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Analyzing pedagogical strategies for personalized learning to compensate for students' learning losses


Analizar estrategias pedagógicas de aprendizaje personalizado para compensar las pérdidas de aprendizaje de los estudiantes

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Abstract

The article is a comprehensive study of current methods and approaches used in modern educational practice to support students facing educational difficulties. The purpose is to analyze the effectiveness of individualization and personalization of the educational process in restoring educational losses. The literature review allows us to cover the existing theoretical frameworks of individualization and personalization in education. The analysis of pedagogical practice includes case studies and expert interviews, which provides an overview of successful strategies in real educational scenarios. The article presents a literature review, including current trends in individualization and personalization of education.



In addition, the authors analyze pedagogical strategies to improve the level of learning. The study identified pedagogical strategies to compensate for students' educational losses, including differentiation of instruction, use of technology, individual counseling, portfolio and self-assessment, flexible assessment methods, individualized curricula, team learning, and a feedback system. The study includes an analysis of the effectiveness of technological innovations integrated into the educational process, as well as the role of socio-cultural aspects in the successful implementation of individualized approaches, and contains a statistical analysis of the collected data. The results of the study provide practical recommendations for the implementation of successful strategies in educational institutions.

Keywords: Individualization, personalization, educational losses, pedagogical strategies, educational process, education applicants, technologies in education, statistical analysis.

Resumen

El artículo es un estudio exhaustivo de los métodos y enfoques actuales utilizados en la práctica educativa moderna para ayudar a los estudiantes que enfrentan dificultades educativas. El propósito es analizar la efectividad de la individualización y personalización del proceso educativo en la recuperación de las pérdidas educativas. La revisión de la literatura nos permite abarcar los marcos teóricos existentes sobre la individualización y personalización en educación. El análisis de la práctica pedagógica incluye estudios de casos y entrevistas a expertos, que proporciona una visión general de estrategias exitosas en escenarios educativos reales. El artículo presenta una revisión de la literatura, incluidas las tendencias actuales en individualización y personalización de la educación. Además, los autores analizan estrategias pedagógicas para mejorar el nivel de aprendizaje. El estudio identificó estrategias pedagógicas para compensar las pérdidas educativas de los estudiantes, incluida la diferenciación de la instrucción, el uso de la tecnología, el asesoramiento individual, el portafolio y la autoevaluación, métodos de evaluación flexibles, planes de estudio individualizados, aprendizaje en equipo y un sistema de retroalimentación. El estudio incluye un análisis de la eficacia de las innovaciones tecnológicas integradas en el proceso educativo, así como el papel de los aspectos socioculturales en la implementación exitosa de enfoques individualizados, y contiene un análisis estadístico de los datos recopilados. Los resultados del estudio brindan recomendaciones prácticas para la implementación de estrategias exitosas en las instituciones educativas.

Palabras clave: Individualización, personalización, pérdidas educativas, estrategias pedagógicas, proceso educativo, aspirantes a educación, tecnologías en educación, análisis estadístico.

1. Introduction

In the contemporary educational landscape, ensuring effective learning for every student, particularly those encountering educational barriers, is a critical imperative. Various factors, including interruptions in schooling, individual characteristics, and socio-economic factors, contribute to the accumulation of educational setbacks. Consequently, there is a growing need to focus on pedagogical strategies aimed at personalizing and customizing the learning experience to actively engage students and address their diverse needs. The most effective strategies include the use of technology, learning differentiation, team-based learning, use of flexible assessment methods, etc. Understanding and implementing these strategies are crucial steps towards fostering an inclusive educational environment and ensuring equitable access to quality education for all learners, regardless of their circumstances. Therefore, this study endeavors to identify, evaluate, and explore the practical application of key pedagogical approaches to remedying educational setbacks and fostering educational inclusivity.

Research goals:

1. To examine current educational trends, identifying the relevance of individualization and personalization in the context of mitigating educational losses.
2. To analyze various pedagogical strategies designed to individualize and personalize the educational process and evaluate their effectiveness in making up for educational losses.
3. To explore the practical aspects of implementing individualized strategies, including technological tools, assessment methods, and student engagement.
4. To assess the extent to which the proposed strategies contribute to the creation of an inclusive educational environment where each student can maximize their potential.

