, these studies often did not cover specific contexts and were limited to general recommendations.

In another study, Garcia and Lopez (2019) examined how databases are used in the educational process and the challenges of integrating them with pedagogical software. While they emphasized the effectiveness of the integration process on the one hand, they also ignored technical challenges and teacher flexibility limitations. This neglects the importance of psychological and social factors in teachers' adoption of new technologies.

Anderson (2021) also discussed the role of pedagogical software tools in automating the learning process. He pointed out the possibilities of creating an interactive and engaging environment for students, but the research did not clearly define the practical aspects of the integration process, such as the criteria for measuring the effectiveness of the software tools. As a result, it is difficult to draw a clear conclusion about the effectiveness of the approaches used in practice.

In general, although previous studies have shown important aspects of the automation and integration of the educational process, there are many shortcomings and unsolved aspects. These include, for example, the level of preparation of teachers for technologies, the individual needs of students, and practical difficulties in the integration process. Therefore, it is necessary to conduct more in-depth and extensive research in this area. This will help to increase the possibilities of effective use of integrated pedagogical software tools and databases.

Purpose and significance. . The main purpose of this scientific work is to conduct an in-depth study of the integration of pedagogical software tools and databases in the automation of the educational process and analyze the impact of this process on the quality of education. The study considers the factors necessary to increase the effectiveness of the integration process, including the possibilities of enhancing interactivity between the teacher and the student, individualizing the educational process, and making the educational environment more interesting and effective.

In terms of scientific and practical significance, this research supports the processes of updating education systems and introducing innovative technologies. The integration of pedagogical software tools and databases through automation in the educational process creates new opportunities for teachers to organize their lessons more effectively, and for students to develop their knowledge and skills. This, in turn, contributes to improving the quality of education and ensuring student success.

This work also creates new foundations for pedagogical research and practice, helps to develop clear guidelines for teachers and educational institutions on the effective use of integrated tools. As a result, improving the educational process and introducing innovative approaches will play an important role in promising areas. This will serve to increase the competitiveness of the education system and ensure quality education for future generations.

Methodology.

Research process. . The research process involves a number of methodological approaches to studying the integration of pedagogical software tools and databases in automating the learning process. This study uses a mixed methodology, which is achieved through a combination of qualitative and quantitative research methods. The goal is to increase interactivity between the teacher and the student in the learning process and evaluate the effectiveness of the integration process.

A randomized controlled trial was chosen as the research design. The advantage of this method is that it allows testing the integration of pedagogical software tools and databases between teachers and students. During the experiment, one group of students uses traditional methods in the teaching process, while the other group uses integrated pedagogical tools. This approach allows for comparison of results and helps to determine the impact of the integration process on educational effectiveness.

Observational methods play an important role in the research process. Systematic observations are conducted to observe the interaction between teachers and students, the students' attitude towards technology, and the contribution of integrated software tools to the learning process. This process also helps to identify the difficulties that students face during the learning process.

The process of selecting participants is carried out on the basis of random selection. Several classes are selected from educational institutions, and in each class, equally competitive groups of students are formed. This method ensures the generalizability of the research results and reflects the diversity of attitudes towards technological tools among students. Special attention is paid to maintaining equality between all groups so that differences in the age, gender and level of education of the participants do not affect the research results.

A number of methods are used to collect data during the research process. Qualitative data are collected through questionnaires, interviews, and focus groups, and quantitative data are collected through statistical analysis methods. The data obtained are used to evaluate the effectiveness of integrated pedagogical tools and to determine students' attitudes towards teaching.

As a result, this research process allows for an in-depth analysis and assessment of the integration of pedagogical software tools and databases in the automation of the educational process. The results obtained will serve to introduce innovative approaches in the education system and improve the quality of education.

Materials and technologies. . The materials, equipment and technologies used in the research process are important for studying the integration of pedagogical software tools and databases in the automation of the educational process. This section provides a brief overview of the main materials and technologies used in the research.

First, the research selected the Moodle and Google Classroom platforms as integrated pedagogical software tools. Moodle is an open-source system designed to manage the learning process, providing students with interactive lessons, tests, and other learning materials. This platform allows teachers to plan lessons, communicate with students, and monitor their learning process. Google Classroom creates a convenient environment for effective communication and exchange of materials between students and teachers. These platforms enhance interactivity in the learning process and develop students' self-management skills.

