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PROJECT-BASED TEACHING: APPLYING INNOVATIONS TO THE TEACHING PROCESS

ENSINO BASEADO EM PROJETOS: APLICANDO INOVAÇÕES AO PROCESSO DE ENSINO

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ABSTRACT

The paper aims to provide a comprehensive view of project teaching as an innovative element of the educational process and analyse its practical applications in the school environment. The research was carried out through a comparative study, in which the results of two groups of secondary school students were compared - one that learned through project-based learning and the other that used traditional methods. The results showed that students in the experimental group achieved a higher understanding of the curriculum, better academic results, and a higher motivation to learn compared to the control group. Additionally, project-based learning significantly contributed to developing soft skills such as teamwork, problem-solving, and self-assessment. Despite its many advantages, research identified challenges in implementing this method, such as being time-consuming, the need for methodological support for teachers, and varying levels of student engagement. It is necessary to ensure systematic support for teaching staff and expand the use of digital technologies in project-based learning. The findings indicate that project-based learning represents a promising direction in education that can contribute to modernising school curricula and improving the quality of teaching. Its wider application can help prepare students for the challenges of the 21st century and support their creativity, independence, and adaptability to dynamic changes in society.

Keywords: Project-based teaching, innovative educational methods, active learning, critical thinking, educational innovations.

RESUMO

O artigo tem como objetivo fornecer uma visão abrangente do ensino de projetos como um elemento inovador do processo educacional e analisar suas aplicações práticas no ambiente escolar. A pesquisa foi realizada por meio de um estudo comparativo, no qual os resultados de dois grupos de alunos do ensino médio foram comparados - um que aprendeu por meio do aprendizado baseado em projetos e o outro que usou métodos tradicionais. Os resultados mostraram que os alunos do grupo experimental alcançaram uma maior compreensão do currículo, melhores resultados acadêmicos e uma maior motivação para aprender em comparação ao grupo de controle. Além disso, o aprendizado baseado em projetos contribuiu significativamente para o desenvolvimento de habilidades sociais, como trabalho em equipe, resolução de problemas e autoavaliação. Apesar de suas muitas vantagens, a pesquisa identificou desafios na implementação deste método, como consumo de tempo, necessidade de suporte metodológico para professores e níveis variados de engajamento dos alunos. É necessário garantir suporte sistemático para a equipe docente e expandir o uso de tecnologias digitais no aprendizado baseado em projetos. As descobertas indicam que o aprendizado baseado em projetos representa uma direção promissora na educação que pode contribuir para a modernização dos currículos escolares e a melhoria da qualidade do ensino. Sua aplicação mais ampla pode ajudar a preparar os alunos para os desafios do século XXI e apoiar sua criatividade, independência e adaptabilidade às mudanças dinâmicas da sociedade.

Palavras-chave: Ensino baseado em projetos, métodos educacionais inovadores, aprendizagem ativa, pensamento crítico, inovações educacionais.

Introduction

The current education system faces ever-increasing demands for modernisation and innovation, reflecting the dynamic development of society, technological progress and changing labour market needs. Traditional teaching

methods, based mainly on the passive reception of information, are proving less effective in preparing students for the practical challenges of the real world. In response to these changes, project-based learning is coming to the fore, representing one of the progressive teaching methods focused on the active involvement of students in the educational process (Azizi, 2017).

Project-based learning offers an interdisciplinary approach to education and allows students to acquire knowledge and skills through solving complex practical tasks. This approach supports the development of critical thinking, creativity, and the ability to solve problems, cooperate in teams and communicate effectively (Salles & Bentes, 2012). In addition, project-based learning combines theoretical knowledge with practical experience, thereby overcoming the isolation of school curriculum from real life (Vartiak & Garbarova, 2024).

The essence of project-based learning lies in individual or group work on projects to solve a specific problem or create a final product. This approach emphasises the autonomy of students who, under the guidance of a teacher, participate in all phases of the project - from planning to implementation to presentation of results. In this way, a deeper understanding of the subject matter and the development of independence and responsibility are supported (Dunleavy & Dede, 2021).

