

2ND INTERNATIONAL SCIENTIFIC CONFERENCE

**TEACHING, LEARNING AND TEACHER
EDUCATION**

**INNOVATIVE AND ADAPTIVE
TEACHING PRACTICES FOR MODERN
EDUCATION**

BOOK OF PROCEEDINGS



TEACHING, LEARNING AND TEACHER EDUCATION



2nd International Scientific Conference

Teaching, Learning and Teacher Education (TLTE)

Publisher

Pedagogical Faculty in Vranje, University of Niš, Serbia

For the publisher

Prof. Dragana Stanojević, PhD

Editors

Aleksandar Spasić, PhD

Biljana Prodović Milojković, PhD

Sanja Anđelković, PhD

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The publication of the Book of Proceedings has been funded by the Ministry of Education, Science
and Technological Development of the Republic of Serbia.



Република Србија
Министарство просвете,
науке и технолошког развоја

2nd International Scientific Conference
Teaching, Learning and Teacher Education (TLTE)

Conference theme:

*Innovative and Adaptive Teaching Practices for Modern
Education*

BOOK OF PROCEEDINGS

Vranje, May 16–17, 2025

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CONTENTS

TOPIC

INNOVATIVE AND ADAPTIVE TEACHING METHODS

FROM CONCEPT TO IMPLEMENTATION: CHALLENGES IN GERMAN LANGUAGE PROJECT-BASED LEARNING MILANA VOJVODIĆ	11
CITIZENSHIP EDUCATION IN THE MULTICULTURAL SCHOOL ENVIRONMENT: FROM THEORY TO PRACTICE ELENI KARAMANOLI	19
HARNESSING TRANSDISCIPLINARITY AT THE PRIMARY EDUCATION LEVEL NATALIA POPA	33
MODULAR TEACHING OF NATURE AND SOCIETY IVKO NIKOLIĆ, LJILJANA MITIĆ, EMILJA TASIĆ STANOJKOVIĆ	49
APPLICATION OF LITERARY TEXTS IN FOREIGN LANGUAGE TEACHING KATARINA STANKOVIĆ, ANĐELA PROTIĆ	61
GAMIFICATION IN MATHEMATICS USING M-LEARNING BRANKA B. ARSOVIĆ	73
INNOVATIVE APPROACHES TO ADDRESSING SPECIFIC LEARNING DISORDERS IN EARLY SCHOOL-AGED CHILDREN SAŠA STEPANOVIĆ, VLADIMIR ILIĆ	89
MATH TEXTBOOKS AND LEARNING ALGEBRAIC CONTENT THROUGH DISCOVERY-BASED LEARNING SANJA ANĐELKOVIĆ, NELA MALINOVIĆ JOVANOVIĆ, ALEKSANDRA MILANOVIĆ	101

TOPIC

INTEGRATION OF TECHNOLOGY IN EDUCATION

CHATGPT AS A TOOL FOR INNOVATING THE TEACHING PROCESS ALEKSANDRA MILANOVIĆ, JELENA MAKSIMOVIĆ, SANJA ANĐELKOVIĆ, BORIS KOŽUH ..	115
STE(A)M LEARNING AND TEACHING OF NATURAL AND SOCIAL SCIENCES – EXAMPLES OF GOOD PRACTICE AT THE PEDAGOGICAL FACULTY IN VRANJE MARIJA DEJKOVIĆ, DRAGANA STANOJEVIĆ, YANKA STOIMENOVA	131

INTERDISCIPLINARY LEARNING IN THE ERA OF GLOBALIZATION: STEAM APPROACH IN MUSIC EDUCATION TATJANA MILOSAVLJEVIĆ ĐUKIĆ, TEODORA KRAGOVIĆ, ALEKSANDAR STOJADINOVIĆ, ANA SPASIĆ STOSIĆ	141
THE APPLICATION OF DIGITAL TECHNOLOGY IN THE TEACHING OF NATURAL AND SOCIAL SCIENCES SINIŠA STOJANOVIĆ, LJILJANA MITIĆ, VERITSA ARSOV.....	151

TOPIC

EVALUATION AND IMPROVEMENT OF EDUCATIONAL QUALITY

PROMOTING THE RULES OF CONDUCT IN THE CONTEXT OF CLASSROOM MANAGEMENT NINA GARȘTEA.....	163
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TOPIC

Innovative and Adaptive Teaching Methods

Original research paper

FROM CONCEPT TO IMPLEMENTATION: CHALLENGES IN GERMAN LANGUAGE PROJECT-BASED LEARNING

UDC 371.3::811.112.2-057.874

Milana Vojvodić

JU Gimnazija „Sveti Sava“ Prijedor, Bosnia and Herzegovina

Abstract. *Project teaching in the context of German language teaching is a promising methodology. However, it faces specific challenges that affect its effective relationship with student outcomes. The aim of this paper is to analyze the obstacles encountered by fourth-grade high school students and the teacher when implementing projects, focusing on interpersonal, resource and organizational factors. The research focuses on the following questions: How do disagreements within student teams and lack of resources affect the dynamics of projects? How do the novelty of the project approach and language barriers limit students' engagement? What strategies have proved effective in overcoming these challenges? The methodological framework includes the analysis of students' survey responses, semi-structured interviews with students and reflections of the teacher who coordinated the projects. The results point to four main problems: conflicts in teams due to different ideas and expectations, lack of material resources (e.g. literature in German, technological tools), time constraints for research and practical implementation, and initial difficulties in adapting to the project methodology and language requirements. In conclusion, the success of project teaching in a language context requires more clearly defined roles in teams, access to multidisciplinary resources and a focus on the gradual adaptation of students through smaller, more structured phases. The implications of the research highlight the importance of developing soft skills (e.g. teamwork, communication) and integrating language skills into project tasks through personalized approaches.*

Keywords: *project-based learning, German language teaching, challenges in PBL*

1. INTRODUCTION

Teachers and students face many challenges every day. Schools are tasked not only with sharing knowledge but also with promoting different skills essential for later life. However, the gap between learning in school and practical application is growing, and it is becoming increasingly clear.

Project-based learning in German addresses these challenges by actively involving all students and encouraging group work. Students must solve technical tasks and overcome hurdles. They meet classmates with whom they otherwise have little contact and learn to work together to find solutions. This social dynamic presents a challenge because differing opinions, communication difficulties, and conflicts are frequent occurrences in group work.

On the other hand, it is important to understand the potential challenges of project work so that they can be accepted and the projects can be carried out successfully.

2. THEORETICAL FRAMEWORK

The word *project* comes from the Latin verb *proicere* (*to throw forward*) and emphasizes the forward-thinking that is central to a project (Kirsch, 2013, p. 72). The terms *project teaching*, *project learning*, *project work* and *project method* are used synonymously to describe a form of teaching in which students work cooperatively to create a product or find a solution to a problem. However, there is no standard definition. Blažević (2007, p. 236) highlights its potential to temporarily transcend conventional school structures and introduce variety into teaching. Similarly, Wicke (2009, p. 136) emphasizes the collaborative aspect, defining it as a form of teaching in which teachers and students jointly plan projects to acquire new knowledge. Central to this approach is the focus on concrete problems and systematic processes: Dubs (2009, p. 51) argues that clear questions lead to concrete results when structured steps are followed, while Rösler (2012, p. 111) underlines that projects are open-ended, time- and labor-intensive activities where students assume responsibility for the entire process.

Several authors further stress the role of student autonomy and active participation. Funk et al. (2014, p. 126) describe projects as complex learning tasks involving individual or cooperative work on authentic problems, with students accountable for their own learning. Legutke (2016, p. 350) similarly emphasizes openness and a high degree of learner engagement, and Schart (2020, p. 49) frames the project method as a time-limited teaching approach with defined objectives, allowing students to work independently. Extending this perspective, Bender (2020, p. 13) refers to project learning as an innovative form of teaching in which students select their own tasks and are motivated by real-world problems, whose resolution can positively affect their immediate environment.

Upon comparing the above definitions, certain overlaps become apparent. Project learning is a cooperative teaching method in which students work on authentic problems, take responsibility, work autonomously, solve different tasks, and have the freedom and creativity to produce a final result or product within a certain timeframe.

Projects can be classified according to various criteria, such as duration, number of participants, school subject, or objectives. However, the fundamental distinction is between micro and macro projects. Micro projects are smaller, time-limited projects usually carried out in one or a few lessons. They help students and teachers develop skills related to project competence, such as learning strategies, social skills, and organizational skills (Legutke, 2016, p. 353). In micro projects, students learn to work systematically, practically, independently, and with a focus on action (Wicke, 2009, p. 142). Students work on real-life problems and use the foreign language as their working language. Microprojects can supplement textbooks and make lessons more interesting (Funk et al., 2014, p. 132–133). Macro projects are larger, longer-term projects that last several days or weeks and are often interdisciplinary. Macro projects include, in particular, intercultural encounter projects (where students have contact with native speakers of the target language), exploration projects (where students explore aspects of their environment) and literature projects (in which students work on literary texts in a creative way) (Funk et al., 2014, p. 137–138). Projects can be organized in various ways, ranging from individual to school-wide, inside or outside the school, and with native speakers or learners of the target language (Matijević, 2008, p. 197).

In project-based learning, the roles of students and teachers differ from those in traditional teaching. The focus is on students taking responsibility for their own learning. They take on a variety of roles. These roles include moderator, helper, reporter, advisor, researcher, coordinator, speaker or illustrator. (Wicke, 2012, p. 72; Matijević, 2008, p. 198). This allows each student to find a suitable role and contribute to the final result. In doing so, students develop various skills, including personal skills such as creativity, forming opinions, and self-awareness; social skills such as communication, cooperation, conflict resolution, and a sense of responsibility; global skills such as knowledge and skills related to real life; organizational skills such as task allocation and coordination; and methodological skills such as literature searches and group formation (Radanović, 2014, p. 43-44). The teacher provides support, advice, mediation, monitoring, and materials. While they may no longer be in the focus, they are nevertheless indispensable for the success of the project. If there are problems, teachers provide advice on finding solutions and ensure a pleasant learning atmosphere (Funk et al., 2014, p. 149–150).

Project-based learning has gained widespread recognition for its many benefits, especially in terms of applying theoretical knowledge in real-world settings. This method encourages collaboration among students, enhances their teamwork abilities, and supports the development of essential 21st-century skills, such as problem solving, creativity, and critical thinking. Beyond academic improvement, PBL often increases student engagement and motivation due to its learner-centered approach. As students actively engage in meaningful projects, they tend to gain a deeper understanding of the subject matter (Batysheva & Kitibayeva, 2022, p. 162). However, despite these benefits, several challenges hinder the effective implementation of PBL. One major issue is the considerable time required to plan, carry out, and evaluate projects. This challenge is amplified in settings with limited resources or strict schedules, where allocating sufficient time for PBL can be difficult. Additionally, monitoring individual student progress in group work can be difficult. Teachers must dedicate considerable effort to tracking participation and ensuring equitable involvement and comprehension among all students (Batysheva & Kitibayeva, 2022, p. 163). Another obstacle is the open-ended nature of PBL, which may not suit every learner. Students accustomed to structured, teacher-led environments may struggle to adapt to the autonomy demanded by PBL. In larger classes, providing personalized feedback, differentiated instruction, and adequate resources can overwhelm educators, potentially impeding successful implementation. Furthermore, unequal student participation is a concern because more proactive learners often take on more responsibility, while less engaged peers remain passive (Zaafour & Salaberri Ramiro, 2022, p. 430). Research focusing on cooperative project-based learning highlights additional context-specific difficulties. One prevalent problem is the lack of foundational knowledge among teachers regarding CPBL processes, which complicates scaffolding, group management, and time allocation. Technical challenges also arise due to educators' insufficient training in CPBL methodologies. Teachers acknowledge that CPBL demands more time than traditional lecture formats, making time management a recurrent issue. Nevertheless, many educators are willing to invest the necessary time, trusting in the approach's long-term benefits (Zaafour & Salaberri Ramiro, 2022, p. 430). Group dynamics presents another critical challenge in CPBL, especially when students with diverse abilities and learning preferences collaborate. Conflicts may emerge, which can negatively affect cooperation and project outcomes. Additionally, many students lack the research skills necessary to complete projects effectively, further complicating matters. Another significant barrier is the lack of student engagement, which often results from poor collaboration within teams and undermines project success (Batysheva & Kitibayeva, 2022, p. 165). In summary, while PBL and CPBL offer substantial benefits in

developing practical skills and enhancing student motivation, their success depends on overcoming challenges such as time constraints, limited resources, group dynamics, and diverse learner needs. Adequate teacher training and support are essential to overcoming these obstacles and realizing the full educational potential of PBL and CPBL (Ferwati et al., 2023, p. 164-165).

3. METHODOLOGY

This study uses a qualitative, descriptive research design to examine the challenges of implementing project-based learning (PBL) in a high school setting for fourth-grade students. The main objective is to analyze challenges of project-based learning faced by students and teachers, paying particular attention to interpersonal conflicts, limited resources, and organizational constraints that affect project execution. The research is guided by the following questions:

1. How do disagreements within student teams and lack of resources affect the dynamics of projects?
2. How do the novelty of the project approach and language barriers limit students' engagement?
3. What strategies have proved effective in overcoming these challenges?

To answer these questions, a triangulated qualitative data collection method was used, including: student surveys (open-ended questionnaires to capture students' reflections and perceptions of the challenges experienced during project work), semi-structured interviews (students participated in individual interviews on a voluntary basis to explore personal experiences, group interactions, and perceived obstacles in greater depth) and teacher reflections (the supervising teacher maintained regular field notes throughout the planning and implementation phases, monitoring aspects such as student engagement, patterns of collaboration, and challenges related to task comprehension).

Throughout the project, the teacher actively observes the students. The observations were both purposeful and random. The observation protocol includes a systematic, structured approach to monitoring students' group work. This involves observing task distribution, the students' ability to collaborate and support each other during project work, and their communication and problem-solving skills within groups. Since teaching is a dynamic process, other relevant phenomena are also considered and documented.

During the observation, the focus was on recording the students' behavior. In particular, it was observed whether they encountered problems, how they solved them, if they improved their conflict management skills over time, and how they collaborated.

Due to the open-ended nature of the collected data, the study uses thematic analysis to identify recurring themes, patterns of difficulty and effective coping mechanisms. This approach provides a nuanced understanding of the implementation process and generates descriptive and interpretative insights that are aligned with the research objectives.

Between December 2022 and May 2023, the research was conducted with 37 fourth-grade students from the "Sveti Sava" Gymnasium in Prijedor. The participants were divided into six groups based on whether they studied German as their first or second foreign language, with three classes involved and two groups formed within each class corresponding to first and second foreign language learners. Their German proficiency was at the B1+ level. Initially, 50 students were involved, but only those who actively participated were included in the study.

Various micro and macro projects were implemented according to the students' proficiency level, group size, and number of weekly German lessons. Micro projects typically lasted one to two lessons and were mainly conducted in class. Macro projects extended over one to two weeks and included both in-class and at-home activities.

4. RESULTS

This study employs qualitative research methods. Observation and survey techniques were applied to collect necessary data. Instruments included an observation protocol, a questionnaire, and an interview. The results are described using the descriptive method.

Initially, project-based learning was unfamiliar to most: some students quickly adapted, while others needed more time. The distribution of tasks went smoothly. Sometimes, the teacher put groups together so that students who normally interacted little with each other would work together. Though not everyone liked this, they followed the teacher's instructions and continued to work in their assigned groups. Collaboration was largely successful. Minor differences of opinion were quickly resolved. The biggest difficulties arose from differing views. This is why students had to learn to collect all ideas, make decisions together, and compromise. Interestingly, lower-performing students also showed more initiative than usual. Many artistically talented students were able to contribute their creativity to the projects while using their German language skills, which helped ensure the projects' success. Numerous compromises were necessary, but the team spirit remained mostly strong.

At the end of the school year, 37 students completed an online questionnaire about their experiences with project work in German class. The following questions were asked:

- How was the atmosphere in the group during project work?*
- Was there team spirit in the group?*
- Were you in a group with classmates with whom you normally have less contact?*
- If so, did working together help you get to know each other better and improve your relationship?*
- Were there any disputes or differences of opinion in the group?*
- If so, how did they arise, and how were they resolved?*
- Would you rate the group's work on the project as successful?*
- What did you learn from the project?*
- How did you feel during the project?*
- Do you prefer traditional lessons or project-based lessons?*
- Did the project work increase your motivation to learn German?*
- Would you like to have projects in other subjects more often?*
- What difficulties did you encounter during the project?*

Most students described the atmosphere during project work as positive. Responses included terms such as *relaxed*, *productive*, *fun*, and *creative*. An overwhelming 97.3% confirmed the existence of a strong team spirit within the groups. Students reported feeling comfortable during the project and found collaborating motivating.

An important aspect of the project was deliberately composing groups with classmates with whom participants would otherwise interact less. 91.9% of respondents participated in these heterogeneous groups. Of those, 86.5% said that collaborating improved their relationships and helped them get to know each other better. These results highlight the added social value of project-oriented methods in breaking down barriers and promoting social integration.

Despite the predominantly positive experiences, minor conflicts or differences of opinion arose among around 21.6% of students. The main reasons for this were differing views and

task distribution. However, students reported that they mostly resolved these problems through compromise and open communication. Some students said they needed time to adjust to the new teaching method. The biggest challenges were accepting different opinions and learning to compromise. Technical problems were also mentioned as occasional hurdles. Nevertheless, the results showed that most students were able to overcome these difficulties and gain valuable learning experiences.

In addition to the survey, a semi-structured group interview was conducted to further explore the responses. The central interview questions were:

How would you describe your impressions and experiences during the project work?

What were the biggest obstacles?

What is the biggest advantage of this form of teaching?

The interview confirmed and supplemented the survey results. Students described project work as one of the best experiences during their time in school. It strengthened not only their technical skills but also their social and communication skills. They emphasized that the projects enabled them to communicate more with each other, work more creatively, and practice using the German language in an authentic context. They perceived the challenges, especially differences of opinion and adaptation processes, as important learning opportunities.

5. DISCUSSION

The findings of this study demonstrate that, although project-based learning provides valuable opportunities to foster creativity, encourage learner autonomy, and enable the practical application of language skills in authentic contexts, implementing it is not without significant challenges. Many of these challenges are similar to those identified in previous research (Ferwati et al., 2023; Batysheva & Kitibayeva, 2022; Zaafour & Salaberri Ramiro, 2022), highlighting persistent obstacles to the effective adoption of PBL methodologies.

One of the most significant and recurring issues across all data sources was interpersonal conflict within student groups. Student feedback and teacher observations revealed that disagreements among team members, a lack of cooperative spirit, and an uneven workload distribution created substantial impediments to smooth project progression. As students collaborated in teams, differences in opinions, varying degrees of motivation, and conflicting working styles often led to coordination difficulties and challenges in reaching consensus. These findings reinforce the idea that group dynamics are a critical and often problematic factor in PBL environments.

Another major challenge identified was the limited availability of adequate materials and technical resources. Students reported issues related to the availability and functionality of filming equipment, props, and appropriate workspaces necessary for effectively completing their projects. Additionally, some students attempted overly complex projects, exacerbating logistical challenges and leading to unmet expectations. This observation supports the argument that resource limitations can hinder the successful execution of PBL activities (Ferwati et al., 2023).

Language barriers emerged as a significant obstacle, especially for students with lower German proficiency. Some learners had difficulty articulating their ideas clearly, comprehending the project requirements, and completing translation-related tasks. These issues highlight the additional cognitive demands that problem-based learning places on

students in foreign language learning contexts, especially when their language skills are still developing.

Time management was another critical issue revealed by the study, affecting students and the teacher alike. While PBL's flexible and open-ended nature encouraged creativity and autonomy, it also resulted in longer preparation periods, delayed project completion, and higher stress levels. The teacher admired the students' initiative and independence. However, a lack of sufficient teacher oversight, particularly when students insisted on working autonomously, resulted in reduced linguistic accuracy. These findings echo the broader literature, which highlights the time-intensive demands of PBL and underscores the importance of providing structured guidance and support throughout the process (Batysheva & Kitbayeva, 2022).

Despite these challenges, the study revealed encouraging signs of student engagement and resilience. Several groups demonstrated a high degree of initiative, managed interpersonal conflicts independently, and showed strong commitment to their project tasks. These results highlight the motivational potential of well-implemented PBL and its ability to foster essential 21st-century skills, including collaboration, problem-solving, and self-regulation. Ultimately, this leads to a richer, more meaningful learning experience.

6. CONCLUSION

In conclusion, successfully implementing project-based learning in a language learning context requires thorough planning, ongoing support, and thoughtful structuring to maximize its educational benefits. One critical factor for success is clearly defining and allocating roles within student teams. Well-defined responsibilities minimize interpersonal conflicts, promote equitable participation, and foster a collaborative learning environment where each student can contribute meaningfully.

Additionally, providing access to a wide array of interdisciplinary and diverse resources is essential for overcoming material and logistical constraints that often limit project scope and quality. Providing students with adequate tools, technological support, and relevant content enables educators to significantly enhance the depth and authenticity of project outcomes.

The study also emphasizes the importance of gradually and systematically introducing project-based learning, particularly for students new to this pedagogical approach. A phased introduction combined with scaffolding techniques can ease students' transition into more autonomous and self-directed learning modes, thereby reducing anxiety and building confidence.

Furthermore, this research emphasizes the powerful synergy between language acquisition and collaborative project work. Engaging learners in meaningful, context-rich projects facilitates the development of linguistic skills and nurtures essential soft skills, such as effective communication, personal responsibility, teamwork, and problem-solving. These competencies are crucial for learners' holistic development and preparedness for real-world challenges.

Based on these findings, future implementations of project-based learning in language education should be carefully tailored to meet students' diverse proficiency levels and individual learning needs. Personalized scaffolding and ongoing teacher guidance are essential. In doing so, educators can leverage the full potential of project-based learning to design engaging, authentic, and impactful educational experiences that prepare students for academic success and lifelong learning.