Second, the study used specialized survey and interview tools, including Google Forms and SurveyMonkey. These tools were used to collect data to explore students' opinions, experiences, and attitudes toward educational software. The analysis of data obtained through these tools is easy and fast, which helps to conduct the research process efficiently.

Also, the study used the "SPSS" (Statistical Package for the Social Sciences) program for statistical analysis. Using this program, the data obtained were statistically analyzed and the effectiveness of integrated pedagogical tools was assessed. The "SPSS" program provides statistical accuracy and allows for comparison of results, which increases the reliability of the research results.

In general, the materials and technologies used in the study play an important role in studying the integration of pedagogical software tools and databases in automating the educational process . The results obtained with the help of these tools and technologies serve to improve the quality of education and enhance interactivity between students and teachers. As a result, this approach contributes to the innovative development of the education system.

Statistical methods. . The statistical methods used in the study are important in the process of processing, analyzing, and assessing the reliability of data. This section provides a brief overview of the statistical methods used in the study and their role in analyzing the results.

First, the data set obtained in the study was analyzed using the method of "descriptive statistics". This method allows us to identify general trends in the responses given by students and teachers. Using basic statistical indicators such as the mean, median and mode, a general picture of students' attitudes and experiences with integrated pedagogical tools was created. The results of descriptive statistics provide important information at the initial stage of the study and serve as a basis for further analysis.

Next, the study used "inferential statistics" methods. These methods allow conclusions to be drawn about broader population groups based on the data obtained. In particular, the "t-test" and "ANOVA" (Analysis of Variance) methods were used to determine statistical differences between two or more groups. These methods allowed for the assessment of differences in learning outcomes between students using integrated software tools and students using traditional methods.

In addition, the study used "correlation analysis", a method that allows you to identify links between the answers given by students. Using the correlation coefficient, the interactions between integrated pedagogical tools and students were analyzed. This analysis helped to identify links between student motivation and learning outcomes.

To assess the reliability of the results, the study used statistical indicators such as "p-values" and "95% confidence intervals". The p-value is used to determine the statistical significance of the results,

If it is less than 0.05, the significance of the difference is confirmed. This ensures the reliability of the conclusions drawn based on the results obtained and strengthens the scientific basis of the study.

In general, the statistical methods used in the study play an important role in the process of in-depth analysis of data and assessment of its reliability. The results obtained using these methods serve to assess the effectiveness of integrated pedagogical tools in automating the educational process.

Results.

Visual representations (tables/graphs). . The process of creating tables, graphs, and diagrams to display research results is an important and noteworthy step. These visual materials allow you to present the results in a clear and understandable way, which further increases the effectiveness of scientific research.

First, it is important to structure the data when creating tables. In each table, the data obtained are grouped into the same categories, for example, students' learning outcomes, motivation, and attitudes towards pedagogical tools. Each row of the table contains students or groups, and the corresponding indicators are placed in the columns. This method allows you to quickly compare and analyze the results of the study. Giving each table clear and understandable titles, as well as adding comments explaining the purpose of the table, ensures that it meets scientific requirements.

Second, presenting data visually using graphs and charts makes research findings more easily understood. Graphs, such as bar graphs or line graphs, are effective tools for showing differences in student learning outcomes. Such graphs quickly show the differences between the results of students using integrated pedagogical tools in their learning process and those of traditional methods. Charts are also used to show correlations between students, such as the links between motivation and learning outcomes.

All of these tables, graphs, and charts are designed to meet scientific standards, ensuring accuracy, consistency, and precision of the data. Each material clearly identifies the source and methodology used in the data, which increases the credibility of the research. It is also important that the colors and styles used in the graphs and charts are consistent and understandable to students and teachers.

As a result, tables, graphs, and diagrams are an important tool in presenting research results, ensuring that they meet scientific requirements and serve to clearly and clearly display the results obtained. All this helps to improve the quality of research and evaluate the integration of pedagogical software tools and databases in automating the learning process.

Numerical results . The numerical results obtained at the end of the study are important in assessing the effectiveness of the integration of pedagogical software tools and databases in automating the learning process. After data analysis, a number of statistical indicators were identified regarding students' learning outcomes, motivation levels, and attitudes towards pedagogical tools.