Innovations in education are a key factor in ensuring quality education in the 21st century (Sarmento, Menegat & Seniw, 2016). Educational institutions are forced to respond to the challenges of digitalisation, globalisation, and increasing demands on the labour market, which require implementing modern teaching methods. The traditional frontal teaching method often appears ineffective compared to interactive and participatory approaches, such as project-based learning (Graham, Zook & Boulton, 2021).

Project-based learning integrates different areas of knowledge, enabling the development of interdisciplinary competencies and contributing to a more adequate understanding of the subject matter (Jaseckova, Konvit, & Vartiak, 2022). When solving project tasks, students learn to work with available information sources,

analyse and synthesise data, use digital technologies, and apply the acquired knowledge in an authentic context (Konvit, Jaseckova & Vartiak, 2024).

Currently, special attention is paid to financial literacy, which is shown to be essential for successful life in modern society (Mocarzel & Pereira, 2016). Implementing financial literacy into teaching through the project method allows students to become practically familiar with financial principles, such as budgeting, investing, managing personal finances, and responsible economic decision-making (Cannistra et al., 2024).

The paper aims to provide a comprehensive view of project teaching as an innovative element of the educational process and analyse its practical applications in the school environment. The paper compares traditional and modern teaching methods, identifies the advantages and disadvantages of project teaching, and provides specific examples of implementing this method in teaching.

Literature Review

Project-based learning is one of the modern educational methods that emphasises the active involvement of students in the learning process and the application of acquired knowledge in practice. This method represents an effective tool for developing critical thinking, independence, creativity and problem-solving skills (Manak & Svec, 2003). This section analyses key findings from the literature on project-based learning and its application in the educational environment.

Historical context and theoretical foundations of project-based learning

Project-based learning has its roots in pragmatic pedagogy, which focuses on experiential learning. John Dewey and William Kilpatrick laid down their fundamental principles, emphasising learning through activities and real-life situations (Kilpatrick, 1935). Dewey (1916) considered school a "laboratory of democracy" in which students should learn through active inquiry and problem-solving.

According to Kosova (1996), project-based teaching based on solving real problems allows students to understand the connections between theory and practice better. Karl Frey (1984) defined nine essential characteristics of project-based teaching: interdisciplinarity, orientation to practical situations, student cooperation, long-term planning and self-evaluation of work results.

Project-based learning is based on constructivist learning theory, which states that students create knowledge based on their experiences and active activities (Kalhous & Obst, 2002). This approach supports students' individual development because it respects their learning pace and provides space for creativity (Vartiak, 2015).

Advantages and challenges of project-based teaching

Project-based teaching brings several advantages compared to traditional teaching. According to Blasko (2013), the project method supports the development of competencies necessary for the 21st century, such as:

The ability to work in a team - students learn to cooperate, communicate effectively and resolve conflicts (Orbanova & Velichova, 2012).

Critical thinking and problem-solving - projects are often based on real challenges requiring analytical thinking (Magalhaes & Menegat, 2024).

Independence and responsibility - students have a greater degree of freedom in decision-making and are responsible for the results of their work.

Digital skills - currently, information and communication technologies (ICT) are used in the implementation of projects, improving students' technological literacy (Bakhshalipour, Khodaparast, Azizi & Kalashi, 2023).

On the other hand, introducing project-based teaching in schools also brings challenges and limitations. According to Solarova (2003), implementing this method can be time-consuming and requires more teacher commitment. It is also necessary to consider individual differences between students, as not everyone has the same abilities to work in a team or organise their work effectively. Some studies (Turek, 2008) also point out that the success of project-based learning depends on the quality of leadership and the correct setting of goals.

Structure and phases of project-based learning

According to Kilpatrick (1935), project-based learning takes place in four main phases:

1. Project planning - students and the teacher determine the project's goal, its content and methods of solution.
2. Project implementation - active work on solving the problem, collecting information and analysing it.
3. Presentation of results - students present their work to classmates, teachers or the wider community.
4. Evaluation and reflection - the process of self-evaluation and feedback on the project and identification of strengths and weaknesses.

These phases allow students to develop their skills and gain practical experience systematically. According to Dori and Belcher (2021), project-based learning is increasingly associated with using digital technologies, supporting information literacy development.

Application of project-based learning in the context of financial literacy

One of the modern trends in education is increasing financial literacy among students, and project-based learning is an effective tool for achieving this goal. As Manikutty, Sasidharan and Rao (2022) state, financial education through project methods allows students to practically become familiar with concepts such as budgeting, investing, loans and savings.