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OD IDEJE DO REALIZACIJE: IZAZOVI U PROJEKTNO ORIJENTISANOJ NASTAVI NJEMAČKOG JEZIKA

Apstrakt. *Projektna nastava u kontekstu nastave njemačkog jezika predstavlja perspektivnu metodu, ali se suočava sa specifičnim izazovima koji utiču na njenu efikasnu povezanost sa ishodima učenja kod učenika. Cilj ovog rada jeste da analizira prepreke sa kojima se susreću učenici četvrtog razreda srednje škole i nastavnik prilikom realizacije projekata, s fokusom na međuljudske odnose, dostupnost resursa i organizacione faktore. Istraživanje je usmjereno na sljedeća pitanja: Kako neslaganja unutar timova i nedostatak resursa utiču na dinamiku rada na projektima? Na koji način novina projektnog pristupa i jezičke barijere ograničavaju angažovanost učenika? Koje su se strategije pokazale efikasnim u prevazilaženju ovih izazova? Metodološki okvir obuhvata analizu odgovora učenika na anketu, polustrukturisane intervjuve sa učenicima i refleksije nastavnika koji je koordinisao projekte. Rezultati ukazuju na četiri ključna problema: konflikte u timovima usljed različitih ideja i očekivanja, nedostatak materijalnih resursa (npr. literatura na njemačkom jeziku, tehnološki alati), vremenska ograničenja za istraživanje i praktičnu realizaciju, te početne poteškoće u prilagođavanju projektnom pristupu i jezičkim zahtjevima. Zaključno, uspješna primjena projektna nastave u kontekstu stranog jezika zahtijeva jasnije definisane uloge unutar timova, pristup multidisciplinarnim resursima i postepenu adaptaciju učenika kroz manje, strukturisane faze. Implikacije istraživanja naglašavaju važnost razvoja mekih vještina (npr. timski rad, komunikacija) i integracije jezičkih kompetencija u projektna zadatke kroz personalizovane pristupe.*

Ključne reči: *projektna nastava, nastava njemačkog jezika, izazovi u projektnoj nastavi*

Original research paper

CITIZENSHIP EDUCATION IN THE MULTICULTURAL SCHOOL ENVIRONMENT: FROM THEORY TO PRACTICE

UDC 316.722:342.7-057.875

Eleni Karamanoli 

Faculty of Education, Aristotle University of Thessaloniki, Greece

Abstract. *Citizenship education aims to help students to understand and respect people with different cultural ties, to respond effectively and respectfully when interacting and communicating, to build positive and constructive relationships, to become aware of and understand assumptions, prejudices, stereotypes, as well as overt and covert discrimination. The present research aims to provide the necessary theoretical context and teaching tools that contribute to the cultivation of specific social skills of secondary school students that will enable them to develop basic life skills required in modern times for personal fulfilment and development, social integration, inclusion, mutual respect. The research was conducted in the school year 2023-2024 on 50 secondary school students and the research results were analyzed qualitatively. The present research captured the characteristics of the new social and educational reality and clarified the basic principles of intercultural learning and the skills that are necessary for students to develop in order to become active citizens of a multicultural society with a high degree of ethnic and cultural diversity. Activities were carried out aimed at cultivating empathic understanding, respect for diversity, intercultural communication skills and the ability to engage in dialogue. The research results indicated that values and attitudes related to democracy and the rule of law, respect for human rights and social justice education were fostered. Also, through activities students developed the ability of multiple perspectives, the ability of a person to distance himself from his own point of view and take into account the views of other people, to understand and respond to thoughts, beliefs, values and feelings of other people, cultivating the ability to mediate in situations of cultural diversity.*

Keywords: *active citizenship, inclusion, democracy, citizenship education*

INTRODUCTION

The education system in a democratic country is essential to help young people become responsible citizens. This includes not only providing knowledge about democratic structures and processes, but also an understanding of democracy as a way of life. As cultural, ethnic, linguistic and religious diversity increases, the challenge of educating citizens to function effectively in a pluralistic democratic society deepens. Diversity enriches a nation as it provides alternative ways of perceiving the world and solving social problems. The key challenge facing pluralist states is how to balance diversity and unity. A nation-state that denies individuals the opportunity to participate freely in their community culture risks

alienating them from the national political culture. The main goal of intercultural education is to help students develop the knowledge, attitudes, and skills needed to participate effectively in cultural communities within the political culture of the nation-state.

There are various definitions of the concept of "active citizenship": "To be a citizen is to participate" (Barber, 1984, p. 85), "The real citizen plays an active and full role in matters concerning his community" (Dagger, 2002), "It is only when one steps out of one's home into the public space that a dialogue about a citizen's idiosyncrasy begins" (Kingwell, 2000, p. 41). One does not engage in political action to promote merely one's welfare, but to realize the inherent principles of political life, such as liberty, freedom, equality, justice, fairness, justice, justice and virtue. The concept of the active citizen has been interpreted as that of a citizen who "governs himself and takes responsibility for his actions, thus reducing his dependence on the state" (Warburton et al., 2003, p. 774). In essence, what the state is trying to consolidate in its response to the community is that those who receive social benefits as a result of the operation of the social state must, through their community participation in community programmes, reciprocate it.

More specifically, the citizen should be able to:

- understand and evaluate what is happening around him/her (critical thinking).
- To be aware of his/her rights and the obligations arising from them, and to defend the rights of all.
- To seek out and be aware of different opinions on a subject.
- To make decisions responsibly, after being informed and weighing up the different aspects of an issue.

The characteristics of active citizenship that are emphasized in the educational proposal that follows are: personal responsibility, mutual respect and coexistence, the ability to identify problems, as well as the ability to formulate proposals and strategies for their solution, the ability to search, discriminate (in terms of reliability) and process information, to see the broader context of an issue, to develop critical thinking, to recognize and defend human rights, to recognize and defend the human rights of others, and to develop a sense of responsibility.

According to European education policy 'active citizenship' of young people is a political priority in the context of the European Union, as it is directly linked to the creation of a European citizenship and the communication around the conditions for the formation of a European identity. Theoretical framework of the learning process in a learning environment: European Framework on Key Competences (European Framework) Civic competence (Civic competence), democracy, rights, justice, justice, privacy, civil rights and civil rights, justice, Justice and culture, legal and political facts of the world, the start of the homework process, the homework process, the homework process in the home, the workplace, the home, the home, the home, the home, the possibility to participate in a public health end of life.

In the context of general education, education for democratic citizenship aims at the creative perception and thorough study of the environment in which each student is recognised and valued as the most important member of the school community. Through the exercise of democratic citizenship, pupils are involved in public life and in activities that are planned from the outset and, at the same time, create new democratic experiences for them. According to contemporary studies, democratic citizenship is necessary for students to become active members of a democratic society, aware of their public roles and functions. Democratic citizenship is not achieved in schools automatically, therefore school communities should make every effort to develop these democratic opportunities for students through systematic teaching and practice.

Defining the goal of education in terms of democratic citizenship can be achieved by taking into account cognitive and ethical considerations, which include (a) the subject matter and teaching methods related to democratic citizenship competences; (b) the practices in the learning process are facilitated for the emergence and development of students' thoughts and actions; and (c) everyday life in school, where every activity is carried out as an institutional social activity. Democratic competence as an important component of citizenship education is reflected in the formal curriculum through teaching and in the "hidden" curriculum through the rules of conduct, the school mission, and classroom interaction. Most of the traditional citizenship education curricula focus on legal aspects of being a citizen, rather than on the skills and dispositions necessary to become a citizen (Larrain et al., 2021). Furthermore, most of the curricula on citizenship education are developed within local educational systems, giving an emphasis on topical issues (Branden, 2022) rather than on global skills and competences that are necessary for future citizens (Reynolds et al., 2020).

Education is absolutely essential for the formation of mature democratic citizens who can take rational decisions on various problems of modern life, contribute to the formation of sound public opinion through active participation in issues and act as responsible subjects in society's decision-making. Adolescence is a period in which the affairs of the local community enter the experience of young people and young people begin to understand various human relationships. Therefore, civic education for democratic citizenship should be included in this period.

One of the aims of democratic citizenship education is to familiarise students with the dynamic, interdependent and diverse environments in which they live. To this end, activities that contribute to the development of the participation and responsibility of the younger generation are reinforced in the school environment. The result is activity that serves as a basis for democratic citizenship, starting at an early age and continuing throughout life through formal and informal education. Education for democratic citizenship remains a central issue in current education policy, according to a review of current scientific literature. Education theorists and policymakers interpret and evaluate its goals, principles, and approaches differently, but all agree that democratic citizenship is characterized by knowledge, skills, and experience of democratic behavior. Multicultural education includes the study of a variety of cultures and is meant to promote the development of a cultural identity, intercultural empathy and tolerance, and the cross-cultural construction of shared positions (Culp, 2025). The manuscript identifies the significance of studying multicultural education and global citizenship, including its role in promoting social cohesion, preparing students for an interconnected world, and fostering responsible citizenship. Intersectionality means promoting a more inclusive and nuanced understanding of social issues and advocating for more comprehensive approaches to equity and justice (Hunduma & Mekuria, 2024).

An active citizen is one who participates in social processes, in the formulation of demands, in decision-making, in the evaluation of results. In other words, he or she has active participation in political and social structures, such as self-government bodies, trade unions, associations, but also informal collectives (social, political or cultural), scientific associations, etc. An active citizen is a citizen who recognises problems, dysfunctions and social injustices based on the principles governing the law, natural law, moral balance and the values of the society to which he or she belongs. It is the citizen who takes initiatives and acts responsibly and coherently, within the framework of the principles of law, to change or improve what is badly done. The citizen who is informed about public affairs, who demands transparency, who knows his/her rights and obligations, who asserts his/her rights in the public sphere, who expresses his/her views with arguments and listens to the views of others.

An active democratic citizen is one who respects the rights and freedom of others (it is the limit of his or her own freedom), has developed intercultural skills, embraces the principles of harmonious coexistence and strives for it.

The question that arises at this point is "Is a child a citizen? ". The answer lies in the International Convention on the Rights of the Child, a set of legally binding rights that apply to all children. The Convention has been ratified and made domestic law, with mandatory application, by all countries of the world except the United States. They provide for the guarantee and protection of freedom of opinion, freedom of expression, freedom of thought, conscience and religion, the right to peaceful public assembly, protection of privacy, and access to appropriate information. This is the group of rights concerning the participation of children as acting subjects in social reality and in decision-making processes, as well as the expression of opinions that are respected and listened to by adults. They are rights that are constantly violated by the adult world. The aim is for children to understand the concept of rights through their personal experiences and knowledge of the world. Because they have a strong sense of right, which they invoke whenever they feel oppressed, mistreated or wronged, the activity is based on the formulation of thoughts and experiences around the right - wrong dichotomy.

Children organise and participate in student councils, in the formation of regulations in schools. They follow current affairs and form opinions, they have an opinion on what is happening around them, they have interests that touch on the public sphere.

The answer also lies in the question, what kind of adult citizen do we want?

In Secondary Education, students come into contact with the concept of citizenship through History (especially with the references to the Athenian Republic), Social and Civic Education, as well as some texts in Language lessons. However, the approach remains theoretical and the extent of the references made does not allow for a clarification of the concept, nor does it allow for its specialization in the contemporary conditions of globalization, digital media and socio-economic crises. Through the individual activities of this unit, it is hoped that students will be able to define more precisely the concept and role of the active citizen and to describe their expected attitudes on a variety of issues concerning themselves, a group and the wider society.

The ability to participate in an interactive debate, where one can effectively express oneself, position and defend one's arguments, actively follow the views of all participants, refute or synthesize non-identical views, is essential for the active citizen who, in modern conditions, will often find himself participating in such processes, not only in a professional context, but possibly also in a political and social one. It is important that the school should be a field for training and exercising students in the ability to engage in public dialogue and to observe democratic procedures. "It's not fair," we hear too often from children when some act or omission they feel puts them at a disadvantage. The same is true if the event involves not themselves, but another child or group of people. In many cases they make moves of self-justification, denunciation or develop arguments, asking for their right or the right of the other person.

The question "what is just?", and the conflicts to claim it, are intertwined with human history and the formation of early communities. The establishment of rules, unwritten and written, was and is an attempt to solve problems of everyday life, arising from living together, and to settle conflicting interests of its members. But are law and rules identical concepts? Historically, important is the parameter of who makes the rules, also whether the interests of all are taken into account equally. Many wars, long-lasting conflicts and ethnic cleansing began by oppressing through legislation and depriving social and ethnic groups of their rights.

Situations often arise where institutions and citizens are called upon to take a position and/or to act in a way that provides solutions to issues of political and social importance, where concepts such as individual freedom and the obligation towards the law, the moral and the legal seemingly and/or actually clash, personal and social good, the interests of one group with those of another, the use of "legal" violence and the control of the forces that apply it, the right to expression and respect for the personality of the other, the right to health and life and that of choice over a therapeutic method, etc. etc.

The education of tomorrow's citizens about the rules and laws in a rule of law, i.e. in a democratic framework of justice and equality, where they will be called upon to develop attitudes and behaviours that defend human rights, respect democratic freedoms and achievements and operate within the established frameworks of dialogue and action, is a component of education for active citizenship. Active citizenship implies being informed about public affairs, knowing one's rights and obligations as a citizen, expressing one's views, demanding transparency and justice, and actively participating in social processes.

In order to shape students as active citizens experiential, student-centered and group activities are used, which are inspired by everyday life, children are invited as citizens to evaluate situations, to make informed and informed choices, to plan and take action, creating added value in each context. They address issues such as identity, coexistence, diversity, rights, obligations, individual and collective responsibility, participation in democracy, rules and law, accurate information, the circulation of accurate information, value-added public positioning, democratic and effective forms of struggle or assertion, strategic planning for action on social issues or challenges at local and/or global level, etc.

Greeks are informed by social networks, mainly Facebook, to a greater extent than residents of other countries. That is, while in most of the countries in the sample (from all 5 continents) the first in use informative websites on the internet are the websites of newspapers and television stations, in Greece it is observed that the interest of citizens is shared in many types of websites, which include several created by journalists who emerged from the dominant traditional media, but also anonymous blogs that often host conspiracy theories. There is a lack of trust in traditional media and a major shift towards free online information. At the same time, Greek internet users comment and share news on social media to a higher degree than residents of most of the sample sites.

In such an environment, the education of tomorrow's citizens in the use of digital (and not only) media in a way that promotes reliable and multifaceted information, the exercise of criticism and dialogue, the assertion of rights, the development of a culture of intercultural coexistence, participation in the public sphere and, ultimately, democracy, is an essential element of education for active citizenship. It is also a matter of understanding, on the one hand, that they themselves are responsible both for creation, and for the reception (consumption) and circulation of information, and on the other hand to know the ways in which this can be achieved. We live in the media age and trust in the media is a constant challenge, since knowledge and information is fully mediated. How can a citizen perceive whether a news item is valid and a source reliable, a piece of information invalid or false? What form can invalid or false information take?

A survey of the "Active Citizenship for Democracy," conducted by the European Commission's Centre for Research on Lifelong Learning (CRELL), produced the following definition of "Active Citizenship for Democracy" (Hoskins et al., 2006):

- Participation in social life, community and/or political life, characterised by mutual respect and absence of violence and a commitment to civil rights and democracy.

Global events, such as the migration crisis and the increasing, ongoing environmental issues have demanded and continue to demand international responses. These changes and

crises influence identities, provoke us to ask what citizenship means in our societies and lead us to question how citizenship education is perceived today. Countries can no longer solely focus on national values; rather they now emphasize international democratic values and encourage citizens to develop the knowledge, skills, and attitudes necessary to become active and critical members of society. Bringing together an overview of citizenship education opportunities and challenges this book provides substantial food for thought and helps us to better understand the international perspective on citizenship education (Holz et al., 2025).

Goyal et al. (2023) argue that educational institutions, as transformative organizations, can strongly contribute to building a more resilient, sustainable, and fair world by shaping the ethical, responsible, and sustainable conscience of future generations, raising public awareness about the consequences and repercussions of unsustainable actions, and addressing the current sustainability challenge facing society.

METHODOLOGY

The research was conducted in the school year 2023-2024 on 50 secondary school students and the research results were analyzed qualitatively. The present research captured the characteristics of the new social and educational reality and clarified the basic principles of intercultural learning and the skills that are necessary for students to develop in order to become active citizens of a multicultural society with a high degree of ethnic and cultural diversity. Activities were carried out aimed at cultivating empathic understanding, respect for diversity, intercultural communication skills and the ability to engage in dialogue. The aim of this article is to contribute to the formation of students as active citizens and to education for democracy. In addition, through the programme, it seeks to cultivate their critical thinking, their analytical ability, their research skills, their intercultural understanding, their ability to communicate and collaborate, their flexibility and adaptability while supporting them to understand the concepts of individual and collective responsibility. Learning is initiated by the students' experience either in their school, family or social environment and fed by data that emerge from it. The teacher can choose among activities of different difficulty those that best suit the learning level, age and interests of his/her students, make variations and adapt them to the needs of his/her class. Activities are largely linked to the students' experiences which are used to highlight the concepts of personal responsibility, solidarity and the prioritisation of needs in a crisis.

This article aims to approach answers to questions related to the search, creation, circulation and use of information in a modern democracy. Who produces information today? How is information transformed into information? What is the role of media in modern democracy? What is the difference between fact and opinion? Where can I write or post my opinion? Can there be consequences of expressing my opinion? Is there censorship on the internet? Where can a citizen get information? How has social media changed the way citizens form opinions? How can a citizen check the truth of a piece of information? By what criteria (should) he/she choose the sources from which he/she is informed? What does it mean for the validity and credibility of a source? What is fake news? Where are they aimed? Why are they spread so easily? What is the role of the citizen in counteracting invalid information? What is the difference between misinformation and false information? What can I do when I realize that a news item contains false or incorrect content? What is the relationship between information/communication and political and social life?

1st activity: Education for all

At this activity students organise a community awareness activity that includes artistic events and the creation of a painting exhibition.

The expected learning outcomes are to recognise the right of all individuals to education regardless of socio-economic or other factors, realise the reasons why some social groups may not have equal access to education, realise the importance of taking action to raise community awareness and support organisations that contribute to the education of all individuals, cultivate organisational skills in order to implement awareness-raising activities for the wider community. The event organised by the students will play an important role in raising awareness of the local community about the activities of the organisation and the value of access to education for all, as well as for the financial support of the organisation.

The students can invite members of the organisation to participate in this event, to talk to the attendees and those present about the activities of their action. In this case, a group of students will coordinate the communication with the persons in charge of the organisation. All the students will have a role for the day of the event, for example participating in an artistic event, coordinating the event, welcoming the guests, recording snapshots of the day.

After the end of the event, the team collects the material from all the stages of the action (e.g. snapshots of the students' event, speech of the representatives of the organisation during the event) and can prepare a presentation in digital format (e.g. presentation, digital book, digital poster with various digital tools) of all the steps and snapshots of the action, presenting also the ways in which they chose to support the activities of the educational organisation. The material can be posted on the school's website.

After the event, the group watches the presentation created with all the steps of the action and reflects on the experience of participating in its activities. The teacher encourages the students to share their feelings and thoughts about their experience at each stage of the activity. They reflect on their conversation with the volunteer representative of the organisation and the information they gathered about the organisation's activities, and share their impressions about the conversation they had with these people. They then share their feelings and thoughts as organizers of the event they offered to their community, using their own skills. They discuss the different ways in which they can give back to their community and are encouraged to mention any active citizenship activities they would like to engage in as a group in the future.

2nd activity: Children talk about their rights

At this activity students discuss children's rights and explore how they are linked to different forms of child labour. They then organise a community awareness campaign to defend children's rights, focusing on their right to education and the fight against child labour.

The expected learning outcomes are to recognise that child labour is linked to the violation of children's rights, report on the factors associated with the violation of children's rights locally and globally, understand the impact of child labour on children's development, well-being and health, and in relation to children's right to education. The class is divided into groups, which choose different sectors/industries linked to child labour in different regions of the world (e.g., coffee, rice, cocoa, clothing and shoe production, cotton, sugar cane, carpet production).

In the plenary, the students decide what kind of activity they would like to organise (e.g. workshop, painting/poster exhibition) and to whom they would like to address (e.g. the school community, the students' parents and guardians, the wider local community), as well as what

options they have to present their material (e.g. Then each group decides how they will choose to present their findings in order to inform and raise awareness in the community.

The teams collect material on the causes and factors associated with child labour in their chosen sector, the impact on children's health, development and well-being and ways to combat child labour. After the day of action, students collect the material (snapshots of the day, creations of each group, information leaflet, invitation/poster, programme) and create a digital collage, book or video which can be posted on the school's website and sent to relevant organisations active in supporting children's rights. The digital material (collage, book, video) is presented to the class. The teacher encourages students to share their thoughts and feelings about their participation in the activity, about:

- (a) collecting the material and the knowledge they gained about child labour and its consequences,
- b) organizing their own initiative to defend child rights and raise awareness in the community,
- (c) working together in the group.

3rd activity: Information is for sharing: together through the hard times

In this activity students collaborate and collect useful materials that will include instructions and guidelines for all members of the school community to help and support children/adolescents and adults in difficult times associated with crisis situations (such as natural disasters and health crises), which will be posted on the school's website.

This activity aims to know the different characteristics and basic management actions in the different crisis situations they will deal with, recognise the importance of the availability of accessible information material for managing difficult situations to all members of the school community, distinguish the different levels of the consequences of a crisis (physical, psychological, social, relationships, living conditions, etc.), recognise that there are common needs for all members of the school community.

The teacher can use an article/text/consciousness that may be from current affairs or from a previous difficult period/crisis event (it can also be linked to the earthquake preparedness exercise in schools). The event is presented to the class and discussed using the following (indicative) questions:

What are the consequences of a crisis such as natural disasters, a health crisis such as a pandemic and at what levels (physical level, living conditions, psychosocial level, etc.), how do we feel when we experience a situation of such a crisis?

To what extent and in what way are the effects of a natural disaster likely to vary according to its type (e.g. in an earthquake, flood or pandemic)?

What helps to better manage the impact of a natural disaster and/or pandemic (knowledge, good preparation, and prevention) both for us as individuals and for a group of people (family, classroom, school, community)?

In relation to natural disasters and health-related crises (e.g. pandemics), what ideas do we have to help as a classroom in providing useful information to the school community? What categories of information would we seek (e.g., physical health, mental health, living conditions)? How could we organize and share the information with other people using the power of the Internet?

The class is divided into groups and each group, based on their interests, is responsible for finding material for the crisis/crises they have chosen. The material is presented to the class and then the same or other groups are tasked with sorting the material by crisis category, by age group the material is aimed at and by content (e.g. whether there are instructions on

safety, physical/physical care and protection or psychological care and support). The groups work together to propose what will be posted on the school website and how (categories based on the information, short introductory text explaining what the material to be posted is about).