2. Literature review

Shvardak (2022) explores educational trends in the context of the new Ukrainian school, examining current changes and challenges in the education sector. Lytvynova (2020) explores the organization of distance learning during the COVID-19 pandemic and discusses issues related to the organization of remote learning in secondary school. Marienko, & Sukhikh (2022) consider the organization of pedagogical strategies in the educational process under conditions of martial law using digital technologies. Tovstohan et al. (2023) explore leading aspects of the transformation of inclusive educational space in the context of compensating for the educational losses of younger students. Batsurovskaya I. and Dotsenko N. are exploring the technology of acquiring competencies by bachelors of higher educational institutions in a digital media communication environment. Batsurovska et.al. (2021).

In his research, Shyrokov (2021) investigates the learning process in the context of the platformization of the educational process in conditions of distance and blended learning in school. Yastrub (2021) studies current issues of school adaptation for first-graders in the context of modern education. Yatsko (2023) presents an analysis of the elective module in 10th-11th grades of the high school.

Dumitrache, & Dumitraşcu (2014) consider the principle of personalization as the basis for an effective educational process. The authors focus on the individualization of learning and the consideration of students' characteristics. Graf (2023) investigates the role of personalization in adaptive educational environments. The author covers aspects of personalized learning using technologies. Demydenko (2023) dedicated their research to the possibilities of building a personalized educational trajectory using the Moodle platform. The article by Denicheva, O. (2018) is devoted to the individualization and differentiation of learning in developing personality in various educational institutions in Austria.

The article by Quandeng (2023) is dedicated to reviewing the personal learning model and provides an overview of current approaches to personalized learning. Pedagogical aspects and strategies for using open scientific services to improve distance, blended, and family learning in secondary school are presented in the research by Sukhikh (2023). Sakhnovskiy (2013) article focuses on specialized education in Ukrainian schools and the search for a new model. The essence of teaching strategies and approaches to their classification were studied by Olendr, & Tsar (2023). Cyphers (2022) investigated the peculiarities of organizing the educational process in schools in European countries in the face of modern challenges and threats. The article contains the experience of Ukraine.

Balukh (2022) research is dedicated to psycho-pedagogical approaches to the formation of competencies for future teachers of primary classes. The article by Kalaian (2017) focuses on pedagogical approaches to the education of learners in STEM classes. The author considers methods that focus on their active participation in the educational process. The article by Kulsharipova, et.al. (2021) is dedicated to pedagogical management in the practice of managing the educational process in primary school. It analyzes

aspects of organizing and managing learning in elementary classes. Sidanich, & Zvarych (2020) characterize the model for monitoring the quality of educational services in secondary schools.

Ovcharuk et al. (2023) investigate the organizational and pedagogical conditions for the use of the informational and digital environment in general educational institutions. The article by Rybalka (2023) analyzes the philosophy of the lesson as a psychological-pedagogical unit and its impact on the personal development of the education recipient. Shi, & Blau (2020) provide an overview of modern learning theories and pedagogical approaches to ensure the success of all education recipients. The literature review by Thakuri (2023) is dedicated to promoting innovative pedagogical teaching for meaningful learning. Lukianova, & Filon (2023) dedicate their research to intra-subject connections as a means of overcoming educational losses for students in mathematics.

However, the issue of analyzing pedagogical strategies aimed at individualizing and personalizing the educational process in order to compensate for the educational losses of students has yet to be sufficiently studied in the psychological and pedagogical literature.

3. Methods

1. *Literature review.* An extensive literature review includes current research, scientific articles, and methodologies for individualizing and personalizing the educational process.
2. *Analysis of pedagogical practices.* This includes case studies, providing an overview of pedagogical strategies for individualization and personalization in real educational institutions. It also focuses on analyzing successful practices and identifying technologies that show high efficiency in leveling educational losses.
3. *Statistical analysis of data.* A statistical analysis of the collected data using appropriate methods, such as calculating the empirical value of χ^2 based on the results of the initial control. This stage will help to identify statistically significant differences and trends in the study results.
4. *Comprehensive comparison of pedagogical strategies.* This stage involves the development of comprehensive comparative analyses of pedagogical strategies, including their effectiveness, adaptability to different contexts, cost of implementation, and level of acceptance by participants in the educational process.
5. *Monitoring the dynamics of students' success.* Implementation of long-term monitoring of the success of students involved in individualized and personalized educational processes.