As part of the empirical part of the research, we analysed the implementation of the National Financial Literacy Standard into the school curriculum and identified several successful project activities, for example (Cannistra et al., 2022):

The "Investing in Stocks" project involves students' simulation of buying and selling shares while monitoring their value on the market.

The project "Creation of a School Magazine on Finance" supports financial literacy and the development of communication and presentation skills.

The results showed that students better understood economic principles and gained practical experience with financial decisions, which confirms the high effectiveness of project-based teaching in this area.

Methodology

The paper aims to provide a comprehensive view of project teaching as an innovative element of the educational process and analyse its practical applications in the school environment. The research focuses on implementing innovative teaching strategies in secondary education, emphasising financial literacy, an essential part of educational standards. Project-based teaching allows students to acquire practical skills and apply theoretical knowledge in real-world situations.

Figure 1 – Research methodology

Specific research objectives include:

To identify the advantages and limitations of project-based teaching compared to traditional methods based on literature and empirical research.

To evaluate the effectiveness of project-based teaching in developing skills such as teamwork, problem-solving, critical thinking, and digital literacy.

To explore the possibilities of integrating the project method into financial literacy teaching in secondary education.

To propose recommendations for teachers and educational institutions for more effective implementation of project-based teaching.

The research combines quantitative and qualitative methods, allowing for a comprehensive analysis of the impact of project-based learning on student learning.

Research design: The research is designed as a comparative study in which the results of a group of students who learn through project-based learning will be compared with a group of students who learn through traditional methods.

Experimental group: Students who will learn through project-based learning using innovative methods in Financial Literacy.

Control group: Students who will learn the same curriculum traditionally.

The experiment will last six months, during which various aspects of learning will be monitored, such as student engagement, the quality of acquired knowledge, and the practical application of acquired skills.

Research sample selection: The research sample will consist of 100 secondary school students aged 15-18, who will be divided into two groups. The sample selection will be done using the stratified random sampling method, ensuring equal representation of boys and girls.

Data collection:

Student questionnaires will contain questions regarding their motivation, interest in the subject, problem-solving skills and teamwork.

Didactic tests: Comparison of students' knowledge before and after the experiment to determine the difference in the level of understanding of the subject matter.

Classroom observation: Analysis of the behaviour of students and teachers when implementing project-based teaching.

Interviews with teachers: They will explore their experiences implementing project-based learning and identify barriers to its application.

Data analysis methods:

Quantitative analysis: The results of the questionnaires and tests will be processed using statistical methods, using t-tests to compare students' performance in the experimental and control groups.

Qualitative analysis: Observations and interviews will be analysed using thematic analysis, which will allow for the identification of main patterns and trends in the responses of teachers and students.

Results and Discussion

This section of the article presents the results of the research, which concern the impact of project-based learning on students' knowledge and their ability to work in a team, solve problems and apply the acquired knowledge in practice.

4.1 Results of quantitative analysis

To compare the performance of students in the experimental and control groups, statistical methods were used, particularly t-tests, to compare the means between the two groups. The main aspects that were examined included:

Academic performance of students - testing knowledge before and after the completion of the project.

Motivation and interest in learning - based on questionnaires filled out by students.

- Development of soft skills - teamwork, communication, problem-solving.

Academic performance of students

The testing was carried out twice - before and after the implementation of project-based learning. The results showed that the average score of students in the experimental group increased by 23%, while in the control group by only 9%.

Experimental group (project-based teaching):

Average score before testing: 63%

Average score after testing: 86%

Increase: +23%

Control group (traditional teaching):

Average score before testing: 64%

Average score after testing: 73%

Increase: +9%

These results confirm the hypothesis that project-based teaching leads to more effective learning of the subject and a better understanding of the context.

Motivation and interest in learning

An analysis of the questionnaires showed that 80% of the students in the experimental group said that they enjoyed project-based teaching more than traditional teaching methods. In the control group, only 45% of the students said that they were motivated by the learning process:

80% of the students in project-based teaching felt more engaged.

45% of students in traditional teaching felt more motivated.

This difference is probably due to the practical nature of project-based teaching, which allows students to work on real situations and see the meaning of learning.