Based on the curriculum, students search and select the material they will post (based on the information presented in class) and then - with the cooperation of the IT teacher if necessary - finalise the format and content, which can be enriched on a continuous basis in case students find new useful material. Another school may be involved in the implementation of the action, with which there will be cooperation in the collection of information/materials.

At the end of the activity, students can share with the class their thoughts, feelings and experiences from their participation in the activities. They discuss both about better understanding of the difficulties and needs that may arise in a crisis situation, but also about recognising their potential. The sharing and recording of thoughts, conclusions, findings, can be synthesized in a text to be posted on the school website expressing the group's experience with a message of hope, strength, solidarity and mutual support. The students also record what they have learnt as individuals in terms of ways to better manage different kinds of crises.

4th activity: Helping to reduce digital inequalities

The activity aims to help students, who have developed technological skills, to help other people (e.g. parents, grandparents, grandparents, peers and their peers, etc.) to acquire basic digital skills (e.g. to communicate electronically with their relatives, public services and banks) useful for their lives.

The expected learning outcomes are concerned for students to define the concept of digital illiteracy and digital inequalities, to identify the impact of digital illiteracy and digital inequalities, to identify the digital needs of different groups, to design appropriate learning activities to meet these digital needs, to apply procedures to assess the extent to which digital needs are met, to assess in practice the value of "digital literacy" and "digital inequalities", identify the digital needs of different groups, design appropriate learning activities to meet these digital needs, apply procedures to assess the extent to which digital needs are met, assess in practice the value of "digital literacy" and "digital inequalities".

The teacher opens the class discussion by asking the question: "Do you know people in your immediate or more distant family or social environment who you would describe as digitally illiterate?" The students discuss in class the concept of digital illiteracy, how important a social problem it is nowadays and the people in their immediate or more distant family and social environment who they know are not familiar with new technologies.

Each student then writes down on a list the names of people they know and at the same time think that it would be very useful for them to have a basic contact with some basic digital tools (e.g. their grandparents, their parents, their neighbor, the grocer or the butcher in the neighborhood), because this would improve their social and professional life.

All the lists of students are collected by a student designated by the class as the person in charge (either by voluntary initiative, or by vote if there are more than one volunteer), in order to create an aggregated list. For example, students will list those people who propose to acquire basic digital literacy skills. Then, after identifying the individuals, they will formulate a list of basic digital skills (e.g. sending an email or downloading their mobile identity) and, by contacting the potential learners, ask them what of these they would be

interested in learning. Students could communicate the activities of the action to the municipality where they belong, asking for the initiative to be communicated to the citizens.

At the end of the action, with the consent of the trainees, the trainees' impressions could be made public (in a video or an article on the school's or municipality's website or local newspapers and websites). For example, it would be very nice to see live how much joy was taken by grandparents who now know how to communicate remotely with their grandchildren or distant relatives using digital tools. Reflection aims to bring out the feelings, knowledge, new experiences that the students had during the activities of the activity. The teacher could invite students to discuss each of the following questions:

What other social groups might have a need for the action activities that were implemented?

How can an action like this impact on the quality of life of the beneficiaries?

What did we gain on a cognitive and emotional level by implementing the action?

CONCLUSIONS

The Education and Active Citizenship is about "The embodiment of values of community involvement in education through participation in community action is expected to encourage the same behaviour as active participation of enthusiasts". The aim is to cultivate citizenship in learners/students through the development of activities and good practice in the school unit. The experience should be a springboard for action specific to an effort to become informed and actively involved in what is happening at local, European or global level.

The role of education in cultivating and promoting an active Citizen's Identity is about knowledge - skills - attitudes - values – identity, the role of teacher, the importance of participation and action, the whole educational system (oppositions, practices, attitudes, attitudes, democratic ethics) as a reflection of the social fabric. All in all active citizenship is the key to build the society of the future: cooperation, integration, participation, to antidote to the democratic deficit at all levels of society and also requires and dictates a link with lifelong learning and education.

The student, who actively participates in school events, is the one who will be an advocate for himself/herself, a responsible citizen for his/her place, and a creative citizen for the world.

Active Learning for an Active Citizenship is a flexible approach to personal and community development through experiential group learning. It advocates strategies for building strong communities by promoting personal effectiveness, social involvement and cooperation and lifelong cultivated through values of cooperation, social justice and respect for diversity. These values require community-focused/adapted (through experiences and actions), focused/adapted to the individual learner and developed through action/activity and critical awareness and reflection. This can be done through active learning in civic education by reinforcing knowledge, values, attitudes and skills are not something fixed, practicing problem solving, solving controversial issues, individual and collective modes of action, giving greater responsibility by learners for content and how they act in areas of interest to them, creating an investigative mind by reviewing of challenges and questions, dare to doubt the answers, cultivating a spirit which can go beyond the narrow context of the one being studied and see the wider context, relevance and usefulness. In addition, cultivating the ability to retrieve and process information and the commitment to personal responsibility: I demonstrate that I can be effective and able to take responsibility for what I learn and want to learn.

The role of the educator is to have civic professionalism. The teacher as an active citizen should have participation and action in community affairs, an open and creative spirit, should deconstruct personal prejudices and processing of life facts, ought to adopt a holistic approach to knowledge: Knowledge level (I know), understanding level (I understand: myself and others, concepts, motives, words and key terms, processes), collaborative level (values: choose, respond, respect, value myself and others), and action Level (decision making, effective communication, active non-violence).

In order to achieve all the above education practices should be adopted such as participation in educational affairs, project submission to the school community (Service Learning), school-community partnership, decision-making and action, promotion of 'good practices, communication on the results and outcomes of an active action and attitude, participation, both formal and informal. We should not forget that active citizens are made not born! In other words, active citizenship needs a good education, encouragement. Active citizenship is about each of us, but also about governments, businesses, media, associations and organisations. It is about how we connect with each other, how we create together common values for a better society. Furthermore, it is about the capacity and action of citizens in the community. It is about the communities that need to work directly together or through elected representatives to bring political, economic, social power to the forefront in the pursuit of common goals. The key to the success of active citizenship is the persistence of the process and not the outcome itself. Educational efforts to achieve objectivity while respecting diversity can offer important contributions to building democratic societies that allow people who share diverse interests to interact freely.

According to research results, at the educational level developing intercultural competence means moving from a monocultural and ethnocentric school to a pluralistic, intercultural and inclusive school. The teacher who wishes to serve this intercultural school should first identify and highlight in a critical and reflective way all those perceptions and practices that reflect the dominant ideology and unequal power relations that either explicitly or implicitly exist within the school and stand in the way of its interculturalisation. In order to respond to these conditions, he/she needs to be distinguished by skills of empathy, flexibility, to be able to be critical of the obviousness of his/her culture and to reflect on his/her stereotypes and prejudices. At the same time, he/she needs to be open to new knowledge about other social groups and their cultural products, in order to understand the cultural background of his/her students and to use this knowledge in the educational process in order to make it interesting and effective. In terms of values, it must recognise human dignity and the right of all children to develop their personality in its entirety (Barrett, 2018; Byram, 1997). Fostering intercultural understanding is crucial for promoting empathy, respect, and cooperation among people from different cultural backgrounds. Intercultural understanding enables individuals to navigate cultural differences effectively, embrace diversity, and collaborate with others to address global challenges such as climate change, poverty, and social injustice (Lyu, 2024).

This means that the interculturally competent teacher needs to take action and support with appropriate pedagogical approaches also students who do not belong to the dominant cultural group, ensuring equal learning opportunities. Thus, alongside the learning of the dominant language and the dominant culture, pupils should be supported in understanding the linguistic and cultural elements of their family culture and experimenting with alternative models of identities of their immediate socio-cultural context, composing their own unique personal identity (Auernheimer, 1995). In such a context, several studies emphasize the need to train teachers not only theoretically but also experientially, focusing on managing the diversity of the student population in practice (Kaldi et al, 2018).

As the research revealed one of the most effective teaching methods involves the use of digital tools based on artificial intelligence and game-based learning, as they enhance listening, speaking, reading, and writing skills, which are considered critical for multilingual students in the context of fostering intercultural competence and acquiring language proficiency (Kazu & Kuvvetli, 2025). Problems arise from limited resources and teacher training, which makes teachers less able to effectively teach multiculturalism (Sarnita & Titi Andaryani, 2023; Yusuf & Wahyuni, 2024). A teacher acts as a class manager, designing and creating an inclusive, safe, and conducive learning environment for student development (Umam & Ferianto, 2023)

Teachers' agency, that is, the degree to which the teachers feel accountable towards the enacted curriculum, plays an important role within educational reform initiatives, related or not to citizenship education (Leeman et al., 2020).

Generally, values of democracy and tolerance are integrated into the curricular subjects (Menezes, 2021), and a recent national strategy on citizenship education (DGE, 2017) promoted the teaching of citizenship and participation explicitly at all schooling levels. Focused on social and educational co-responsibility in both students and teachers, various training activities connected to education for global citizenship and sustainable development can be implemented in coherence to guarantee the right to education in accordance with the GCE (Ancheta-Arrabal & Cercos-Chamorro, 2024).

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GRAĐANSKO VASPITANJE U MULTIKULTURALNOM ŠKOLSKOM OKRUŽENJU: OD TEORIJE DO PRAKSE

Apstrakt. Građansko vaspitanje ima za cilj da pomogne učenicima da razumeju i poštuju osobe sa različitim kulturnim vezama, da efikasno i sa uvažavanjem reaguju u interakciji i komunikaciji, da izgrade pozitivne i konstruktivne odnose, kao i da postanu svesni i razumeju pretpostavke, predrasude i stereotipe, kao i otvorene i prikrivene oblike diskriminacije. Ovo istraživanje ima za cilj da obezbedi neophodan teorijski okvir i nastavna sredstva koja doprinose razvoju specifičnih socijalnih veština učenika srednjih škola, a koje će im omogućiti razvoj osnovnih životnih veština potrebnih u savremenom društvu za lično ispunjenje i razvoj, socijalnu integraciju, inkluziju i međusobno poštovanje. Istraživanje je sprovedeno u školskoj 2023/2024. godini na uzorku od 50 učenika srednjih škola, a dobijeni rezultati su analizirani kvalitativno. Istraživanje je obuhvatilo karakteristike nove društvene i obrazovne stvarnosti i razjasnilo osnovne principe interkulturalnog učenja, kao i veštine koje je potrebno da učenici razviju kako bi postali aktivni građani multikulturalnog društva sa visokim stepenom etničke i kulturne raznolikosti. Realizovane su aktivnosti usmerene na razvijanje empatičkog razumevanja, poštovanja različitosti, interkulturalnih komunikacionih veština i sposobnosti za dijalog. Rezultati istraživanja ukazuju na to da su podsticane vrednosti i stavovi povezani sa demokratijom i vladavinom prava, poštovanjem ljudskih prava i obrazovanjem za socijalnu pravdu. Takođe, kroz aktivnosti su učenici razvijali sposobnost sagledavanja više perspektiva, sposobnost distanciranja od sopstvenog stanovišta i uvažavanja stavova drugih, razumevanja i reagovanja na misli, uverenja, vrednosti i osećanja drugih ljudi, kao i razvijanje sposobnosti posredovanja u situacijama kulturne raznolikosti.

Cljučne reči: aktivno građanstvo, inkluzija, demokratija, građansko vaspitanje

Original research paper

HARNESSING TRANSDISCIPLINARITY AT THE PRIMARY EDUCATION LEVEL

UDC 373.3:371.3
371.25

Natalia Popa 

Faculty of Education Sciences, “Ion Creangă” State Pedagogical University of Chisinau,
Moldova

Abstract. *This study outlines the theoretical and methodological landmarks of transdisciplinarity within the context of implementing the educational process at the primary education level. It argues that optimizing the instructional-educational process, through the lens of transdisciplinarity, requires the adoption of flexible teaching strategies that facilitate the curricular integration of school subjects. This approach stimulates the development of higher-order cognitive skills, enabling students to identify relationships between the components of a system, synthesize information, and integrate it into complex cognitive structures, thus contributing to the formation of advanced hierarchical mental representations. Transdisciplinarity promotes integrative thinking and emphasizes the importance of the dynamic interaction between the student and the source of knowledge, stimulating metacognitive processes similar to critical and creative thinking. The study highlights the necessity of pedagogical individualization and differentiation in organizing the educational process at the primary education level, also presenting an analysis of relevant normative documents. Transdisciplinary competences specific to school subjects are identified, and transdisciplinary teaching activities applicable at the primary education level are proposed, promoting a personalized approach to the learning process.*

Keywords: *transdisciplinarity, primary level of education, transdisciplinary activities, specific competence, individualization, differentiation*

INTRODUCTION

Transdisciplinarity represents an imperative of reality because current educational paradigms are receiving new interpretations. As a result, the educational process is not solely the exclusive outcome of the teacher's activity, but rather a complex cognitive process and an intra- and interpersonal social activity. The distribution of the learning process differs from one student to another, both in space and time. The opportune moment for acquiring knowledge can no longer be assumed or imposed, as researchers M. Ardelean and V. L. Pop affirm (Ardelean & Pop, 2011).

Corresponding author: Natalia Popa

Faculty of Education Sciences, “Ion Creangă” State Pedagogical University of Chisinau, Moldova
E-mail: popa.natalia@upsc.md

Transdisciplinarity guides an integrated curriculum approach, centered on real-world issues in everyday contexts. It focuses on solving real-life problems to develop competencies for life and society (Bâlici, Callo, etc., 2022, p.22).

TRANSDISCIPLINARITY. THEORETICAL LANDMARKS

According to researcher Basarab Nicolescu (2000, 2007), the notion of transdisciplinarity was first proposed by Jean Piaget in 1970 (Nicolescu, 2000, p. 232). „Extending his professor Eugen Lupașco's reflection on investigating nature at different orders of magnitude, Basarab Nicolescu came to define transdisciplinarity with the help of three methodological postulates:

The existence of multiple levels of reality and perception, with specific laws (the infinitely small, the human scale, the infinitely large);

The logic of the included middle;

Complexity” (Explanation of words specific to the theology and science domain).

„Transdisciplinarity, as the prefix 'trans' indicates, concerns what is at the same time between disciplines, what passes through them, and what is beyond any discipline. Its ultimate goal is to understand the contemporary world, with one of its imperatives being the unity of knowledge” (Nicolescu, 2007).

Researcher Basarab Nicolescu maintains that disciplinarity and transdisciplinarity „are not antagonistic but complementary, both methodologies being founded on the scientific spirit” (Nicolescu., 2000, p. 233). From the perspective of reality, the space between and beyond disciplines is filled with multiple pieces of information (“Transdisciplinaritatea”, 2024).

Disciplinary research refers to one and the same level of reality, but most frequently, it refers to fragments of the same level of reality. At the same time, we must mention that transdisciplinarity is concerned with „the dynamics caused by the simultaneous action of multiple levels of reality” (“Transdisciplinaritatea”, 2024). The unveiling of this dynamic is found in disciplinary knowledge. Transdisciplinarity does not represent a new discipline or a super-discipline; rather, it stems from disciplinary research, which is clarified in a new manner while simultaneously avoiding transdisciplinary knowledge (“Transdisciplinaritatea”, 2024).

Transdisciplinarity differs from multidisciplinary and interdisciplinarity through its ultimate goal: understanding the current world, an aim that does not fit within the research of a single discipline. The ultimate goal of multidisciplinary and interdisciplinarity is always research at the level of a single discipline. Transdisciplinarity is frequently likened to interdisciplinarity and multidisciplinary, just as interdisciplinarity is likened to multidisciplinary. This phenomenon can be explained by the fact that all three transcend the boundaries of disciplines (“Transdisciplinaritatea”, 2024).

According to researchers in the field of pedagogy, the goal of effective education is preparation for life. In this sense, the school plays a promotional role with „multiple functions, capable of effectively responding to the psychological and social needs of the student, ensuring the optimal framework for their well-being” (Ardelean & Pop, 2011, p. 8).

In the traditional education system, monodisciplinarity (the unilateral, rigorous, and correct staggering of information proposed for study) predominates. However, frequently, transferable elements, which are outside the discipline, and elements of transdisciplinarity are lacking. Researcher Basarab Nicolescu (2007), when formulating the definition of transdisciplinarity, mentioned that „because we are currently in the midst of an intelligence revolution, we must understand that transdisciplinarity reveals the poetic dimension of

existence, traversing, as I said, all disciplines, beyond them. However, it should not be confused with pluridisciplinarity and interdisciplinarity” (Nicolescu, 2007).

In this context, we wish to clarify the notions of monodisciplinarity, pluri/multidisciplinarity, interdisciplinarity, and transdisciplinarity.

Thus, monodisciplinarity implies the implementation of „separate, independent disciplines, which are considered isolated; the importance of each discipline, seen as a whole, is emphasized. When speaking of monodisciplinarity, the absence of integration elements beyond the intradisciplinary level is highlighted” (Ardelean & Pop, 2011, p. 10).

Pluridisciplinarity / multidisciplinarity represents a “superior form of interdisciplinarity, consisting of the overlapping of elements from various school disciplines that collaborate with each other. Content/a subject belonging to a concrete domain is analyzed from the perspective of several disciplines, which retain their structure and conceptual independence” (Ardelean & Pop, 2011, p. 10).

Interdisciplinarity necessitates „cooperation between related disciplines; it is a less developed form of communication, integrating disciplines, which implies the intersection of curricular areas. Interdisciplinarity is focused on the formation of transversal competencies, with greater durability over time”.

Transdisciplinarity is approached as „the interpenetration of several disciplines, in the form of curricular integration, with the possibility of establishing, over time, a new discipline or a new field of knowledge, through what is called fusion – the most radical phase of integration” (Ardelean & Pop, 2011, p. 10).

Transdisciplinarity differentiates itself from other concepts, interdisciplinarity and pluridisciplinarity, by its ultimate goal, the understanding of the present world, which is not confined to the study of a single discipline. The goal of interdisciplinarity and pluridisciplinarity is based on disciplinary knowledge. Transdisciplinarity is indispensable because the paradigms of the educational process are constantly changing, gaining new interpretations. As a final outcome: “learning is no longer the exclusive result of the teacher's efforts, but rather a complex cognitive process, an intra- and interpersonal social activity; this differs from one individual to another in space and time. The appropriate period for acquiring knowledge can no longer be predicted or imposed; only the lesson can be localized in space and time in the classroom” (Ardelean & Pop, 2011, p. 11).

„Transdisciplinarity involves the study and exploration of complex processes and phenomena, so that through the coordination of research and the corroboration of its results, new disciplines can be formed. Its ultimate goal is the understanding of the present world, one of its imperatives being the unity of knowledge” (Gavrilă, et. al., 2015, p. 21). Transdisciplinary research targets what is simultaneously within various disciplines, between disciplines, and beyond any discipline. Transdisciplinarity involves studying and exploring complex processes and phenomena so that through the coordination of research and the corroboration of its results, new disciplines can be formed. Its ultimate goal is to understand the present world, one of its imperatives being the unity of knowledge. For example, problems related to education for change and development can be addressed by a team consisting of philosophy, psychology, sociology, pedagogy, economics, geography, biology teachers, etc., within synthesis lessons, seminars, conferences, and debates. Transdisciplinarity leads to the intensification of relationships between disciplines and the discovery of new horizons of knowledge (Gavrilă, et. al., 2015, p. 22).

Researchers Ardelean M. and Popa V.L. (2011) affirm that in the 21st century, the differentiation and individualization of the educational process, and the integrated approach to competencies, become mandatory. Transdisciplinarity allows for: the formation of transferable competencies in students; the development of communication skills, self-

knowledge, self-awareness, assuming roles in a team, and the formation of prosocial behavior; formative assessment. At the same time, transdisciplinarity is oriented towards: the creation of mental models based on transfer and integration that determine success in the personal and social life of the learner; the development of the “learning to learn” competence; personalized reading of the school curriculum and the elaboration of conceptual (cognitive) maps (Ardelean & Pop, 2011, p. 11).

The move toward integrated curriculum models highlights the profound pedagogical efficacy of the transdisciplinary approach to learning. This approach offers a range of key benefits that fundamentally restructure the teaching and learning process. Crucially, it facilitates a reciprocal, one-to-one (bijective) learning relationship between the educator and the learner, moving beyond traditional hierarchical models. As articulated by Ardelean and Pop (2011, p. 11-12), this shift promotes a transition toward a deep, meaningful, and conceptually useful type of learning that is sustained throughout the entire school year. The transdisciplinary framework is inherently designed to enhance student engagement by immersing learners in challenging, meaningful real-world problems that are adapted to their cognitive level and zone of proximal development. This focus on authentic inquiry prioritizes collaborative investigation, integrated learning, and the systematic identification and resolution of problems. By providing an adequate structure for organizing newly acquired knowledge, the approach powerfully enables the acquisition and application of knowledge in new and complex contexts, thereby fostering effective knowledge transfer across vertical and horizontal curricula and facilitating the generation of new knowledge. Furthermore, its methodology maintains a strong and beneficial correlation with continuous and predominantly formative assessment methods.

In modern pedagogy, transdisciplinarity occupies a separate place and is constantly developing. It refers to „the approach of domains/subdomains, ideas, concepts, and the development of research that contributes to the emergence of new disciplines or fields of study. In terms of action, it is recommended to extend research into domains that give rise to these evolutionary states, to provide foundations and experiences for future approaches and discoveries. Efficient management and combination depend on theorists, designers, and practitioners, so that the student is provided with a correct understanding of the surrounding reality, without risking elements of superficiality, lack of depth, and rigor in knowledge” (Gavrilă, et. al., 2015, p. 79-80).

The new educational model is based on inter- and transdisciplinary learning and contributes to the acquisition, formation, and development of 5 fundamental competencies: learning to know (to acquire knowledge); learning to do; learning to live together with others; learning to be; learning to transform oneself and change society (Bâlici, Callo, etc., 2022, p. 6).

Thus, in current society, a person who continuously learns from all possible sources, using all available means, is much more valued. For these reasons, the school’s mission is to equip the student, from early schooling, with those key competencies that „allow them to adapt to the ever-changing conditions of life, to face all challenges of society” (Bâlici, Callo, etc., 2022, p. 6).