4. Results and discussion

Individualization and personalization of the learning process are essential strategies for compensating for students' educational losses. The following pedagogical strategies aim to individualize and personalize the learning process to recover students' educational losses. Let us analyze them.

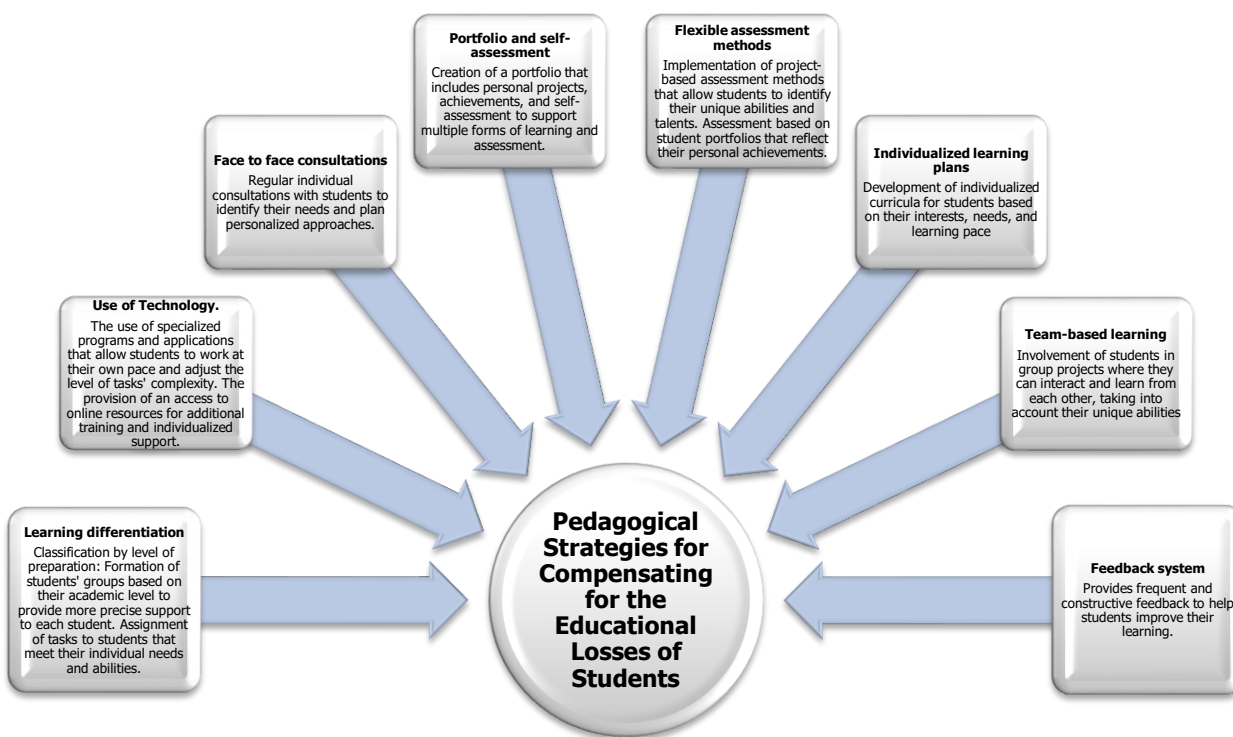


Figure 1. Pedagogical strategies for compensating the educational losses of students.

Differentiated learning is an approach in education aimed at adapting the learning process to the diverse needs and levels of preparedness of students. The main idea of differentiated learning is to provide students with various teaching methods, materials, and assignments based on their individual needs. This approach allows teachers to consider differences in learning paces, styles, and levels of abilities among students. Differentiated learning also involves the use of various assessment methods to evaluate individual student achievements. It creates a more inclusive educational environment where students can maximize their potential. This approach can be applied at multiple educational levels, from elementary school to higher education. It considers each student group's specific characteristics.