Development of soft skills

Another critical aspect of the study was the development of teamwork and problem-solving. After the project:

87% of students in the experimental group reported that they had learned to work better in a team.

68% of students in the experimental group noted improved problem-solving skills.

Only 39% of students in the control group noticed an improvement in these areas.

Table 1 – Results of quantitative analysis

Aspect	Experimental Group (%)	Control Group (%)
Academic Performance (Increase in Score)	Increase: 23%	Increase: 9%
Motivation and Interest in Learning	80% Enjoyed More	45% Motivated
Development of Soft Skills (Teamwork)	87% Improved Teamwork	39% Improved Teamwork
Development of Soft Skills (Problem-Solving)	68% Improved Problem-Solving	39% Improved Problem-Solving

These data indicate that project-based teaching also positively affects students' social and cognitive competencies, which are crucial for their future professional application.

4.2 Results of the qualitative analysis

In addition to the quantitative data, interviews with teachers and classroom observations were also analysed, providing essential insights into implementing project-based learning.

Teachers' opinions

Most teachers who conducted project-based learning described this method as effective but also pointed out particular challenges:

Advantages:

More interactive and practical learning,

Better student motivation,

Development of real-life competencies.

Challenges:

Time-consuming preparation and assessment,

Various levels of student engagement,

Need for good coordination and technical equipment.

According to teachers, project-based learning is ideal for complementing traditional teaching, not a complete replacement.

Classroom observations

Observations in the experimental group revealed that students were more active, discussed, solved problems, and collaborated. In contrast, in the control group, most of the teaching was passive, with minimal student interaction.

Table 2 – Results of the qualitative analysis

Aspect	Details
Teachers' Opinions (Advantages)	More interactive and practical learning, Better student motivation, Development of real-life competencies
Teachers' Opinions (Challenges)	Time-consuming preparation and assessment, Various levels of student engagement, Need for good coordination and technical equipment
Classroom Observations (Experimental Group)	Students were more active, discussed, solved problems, and collaborated
Classroom Observations (Control Group)	Most teaching was passive, with minimal student interaction

4.3 Discussion and interpretation of the results

The research results clearly indicate that project-based learning effectively improves students' knowledge, motivation, and soft skills development. These findings are consistent with previous studies that have confirmed that active learning leads to a deeper understanding of the subject matter.

Table 3 – Interpretation of the results

Aspect	Details
Effectiveness of Project-Based Learning	Improves students' knowledge, motivation, and soft skills development, consistent with previous studies on active learning
Comparison of Academic Performance	Project-based learning group showed a significantly higher increase in academic performance compared to the control group
Barriers to Implementation	Time requirements, need for careful planning from teachers
Conclusion	Advantages outweigh disadvantages when project-based learning is properly integrated into the curriculum

While academic performance improved in both groups, the project-based learning group recorded a significantly higher increase. This suggests that this method is more interesting for students and more effective in terms of long-term acquisition of the subject matter.

The main barriers to implementing project-based learning are the time requirements and the need for careful planning on the part of the teacher. Despite these challenges, the advantages of project-based learning outweigh its disadvantages, especially when properly integrated into the curriculum.

Conclusions

The research results confirmed that project-based learning represents an effective innovative approach to education, which significantly contributes to developing students' competencies. Compared to traditional teaching methods, project-based learning enables a better connection of theoretical knowledge with real life, supports active learning and increases students' motivation.

The analysis of academic results showed that students involved in project-based learning achieved a higher understanding of the subject matter and better mastered practical skills. It was also revealed that this method supports the

development of critical thinking, problem-solving and teamwork, essential skills for successful implementation in 21st-century society.

Despite the clear advantages, specific challenges were also identified, such as the time-consuming nature of preparing project tasks, the diverse involvement of students and the need for methodological support for teachers. These factors indicate that implementing project-based learning requires systemic support from educational institutions and a wider use of digital technologies.

Based on the results obtained, it can be concluded that project-based learning is a valuable tool of modern education that contributes to developing students' independence, creativity, and practical skills. Its broader application in the school environment could significantly contribute to modernising the teaching process and better-preparing students for future challenges. Therefore, it is desirable that this method becomes an integral part of the education system and is supported through teacher training and the availability of the necessary resources.

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