Consequently, it is evident that monodisciplinary teaching provokes students towards a disintegrated vision regarding the imperatives of reality. Therefore, it is considered necessary to outline transdisciplinary competencies through integrated study objectives, moving “in depth towards certain themes” (Cucoş, 2017, p. 73). C. Cucoş writes that „a certain theme with a transdisciplinary character can be approached multi-modally and multi-directionally, by engaging several interpretative profiles.” At the same time, the researcher mentions that „it is necessary to combine several approaches, both specialized, deeply disciplinary (...), but

also integrated, through transdisciplinary surveys, organized by themes or problems, where high-level processing and re-signification should dominate” (Cucoş, 2017, p. 74).

The transdisciplinary approach can be realized based on open initiatives towards the integrated approach of school disciplines, which, by interrelating, are oriented towards „the main direction of action aiming first at the intuitive-reflective identification of the parts of the whole, then the synthesis of information and its integration into structures that allow hierarchical and superior representations of knowledge” (Cucoş, C., 2017, p. 169). Transdisciplinary learning values aspects of integrated thinking, „the quality of relationships between the learner and the source of knowledge,” and helps to form interdependent relationships between the learning process and action that are similar in structure to those of creative thinking. Emphasis is placed on aspects of individualization and differentiation, being considered effective in the process of organizing education (Bâlici, Callo, etc., 2022, p. 18).

TRANSDISCIPLINARITY. METHODOLOGICAL AND CURRICULAR LANDMARKS

Within learning, teachers have the opportunity to resort to different aspects: initiative, structural adaptability, imagination, creativity. Learning can become more dynamic, more flexible, and more efficient in relation to the orientations valued within transdisciplinarity and can provide the answer to the necessity of realizing the basic components of education valued in experiences that lead to the valorization of creative potential.

The transdisciplinary approach must be in accordance with the logic of the development of postmodern sciences and respond to the requirements of the national curriculum and the possibility of acquiring, forming, and developing key/transversal competencies. As Basarab Nicolescu states, it is oriented towards valuing all dimensions of students' personalities and implies establishing a balance between effective and affective, information and thinking, ethical and aesthetic. It is an open approach because it transcends all limits of favored knowledge domains, these being intuition, sensibility, imagination (Bâlici, Callo, etc., 2022, p. 18).

A real approach to human experience has openings towards ontology, existence, and phenomena. Any problem, any phenomenon addressed within and outside lessons, to be understood, requires reference to its integral character, the primary goal of the school being the acquisition, formation, and development of the competence to learn how to learn. This becomes achievable if teachers apply the interrogative-explanatory style, which can be characterized as open, creative, investigative, but little valued, which provokes students to ask questions, reflect, debate different ideas, seek necessary arguments, approach any activity from all possible and accessible sides, see the world integrally, decipher, and choose reasonable solutions to the created situation (Bâlici, Callo, etc., 2022, p. 19).

Referring to the methodological aspects of transdisciplinarity, we must clarify some notions: method, its structure, and present those possible to approach from a research perspective.

Firstly, as several researchers affirm, „methods represent working tools for both the teacher and the students. They have a scope covering all components of the didactic process, with implications for teaching, learning, and assessment” (Ardelean & Pop, 2011, p. 23).

The National Curriculum for Primary Education in the Republic of Moldova (2018) recommends transdisciplinary approaches:

- Integrated into a school day – 7 days per year;

- Integrated into a lesson – especially moral-spiritual education and personal development lessons (Ministry of Education and Research of the Republic of Moldova [MERRM], 2018, p. 247).

The theme of transdisciplinary activity days is: *School without textbooks: let's better understand the world around us, let's become better*. For transdisciplinary activity days, no homework is assigned. Children come to school without textbooks and notebooks. In some cases, at the teacher's request, they bring the necessary materials for the planned activities (MERRM, 2018, p. 247).

As a tool for determining the integrative framework of transdisciplinary activity days, the curriculum proposes a generative matrix consisting of seven generic contents with thematic subjects recommended for each class. Generic contents determine the framework for transdisciplinary formation of values and attitudes. Transdisciplinary thematic subjects outline contexts linked to students' daily lives and enable communication between the flow of information traversing the external world and the flow of consciousness traversing the child's inner universe (MERRM, 2018, p. 247).

Depending on the needs and preferences of the students, available resources, etc., the teacher will choose the generic content for the respective day (5-7 contents per year). The thematic subject can be chosen from those recommended or proposed by the teacher/students/parents (MERRM, 2018, p. 247).

Any method includes in its structure a number of operations ordered in a certain logical sequence. Any method appears as a set of procedures that, depending on the situation and content addressed, can change or take on another function. The didactic method, in itself, represents a plan of actions conceived for initiating and utilizing learning situations. „The choice of instructional method depends on two categories of factors:

- Objective (nature of objectives; internal logic of science; learning mechanisms, etc.)
- Subjective (human and didactic context in which the method is applied; teacher's personality; student/class psychology), students' learning styles, etc.” (Ardelean & Pop, 2011, p. 23).

Referring to the methodological suggestions for transdisciplinary activities reflected in the Curriculum Implementation Guide for Primary Education (2018), we find recommendations regarding the application of different types of learning.

Adventure/expeditionary learning „represents a way for students to actively and interactively participate in the didactic process, which involves creating groups (preferably from different socio-cultural backgrounds) and 'immersing' them (for a certain period of time) in areas with high potential for geographical, social, and cultural exploration” (MERRM, 2018, p.248). The major goals of applying this method are: „exploring the environment (natural and social), conducting investigations and micro-research, and carrying out personal and collective reflections on environmental, local, and global community issues, with a view to personal cognitive, social, and cultural development” (MERRM, 2018, p.248).

Adventure learning is aimed at promoting collaboration among students, an integrated approach to individual development, and group development. The method credits some elements of problem-based learning and project-based learning, as well as action research elements (Bocoş, 2013, p. 351-352).

Experiential learning is „the process by which knowledge is created from direct experience, in the sense of the well-known expression 'learning from experience.'” It is learning based on reflection on what is being done, similar to „learning through adventure, through action, through cooperation, through community service. In this case, the individualized learning process is emphasized, and intervention occurs only when a person

is engaged in an activity, approaches the activity critically, draws congruent conclusions, and applies solutions in practice” (MERRM, 2018, p.248). Experiential learning has three components:

- Knowledge (concepts, facts, prior experience);
- Activities (knowledge applied in current or ongoing activities);
- Reflection (thinking based on the analysis and evaluation of one's own activities and contributions to personal development) (9).

„Phases of experiential learning (David Kolb's model: ELM – Experiential Learning Model):

- Concrete experience;
- Exploration, observation, and reflection;
- Generalization of experience;
- Active involvement” (MERRM, 2018, p.248).

Collaborative learning „is a form of collaborative learning, an instructional technique in which students work in groups to achieve common goals, with each of them contributing individually.” Researcher Muşata Bocoş states that collaborative learning is „a didactic method based on the organization, according to well-established operational objectives, of collective work founded on complementarity and teleological convergence, aimed at ensuring the social aspect of learning and targeting the development of interpersonal communication skills, interactions, competencies, and social behaviors of an interactionist and communicative type in students. It values students' need to work together as a true team, in a collegial, supportive climate, to correct each other, to activate, update, and review their prior knowledge, to exercise their active, logical, divergent, and creative thinking” (Bocoş, 2013, p. 319, MERRM, 2018, p.248).

Discovery learning „represents that mode of active and interactive student participation in the didactic process, which consists of conducting one's own, independent (individual or collective) investigative activities, oriented towards researching, reconstructing, and rediscovering scientific truths and the methods of their elaboration” (MERRM, 2018, p.249). A student learns through discovery when a problem arises before them, but no known method fits for its solution, „when they study it deeply, restructuring its data and analyzing its connections and constraints, when they imagine variants of solution, when they find the optimal one, apply it, and find solutions (which represent new knowledge, a correlation, a conditioning, a rule, a regularity, a working method, a procedure, a technique, etc.) through the act of discovery” (Bocoş, 2013, p. 308-309).

Research-based learning involves the direct and active participation of the student together with the teacher in scientific research activity, in reviewing the scientific process of knowledge formation. The authority of the teacher is replaced by scientific cooperation for the experimental argumentation of authenticity. Becoming a powerful source of motivation, this improves the teacher-student relationship and develops the student's ability to work independently, the ingenuity of the learner, and conducts research for their own self-realization, for the discovery and argumentation of scientific realities (The Timiş Center for Culture and Development, 2024, p. 38-39).

Problem-based learning „represents that mode of active and interactive student participation in the didactic process, which consists of placing them in learning situations where they must solve an insufficiently structured, contextualized problem that reflects aspects and fragments of the real world, through direct experiences, realized through their own effort.” It simultaneously develops opportunities for selecting problem-solving strategies and the involvement of one's own acquisitions from different school disciplines

(MERRM, 2018, p.249). Problem-based learning creates situations for students to identify a problem, define it accurately, identify the information needed to understand it and the resources required to collect the necessary information, generate possible solutions, and present the discovered solutions (Bocoş, 2013, p. 342).

Project-based learning is considered a learning strategy that requires students' involvement in „learning content and developing skills through an enhanced process, structured around genuine and complex questions/problems, resulting in one or more products. This learning strategy 'involves collecting information, processing and systematizing it, interpreting and personal reflection, and cooperation in performing tasks'" (Bocoş, 2013, p. 216-217).

„Stages in completing a project:

- Presentation/Choosing the theme;
- Organizing project activity: forming teams; assigning roles (tasks); (MERRM, 2018, p.249)
- Exploration and information gathering;
- Practical realization;
- Implementation (if applicable);
- Presentation, self-assessment" (MERRM, 2018, p.250).

Task-based learning „involves exploring and initiating actions in specific real-life situations, which become learning frameworks. This type of learning combines the following specific elements: students are faced with a task to be solved (presented by the teacher or a textbook); students plan their actions and implement the action plan; students reflect on their learning process and present their results" (Living Democracy, 2025).

„Phases of task-based learning:

- Simulating reality in the classroom (role-playing games; decision-making games; conferences, etc.);
- Exploring actions in specific real-life situations (interviewing a specialist; street interviews; case studies, etc.);
- Result of the activity (presentation; poster; flyer; bulletin; exhibition; portfolio, etc.)" (MERRM, 2018, p.250).

Learning through excursions, as researcher Constantin Cucuș states, involves “organizing activities in the midst of nature and social life and confronting children with reality through an active, investigative perception of geographical areas and historical sites, through direct actions on objects and phenomena in the environment. Children examine with attention and curiosity, respond to requests to perform analyses and comparisons to determine the essential characteristics of the things they come into contact with, to spontaneously observe some natural phenomena in their movement and development, and, with help, grasp some causes that determine them” (Alexandrache, 2024).

Learning in museums/museum education is a method that aims to identify and authenticate strategies that lead to the valorization of the formative virtues of the museum space, connecting the interaction between museum and school from an educational perspective. Museum learning objectives are correlative but not identical to those promoted by educational institutions. They are more focused on the formative axis, aimed at forming evaluative attitudes and behaviors, and broader cultural competencies, for signifying or integrating new learning values or experiences (MERRM, 2018, p.250). Learning activities, carried out in correlation with the museum, can be varied: organized/thematic visits, circles organized by the museum, museum excursions, competitions, symposia, roundtables, musical evenings, etc. Experiences accumulated in museums can be utilized by creating

portfolios, documenting for presentations, organizing debates on established themes. Learning in museums is usually done individually or in small groups and is certainly based on the observation and research of a specific object (Cucuă, 2014, p. 8, MERRM, 2018, p.250).

Within transdisciplinary activity days, evaluation strategies can be formative: interactive formative evaluation, self-evaluation, peer evaluation, systematic observation of students' behavior during didactic activity (interrelationships, behavioral actions) (MERRM, 2018, p.251). However, formative evaluation in stages or summative evaluation (possibly annual) is also possible through complementary methods for some disciplines (where grades are not awarded: moral-spiritual education, personal development, sciences, visual arts education, and technological education). In such a case, the teacher can choose the products to be evaluated either from the list of those recommended in the disciplinary curricula for the respective class; or the list of transdisciplinary proposals; or by personally developing the product (MERRM, 2018, p.251).

The extensive discussion on transdisciplinarity reveals it as a critical and evolving educational imperative in the 21st century. It's clear that traditional monodisciplinary approaches are no longer sufficient to address the complexities of our modern world. Transdisciplinarity, unlike its cousins multidisciplinary and interdisciplinarity, aims for a deeper, more unified understanding of reality by exploring what lies between, though, and beyond individual disciplines.

The shift towards transdisciplinarity fundamentally redefines the learning process. It moves beyond the teacher as the sole fount of knowledge, recognizing learning as a complex, multifaceted cognitive and social activity that is highly individualized in its spatial and temporal manifestation. This paradigm challenges the rigid imposition of learning moments, advocating for an educational environment that fosters transferable competencies, communication skills, and prosocial behaviors, while also promoting formative assessment.

Moreover, transdisciplinary learning encourages the development of mental models that facilitate knowledge transfer and integration, fostering a „learning to learn” competence vital for lifelong adaptation. The advantages are numerous, including a more dynamic student-educator relationship, deeper conceptual understanding, and engaging students with real-world problems. It emphasizes collaborative investigation, integrated learning, and the application of knowledge in novel, complex situations, allowing for the horizontal and vertical transfer of knowledge across disciplines and into daily life.

Modern pedagogy embraces transdisciplinarity as a means to respond to the demands of a rapidly changing world. By combining specialized disciplinary depth with integrated, thematic, transdisciplinary surveys, education can equip students with the ability to perceive the world holistically and to engage in high-level processing and re-signification of information. This holistic approach, grounded in the principles of Basarab Nicolescu, fosters a balance between the effective and the affective, information and critical thinking, and ethical and aesthetic considerations, ultimately developing well-rounded individuals capable of transforming themselves and society.

The practical application of transdisciplinarity is demonstrated through various innovative learning methodologies, such as adventure learning, experiential learning, collaborative learning, discovery learning, research-based learning, problem-based learning, project-based learning, task-based learning, excursions, and museum education. These methods actively engage students, encourage critical thinking, and allow for the practical application of knowledge in diverse, real-world contexts. Formative assessment strategies are crucial in supporting this dynamic learning environment.

In essence, transdisciplinarity represents a profound and necessary evolution in education, guiding us toward a future where learners are equipped not just with compartmentalized knowledge, but with the integrated understanding and adaptable skills needed to navigate and shape an increasingly interconnected world.

TRANSDISCIPLINARITY. PRAXEOLOGICAL ASPECTS

From the perspective of the theoretical and methodological aspects addressed, we proposed conducting a study aimed at ascertaining the specific aspects of capitalizing on transdisciplinarity within the subject moral and spiritual education in primary grades. Consequently, we administered a questionnaire consisting of objective, semi-objective, and subjective items. The sample was comprised of teaching staff from the primary education level. The formulation of the questionnaire items took into account the theoretical, methodological, and curricular aspects of transdisciplinarity. The questionnaire was administered online and adhered to the principle of personal data protection. The content of the administered questionnaire is presented below:

Capitalizing on transdisciplinarity within moral and spiritual education lessons

Dear colleagues,

We kindly request you to allocate 10-15 minutes to complete this questionnaire.

1. What is transdisciplinarity?

a new subject

anti-disciplinarity

understanding the present world

encyclopedism

other

2. Which educational policy documents reflect recommendations regarding the capitalization of transdisciplinarity at the primary education level?

The Education Code of the Republic of Moldova (2014)

National curriculum: primary education (2018)

Guide for curriculum implementation in primary education (2018)

Methodology for implementing criterion-referenced assessment using descriptors (2019)

Methodological guidelines for organizing the educational process in primary education, by study years

School textbooks

Instruction on completing the school register

Framework education plan

Other documents

3. The transdisciplinary approach can be promoted:

over a year

over a week

over a day

during a lesson

4. Transdisciplinary activities are organized:

in the classroom

outside the classroom

other

5. What is the theme/generic title of the transdisciplinary activity days?

6. Are homework assignments planned for the transdisciplinary activity days?

Yes

No

I don't know

7. A transdisciplinary approach can be promoted within the Moral and Spiritual Education subject.

Yes

No

I don't know

8. The products obtained during transdisciplinary activities are not subject to evaluation.

Yes

No

I don't know

9. Name 3 types of learning that can be capitalized upon within transdisciplinary activities.

In order to establish the level of knowledge of teaching staff regarding the organizational aspects of the educational process in conditions of simultaneous activities, we formulated the following descriptors:

Table 1. Assessment criteria

Performance level	Descriptors
Superior level	Knows the concept of <i>transdisciplinarity</i> . Recognizes the sources of information regarding the organization of the educational process in the context of transdisciplinary education. Distinguishes the specific particularities of the educational process at the primary education level under conditions of transdisciplinary activity. Knows the generic title/theme of the Transdisciplinary Activity Days. Knows assessment aspects in the context of transdisciplinary education. Names the types of learning that can be capitalized upon in transdisciplinary activities.
Medium level	Knows the concept of <i>transdisciplinarity</i> , but is not certain of the offered answer. Recognizes several sources of information regarding the organization of the educational process in the context of transdisciplinary education. Distinguishes, with minor hesitation, the specific particularities of the educational process at the primary education level under conditions of transdisciplinary activity. Knows, with minor hesitation, assessment aspects in the context of transdisciplinary education. Knows, with minor hesitation, the generic title/theme of the Transdisciplinary Activity Days. Names the types of learning that can be capitalized upon in transdisciplinary activities.
Inferior level	Does not correctly identify the concept of <i>transdisciplinarity</i> . Does not recognize the sources of information regarding the organization of the educational process in the context of transdisciplinary education.

	<p>Does not distinguish the specific particularities of the educational process at the primary education level under conditions of transdisciplinary activity.</p> <p>Does not know assessment aspects in the context of transdisciplinary education.</p> <p>Does not know the generic title/theme of the Transdisciplinary Activity Days.</p> <p>Cannot name the types of learning that can be capitalized upon in transdisciplinary activities</p>
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Qualitatively interpreting the questionnaire results, we established and presented in Table 2 the results of the survey, identifying the performance levels (Superior, Medium, and Inferior) demonstrated by the teaching staff.

Table 2. Survey results

Performance level	Results
Superior level	30,8%
Medium level	53,8%
Inferior level	15,4%

The survey results indicate that the majority of teaching staff in primary education, while implementing transdisciplinary activities, demonstrate a medium level of knowledge regarding the praxeological aspects of transdisciplinarity.

It is observed that the majority of teachers (53.8%) are familiar with the concept and partially recognize the sources of information and the particularities of the process. This suggests a need for the clarification and consolidation of theoretical and methodological knowledge.

However, we are encouraged by the fact that 30.8% of the total number of teaching staff involved in the survey reached the superior level, demonstrating a solid understanding of the concept, the relevant curricular documents, and the specific assessment and learning aspects of transdisciplinarity.

The distribution of results underscores the necessity for effective continuous professional development interventions, which should focus on: ensuring knowledge of the provisions within educational policy documents and the methodological guidelines that regulate the capitalization of transdisciplinarity; and standardizing the understanding of the specific aspects of transdisciplinarity.

Based on the objective of administering the questionnaire for the moral and spiritual education subject, it can be concluded that there is an implicit recognition of this subject's potential to promote the transdisciplinary approach. Nevertheless, the overall results suggest that, despite the teachers affirming this possibility, the effective and correct implementation of this approach within the subject may be affected by the incomplete knowledge highlighted.

In conclusion, the study based on the questionnaire indicates a discrepancy between the intention to capitalize on transdisciplinarity and the actual level of expertise demonstrated by the teaching staff at the primary education level.

GENERAL CONCLUSIONS

The study underlines that transdisciplinarity is not merely an academic concept, but an imperative of contemporary educational reality, demanding a new interpretation of learning paradigms.

Transdisciplinarity, as defined by researcher Basarab Nicolescu, is what is at the same time between the disciplines, across the different disciplines, and beyond any discipline. Its major finality is the understanding of the current world, with the unity of knowledge as a core imperative.

The methodological postulates that define transdisciplinarity are oriented toward the existence of several levels of reality and perception, each with specific laws, and complexity. Transdisciplinarity is neither a new discipline nor a super-discipline. It differs from multi/pluridisciplinarity and interdisciplinarity in that the finality of the latter remains based on disciplinary knowledge, while transdisciplinarity aims for the understanding of the present world, beyond the limits of a single discipline.

The transdisciplinary approach at the primary education level focuses on curricular aspects, being centered on the problems of reality in the everyday context and the solving of real-life problems. In this context, the National Curriculum for Primary Education in the Republic of Moldova recommends transdisciplinary endeavors in two forms: embedded within a school day (7 days per year) and embedded within a lesson, particularly in subjects like Moral and Spiritual Education and Personal Development. The transdisciplinary activity days have the generic title: *School without textbooks: To better understand the world around us, to become better people*. For these days, no homework is planned, and students come to school without textbooks and notebooks.

The transdisciplinary approach is open and flexible, surpassing the limits of knowledge and favoring intuition, sensibility, and imagination. The primary curriculum implementation guide recommends the application of various learning types that can be capitalized upon in transdisciplinary activities: adventure/expeditionary learning; experiential learning; collaborative learning; discovery learning; research-based learning; problem-based learning; project-based learning; task-based learning; learning through excursions; and museum education.

Within transdisciplinary activities, the evaluation strategies are predominantly formative (interactive formative evaluation, self-assessment, peer evaluation, systematic observation of student behavior). Summative evaluation (potentially annual) is also possible through complementary methods for subjects that do not assign grades, including Moral and Spiritual Education.

Although the theory of transdisciplinarity offers a coherent framework for integrated, deep, and competence-centered learning, the experimental study indicates a discrepancy between the theoretical vision and effective methodological implementation. The medium level of knowledge of praxeological aspects suggests that the vast potential of transdisciplinary methods is not being capitalized upon to its optimal capacity by teaching staff at the primary education level.

Based on the conclusions previously formulated, the following recommendations are imperative, focusing on theoretical and methodological aspects:

Integration into continuous training programs of modules that distinctly delineate transdisciplinarity from multidisciplinary and interdisciplinarity, emphasizing the specific finality of transdisciplinarity: the understanding of the present world and the unity of knowledge.

Training interventions must guarantee a detailed knowledge of educational policy documents and methodological landmarks that regulate transdisciplinarity.

Focusing on transdisciplinarity-specific methods, meaning that professional development programs should be centered on the active demonstration and practice of the learning types that can be capitalized upon within transdisciplinarity.