The use of technologies focused on individualization and personalization of the learning process becomes an effective tool for compensating for students' educational gaps. Technological tools (for example, educational programs that adapt to individual student needs) help to bridge knowledge gaps and enhance educational levels. Programs based on artificial intelligence can analyze unique abilities and learning paces, providing personalized learning materials. Technologies also enable the creation of interactive educational platforms. They promote a deeper understanding of the material and improve academic performance. A customized approach based on technology can be particularly beneficial for students with different learning styles and levels of preparedness. The integration of modern technologies into the educational process contributes to the development of flexible and adaptive teaching methods, leveling educational inequalities.

Face-to-face consultations become a key element in individualizing and personalizing the learning process to compensate for students' educational losses. Organizing individual consultations allows teachers to more accurately identify the personal needs of each student and develop personalized learning plans. During private consultations, teachers can assess the level of understanding of the material and adjust teaching to the specific characteristics of the student. Such consultations create a favorable environment for discussing difficulties and questions, leading to more effective addressing of educational gaps. Private

consultations may include applying various teaching methods and using additional educational resources tailored to the student's needs. Overall, personal consultations play a crucial role in creating an individualized academic environment, contributing to the successful recovery from educational losses.

Portfolio and self-assessment. The use of portfolios in education promotes the individualization and personalization of the learning process. They allow students to document their educational journey. Systematic self-assessment, included in the portfolio, enables students to consciously evaluate their progress, identify strengths, and determine areas for further development. Portfolios can consist of various materials such as projects, essays, and creative works. They allow students to demonstrate their unique abilities and achievements. The individualized self-assessment, embedded in the portfolio, helps students work more consciously on addressing educational gaps. Creating a portfolio can be adapted to each student's individual needs, supporting their unique learning styles. Overall, the combination of portfolios and systematic self-assessment contributes to more effective tracking of educational losses. It highlights personal achievements and potential.

Flexible assessment methods. The application of flexible education assessment methods aims to individualize and personalize the learning process, considering the diversity of students' needs. Flexible assessment methods allow teachers to adapt assessment procedures to the individual abilities and learning styles of each student. The use of various forms of assessment, such as projects, portfolios, and self-assessment, contributes to a more objective evaluation of students' achievements. Flexible assessment methods support students in the process of tracking educational losses. These methods allow them to demonstrate their progress in a more tailored form. A personalized approach to assessment may also involve considering individual interests and goals and promoting active student participation in the educational process. Flexible assessment methods contribute to tracking educational losses and create incentives for self-development and motivation for students.

Individualized learning plans play a key role in the strategy of individualization and personalization of the education process, especially in compensating for educational losses in learners. Creating individualized learning plans allows teachers to adapt the content and teaching methods, taking into account the level of knowledge, interests, and needs of each student. Individualized learning plans include a flexible learning schedule and a personalized approach to assessment. They promote a more effective process of tracking losses. Learners with individualized learning plans can better cope with educational challenges, as learning is structured considering their unique needs. Individualized learning plans also include mechanisms for regular reflection and adaptation. They allow quick responses to changes in the learning process and the needs of the student.

Team-based learning provides an opportunity for students to work together, taking into account their individual needs. It aims to individualize and personalize the learning process. As part of team-based learning, teachers can use differentiated methods and approaches to meet the unique educational needs of each student. Group learning projects promote mutual understanding, collaboration, and knowledge sharing, which contributes to more effective learning loss management. Collective educational research can become a platform for sharing experiences and mutual support, strengthening individual efforts to overcome educational losses. Teamwork also creates a favorable environment for sharing learning strategies and techniques. This can have a positive impact on the success of learning loss management. Team-based learning focused on individualization contributes to the formation of an inclusive educational environment where each student can contribute to the overall educational achievement.