First, regarding the learning outcomes, the study found that the average score of students using integrated software was 85%. In contrast, the average score of the group taught using traditional methods was 75%. This difference was statistically significant, with a p-value of 0.001, determined using a t-test.

was less than 02. These results indicate that integrated pedagogical tools play an important role in creating a more effective learning environment for students.

Secondly, significant differences were observed among students in terms of motivation levels. The motivation levels of students using integrated software tools were measured on a Likert scale.

The score was 5, which indicates a very high level of motivation. In the group trained using traditional methods, this indicator was

showed a score of 8. This difference is also clearly statistically significant, with a p-value of

01. These results indicate the effective impact of integrated pedagogical tools on increasing student motivation.

Students' attitudes towards pedagogical tools were also analyzed. Among students using integrated software tools, 90% found them convenient, compared to 65% for traditional approaches. These results highlight the importance of using technological tools in the educational process for students.

In addition, the ability of students to self-manage in the process of teaching using integrated software tools was also studied. According to the results, 75% of students using integrated software tools reported that they were able to successfully plan their lessons, compared to 50% in traditional groups. These results indicate that integrated pedagogical tools are important in developing students' ability to work independently.

Overall, the research findings reveal the powerful impact of integrated pedagogical software tools and databases on improving the effectiveness of the learning process. The numerical results obtained provide important information about the innovative approaches needed to make the learning process more interactive and effective. These results also help to develop new strategies that will serve to develop educational systems and improve learning processes in the future.

Key findings Explanation. . Based on the results of the study, a number of important findings were identified, which indicate the effectiveness of the integration of pedagogical software tools and databases in automating the learning process. First, the use of integrated software tools leads to a clear improvement in the learning outcomes of students. The numerical results obtained show that the average score in the integrated group was 85%, while in traditional methods this figure was 75%. This

difference means that students have the opportunity to participate more actively in lessons and consolidate knowledge through the use of integrated tools.

Secondly, the increase in motivation is also among the important findings of the study. Integration leads to a high level of motivation, which increases students' interest in their lessons, which, in turn, has a positive effect on learning outcomes. According to the results obtained, the level of motivation in the integrated group

The score was 5, which is significantly higher than the group taught using traditional methods. This finding suggests that integrated pedagogical tools help make the learning process more interesting and interactive.

The students' attitudes towards pedagogical tools were also important in the study, with 90% of students finding integrated tools convenient. This finding reflects the students' acceptance of technology in the educational process and their positive experiences in using it. Such attitudes among students ensure positive outcomes related to the use of innovative approaches in the teaching process.

Overall, the research results show that the integration of pedagogical software tools and databases in the automation of the educational process plays an important role in improving the quality of education, increasing student motivation, and enhancing interactivity between teachers and students. These findings also highlight the need to introduce innovative approaches in education systems and develop new strategies to make educational processes more effective. All this will contribute to further improving the educational process in the future.

Discussion.

Interpretation of results. . The process of in-depth analysis and scientific interpretation of the results obtained further increases the significance of the study. In this study, the effectiveness of the integration of pedagogical software tools and databases in automating the learning process was assessed. The results obtained, in comparison with previous studies, include new approaches and methodologies, which provide important innovations in the field of education.

First, the results of the study showed that the use of integrated pedagogical tools significantly improves student learning outcomes. A 10% difference in mean scores indicates the effectiveness of the integrated approach compared to traditional teaching methods. This serves as stronger evidence when compared to previous studies, such as those conducted by Smith and Johnson (2020). This study also emphasized that the use

of technology serves to increase student motivation, but the results obtained show a clearer and more pronounced difference.

Secondly, the increase in motivation is also important in the study. According to the results, the motivation level of students using integrated software tools is

It was 5 points, which is the same as that provided by Garcia and Lopez (2019)

Much higher than 9 points. This shows that integrated pedagogical tools increase student interest and develop self-management skills. The 90% comfort level among students also reveals a level of innovation compared to previous studies. This ensures the acceptance and effectiveness of innovative technologies in the educational process for students.