Teaching staff must be encouraged and trained to apply the interrogative-explanatory style, characterized as open, creative, and investigative, which prompts students to reflect, debate, and adopt an integrated approach to the world.

Through the implementation of these recommendations, the gap between the curricular vision and school practice can be reduced, ensuring a more efficient and correct capitalization of the transdisciplinary potential at the primary education level.

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PRIMENA TRANSDISCIPLINARNOSTI NA NIVOU OSNOVNOG OBRAZOVANJA

Apstrakt. Ova studija razmatra teorijske i metodološke okvire transdisciplinarnosti u kontekstu realizacije vaspitno-obrazovnog procesa na nivou osnovnog obrazovanja. Polazi se od stava da optimizacija nastavnog i obrazovnog procesa, posmatrana kroz prizmu transdisciplinarnosti, zahteva primenu fleksibilnih nastavnih strategija koje omogućavaju kurikularnu integraciju školskih predmeta. Ovakav pristup podstiče razvoj kognitivnih veština višeg reda, omogućavajući učenicima da uočavaju odnose između elemenata sistema, sintetišu informacije i integrišu ih u složene kognitivne strukture, čime se doprinosi formiranju naprednih hijerarhijskih mentalnih reprezentacija. Transdisciplinarnost podstiče integrativno mišljenje i naglašava značaj dinamičke interakcije između učenika i izvora znanja, stimulišući metakognitivne procese slične kritičkom i kreativnom mišljenju. U radu se ističe potreba za pedagoškom individualizacijom i diferencijacijom u organizaciji obrazovnog procesa na nivou osnovnog obrazovanja, uz analizu relevantnih normativnih dokumenata. Identifikuju se transdisciplinarne kompetencije specifične za školske predmete i predlažu transdisciplinarne nastavne aktivnosti primenljive u osnovnom obrazovanju, koje doprinose personalizovanom pristupu učenju.

Ključne reči: transdisciplinarnost, osnovno obrazovanje, transdisciplinarne aktivnosti, specifične kompetencije, individualizacija, diferencijacija

Professional article

MODULAR TEACHING OF NATURE AND SOCIETY

UDC 371.2:[371.3:3/5

Ivko Nikolić¹ , Ljiljana Mitić² , Emilija Tasić Stanojković³

¹Faculty of Teacher Education, University of Belgrade, Serbia

²Pedagogical Faculty in Vranje, University of Niš, Serbia

³Wichtel Academie Obersendling, Munchen, Germany

Abstract. *In contemporary educational systems, there is an increasing emphasis on improving teaching methods in accordance with new pedagogical theories and the development of educational technologies. One of the approaches that stands out due to its flexibility and student-centered orientation is modular teaching. Modular teaching represents a model of organizing the educational process through thematically and functionally integrated units, modules that enable students to actively engage in learning through various sources of knowledge, work methods, and forms of participation. In the context of the subject Nature and Society, this model allows for the connection of theoretical content with students' everyday experiences, the development of functional knowledge, and the encouragement of critical thinking and a spirit of inquiry. The interdisciplinary dimension of modular teaching is particularly significant, as it contributes to a better understanding of cross-curricular connections and prepares students for complex life situations. This paper analyzes the fundamental principles of modular teaching, its advantages in terms of individualization and active learning, as well as the challenges related to its implementation in the school context. Furthermore, specific guidelines are presented for the successful application of the modular approach in teaching Nature and Society in primary education, with a focus on contemporary didactic practices and an inclusive approach to learning.*

Keywords: *modular teaching, Nature and Society, education, active learning, thematic planning, interdisciplinarity*

INTRODUCTION

Modern education is increasingly confronted with the need to innovate teaching approaches in line with contemporary pedagogical theories, technological advancements, and students' evolving needs. One of the modern models that addresses these challenges is modular teaching, which is based on thematically and functionally connected content planning through clearly defined modules. This model is particularly effective in teaching the subject *Nature and Society*, as it enables the integration of theoretical knowledge with students' practical experiences, the development of functional knowledge, and the encouragement of both inquiry-based and critical thinking. Modular teaching also facilitates the individualization of the learning process, allows for the inclusion of diverse teaching

methods, and enables the structuring of instruction according to students' needs and interests. Given the growing demand for interdisciplinary approaches in education, modular teaching emerges as a highly valuable didactic model that promotes the integration of various educational domains and fosters the development of competencies essential for everyday life. The aim of this paper is to analyze the potential of modular teaching within the context of *Nature and Society*, providing specific guidelines for its successful implementation in primary education.

In today's society, marked by rapid change, digital advancement, and the need to develop a wide range of life skills, modular teaching proves to be a particularly relevant approach. Unlike traditional models, which often rely on frontal instruction and passive student roles, modular teaching encourages active and independent learning by prompting students to explore, ask questions, and connect curricular content with real-life situations. This model supports learning individualization, as it can be adapted to different learning styles, interests, and student needs.

Moreover, modular teaching aligns with contemporary educational policies aimed at developing functional knowledge and transversal skills such as collaboration, communication, critical thinking, and problem-solving. In the subject *Nature and Society*, which by its nature integrates multiple scientific fields, the modular approach further reinforces interdisciplinarity and enables students to acquire knowledge in the context of real-life, meaningful situations. In this sense, modular teaching not only enhances understanding of curricular content but also prepares students for active and responsible participation in modern society. It also integrates well with e-learning, online courses, and digital platforms, thereby supporting distance and hybrid learning, as well as access to various learning resources.

In the current educational landscape, systems around the world are challenged to respond to the demands of a dynamic and globalized society. Traditional teaching models, based on static knowledge transmission, are increasingly insufficient in meeting students' needs for understanding, connecting, and applying knowledge in real-world contexts. Digital transformation, the rise of the digital society, and the emphasis on 21st-century competencies such as creativity, collaboration, digital literacy, and problem-solving require a paradigm shift in education: from knowledge transmission to knowledge construction.

In this context, modular teaching stands out as a response to these changes by enabling flexible planning and delivery of instruction in accordance with modern didactic principles. Through thematically organized modules, students are encouraged to take an active role in learning, investigate everyday problems, and relate them to curricular content. Such an approach supports both horizontal and vertical content integration, as well as cross-disciplinary connections, thereby strengthening the development of interdisciplinary knowledge.

Furthermore, modular teaching aligns with the reform directions of educational systems that aim for inclusivity, differentiation, and personalized instruction to ensure equity in education and support the full development of each student's potential. In this way, the modular approach not only improves the quality of teaching but also contributes to shaping education that is modern, functional, and oriented toward the needs of both learners and society as a whole.

What is Modular Teaching?

The term "*module*" (from Latin *modulus* – measure, standard) holds various meanings across mathematics, exact sciences, and architecture, but generally refers to a unit of measure,

magnitude, or coefficient (Sokolov, 2012). The concept of modular teaching was extensively developed by Prokopenko, I. F. (1985), particularly within the context of vocational education and pedagogical technology. He defined a module as a complete didactic unit that enables independent learning tailored to the individual pace of each student. Prokopenko emphasized clearly defined learning goals and success criteria for each module, advocated for the active role of students in the learning process, meaning increased independent work and personal responsibility, and promoted a differentiated and flexible approach to teaching that could be adapted to the needs and abilities of each student. He also developed methodological guidelines for designing and implementing modules in the classroom. His contribution lies in presenting modular teaching as a systematic and practically applicable model for improving the quality of education.

An analysis of the literature shows that one of the early contributors to modular teaching was Russel, J. (1974), who defined a module as a teaching package encompassing a conceptual unit of subject matter along with prescribed student activities. According to Goldschmid, B. & Goldschmid, M. (1973), a module is an autonomous and self-contained instructional unit designed to help students achieve clearly defined objectives. Owens, G. (1995) described a module as a closed educational system comprising the teacher, student, subject matter, and instructional materials, all of which facilitate an individualized approach and interactive learning between teacher and student.

The concept of a "module" was further refined by Timofeyeva, J. F., who defined it as a relatively independent segment of a larger system with a specific functional purpose. In the context of teaching, this refers to a "dose" of information or activity sufficient for acquiring specific professional knowledge and skills.

Modular teaching is an organizational and didactic model that structures the teaching process into clearly defined, thematically complete units/modules that enable systematic, functional, and active learning. Within this approach, each module includes a specific set of objectives, content, methods, and evaluation strategies aimed at developing particular competencies and connecting knowledge with students' real-life experiences. Notes that modular teaching implies a structured yet sufficiently open learning environment that offers multiple learning pathways to achieve educational outcomes.

According to Vilotijević, M. and Mandić, D. (2022:181), in the context of education, a module refers to the structuring of teaching content into thematically coherent units. The authors list several definitions of a module:

- a) a relatively autonomous and functionally oriented part of the teaching process;
- b) a constructed whole composed of logically interrelated elements;
- c) a relatively independent component of a larger system with a specific function;
- d) a logically delineated portion of a subject's content or an integrated whole derived from multiple subjects, intended to be mastered in order to achieve a defined objective.

Key Characteristics of Modular Teaching:

1. Thematic Coherence – Each module is a self-contained instructional unit with clearly defined themes, goals, and outcomes.
2. Functional Knowledge – Emphasis is placed on applying knowledge in real-life situations and developing life skills.
3. Flexibility – Modules can be adapted to students' age, interests, and capabilities.
4. Student-Centered Learning – Students actively participate in designing activities, choose learning methods, and take responsibility for their own learning.
5. Interdisciplinarity – Modules integrate content from multiple subject areas to foster knowledge connection and broader conceptual understanding.

6. Differentiation – Content and methods are tailored to different learning styles and paces.
7. Formative Assessment – Student progress is monitored through reflection, portfolios, presentations, and other formative evaluation methods.

This approach is particularly effective in primary education, where there is greater flexibility in organizing time and content, and closer monitoring of student development is possible. Modular teaching enhances motivation, independence, and collaboration, aligning well with contemporary educational trends (Ivić, Pešikan & Antić, 2001).

FUNDAMENTAL PRINCIPLES OF MODULAR TEACHING

Modular teaching does not rely solely on organizing content into thematic units; rather, it is grounded in clearly defined didactic-methodological principles that support the achievement of modern educational goals. These principles form the foundation of the modular approach and guide its successful implementation in teaching practice. Key principles include:

1. Individualization and Differentiation
One of the core principles of modular teaching is adapting the educational process to the needs, interests, and abilities of each student. The modular approach allows students to work at their own pace, select activities and methods that suit them, and thereby fosters independence and personal responsibility for learning.
2. Active and Experiential Learning
In modular teaching, students are not passive recipients of information but active participants in the learning process through inquiry, problem-solving, experimentation, and teamwork. This approach is based on constructivist principles, where knowledge is built through personal experience (Bruner, 1966).
3. Thematic and Functional Planning
Content is organized into modules that are connected to real-life situations, enabling students to apply acquired knowledge in concrete contexts. This facilitates the development of functional and transdisciplinary knowledge, which has broader applicability and contributes to a deeper understanding of the world (Satyarthi, 2021).
4. Interdisciplinarity
Modular teaching involves the integration of content from various subject areas to enable a holistic view of topics and the development of knowledge-linking abilities. This approach enhances the development of multiple competencies and prepares students for complex tasks and real-life problems (Medar-Zlatković, 2021; Ivić et al., 2001).
5. Formative Assessment and Self-Evaluation
In the modular approach, evaluation is a continuous and formative process that tracks student progress through reflection, feedback, and self-assessment. Assessment is not limited to test results but encompasses the overall engagement of students throughout the module implementation.

MODULAR VS. TRADITIONAL TEACHING

Compared to traditional instruction, modular teaching represents a more modern and flexible educational approach that better aligns with the needs of today's students and

educational systems. The differences between these two models are reflected in several key areas:

Element	Traditional Teaching	Modular Teaching
Teacher's Role	Central figure, transmitter of knowledge	Facilitator, learning guide
Student's Role	Passive recipient of knowledge	Active participant in learning
Content Organization	Linear, textbook-based	Thematically and functionally integrated modules
Learning Approach	Reproductive, memorization-based	Inquiry-based, problem-solving, experiential
Methodology	Frontal instruction, lecturing	Group work, experiments, projects
Assessment	Summative, end-of-process	Formative, ongoing, includes self-assessment
Focus	Acquisition of facts	Development of competencies and critical thinking

According to Bruner (1966), traditional teaching often fails to stimulate deep understanding and instead encourages the accumulation of facts. In contrast, modular teaching allows students to actively construct knowledge through inquiry and experience. Emphasizes that the modular model integrates multiple disciplines into a coherent whole, thereby enhancing the relevance of educational content. Ivić and colleagues (2001) point out that modular teaching supports active learning and the development of essential skills, whereas the traditional model often neglects the individual needs of learners.

Highlights that the modular approach significantly contributes to inclusive education, as it enables differentiation and flexible learning pacing features that are difficult to achieve within traditional frameworks.

The Role of Students in Modular Teaching and the Use of Diverse Knowledge Sources

One of the core values of modular teaching is the active role of students in the learning process. Unlike traditional teaching, where students are often passive listeners and task performers, the modular approach positions them as researchers, collaborators, decision-makers, and reflective participants in their own educational development. Modular instruction encourages students to ask questions, explore phenomena, experiment, and solve problems in real or simulated life situations. According to Ivić, Pešikan, and Antić (2001:44), this approach leads to “deeper understanding, longer retention, and greater intrinsic motivation for learning.” The student's role transforms from knowledge recipients to knowledge constructors through personal engagement, while the teacher assumes the role of facilitator, offering guidance and support.

A key advantage of modular teaching lies in its openness to diverse information sources, printed, digital, visual, and experiential. Students learn not only from textbooks but also from:

- field observations,
- interviews with community members,
- documentary programs,
- scientific experiments,
- online resources,
- multimedia presentations.

This multi-source exposure promotes the development of information and digital literacy, as well as the ability to critically evaluate the reliability and relevance of sources. Emphasizes the importance of learning through multiple “entry points”, visual, auditory, and kinesthetic corresponding to various learning styles and enhancing learning effectiveness.

In modular teaching, collaborative work is strongly encouraged, including pair and group projects, as well as joint presentations. These practices foster social skills and a sense of responsibility for shared goals. Furthermore, through reflective journals, self-assessments, and portfolios, students learn to reflect on their own progress, identify challenges, and plan further development.

The Role of the Teacher in Modular Teaching of the Subject "Nature and Society"

In modular teaching, the role of the teacher differs significantly from the traditional model, in which the teacher serves as the primary source of knowledge and authority in the classroom. Within the modular approach, the teacher acts as a facilitator, organizer, and mentor in the learning process, with the central responsibility of creating conditions for active, inquiry-based, and functional learning.

1. Planner and Organizer of Modules

The teacher's role begins at the planning stage, where they design modules that are thematically linked to students' real-life experiences and integrated with other subject areas. The teacher selects content, methods, and activities appropriate to students' age and interests, ensuring the inclusion of diverse knowledge sources and the availability of learning materials. In this way, modular teaching becomes flexible and adaptable to the actual classroom environment.

2. Learning Facilitator and Motivator

During the implementation of the modules, the teacher does not transmit ready-made knowledge, but encourages students to explore, draw conclusions, and discover answers independently. The teacher employs questioning strategies, facilitates discussions, initiates experiments, and enables various forms of work—individual, pair, and group activities. Emphasizes that the teacher's role is to "create an environment in which students can learn independently, make mistakes, correct themselves, and reflect," which modular teaching fully supports.

3. Adapts Teaching to Student Needs

The teacher in modular teaching is tasked with recognizing different learning styles, levels, and paces, and with adapting content and activities to suit students with diverse educational needs. This is especially important in teaching Nature and Society, as topics are closely related to students' daily lives and allow for task differentiation (Zukorlić, 2023). In this context, the teacher also assumes an inclusive role, since the modular approach supports the equal participation of all students in the learning process.

4. Assesses and Monitors the Learning Process

The teacher employs formative assessment methods, such as portfolios, learning journals, self-assessments, and presentations, to monitor student progress throughout the module. Rather than evaluating students solely based on final outcomes, the teacher assesses their learning process, engagement, collaboration, and the application of knowledge in real-life contexts (Ivić et al., 2001).

Modular Approach in Teaching “Nature and Society” – Connecting Theory with Students’ Practice and Experience

One of the key advantages of the modular approach in teaching the subject “Nature and Society” is its ability to connect theoretical knowledge with real-life situations, making the educational content meaningful and functional for students. By its nature, “Nature and Society” allows exploration of phenomena from students’ immediate environment natural phenomena, social relations, traffic, health, culture, and tradition which modular teaching further strengthens through thematic organization.

1. Theory in the Service of Real Life

Unlike the traditional approach, where knowledge is often presented as abstract and isolated facts, modular teaching enables students to understand theoretical concepts through concrete examples from everyday life. For instance, when students learn about water as a natural resource, they not only read about its properties but, through the modular approach, can conduct simple experiments, observe local water sources, engage in discussions with community members about water conservation, thereby understanding its significance and role. According to Ivić et al. (2001), such situational and problem-based learning fosters students’ ability to connect knowledge and apply it in various contexts, achieving functional knowledge rather than mere reproductive memorization.

2. Valuing Students’ Experience and Environment

Modular teaching especially appreciates what students already know from their personal experiences, family, and local environment. Teaching is not viewed as one-way knowledge transmission but as an interaction between school content and students’ reality. This leads to greater motivation and internal drive for learning, as students recognize the connection between the curriculum and their own lives. For example, when covering the topic “Traffic in the Neighborhood,” students do not just learn traffic rules but engage in field activities—drawing maps of their neighborhood, interviewing traffic officers, observing school zone safety, and proposing solutions to identified problems. Such an approach also promotes civic education and responsibility, as students participate in real community issues.

3. Interdisciplinary Potential

Thanks to its structure, modular teaching in “Nature and Society” easily integrates elements from other subject areas—mathematics (e.g., measurement and statistics), language arts (describing phenomena), and visual and musical culture (visualizations, songs about nature)—which further contributes to comprehensive learning. Emphasizes that thematic modules are most effective when based on real-life questions that bridge boundaries between subjects and encourage thinking in a broader context.

Encouraging Critical Thinking and the Spirit of Inquiry through Modular Teaching

One of the most important tasks of modern education is the development of critical thinking and the spirit of inquiry in students, especially at early school age when foundational intellectual and social skills are being formed. The modular approach, with its open structure and flexible methodology, provides optimal conditions to foster these essential learning aspects.

1. Critical Thinking as an Educational Priority

Critical thinking involves the ability to analyze, evaluate, and argue—skills that are difficult to develop in teaching models focused solely on knowledge

reproduction. Modular teaching enables students to question information, compare various sources, and build their own viewpoints. Students are encouraged to ask questions, seek explanations, and discuss alternative solutions to problems. As Ennis (2011:20) states, “critical thinking in education must be deliberately cultivated through the instructional process, not left to chance.” The problem-based and inquiry-oriented nature of modular teaching precisely facilitates such deliberate development.

2. **Spirit of Inquiry through Project- and Problem-Based Learning**
Modular teaching relies on methodologies that actively engage students in the process of knowledge discovery—such as project-based instruction, research workshops, fieldwork, and experimentation. In the subject “Nature and Society,” for example, students can investigate local flora and fauna, analyze environmental changes, or collect data on customs and traditions of their region. This approach develops research literacy and prepares students for problem-solving in their future lives and careers.
3. **Learning through Open-Ended Questions**
Module-based instruction frequently uses open-ended questions as a didactic tool to stimulate thinking processes. Instead of questions with a single correct answer, students receive tasks that require analysis, comparison, synthesis, and argumentation. For example: “Why are some settlements more developed than others?” or “How do climate changes affect the plant and animal life in our region?” out that instruction fostering the spirit of inquiry does not provide ready-made answers but encourages students to discover patterns and relationships among phenomena by themselves.
4. **Development of Self-Reflection and Metacognition**
Critical thinking also involves reflecting on one’s own learning. Modular teaching, through activities such as learning journals, presentations, and discussions, enables students to think about what they have learned and how they arrived at that knowledge, thus developing metacognitive skills (Kuhn, 2005).

ADVANTAGES OF MODULAR TEACHING

Modular teaching brings a number of significant pedagogical advantages that make it particularly suitable for contemporary educational needs. Its flexibility, openness to students, and focus on competency development align with the demands of reformed curricula and modern didactic approaches.

1. Individualization and Adaptability

One of the fundamental advantages of the modular approach is the possibility of individualizing learning. Modules allow students to learn at their own pace, choose activities according to their interests and prior knowledge, thus realizing the principle of differentiated instruction. Modular teaching is a “natural framework for respecting diversity among students.”

2. Encouragement of Active and Independent Learning

In the modular model, students are active knowledge builders rather than passive recipients of information. Participation in projects, problem-solving, and discussions develops autonomy, initiative, and responsibility. Vukašinović and Stojanović (2020:78) emphasize that “active learning in modular teaching

contributes to greater long-term knowledge retention and the development of functional competencies.”

3. Interdisciplinarity and Content Integration

Thanks to its thematic and problem-oriented approach, modular teaching enables the connection of different fields of knowledge, fostering comprehensive understanding and the development of integrated skills. Matić (2021:101) highlights that modules represent “an ideal basis for contextual learning across multiple disciplines and real-life situations.”

4. Increased Motivation and Student Engagement

Students in modular teaching are more motivated because they recognize the meaning and purpose of what they learn. Working on tasks that are close and understandable to them fosters intrinsic motivation, which contributes to better concentration, collaboration, and greater school satisfaction.

5. Enhanced Professional Autonomy for Teachers

The modular approach grants teachers greater freedom in choosing content, methods, and pacing. This opens space for innovation, creativity, and professional development, which are key elements of quality teaching.

CONCLUSIONS AND GUIDELINES FOR PEDAGOGICAL PRACTICE

Based on theoretical analysis and literature review, several key conclusions can be drawn regarding the significance and potential of modular teaching in contemporary education, especially within the subject of Nature and Society:

- Modular teaching represents a modern, flexible, and student-centered learning model that enables the connection of theoretical knowledge with students’ everyday experiences and the development of functional competencies.
- The role of the student shifts—from a passive recipient of knowledge to an active participant, researcher, and collaborator in learning—while the teacher becomes a facilitator who guides the learning process and encourages critical thinking.
- The modular approach allows integration of multiple subject areas, development of research skills, and the use of diverse sources of knowledge, thereby promoting interdisciplinary, reflective, and experiential learning.
- This model particularly supports inclusive practice by enabling differentiation of content and methods according to each student’s needs and capabilities, thus contributing to equal educational opportunities.
- Critical thinking, collaboration, digital and communication literacy—key competencies for the 21st century—are naturally developed through modular, problem-oriented educational content.