An individualization-oriented **feedback system** is becoming a key tool for compensating for students' educational losses. It allows us to determine their needs accurately. Personalized feedback will enable teachers to assess the academic progress of each student, identify weaknesses, and direct efforts to overcome them. The feedback system can include both formal methods, such as assessments, and a more

informal one, such as discussions and regular conversations with students. Personalized feedback contributes to a deeper understanding of individual student needs, which is vital for effective learning loss prevention. Transparency and dialogue in the feedback system create a favorable environment for discussing improvement strategies and developing personalized education plans. A feedback system focused on individualization stimulates active interaction between teachers and students. It supports their joint efforts to overcome educational losses. These strategies can be successfully integrated to create a supportive and inclusive educational environment that promotes successful coping with students' academic losses.

A pedagogical experiment was conducted during the academic year 2022-2023 to test the effectiveness of pedagogical strategies. These strategies are focused on individualizing and personalizing the educational process in order to compensate for the educational losses of students. The experiment involved students from 3rd to 10th grades in Ukrainian secondary education institutions, totaling 470 students. The experimental group (EG) included 234 students, while the control group (CG) had 236 participants. In the CG, education was conducted using traditional methods.

In the EG, the implementation of pedagogical strategies focused on individualization and personalization of the learning process was planned to address the educational losses of students. Strategies for compensating educational losses included the formation of groups based on students' academic levels to provide more precise support to each student. Additionally, students were given tasks tailored to their individual needs and abilities. The research team used modern technologies. Furthermore, specialized programs and applications allowed students to work at their own pace and adjust the level of task difficulty. Students received an access to online resources.

The school held regular face-to-face consultations with students to identify their needs and plan individualized approaches. The school also implemented a portfolio that includes personal projects and introduced project-based assessment methods that allow students to identify their unique abilities and talents. Individual curricula were developed for students, taking into account their interests, needs, and pace of learning. Students were involved in group projects where they could interact and learn from each other, taking into account their unique abilities. Also, there was constructive feedback to help students correct their performance. The results of the study are presented in Table 1.

Table 1.

The results of implementing pedagogical strategies focused on individualization and personalization of the educational process in order to compensate for the educational losses of students after the experiment: calculation of the empirical value of χ^2 based on the initial control results.

Score	Percentage (EG)	Empirical frequency n_i (EG)	Percentage (CG)	Empirical frequency n_{i1} (CG)	$(n_i - n_{i1})^2$	$(n_i - n_{i1})^2 / n_{i1}$
12	3,85%	4	0,95%	1	9	9,00
11	43,27%	45	3,81%	4	1681	420,25
10	39,42%	41	8,57%	9	1024	113,78
9	37,50%	39	5,71%	6	1089	181,50
8	33,65%	35	18,10%	19	256	13,47
7	25,00%	26	46,67%	49	529	10,80
6	17,31%	18	56,19%	59	1681	28,49
5	13,46%	14	56,19%	59	2025	34,32
4	10,58%	11	15,24%	16	25	1,56
3	0,96%	1	10,48%	11	100	9,09
2	0,00%	0	2,86%	3	9	3,00
Total amount	100,00%	234	100,00%	236		825,26

The empirical value is $\chi^2=825,26$. The critical value is chosen for the extent of freedom $v=10$. $\chi^2_{\text{emp}} \geq \chi^2_{\text{kp}}$ means that there are significant deviations between the distributions. It means that they belong to the zone of significance. It is evident that the introduction of pedagogical strategies aimed at individualizing and personalizing the educational process in order to compensate for the academic losses of students, which was carried out in the context of the experimental group, is promising.

The statistical results can be presented graphically in Figure 2.