Third, while previous studies have provided general recommendations on the integration of pedagogical software and databases, this study focused on an in-depth analysis of the problems and challenges that exist. Other studies, such as those conducted by Anderson (2021), have not sufficiently explored the practical aspects of the integration process. In this study, the level of preparation of teachers for technology and the individual needs of students were separately considered in the research process. This ensures the success of using integrated software in the educational process.

As a result, the results obtained suggest a new approach to the automation of the educational process and the integration of pedagogical software and databases. This study, compared with previous research, provides new foundations for the effective organization of the educational process through the integration of innovative approaches and methodologies in the field of education. This opens up significant opportunities for increasing the competitiveness of the education system and improving educational processes in the future. All this serves to further strengthen the role of pedagogical software in improving the quality of education.

Practical results and future directions. . The research results provide important practical recommendations for implementing the integration of pedagogical software tools and databases in the automation of the educational process. These recommendations may be useful for educational institutions, teachers, and education management bodies.

First, it is necessary to expand the use of innovative technologies in the educational process. Introducing students to integrated pedagogical tools and creating opportunities to use them will help increase their motivation and improve learning

outcomes. Organizing trainings and seminars for teachers will contribute to their familiarity with technologies and the development of their ability to use them effectively.

Secondly, it is important to take into account the individual needs of students. Using integrated pedagogical tools, it is possible to develop individual learning plans for students, organizing the learning process more effectively. This strengthens students' self-management skills and increases their motivation to study.

Third, it is also important to enhance interactivity in the learning process. Teachers should use integrated tools to communicate with students and actively involve them in the learning process. This will develop teamwork skills among students and make the learning environment more interesting and effective.

In terms of future directions, there is a need for a number of new studies in the field of research. First of all, it is important to conduct research on the long-term impact of the integration of pedagogical software tools and databases. This will allow us to more deeply determine the impact of integrated approaches on the quality of student education.

New research is also needed to explore students' attitudes toward technology and assess their readiness to use technology in the learning process. This will help develop strategies to strengthen student-teacher relationships and make the learning process more effective.

As a result, the research results provide important recommendations for practical application and open new directions for future research. It is very important to develop the necessary strategies to improve the educational process using innovative approaches, increase the quality of education and ensure student success. This will increase the competitiveness of the education system and ensure quality education for future generations.

Conclusion.

CONCLUSION

The results of the study showed the impact of the integration of pedagogical software tools and databases in automating the learning process on the quality of education. The obtained numerical results confirm that the use of integrated pedagogical tools leads to a significant improvement in the learning outcomes of

students. The 10% difference between the average scores indicates the effectiveness of innovative technologies in the educational process and is associated with a more active involvement of students in their lessons. Such results indicate that students have the opportunity to master knowledge more deeply through the use of integrated tools.

Increased motivation was also shown as an important result in the study. Students using integrated software tools have a higher level of motivation, which helps to make the learning process more interesting and interactive. The results, when compared with previous studies, reveal the contribution of new approaches to the educational process. This also plays an important role in developing students' self-management skills.

Another important aspect of the research findings is the attitude of students towards pedagogical tools. The percentage of students who consider integrated programs convenient is high, which reflects positive experiences in the adoption and use of technological tools in the educational process. Students' feelings of comfort motivate them to master new technologies and make the educational process more effective.

The results of the study also indicate the need to increase the level of preparation of teachers for technologies. Organizing trainings and seminars for teachers will help them develop skills in using integrated pedagogical tools. This approach will increase the ability of teachers to effectively use integrated tools in communicating with students and actively involving them in the lesson process.

Recommendations for the practical application of the research results emphasize the need to introduce innovative technologies in educational institutions. It is also necessary to conduct new research to take into account the individual needs of students and assess their readiness to use technologies in the educational process. This will help to organize the educational process more effectively and increase student success.

As a result, the research results reveal the importance of integrating pedagogical software and databases in automating the learning process. This contributes to the introduction of innovative approaches in education systems and the development of new strategies for improving learning processes. The results obtained serve to improve the quality of education, develop students' self-management skills, and enhance interactivity between teachers and students. This will serve to increase the competitiveness of the educational process in the future and ensure quality education for new generations. Innovative development of the education system has a positive

effect not only on the knowledge and skills of students, but also on their development as individuals.

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