To successfully implement modular teaching in primary education, the following recommendations are proposed:

1. Thematic Planning of Lessons – Teaching units should be organized into functional modules that connect content from multiple areas and have clearly defined objectives and outcomes.
2. Focus on Active Learning Methods – Employ investigative learning, group projects, task-based learning, simulations, discussions, and case studies.
3. Use of Diverse Sources of Knowledge – Including digital, local, visual, and empirical resources to enrich the teaching process and encourage multimedia and multi-channel learning.

4. Support Learning Through Formative Assessment – Continuous monitoring of student progress, reflection, self-assessment, and development of metacognitive skills.
5. Inclusive Approach in Planning and Implementation – Tasks should be adapted to different knowledge levels and learning styles, ensuring support for students with learning difficulties or language barriers.
6. Professional Development for Teachers – It is essential to continuously develop teachers' competencies in planning and implementing modular teaching, particularly in integrated curriculum, active methods, and inclusive education.

Modular teaching in primary education, especially in the subject of Nature and Society, represents a pedagogically justified and socially relevant approach aligned with the contemporary needs of students and society. Its successful implementation requires support for teachers, quality educational planning, openness to innovation, and consistent application of inclusivity principles.

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MODULARNA NASTAVA PRIRODE I DRUŠTVA

***Apstrakt.** U savremenim obrazovnim sistemima sve više se ističe potreba za unapređenjem nastavnih metoda u skladu sa novim pedagoškim teorijama i razvojem obrazovnih tehnologija. Jedan od pristupa koji se izdvaja svojom fleksibilnošću i orijentacijom ka učeniku jeste modularna nastava. Modularna nastava predstavlja model organizovanja obrazovnog procesa kroz tematski i funkcionalno integrisane jedinice/module koji omogućavaju učenicima aktivno učešće u učenju putem različitih izvora znanja, metoda rada i oblika angažovanja. U kontekstu predmeta Priroda i društvo, ovaj model omogućava povezivanje teorijskih sadržaja sa svakodnevnim iskustvima učenika, razvoj funkcionalnog znanja i podsticanje kritičkog mišljenja i istraživačkog duha. Posebno je važna interdisciplinarna dimenzija modularne nastave, koja doprinosi boljem razumevanju međupredmetnih veza i priprema učenike za složene životne situacije. Ovaj rad analizira osnovne principe modularne nastave, njene prednosti u pogledu individualizacije i aktivnog učenja, kao i izazove u vezi sa njenom primenom u školskom kontekstu. Takođe, prikazane su konkretne smernice za uspešnu primenu modularnog pristupa u nastavi Prirode i društva u osnovnom obrazovanju, sa fokusom na savremene didaktičke prakse i inkluzivni pristup učenju.*

***Cljučne reči:** modularna nastava, Priroda i društvo, obrazovanje, aktivno učenje, tematsko planiranje, interdisciplinarnost*

Professional article

APPLICATION OF LITERARY TEXTS IN FOREIGN LANGUAGE TEACHING

UDC 371.3::811.161.1

Katarina Stanković , Anđela Protić 

Pedagogical Faculty in Vranje, University of Niš, Serbia

Abstract. *This paper provides a theoretical overview of the role and methodological potential of literary texts in foreign language teaching, with a special emphasis on Russian as a foreign language. Drawing on contemporary methodological approaches and relevant pedagogical principles, the paper discusses the linguistic, cultural and educational value of literary texts, highlighting their contribution to the development of vocabulary, grammatical awareness, communicative competence and intercultural understanding. Special attention is paid to the criteria for selecting appropriate literary material in relation to students' age, level of knowledge, interests and cognitive abilities. The paper also presents methodological guidelines for the effective use of literary texts in the classroom, illustrating how these texts can support phonological development, creativity, emotional engagement and meaningful use of language. The aim of the paper is to offer a comprehensive theoretical basis and practical methodological recommendations that can assist foreign language teachers in planning and implementing lessons enriched with literary content.*

Keywords: *literary text, foreign language, Russian language, language teaching methodology*

INTRODUCTION

The study of foreign languages has always been of great importance, as it enables individuals to access new cultural, communicative and academic perspectives. Within this process, literature plays a significant role, since it reflects the linguistic and conceptual world of the target language. There is an increasing emphasis on interaction in a foreign language, as well as on establishing connections with people of diverse backgrounds and cultures. For effective and meaningful interaction, it is essential to expose learners to authentic language use, which literature naturally provides. It is necessary to internalize the language, to study and analyze it more deeply. One of the effective ways to achieve this is through reading and engaging with literary texts.

Literary texts are valuable material in foreign language instruction, serving as a rich source of vocabulary and linguistic structures, as well as a pathway to another culture. The

role of literary texts in the history of foreign language teaching has undergone significant changes and remains a relevant topic today. Numerous scholars continue to explore this area in order to enhance the overall process of foreign language acquisition.

A carefully selected literary text can play a major role in language learning. In this regard, it can be stated that literature is not merely a tool for acquiring grammar and vocabulary, but also serves to develop communication skills, intercultural awareness, critical thinking, and values.

The aim of this paper is to examine and analyze the methodological possibilities and effects of integrating literature into foreign language instruction, specifically in the teaching of the Russian language.

1. LITERATURE IN FOREIGN LANGUAGE TEACHING

Literature is highly authentic, unique, and possesses both artistic and aesthetic value. It contributes to raising awareness not only of language but also of life itself. Literature stimulates interaction, dialogue, and the exchange of opinions about events, characters, actions, emotions, and relationships presented in the text. „Literature is a royal road leading to culture, and it is a reservoir of forms and constructions that reflect linguistic norms” (Rosier, 2002: 54; Brajović, 2015: 438).

Foreign language instruction represents a complex process involving the acquisition of knowledge, skills, and competences by learners. During the 19th and early 20th centuries, the predominant approach in foreign language teaching was based on grammar and translation. This model focused on learning grammatical rules and vocabulary through the translation of written texts from the foreign language into the mother tongue. In this approach, oral communication skills were largely neglected, while reading held a primary role.

With the development of contemporary pedagogical theories, the need has emerged to perceive foreign language teaching not merely as the acquisition of linguistic structures, but also as a process of developing cultural understanding. Language is no longer viewed solely as a means of communication, but also as a carrier of cultural values and behavioral patterns. In this context, literary texts are recognized as valuable instructional materials, as they enable the simultaneous development of both linguistic and cultural competences. They serve as a bridge between linguistic expression and cultural content, providing learners with opportunities for deeper understanding of the social and civilizational contexts in which the language operates.

Contemporary trends in foreign language teaching have brought a shift toward the communicative model, which emphasizes the practical use of language in real-life situations. Rather than focusing on isolated grammar instruction, the emphasis is placed on the development of all language skills within a functional and meaningful context. This approach encourages active language use and the integrated acquisition of communicative competence.

Although literature traditionally held an important role in language instruction as a source of rich linguistic input and cultural reference, the 1950s and 1960s witnessed its marginalization. With the rise of structuralist and formalist approaches, interest in literary texts within the classroom diminished, resulting in the loss of their former status in teaching methodologies.

The fact that literary texts hold significant value in foreign language instruction is supported by numerous studies devoted to this very topic. Literature is composed of language and simultaneously serves as a space for its creative application (Babaei & Yahya, 2014: 80). In foreign language teaching, literary texts can function as authentic materials that provide

learners with direct exposure to real forms and styles of linguistic expression, thereby enhancing motivation and emotional engagement (Lebed & Kylyvnyk, 2024: 48). Their use enables the integration of language learning with cultural content, contributing to the development of intercultural competence and critical thinking. It is precisely this combination of aesthetic value and linguistic functionality that makes the literary text an exceptionally valuable resource in the process of foreign language acquisition.

2. THE ROLE OF LITERATURE IN THE DEVELOPMENT OF STUDENTS' COMPETENCIES

There are many reasons why it is important to have literature in foreign language classes and in foreign language textbooks, and Lazar (1993) suggested following five reasons for integrating literature in foreign language teaching:

1. Expanding students' language awareness
2. Encouraging language acquisition
3. Developing students' interpretative abilities
4. Motivating materials
5. Educating the whole person.

Teaching in the 19th and 20th centuries, as previously pointed out, did not sufficiently encourage deeper understanding of the text or the development of a broader range of linguistic and cognitive skills. Building upon McKay's (1982) assertion that literature in foreign language teaching fosters reading skills, develops tolerance, and nurtures students' creativity, it can be concluded that literary texts function as multidimensional pedagogical resources that enable the comprehensive development of learners, not only on a linguistic level but also on cognitive and affective levels.

One of the more effective ways to foster the integral development of various student competencies is the application of literary texts in foreign language teaching. Within the Standards of Achievement for the End of Primary Education for Foreign Languages (Institute for the Evaluation of the Quality of Education and Upbringing, 2017)* the development of general competencies is emphasized, including social competencies (adaptation to teamwork, integration into and positioning within a group), communicative competencies (understanding and applying the principles of verbal and non-verbal communication; acquiring conversational conventions and learning strategies; more accurate comprehension of cultural phenomena and cultural relativism), as well as the development of cognitive abilities, personality formation, emotional security, and identity stabilization. For instance, one of the standards states that the student should "understand information, main ideas and messages of fictional stories and other forms of literature for youth" (DST.3.1.10). Accordingly, it is evident that the literary text in foreign language teaching is not used merely as linguistic material, but also as a means for developing higher cognitive and communicative competencies. This involves the development of analytical thinking, the ability to draw conclusions, and the identification of implicit meanings and emotions in language. Understanding a literary text entails not only decoding linguistic structures but also perceiving deeper layers of meaning, implicit messages, characterizations, and narratives – which includes the development of interpretation, analysis, and critical thinking. This standard also lays the foundation for the development of students' expressive skills – as

* *Pravilnik o opštim standardima postignuća za kraj osnovnog obrazovanja za strani jezik* (Službeni glasnik RS, br. 78/2017).

understanding the message of a literary work opens the space for interpretation, discussion, and creative production, whether oral or written. The student does not remain at the level of content reproduction but is encouraged to express personal opinions, to develop an emotional connection with the text, and to actively participate in the linguistic and cultural dialogue that the literary text enables.

Many linguists, literary critics, methodologists, and foreign language teachers have justified and recommended the integration of literature into foreign language teaching. In this regard, Perišić states the following: „In the teaching of the mother tongue (as well as a foreign language), it is necessary to establish a connection between the content of language and literature” (Перишић, 2017: 257). Literature is unique and authentic, artistic and aesthetic, vivid and imaginative, realistic and rooted in life. Given that every author of a literary work possesses a specific linguistic style, it is essential to introduce students to the unmodified language in which the work was originally written. In doing so, we encourage students to reflect on the meaning of more complex and unfamiliar language, which will, in turn, contribute to the development of their functional knowledge applicable in real-life situations. Literature also invites interaction and discussion, as well as engagement with areas of indeterminacy, which Ingarden also addresses. Moreover, it fosters an awareness not only of language but also of the broader knowledge acquired in foreign language classes.

Through the reading of literary texts, whether simpler or more complex in content, depending on the students' age, students develop on cognitive, emotional, and sociological levels. There are numerous benefits to reading literary texts, including the acquisition of new vocabulary, the ability to analyze and synthesize what has been read, the development of critical thinking, imagination, and creativity, as well as the application of grammatical knowledge and rules (in the areas of morphology, lexicology, syntax, orthography, etc.). Reading literary texts certainly differs from reading other types of texts-non-literary ones (such as newspaper articles, advertisements, announcements, encyclopedic entries, etc.). While non-literary texts may be read at a pace that allows for a general understanding of the topic, literary texts must be read at a pace that allows for deeper analysis and the identification of aesthetic values, which therefore requires slower reading.

In teaching Russian as a foreign language, literary texts represent an exceptionally rich source for the integrated learning of vocabulary and grammar. Through literary texts, „artistic experiences make grammatical material more concrete, easier, and more applicable” (Petrovacki-Štasni, 2008: 30; Перишић, 2017: 258). Fairy tales, as a genre familiar to students, offer a wide range of lexical phenomena-phraseological units such as *to bang one's head against a brick wall* (*бить как рыба об лёд*), *to live on easy street* (*жить прелеваючи*), or *a golden fish* (*золотая рыбка*) not only enrich vocabulary but also introduce students to culturally conditioned meanings and symbolism. Synonymy and metaphors in literary texts support the development of semantic sensitivity and interpretative skills, which is especially important in teaching foreign language. Given that in the examples mentioned there is a likelihood that such phraseological units are not included in certain textbooks for Russian as a foreign language, we may cite Stanković: „In cases where teachers use textbooks published by other publishers, it is recommended that they incorporate some phraseological units from various sources into their teaching practice” (Stanković, 2022: 66).

Grammar, in this type of approach, is not taught in isolation, but rather presented „in function”-within the context of the text, the communicative situation, and the semantic whole. An example of this is the fairy tale *The Old Man and the Golden Fish* by A. S. Pushkin (*Старик и золотая рыбка*), which allows students to practice past and future verb tenses, as well as modal verbs such as *can* (*мочь*), *to want* (*хотеть*), and *must* (*должен*), and reflexive verbs such as *to address someone* (*обратиться*), *to complain* (*жаловаться*), and

to wash oneself (умываться). In this way, grammatical categories acquire a clear communicative function, and students internalize them through meaningful speech activities.

In addition to linguistic analysis, the incorporation of diction and recitation as methodological techniques plays an important role in the development of pronunciation skills and intonational accuracy. Poetry, as a distinct form of literature, significantly contributes to the development of students' phonological awareness-through rhyme, rhythm, and sound devices, students master the melody and musicality of the Russian language. Unlike prose, which enables logical tracking of the plot and structural comprehension of sentences, poetry stimulates auditory perception and articulation, which is particularly important in the early stages of foreign language learning.

3. DEVELOPING INTERCULTURAL COMPETENCE THROUGH LITERARY TEXTS

Intercultural education, in accordance with its objectives, should aim to achieve the following outcomes: „preparing students for encounters with diversity; preparing students to respond positively and to perceive diversity as an opportunity for gaining new experiences; reflecting on social and educational problems related to cultural differences; acquiring knowledge and developing the ability to use knowledge about others; developing critical thinking skills as well as recognizing the right of others to possess a cultural identity; developing communication skills; fostering social sensitivity and a sense of engagement in solving social problems; developing the ability to cooperate in a multicultural environment” (Daniels, 1999; Jevtić, Petrović, 2014: 27; Bjelak, 2021: 6).

Language and culture are inseparable. When teaching a foreign language and using authentic linguistic material, which often includes literature, we simultaneously teach culture, and students acquire it consciously or unconsciously, just like the language. „Intercultural theory is an integral part of foreign language teaching. This is also the case in teaching literature, understanding a literary text often entails understanding a specific cultural context, which may or may not be the aim of literature teaching; it is not the main goal of foreign language teaching, but only one of its objectives” (Elezović, 2017: 236). „For teaching methodology, information about the culture of the country and people whose language is being learned is of particular importance” (Nikolić & Mežinski, 1996: 73).

Literature in foreign language teaching creates space for the development of creativity and personal expression, which is significant for the stabilization of students' identity and their self-conception within an intercultural context. Learning Russian as a foreign language in the upper grades of primary school provides not only the acquisition of language skills but also the development of intercultural understanding. The question arises whether intercultural communication, through the contact between the Serbian language and culture and Russian, leads to the uniformity of students and their cultural views or rather promotes the development of harmony in diversity. In the school context, learning Russian language can contribute precisely to this „harmony of differences” as students come into contact with a rich and complex culture without the need to renounce their own identity. Through reading, listening, and discussions about Russian literature, customs, values, and everyday life, students develop the ability to understand the „other” without necessarily identifying it with the „self.”

„Intercultural learning becomes an essential tool for preparing young people for life in a globalized world, where cultural diversity and dialogue are fundamental prerequisites for harmonious living” (Protić, 2025: 153). Such harmony, if nurtured through critical thinking, openness, and appreciation of cultural differences, can become a stable construct in the

consciousness of young people. Thus, the Russian language, like any other foreign language, ceases to be merely a means of communication and becomes a bridge towards understanding, acceptance, and the shared living of differences in the contemporary world.

According to Nietzsche's insight that reality is always interpreted from a particular perspective, different forms of life manifest through a multitude of diverse worlds (cultures). In this sense, every language-including Russian-not only serves as a means of expression but also carries within it a specific cultural perspective, a way of perceiving the world, values, historical experience, and emotional patterns of a people.

Literary texts have been the cornerstone of foreign language teaching, as they represented models of „good” written work while simultaneously illustrating grammatical rules of the language (Elezović, 2017: 228).

By introducing the Russian language into the educational context of the upper grades of primary school, students do not learn only grammatical structures and vocabulary, but also open themselves to a different worldview. Through the language, they encounter Russian concepts that have no direct translations, poetic images that shape emotions differently, and narratives that offer alternative ways of understanding history, society, and the individual. This foreign language learning experience can be students' first encounter with the notion that „their” reality is not the only possible one-that there are other truths, other values, and other worlds that are not necessarily better or worse, but simply different. Thus, not only linguistic competence is developed, but also intercultural sensitivity and the ability to live simultaneously in one's own world and to understand the existence of other worlds. In this sense, contemporary Russian language teaching does not contribute to the uniformity of thought but encourages dialogue among different perspectives.

The UNESCO guidelines for intercultural education (2006) establish three fundamental principles of intercultural education: respect for the cultural identity of each student, providing all students with cultural knowledge, skills, and attitudes that enable their participation in society, and the contribution of intercultural education to respect, understanding, and solidarity among individuals in society. In accordance with UNESCO's principles, the use of literature in foreign language teaching supports respect for cultural identity, promotes mutual understanding, and enables the formation of a value framework based on dialogue and tolerance. The application of literary texts, especially those addressing social, historical, or moral aspects of a culture's life, allows students to confront foreign cultural values within narratives that are more immediate and personal than those provided by informational texts. In this way, intercultural understanding is fostered not only through learning „about” another culture but also through learning „from” it.

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In this regard, we may cite Petar Mitropan: „... the aim of a modern textbook is not to provide the learner with ready-made knowledge in its entirety, nor to have them passively

memorize rules, words, phrases, and exceptions and reproduce them, but rather to enable them-through inventively designed and carefully selected linguistic elements-to actively develop the skills necessary for independently constructing their own linguistic expression” (Nikolić & Mežinski, 1996: 27).

In this regard, we conducted a brief review of Russian as a foreign language textbooks currently used in primary schools in Serbia. The textbooks in question are: *Конечно! 2*, *Конечно! 3*, *Конечно! 4*. Following the analysis of these textbooks intended for sixth, seventh, and eighth-grade students, we conclude that they primarily utilize dialogue-based texts accompanied by appropriate illustrations in order to promote the development of communicative competence. Through the analysis, we identified a few literary texts, such as: *Two Friends* (*Два друга*, based on the work of L. Tolstoy), the fairy tale *Three Bears* (*Три медведья*, based on Tolstoy's tale), the poem *Fairy-Tale Taiga* (*Сказочная тайга*), and the story *Marusya* (*Маруся*, inspired by the book by Polina Voloshina). Thus, literary texts are almost entirely absent, which represents a significant shortcoming for learners of Russian as a foreign language-especially considering that both Russian and Serbian literatures are exceptionally rich. Incorporating literary texts into Russian language instruction would therefore be highly beneficial.

When selecting literary texts, in addition to following the official curriculum for a given language, there is also room for the teacher's own judgment and selection, taking into account the specific grade level being taught-since the needs of beginners differ significantly from those of learners who already possess a command of vocabulary and grammar. The selection should also consider the purpose of the lesson, the topic, students' abilities, and their interests. The teacher must be aware of the inherent value of literature and recognize that, alongside non-literary texts, there is room to engage students with works that are artistically and aesthetically worthy of reading and analysis, ultimately contributing to their personal and academic development. It is also beneficial to transmit such an attitude to students, as there will always be space for both realistic and imaginative content that literary texts provide. Therefore, one of the key strategies for integrating literature into the teaching of Russian-or any foreign language-is the careful and appropriate selection of literary texts, which can serve as a basis for achieving a wide range of educational outcomes. In accordance with the curriculum for the Russian language in the upper grades of primary education (grades 5 to 8), which clearly defines the content and topics for each year of study, the use of literary texts in teaching is possible only within the prescribed units. Additional or replaced texts may be introduced only if they are methodologically justified, with a clear explanation that they better support the outcomes of the curriculum with their linguistic accessibility, thematic appropriateness and pedagogical value.

In order to ensure the effective integration of literature into foreign language teaching-including the teaching of Russian-it is essential that the teacher selects texts that are not incomprehensible to students in any respect. If the texts are too difficult, both the teacher and the students may experience confusion and stress. This does not imply that text length or vocabulary are necessarily obstacles to comprehension. For example, longer texts can be assigned for reading at home prior to classroom analysis, while unfamiliar words and phrases can be approached through contextual clues or the use of dictionaries. There are several factors that foreign language teachers should take into account when selecting literary texts for classroom use: clear comprehensibility of the text, sufficient class time for working with the material, alignment of the text with the broader curriculum, its relevance and motivational potential for students, the appropriate level of cultural or literary background knowledge required, the linguistic complexity of the text, and so on (Elezović, 2017: 234). Therefore, one of the key factors is the linguistic complexity of the literary text. A student who is still

acquiring the basic elements of a foreign language will not be able to understand complex syntactic structures, archaic forms, or abstract stylistic devices, which may lead to demotivation and a loss of interest in both the text and the learning process in general. For this reason, the selected text should be: lexically transparent (containing familiar or predictable vocabulary), grammatically accessible (featuring structures that the student already knows or can intuitively grasp), and structurally clear (with simple sentences and a narrative logic that is easy to follow).