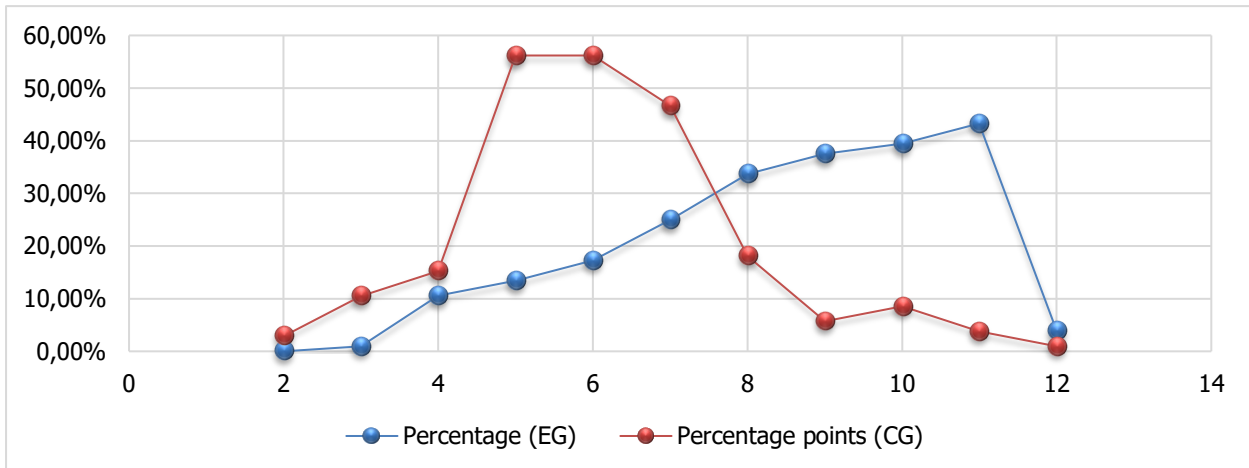


Figure 2. Statistical results of implementing pedagogical strategies focused on individualization and personalization of the educational process in order to compensate for the educational losses of students.

The grades range from 2 to 12 points. This is a wide range, which may indicate a diversity of student performance. Most students received grades between 6 and 11, showing that most students coped with the experiment quite well. The percentage of higher grades (11 and 12) in CG and EG is relatively small (3.85% and 0.95%, respectively). This indicates that the experiment was a challenge for most students. The grades of 3 and 2 are rare, which may suggest that most students coped with the minimum requirements. The percentages in the CG are more variable, especially with low grades. This may indicate differences in the performance of students in the CGs. The most frequent grade is 7, and the percentage of students in CG (46.67%) is significantly higher than in EG (25.00%).

We agree that recent research in the field of education, conducted by Shvardak (2022) and Lytvynova (2020), reveals the current trends and challenges facing modern education. Special attention to pedagogical strategies in the context of the implementation of digital technologies, as shown by the studies of Marienko & Sukhikh (2022), Tovstohan et al. (2023), is an important step in solving the problem of educational losses among younger students. We also agree that the studies of Shyrokov (2021), Yastrub (2021), and Yatsko (2023) reveal key aspects of the adaptation of the educational process to modern realities, in particular, in the context of distance learning and the choice of subjects for study. We partially agree with the articles of Dumitrache & Dumitraşcu (2014), Graf (2023), Demydenko (2023), which emphasize the role of individualization and personalization of learning in the formation of an effective educational process. However, we believe that this aspect can be more deeply analyzed in view of the relationship between individual needs and general educational goals. We do not agree that the problem of analyzing pedagogical strategies aimed at individualizing and personalizing the educational process in order to compensate for the educational losses of students has been sufficiently explored in the psychological and pedagogical literature. This problem remains relevant and requires further research and discussion.

5. Conclusions

The analysis of pedagogical strategies aimed at individualizing and personalizing the educational process clearly indicates their key role in successfully building educational links for students. These strategies not only take into account the specific needs of students but also create favorable conditions for their active participation in the educational process. The results of the analysis emphasize the importance of integrating modern technologies into pedagogical strategies. Electronic educational resources, adaptive programs, and online platforms have a significant impact on the creation of individualized learning environments. The balance between freedom of choice and educational standards includes one of the key issues - the need to strike a balance between individual freedom of choice and adherence to common academic standards. Effective strategies should provide students with freedom while maintaining a high standard of education.

The prospects for further research and practice include:

- Additional research on the effectiveness of specific methods.
- The development of new technological solutions.
- Deepening the issues of cultural adaptation of educational strategies.

Overall, the results of the analysis confirm the importance of continuing research in this area to improve the learning process further and ensure equal educational opportunities for everyone.

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