When a literary text is incorporated into foreign language instruction, students are expected to engage actively—not only during reading, translating, and analyzing the text, but also by going beyond the identification of linguistic structures. It is equally important to recognize character traits and relationships, descriptions of nature, the underlying message of the literary work, and to relate the events depicted in the text to real-life situations or to similar experiences from their own culture or daily life. Literary texts also create authentic contexts for communication, thereby contributing to the development of communicative competence (Šnjarić, 2008). While reading literary texts, students are not merely practicing reading skills—they also have the opportunity, as Lindstromberg (2004) suggests, to express their own opinions. Moreover, students can compare literary characters with similar figures from literature they are familiar with (in their native language), and reflect emotionally on the actions of these characters by asking questions such as: *Would I act the same way? Why or why not?* Students may also extract key words and expressions from the text and reuse them in new contexts.

The poem *Telephone (Телефон)* by Korney Chukovsky, a classic of Russian children's literature, can be considered suitable for lower levels of Russian language learning (A1/A2), particularly for students in the 5th and 6th grades of primary school. This poem is characterized by a rhythmic structure, repetition, and simple vocabulary related to everyday life, such as animals and common objects, as well as the theme of making phone calls. In terms of linguistic structure, the poem includes simple sentence constructions, elements of the imperative mood, and vocabulary drawn from daily life. It features animals such as elephant, bear, crocodile, kangaroo, hippopotamus, chimpanzee, and rhinoceros; objects and phenomena from everyday experience such as telephone, books, gloves, merry-go-rounds, swings, and apartment; verbs such as calls, speaks, asks, sends, wants, lies, floats; as well as pronouns and basic conjunctions like you, we, and, but, if.

The excerpt from the poem *Ruslan and Ludmila (Руслан и Людмила)* by Alexander Sergeyevich Pushkin (By the seashore stands a green oak tree...- *У лукоморья дуб зелёный...*) represents an exceptionally valuable resource for use in teaching Russian as a foreign language, particularly for students in the 6th or 7th grade of primary school. Its methodological value lies in several dimensions—linguistic, cultural, affective, and cognitive. First and foremost, the text is rich in fairy-tale elements—such as the talking cat, rusalki (water nymphs), Baba Yaga, Koschei the Deathless, and other figures from Russian folklore—that are engaging and familiar to children of this age. In this way, the development of intercultural competence is also supported, as students are given the opportunity to compare cultural motifs from Russian and their own national folklore traditions. From a linguistic perspective, the excerpt is abundant in basic nouns from nature and the fantastical realm (e.g., oak tree, chain, cat, forest, knights, princess, wolf), as well as verbs in the third person singular (e.g., walks, speaks, sits, carries), which makes it particularly suitable for working on elementary language structures. Special methodological potential lies in the phonetic and rhythmic aspects of the text; the presence of stanzas with a clear rhythm and rhyme allows for practice in pronunciation, intonation, memorization, and rhythmic reading. Furthermore, the excerpt stimulates the development of students' narrative skills by offering opportunities to continue

the story, describe characters, and interpret the symbolic meanings of certain motifs, such as the „learned cat” the „ancient oak” or the „magical hut”. Students are encouraged to develop critical thinking, symbolic reasoning, and communicative ability in the target language through discussions, writing short compositions, creating illustrations, or participating in role-playing activities. Methodically, this text offers a wide range of teaching strategies—from lexical exercises (e.g., word categorization), through interactive activities (e.g., pair work, dramatization), to cultural interpretation and connecting the text to students’ everyday experiences. Moreover, the excerpt fosters the development of emotional and aesthetic awareness, offering learners an experience of poetic beauty and the spiritual richness of Russian culture, as encapsulated in the poem’s concluding line: *There is the Russian spirit... it smells of Russia!*

A text worthy of attention is the poem *Winter Morning (Зимнее утро)* by Aleksandr Sergeyevich Pushkin, especially due to its thematic connection with the well-known elements of the poem *Winter (Зима)* by Dušan Vasiljev, which is studied by students in the third grade of primary school. It is therefore beneficial to remind students of the relationship between these two poems and to conduct a comparative analysis that can stimulate conversation, creativity, and imagination. A challenge for students could be, for example, to translate Pushkin’s *Winter Morning* from Russian into Serbian, thereby developing their translation competencies. The theme of the poem *Winter Morning*, as the title suggests, is a winter morning, presenting a contrast between the previous stormy night and the current sunny, calm day, which can encourage emotional engagement among students. The text offers diverse thematic lexical groups: nature and weather—frost, sun, snow, blizzard, sky, forest, spruce, river, ice; domestic environment—room, stove, bed; movement and activities—sled, belt, running, skating, visiting. Colors and visual expressions are also present—white, blue, amber, pale spot—which promote visualization and descriptive skills among learners. Verbs in the imperative mood (e.g., „wake up”, „open”) are suitable for introducing grammatical analysis of the imperative form in the Russian language. The poem is ideal for working on the perception of contrast: a cold, dark night versus a bright, shining morning. The poet’s friendly and gentle tone („charming friend”, „beauty”, „dear friend”) creates a warm, intimate atmosphere and encourages students to develop empathy and affective behavior. Analysis of this poem can help students to express emotions and states (such as sadness, joy, surprise); to develop imagination and landscape visualization; and to participate in narration and description, practicing language use in a communicative context. The text can be connected with artistic activities (illustrating the poem or scenes from nature); musical activities (listening to compositions with winter motifs); and discussions about nature, winter landscapes, and emotions related to the seasons.

The verse fairy tale *The Tale of the Fisherman and the Fish (Сказка о рыбаке и рыбке)* by Alexander Sergeyevich Pushkin is also suitable for use in the 5th or 6th grade, particularly for the analysis of phraseological units. This fairy tale is suitable for the teaching of phraseology „tell him terrible words”. In order to perform a more detailed analysis of this phraseology, we need to skillfully lead students to conclude that: „1. *tell*- a verb that denotes the act of conveying a certain message, in this case criticism, warning; in the context of the phrase, it indicates the action of transferring „terrible word” or a serious criticism; 2. *him*- an adverb that determines to whom the message or criticism is addressed; the message refers to a male person; 3. *terrible words*- a phrase consisting of two words that indicate serious criticism; the adjective *terrible* adds a stronger intensity to the message, while the *word* suggests that the message is sent verbally, by oral, angry addressing” (Protić & Stanković, 2023: 138-139). Interesting activities that can motivate students to work and be active in

teaching the Russian language when it comes to this song, suggested by the authors Protić & Stanković (2023) are *creation of a picture book* and *memory of phraseologisms*.

Vocabulary acquisition holds a significant place in foreign language instruction, and it is therefore important to reflect on methodological approaches that can enhance its quality and ensure that newly introduced words become part of the learners' long-term knowledge. If a foreign language teacher determines that certain literary texts contain a large number of unfamiliar words or complex lexical items whose explanation would take up a considerable amount of class time, these texts may still be introduced if their themes, characters, or situations are engaging for reading and further learning. In such cases, it would be advisable to include activities, tasks, or even games that facilitate more effective and enjoyable vocabulary learning; nevertheless, even texts with a somewhat higher lexical load may remain suitable for classroom use when their themes or characters are pedagogically valuable and accessible to learners. This approach also allows more time to be dedicated to analyzing the literary text itself. For example, some applicable vocabulary-based games may include: matching unfamiliar words with appropriate illustrations that represent their meaning; presenting a short story created by the teacher that introduces and clarifies the meaning of selected difficult words; a „mystery box” activity, where students randomly draw unfamiliar words and their possible meanings, and are tasked with matching them based on their intuition, experience, or contextual clues. An especially engaging and immediate way for students to enjoy themselves while learning something new in foreign language classes is dramatization or the use of puppet theatre. As Protić notes, the puppet serves as “a multi-meaning metaphor for play, imagination, joy, playfulness, relaxation, but also serious preparation for the numerous roles that life brings” (Protić, 2023: 310).

CONCLUSION

The use of literary texts in foreign language teaching represents a powerful didactic tool that enables the integrated acquisition of linguistic, cultural, and communicative competencies. Literature, through its style, lexical richness, and artistic function of language, provides students with the opportunity to authentically recognize and assimilate grammatical structures, expand vocabulary, and develop the ability to interpret and gain deeper understanding of the target language culture. The use of genres such as fairy tales and poetry is particularly significant, as they contribute not only to lexical and grammatical development but also to the development of phonological awareness and expressive skills.

Through such content, the student does not perceive language as a set of isolated rules but as a living means of communication and creative expression. The integration of teaching methodological techniques such as diction, recitation, and communicative text analysis further contributes to active and engaged teaching. Therefore, it can be concluded that literary texts are not only a means for improving linguistic competence but also an important carrier of intercultural learning, aesthetic education, and the development of critical thinking in foreign language teaching.

Although it is recognized that literary texts, like any other teaching resource, may have certain limitations depending on how they are used, research shows that their inclusion in modern, communicative, and eclectically oriented foreign language teaching is beneficial and motivating. The use of literature makes it possible to develop not only linguistic but also personal and cultural competencies of students and learners. Considering the longstanding prominence of this topic among experts and teachers, it would be valuable to investigate the experiences of both students and teachers who have participated in teaching that employed

works of world literature in a foreign language in various ways. It is necessary to continue empirical research on the impact of integrating literature into language curricula, especially in working with diverse groups of students and in different educational and social contexts. Although contemporary teaching offers numerous resources and methods for successful foreign language learning, the use of literary texts represents a valuable initiative that should be further promoted. Teachers should be encouraged to develop critical thinking and creativity in students, organize literary events (poetry, prose, drama) in foreign languages, and enable active student participation. This fosters the connection of emotions, attitudes, and intercultural awareness with linguistic knowledge, thereby contributing to their overall development.

Valuable results could be obtained by examining students' use of works of world literature in a foreign language, works of a particular culture, as well as investigating the specific effects these have on students and on foreign language teaching itself. It is important to encourage foreign language teachers to invest in literature teaching in the foreign language, to bring the culture of another people closer, and to organize diverse activities that will motivate students not only to acquire the foreign language but also to internalize it. It is also beneficial to consider how to engage and activate students more effectively so that they independently arrive at certain conclusions, find answers to questions on their own, and take initiative to explore the literature and culture of another people, which will broaden their horizons, deepen their understanding, and assist in their overall personal development.

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ПРИМЕНА КЊИЖЕВНИХ ТЕКСТОВА У НАСТАВИ СТРАНОГ ЈЕЗИКА

Апстракт. Овај рад пружа теоријски преглед улоге и методолошког потенцијала књижевних текстова у настави страних језика, са посебним акцентом на руски као страни језик. Ослањајући се на савремене методолошке приступе и релевантне педагошке принципе, рад разматра лингвистичку, културну и образовну вредност књижевних текстова, истичући њихов допринос развоју вокабулара, граматичке свести, комуникативне компетенције и међукултурног разумевања. Посебна пажња посвећена је критеријумима за избор одговарајућег књижевног материјала у односу на узраст ученика, ниво знања, интересовања и когнитивне способности. Рад такође износи методолошке смернице за ефикасну употребу књижевних текстова у учионици, илуструјући како ови текстови могу подржати фонолошки развој, креативност, емоционално ангажовање и смислену употребу језика. Циљ рада је да понуди свеобухватну теоријску основу и практичне методолошке препоруке које могу помоћи наставницима страних језика у планирању и реализацији часова обогаћених књижевним садржајем.

Кључне речи: књижевни текст, страни језик, руски језик, методика наставе

Exploratory research

GAMIFICATION IN MATHEMATICS USING M-LEARNING

UDC 371.3:51:[004.9:794

Branka B. Arsović 

Faculty of Education in Užice, University of Kragujevac, Serbia

Abstract. *One of the main problems in learning mathematics is how to make the presented educational material more stimulating, so that students are more assertive and the material itself is easier to understand. The use of attention-grabbing experiences in computer games, as well as the use of other various advantages of games, leads to a combination of learning mechanisms called gamification. Gamification is the process of applying game methods to non-game activities to increase user interactivity. The proposed model of gamification in a mathematics application for m-learning can be developed using the Attention, Relevance, Confidence and Satisfaction (ARCS) learning model and the Octalysis Framework gamification method. Gamification in a math m-learning application would apply game strategy using a system of levels, missions, challenges, points, progress bars, leaderboards, and badges. Based on previous research and expert literature, it can be concluded that the implementation of m-learning applications, ARCS learning models, and gamification of education itself, are still in the research and development phases. There is a small number of studies that combine these three elements and approaches. This paper represents a modest contribution to the systematization of previous research and expert opinions on the development of a proposed model for m-learning in mathematics, based on gamification by integrating the ARCS model and the Octalysis framework.*

Keywords: *Mathematics, gamification, m-learning, ARCS, Octalysis Gamification Framework*

1. INTRODUCTION

Mathematics is the science that is studied through all educational levels, from elementary school to university. Mathematics, as school subject, is considered a complex and hard because it is logical, systematic, abstract, and full of confusing formulas and symbols (Acharya, 2017). Mathematics has retained a conventional, traditional approach to teaching and learning, which is recognized as the reason for the various challenges that teachers face while developing the material provided for in the curriculum and contained in textbooks. This approach to teaching produces extensive and numerous teaching materials. From the perspective of students, all of the above are the reasons that lead to their reduced interest in learning mathematics, and incomplete understanding of the concepts introduced. Hence, despite the enthusiasm for learning, there is a weak motivation for work, so many students

perceive mathematics as a difficult, incomprehensible, and even uninteresting subject (Norton, 2024).

Modern ICTs have significantly changed the context of education, and have also contributed significantly to the field of mathematics education, as expected. Computer applications for learning mathematics have already been significantly developed and implemented, as a type of alternative educational media (Akçay, Karahan, and Bozan, 2021; Viberg, Grönlund, and Andersson, 2023).

As a result of the widespread use of mobile, smart gadgets and mobile applications, a special type of e-learning has developed, known as m-learning, which is currently a contemporary medium in the development of educational applications (Marunevich et al, 2021). The relevance of m-learning exceeds e-learning for numerous reasons: easy and fast access to educational materials, more flexible learning, more responsive formats of educational materials and objects, student-friendly applications, and the provision of interactive communication mechanisms (Shoaib et al, 2024). As the use of mobile gadgets, especially smartphones, among digital native students is primarily associated with entertainment content, games, and multimedia, the future direction of implementing m-learning is precisely through some form of educational games.

Gamification is the process of using game mechanisms or rules for non-game activities to increase user interactivity (Saleem, Noori, and Ozdamli, 2022). Gamification (in education) provides an interface and design that mimics game elements, so that the content, presented in this way, is much more attractive. It is known that game concepts are fun and easy to understand, which ensures greater attractiveness of the presented content (Sezgin, and Yüzer, 2022). Hence, the gamification application model must have such characteristics that will attract and maintain the attention of students during use. It must also be suitable for motivating students and building their self-confidence during learning, actively helping to improve students' logical reasoning and thinking when completing tasks, and increasing students' job satisfaction, i.e. making students more fulfilled after using the application (Fiş Erümit, and Karakuş Yılmaz, 2022).

To successfully develop and implement gamification in an educational application, it is necessary to first have a reference model (Mee et al, 2021). Previous research and theories (Yu, and Liu, 2024; Konstantinidou, and Nisiforou, 2021; Fang et al., 2024) present the ARCS model of learning as a model that integrates several forms of student attitudes - attention (A), relevance (R), confidence (C) and satisfaction (S). The ARCS model was designed and developed to stimulate student motivation for learning, by giving attention to the student, and through an application that adapts the subject to the student's previous learning experience (Jatmoko et al., 2021). In this way, self-confidence and a sense of satisfaction are created in students, which is certainly an incentive for further learning.

To develop the ARCS model, an octalysis gamification framework is required. The octalysis framework implies that the concept of gamification is designed by analyzing eight aspects of psychology of games (Khaleghi, Aghaei, and Mahdavi, 2021) which is a concept of gamification with an accent on human-centered design (Inano, 2024), in order to optimize human motivation in the system, as opposed to a design that focuses on the function of the system (Weber, Grönewald, and Ludwig, 2022).

Based on above, it can be concluded that the implementation of m-learning applications, ARCS learning models, and gamification of education, are still in the research phases. There are few studies that summarize the aforementioned approaches. This paper represents a contribution to the systematization of existing research on the development of a model for m-learning in mathematics, based on gamification by integrating the ARCS model and the Octalysis framework.

2. GAMIFICATION

The game represents the most important child's activity, which promotes his overall development. The advantage of the game is its ability to be adapted to the child's abilities, and to completely capture the child's attention and concentration, awaken imagination and creativity, and create a feeling of unburdened work. In this process, the child experiences happiness and joy, which awakens his curiosity and environment exploration. As play is a child's activity that cannot be replaced, teachers and schools should not deprive students of play. This activity should be used, so that students can learn new content through the game. Necessary knowledge and skills can be very successfully acquired in class through games used in the teaching process. The development of computer games and the expansion of ICT in the educational field gave rise to the idea of using games and game-like applications for learning purposes (Manzano-León, et al., 2021). This is how the concept of gamification is introduced.

Gamification is a problem-solving strategy and type of activity that involves implementing the philosophy, interface, and rules of a game and other game elements into non-game activities (Lampropoulos et al., 2022). In the world of education, it can be said that gamification is the process of changing existing traditional, educational or learning activities and converting learning content into interactive, game-like materials (Admiraal et al., 2011; Lampropoulos et al., 2022; Fiş Erümit, and Karakuş Yılmaz, 2022; Manzano-León, A. et al., 2021). More precisely, gamification can be defined as a concept that uses game-based mechanism, aesthetics, logic, and game thinking to engage participants, stimulate action, encourage learning, and problem solving (Azouz, and Lefdaoui, 2018). Gamification also provides further motivation to ensure that students participate in widespread learning activities (Lampropoulos et al., 2022; Fiş Erümit, and Karakuş Yılmaz, 2022). The goal of the concept of gamification of learning is to increase the comfort of student learning, and thereby increase inspiration and motivation for learning (Li, Hew, and Du, 2024). Although it is not directly related to knowledge and skills, gamification can contribute to increasing students' knowledge, skills, and abilities, influencing their behavior, engagement, and motivation (Zeng et al., 2024; Li, Hew, and Du, 2024).

Video games require dedication, perseverance, and an emphasis on details, which is precisely where the concept of gamification of learning comes from. One of the main elements of playing games is precisely the accumulation of points, which has the potential for great application in education, because it creates a sense of progress that can be absent in traditional teaching. Gradual accumulation of points leads to a grade, and with visible progress, student motivation increases, as does the level of knowledge acquisition. Another component of games is leveling, which is applied to education as step-by-step learning. Gamification focuses on the acquisition of knowledge without pressure, with an incentive towards planning moves in which mistakes are allowed, even encouraged, in order to determine what has been learned and improve performance (Mora et al., 2017). Gamification can have a special impact on strengthening unity within the classroom. Despite not being directly related to formal education, gamification can contribute to the growth of students' knowledge and skills by influencing their behavior, commitment, and motivation. Game elements that stand out in use in gamification are described in Table 1 (Figueroa, 2015).

Table 1. Game Elements (Figueroa, 2015)

No.	Game Elements	Description
1.	Points	Numeric accumulation based on certain activities.
2.	Badges	Visual representation of achievements for the use shown online.
3.	Leaderboards	How the players are ranked based on success.
4.	Progress bars/ Progression	Shows the status of a player.
5.	Performance graph	Shows player performance.
6.	Quests	Some of the tasks players have to fulfill in a game.
7.	Levels	A section or part of the game.
8.	Avatars	Visual representation of a player or alter ego.
9.	Social elements	Relationships with other users through the game.
10.	Rewards/ reward system	System to motivate players that accomplish a quest.

These game elements (Table 1), are generally consistent with mathematical logic, and the opinion that computer use is associated with mathematical skills has become widespread.

Building student experience through gamification strategies makes learning mathematics more fun, especially in learning basic mathematics. Students are empowered in roles in games, they work in groups. Determining the elements of gamification that can be applied in mathematics learning is important, especially in terms of solving mathematical problems. In general, it can be described as the elements in gamification that can be applied in learning mathematics for school using the MDA framework (standing for Mechanics, Dynamics, and Aesthetics according to Table 2).

Table 2. Division of Gamified Elements Using MDA Framework (Hunicke, Leblanc, and Zubek, 2004)

MDA Framework	Description
Game mechanics	Points, Levels, Challenges, Virtual, Goods, Leader-Boards, Badges, Gifts, and Charity
Game dynamics	Reward, Status, Achievement, Self-Expression, Competition, Altruism
Game Aesthetics	Satisfaction, Pleasure, Envy, Respect, Connection

The necessity to integrate gamification tools in educational and cognitive activities, in order to develop research skills of an individual, is discussed in the works by Koroleva (2016), Maloshonok (2016), Polyakova and Kozlov (2015). However, the issue still doesn't have a comprehensive methodological solution. The first problem faced by a mathematics teacher who intends to gamify teaching is choosing a software tool that meets the requirements of gamification and has the maximum effect in terms of achieving learning goals. Another methodological problem is the necessity for proper teacher training with regard to mastering the functional capacities of gamification tools. To overcome the challenges of gamification in teaching, a well-designed gamification model is needed (Mora et al., 2017).

The gamification model proposed in 2015. (Figure 1), consists of elements Mechanics – which refers to the elements that include gamification; Measurement - which refers to how progress in gamification is evaluated; Behavior - refers to the desired actions that players will

promote as a result of playing the game; and Rewards - refers to the types of motivations given to players (Mora et al., 2017).

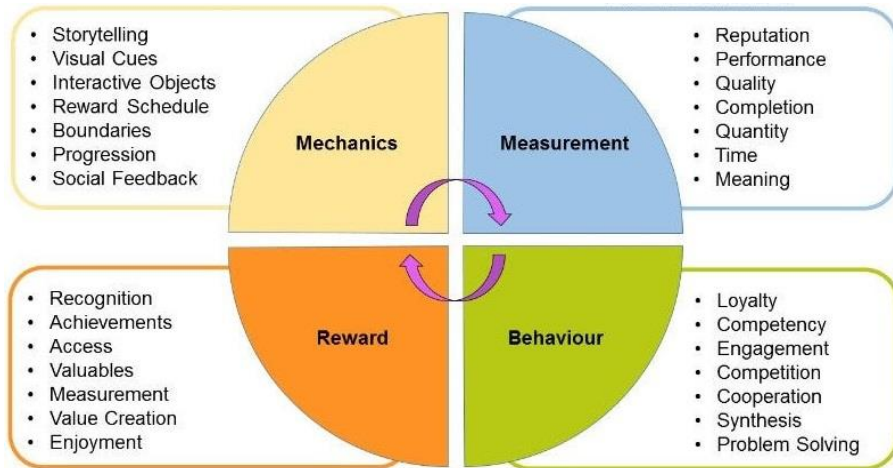


Figure 1. Gamification Model of Learning. Available from:

<https://ivantehrunningman.blogspot.com/2015/04/gamification-of-learning.html>

3. ARCS MODEL

Motivation, as an essential topic in educational research, has a close relationship with students' learning outcomes. Numerous education experts have made efforts to identify effective motivational models that foster student motivation for learning and improve learning performance. Among current motivational models, Keller's Attention, Relevance, Confidence, and Satisfaction, or ARCS model is popular in both educational research and practice, of which a growing interest in applying this model in technology-enhanced learning environments (Ma, and Lee, 2021).

ARCS model of motivation/learning, includes 4 areas for maintenance and sustaining motivation in the learning process: Attention, Relevance, Confidence, and Satisfaction. The ARCS Model was formulated by John Keller in 1983, and it was developed as an alternative that can be used by teachers to motivate student learning by carrying out learning activities well (Sharma, 2019). This model focuses on methods, tools, and didactic skills for encouraging students to learn new concepts and skills inside and outside the classroom. These 4 aspects of ARCS (Figure 2), that are an integral part of learning activities, are explained below (Keller, 1987; Maiti, and Priyaadharshini, 2023; Pratama, Sudiyanto, and Riyadi, 2019):

1. Attention – refers to generating and maintaining student attention during the learning process. This is the most important aspect because it is the starting point to motivate the students.

2. Relevance – providing subject matter relevant to students. Relevance must be established by using language and examples that the learners are familiar with.

3. Confidence – this aspect's focus is to establish learners' self-confidence and positive expectations for success. Confidence is built through personal achievement's positive reinforcement, by giving well-timed and relevant feedback.

4. Satisfaction - foster student satisfaction with the learning process. Satisfaction must be gained by learners from the learning experience, such as a sense of achievement, praise from a higher-up, or mere entertainment. When learners appreciate the results from feedback and reinforcement, they will be motivated to learn.



Figure 2. ARCS model in gamification

According to Keller (1987), the ARCS Model suggests that teacher can usually improve a student's motivation to learn by focusing on the 4 aspects described above. Within the teaching process, motivational analysis must be a continuous process. Only in this way it is possible to ensure that gamification matches motivational factors throughout the learning process. The ARCS model provided several specific steps for examining the essential motivational characteristics in the use of different media in the learning process (Maiti, and Priyaadharshini, 2023; Sharma, 2019).

These 4 components have subcategories, each of which implies certain emotions, states, and even social contexts. The following Table 3 presents those subcategories, along with a brief description of some examples of strategies for achieving them.

Table 3. ARCS model with subcategories and proposed strategies (ARCS Model of Motivational Design (2008). Retrieved April 05, 2025, from <http://teachinglearningresources.pbworks.com/w/page/19919538/ARCS%20Model%20of%20Motivational%20Design>)

Components	Subcategories	Strategies
A	Perceptual Arousal	<ul style="list-style-type: none"> ✓ Real-world examples: using of related and specific examples about content. ✓ Humor: using of small amount humor to maintain interest. But, too much humor may be distracting. ✓ Incongruity and conflict: going against students' past experiences or providing opposite point of view
	Inquiry Arousal	<ul style="list-style-type: none"> ✓ Active participation: providing students with hands on or role playing activities. ✓ Inquiry: allowing students to do brainstorming or critical thinking.
	Variability	<ul style="list-style-type: none"> ✓ Using of variety of methods and approach (e.g. videos, discussion groups, lectures, collaborate learning) to sustain interest.

R	Goal Orientation	<ul style="list-style-type: none"> ✓ Perceived present worth: explanation why and how this content helps the students today. ✓ Perceived future usefulness: explanation why and how this content help the students in the future (e.g. finding a job, getting into a college, etc.).
	Motive Matching	<ul style="list-style-type: none"> ✓ Needs matching: assess students to get better understanding whether they learn because of achievement, power, or affiliation. ✓ Choice: allow students to choose their own instructional method and strategies.
	Familiarity	<ul style="list-style-type: none"> ✓ Link to previous experience: giving students a sense of continuity by allowing them to establish connections between new information and what they already know. ✓ Modeling: showing to students role models using the content that presented during teaching, to improve their lives.
C	Learning Requirements	<ul style="list-style-type: none"> ✓ Communicate objectives and prerequisite: providing students with learning standards and evaluation criteria so that they can establish positive expectations, and achieve success.
	Success Opportunities	<ul style="list-style-type: none"> ✓ Facilitate self-growth: giving students opportunity to be successful by providing multiple and varied experiences. ✓ Provide feedback: giving students feedback about their improvements and deficiencies during the process so that they can adjust their performance.
	Personal Control	<ul style="list-style-type: none"> ✓ Give students control: students need to get control over their learning process, so that they can feel that their success does not totally depend on external factors. Instead, they have internal factors affecting their success.
S	Intrinsic Reinforcement	<ul style="list-style-type: none"> ✓ Encouraging intrinsic enjoyment of learning experience so that students have fun, continue the learning process without expecting reward or other kind of external motivational elements.
	Extrinsic Reward	<ul style="list-style-type: none"> ✓ Praise or rewards: providing students with positive feedback, rewards, and reinforcements.
	Equity	<ul style="list-style-type: none"> ✓ Maintaining of consistent standards and consequences for success. Using consistent assessment rubrics, and sharing them with students.

The identification of a subcategory in each of the dimensions of the model can be considered a guide to achieving greater student motivation and engagement during learning.

The 1st step in instructional design for motivation is to capture the learners' attention through either perceptual stimulation or inquiry arousal. Basic question of this aspect is – does the educational content attract and retain the attention of students? Methods to activate attention (Keller, 1987):

- Active participation: encourage active participation by using games, simulations, and other strategies to involve students.
- Variability: use a variety of modalities for presenting content.
- Humor: use cartoons, humorous stories to keep interest.
- Incongruity and Conflict: use debate and discussion to confront comments that contradict students' experiences.
- Specific examples: provide examples of the content through images, stories, etc.
- Inquiry: ask questions, present problems for the students to deal with and discuss.

Relevance helps connect content to the real world. Basic question of this aspect is – why should student care about content and how does it link to the reality? Methods for activation (Keller, 1987):

- Experience: show students how new learning will use their existing skills and experience.
- Present worth: demonstrating how the content will be immediately useful.
- Future usefulness: show how the content will be useful in the future.
- Needs matching: show how the content connects to the student's needs.
- Modeling: show students how to apply the learning and what to do.
- Choice: build in choice so students can use different ways of showing what they know.

Success must be achievable. If the difficulty is too high, motivation will decrease. The basic question of this aspect is – do the students feel like they can succeed in learning? Methods to activate confidence (Keller, 1987):

- Provide objectives and prerequisites: they help students see what is expected of them, but they can also check for themselves whether they have the necessary knowledge or skills.
- Plan for meaningful success: support and organize the learning so students can experience success. Success should be significant enough to represent an achievement.
- Grow the learners: scaffold and organize content so the learning increases in difficulty.
- Feedback: provide feedback that helps students attribute their effort to their success in learning the material.
- Learner control: students should have some degree of control over the learning process, so they can see that their success is a direct result of their choices and efforts.

Satisfaction during learning could come from achievement and praise. Basic question of this aspect is – do the students feel good about their accomplishment in learning? Methods of activation are (Keller, 1987):

- Essential reinforcement: learning should be useful and beneficial to the student; they have to see benefit by applying knowledge in a real-world setting.
- Extrinsic rewards: give unexpected rewards and direct encouragement to learn.
- Equity: keep standards high so learners know they are achieving.

By presenting ARCS model in this way, its suitability for learning in a gamified educational environment is evident. The model suggests a bunch of different formats of educational materials, approaches and methodologies, which are mostly interactive and require full student engagement, partly through informal methods. The gamification is based on these principles, too. Because of this compatibility, the ARCS model should be considered when creating a gamified environment for learning mathematics (Suherman, Zaman, and Farida, 2021). Mathematics implies learning in context, obvious learning, presentation of different formats of information, and the strategies of the proposed model are based on this (Peng, 2023).

Overall, the ARCS model is perceived differently by both teachers and students. For teachers, the driving factors are attention and self-confidence, while for students, satisfaction and relevance are crucial aspects. This methodology allows students to improve their cognitive skills and to address the different learning styles. It also helps teachers to design course plans and content according to the expectations of students. Even the quality of teaching improves, because the combined pedagogical strategy is interesting for both facilitators and also creates modified and reliable course content to be delivered to students with different learning styles (Ma, and Lee, 2021; Maiti, and Priyaadharshini, 2023; Sharma, 2019).

4. OCTALYSIS GAMIFICATION FRAMEWORK

Gamification occurs when human motives are used to encourage decision-making and the performance of activities. It is precisely human motivator that allowed Yu-kai Chou in 2014, to create an innovative gamification design framework, Octalysis, an octagon-shaped model with eight basic motives (Chou, 2015; Chou, 2019). Chou, created Octalysis as a new framework that helps people understand human nature and how they can be motivated, so they can do their best to accomplish their goals. The main objective of this framework is to give eight motivators that will lead to successful gamified experiences.

Octalysis gamification design framework takes its name from the shape of an octagon with eight Core Drives (CD) representing each side to analyze and construct strategies around various systems that make games more compelling (Chou, 2019). These motivators (CDs) are: meaning, empowerment, social influence, unpredictability, avoidance, scarcity, ownership, and accomplishment (Figure 3).

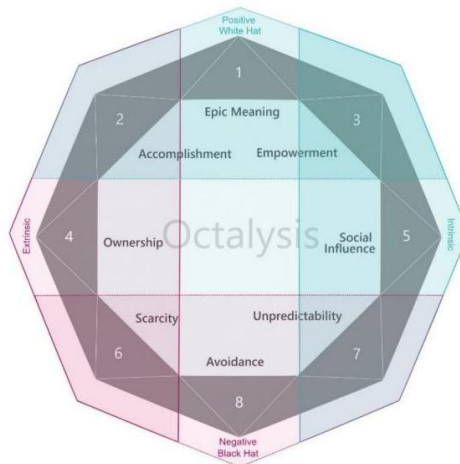


Figure 3. Octalysis Framework (Chou, 2015)

The eight CD of Octalysis are separated vertically into right brain (creativity, self-expression, social features) and left brain (analytical thought, accumulations, ownership), while horizontally into Top (white hat), which contributes to positive aspects of motivation, giving a greater sense of importance and control, and Bottom (black hat), which contributes to negative aspects of motivation, which can be compensated in order to attain the best results (Chou, 2015; Chou, 2019). Recent empirical research (Marisa et al., 2021) on motivation recommends usage of the Octalysis framework to specify which CDs need to be upgraded or maintained more carefully. Experts claim that the Octalysis framework requires empirical justification and validation, and continuous methodological modification for effective design practice, a need that applies to other gamification frameworks and methods (Weber, Grönwald, and Ludwig, 2022). Each CD found within Octalysis framework is explained as (Marisa et al., 2020):

1. Epic Meaning and Calling – this CD acts as a tool to enhance the desire to perform tasks, based more on the well-being of others than on personal gain.
2. Development and Accomplishment – the drive to act because of the satisfaction that comes from achieving a goal (because appropriate reward is expected).

3. Empowerment of creativity and Feedback – having the willingness to discover or create something new; students are encouraged to take action because they enjoy the independence of direct work and being part of a creative experience.
4. Ownership and Possession – this CD acts as an encouragement for acquisition and aims for improvement, based on the idea that the stronger the sense of ownership of something, the more a person will want to preserve and develop it.
5. Social influence and Relatedness – such motivation is triggered by people in social interactions and can transform an individual's behavior.
6. Scarcity and Impatience – this CD is caused by the desire to obtain and own an entity simply because it is rare, unique and difficult to obtain.
7. Unpredictability and Curiosity – a CD that encourages some form of activity due to an unexpected aspect of an item.
8. Loss and Avoidance – the drive to achieve something out of fear of missing out on an opportunity, which is similar to the drive of curiosity or uncertainty. The difference between the aforementioned CDs is that this motivator is mainly focused on avoiding possible negative outcomes, as well as the threat of failure, which results in the desire to achieve the item.

From this explanation of motivators, it can be comprehended that some are positively oriented, i.e., towards acquiring and improving certain traits, while others are oriented towards avoiding negative outcomes (Chen, Ming-Chaun, and Kuo, 2023).

When Octalysis framework is used for creating a gamified educational environment, then that process must have two stages. An analysis of game elements from the Octalysis framework is the 1st stage, while the 2nd stage is the application of game elements in 4 phases that have been provided.

When a gamified educational environment is creating, it is necessary to pair game techniques, strategies, and elements with targeted CDs. Chou identified and collected more than 100 game design elements that he mapped to one or more core drives (Chou, 2015; Chou, 2019).

Figure 4 shows the gamification framework using the Octalysis method at the 1st level, with appropriate elements and game mechanisms, for each of the CDs.

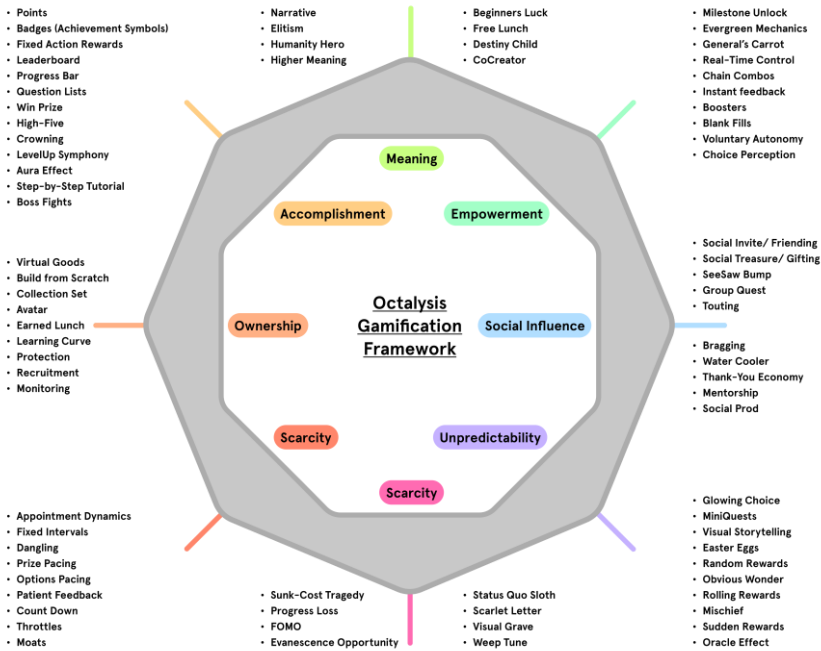


Figure 4. Level I Octalysis Gamification Framework (<https://yukaichou.com/gamification-examples/octalysis-complete-gamification-framework/>)

After applying the game elements that will be used, the elements are arranged into 4 phases which are part of the 2nd level of Octalysis framework (Figure 5). Second stage of Octalysis involves optimization of experience throughout all 4 phases of a student’s journey (Chou, 2019):

1. Discovery (why would student even want to start the journey);
2. Onboarding (how students are taught the rules and tools for playing the game);
3. Scaffolding (the regular journey of repeated actions towards a goal);
4. Endgame (how to retain veterans).



Figure 5. Second stage of Octalysis Gamification Framework (<https://yukaichou.com/gamification-examples/octalysis-complete-gamification-framework/>)

There are further stages that factor in different types of students. In this way, it is possible to determine not only what motivates individual students, but also how their motivation

changes at different levels of the educational experience. But for a start, the first 2 levels of the Octalysis Gamification framework are quite sufficient.

5. PROPOSED M-LEARNING MODEL OF MATHEMATICS GAMIFICATION

The next step should be to develop a research and work strategy, which should aim at a conceptual model of gamification in mathematics teaching.

First, problem formulation should be done, which is an attempt to discover a number of things related to the problem being solved (Mintarsih et al., 2025; Abdan Syakuran, and Afrianto, 2022). The formulation of the problem itself should be done by identifying existing problems in mathematics learning, what their shortcomings are and the solutions offered to solve them.

The next step should be gathering of data using literature studies, discussions and questionnaires. The literature study would be carried out by collecting previous studies related to the ARCS learning model, theory and implementation of gamification (Tamara, and Shishido, 2021; Abdan Syakuran, and Afrianto, 2022). Discussions with mathematics teachers and students would also have a positive impact, in order to collect data on learning materials, obtain input, and describe the desired solution.

The next phase would be the development of m-learning mathematical software. Software development should start from a conceptual part that contains a model of the developed system, users, use cases and functions in the system (Mintarsih et al., 2025; Tamara, and Shishido, 2021; Abdan Syakuran, and Afrianto, 2022). This would be followed by a design and development part, where the system design is carried out, the creation of the assets in the system would be developed, as well as the coding of the system and the implementation of initial testing. The last part in this phase would be the evaluation by testing the system, both functionally and in terms of user acceptance.

Therefore, creating a gamified m-learning environment for teaching mathematics involves the following phases (Abdan Syakuran, and Afrianto, 2022):

- Analysis of Current Learning Conditions – Through interviews and field observations, data is collected on the state of mathematics teaching, from both the teacher and student perspectives;
- Conceptualizing Mathematics M-Learning Gamification – Application conceptualization is conducted to describe what the system will do along with its methods and working functions. Application development starts from user needs, implementation of the ARCS model and gamification in the application, followed by application development to achieve the expected goals (Figure 6);
- Octalysis Gamification Analysis – The Octalysis method has eight basic elements, each of which has a game technique that can be chosen to be applied. This method begins with Level 1, analyzing the elements to be applied, and then enters the second phase, Level 2, which is making the game;
- ARCS Model and Octalysis Gamification Mapping – This phase is implemented by mapping the ARCS learning model based on the categories of Attention, Relevance, Confidence, and Satisfaction, as well as the octalysis method in application development;
- Analysis System Architecture – M-learning application development has three subsystem architectures. The first subsystem is a frontend application that functions as a gamification application used by students, a backend application used by teachers to manage the system and track student learning outcomes, and the internet used to exchange and store

application data. In this phase, the architecture of the developed system is analyzed, according to pre-determined needs;

- **Gamification Logic Design** – To develop the functionalities described in the use case diagram, a logical design is created for each function that shows the learning flow that can be implemented in the application of m-learning mathematics. The flow starts from accessing the module to its completion, through the calculation of points and badges, as well as the awarding of rewards for student achievements for the material completed, etc.;

- **Gamification Asset Design** – In-app assets are symbols used to demonstrate the concept of gamification in the application that has been created. In this phase, assets are created that will be delivered to students, to help them better understand the application (badge assets, as a form of reward; assets awarded for certain levels of achievement in the game; avatar assets, which the student can win after a certain progress and tell about the level they are at; profile assets and leaderboard...); and

- **Application Testing** – As the final stage of developing an m-learning gamified application, there should be testing of that application. Several tests can be conducted. Alpha testing is a functional test used to test a new system and focuses on the functional requirements of the software. Beta testing is a test that is conducted objectively, where the testing is conducted directly on students.

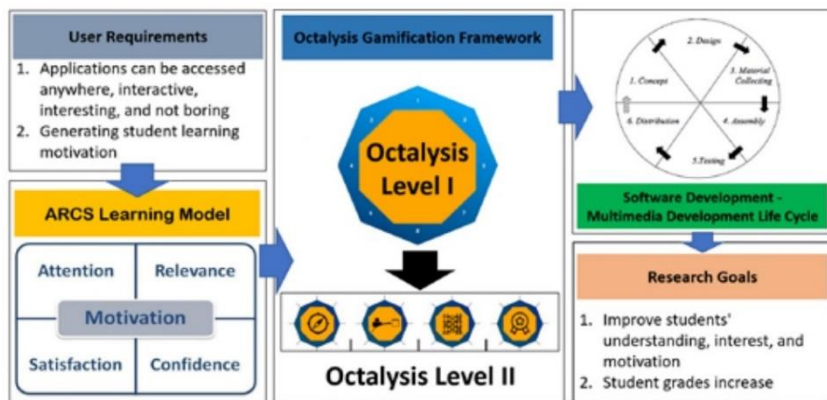


Figure 6. Conceptual Development of Mathematics Gamification Applications (Abdan Syakuran, and Afrianto, 2022)

6. CONCLUSION

Although gaming has been assimilated into education as a way to engage students in the learning process and increase their motivation to learn in a playful and recreational way, over time, these strategies have been configured in numerous ways. When talking about gamification, it is necessary to keep in mind its varieties and variations. This article provides a general overview of topics such as gamification, as well as the use of the ARCS model of motivation and the subsequent Octalysis framework as a strategy for optimizing gamified experiences to increase successful outcomes.

This article examines several approaches and models to gamification and m-learning of teaching. Specifically, it proposes an approach to developing a conceptual model of a

mathematics mobile learning application that would combine elements of gamification with the Octalysis method and the ARCS learning model.

However, the lack of concrete application development according to the proposed model and its future, possible implementation and testing in an educational environment still needs to be addressed in future work.

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ГЕЈМИФИКАЦИЈА У МАТЕМАТИЦИ ПОМОЋУ М-УЧЕЊА

Апстракт. Математика је један од основних, општеобразовних предмета у школи. У многим школама наставне методе које се користе у математици су и даље конвенционалне, традиционалне, односно предавања и вежбе. Један од главних проблема у учењу математике је како презентовани наставни материјал учинити стимулативнијим, како би ученици били асертивнији и сам материјал био лакши за разумевање. Коришћење искустава који привлаче пажњу у компјутерским играма, као и коришћење других различитих предности игара, доводи до комбинације механизма учења званих гејмификација. Гејмификација је процес примене метода игре на активности које саме по себи нису игра, а како би се повећала интерактивност корисника. Предложени модел гејмификације у математичкој апликацији за м-учење, може се развити коришћењем модела учења пажње, релевантности, поверења и задовољства (ARCS) и октализоване методе гејмификације. Гејмификација у апликацији за м-учење математике би применила стратегију игре користећи систем нивоа, мисија, изазова, поена, скале напретка, табеле са резултатима и значака.

Кључне речи: математика, гејмификација, м-учење, ARCS, октализована метода гејмификације

Review article

INNOVATIVE APPROACHES TO ADDRESSING SPECIFIC LEARNING DISORDERS IN EARLY SCHOOL-AGED CHILDREN

UDC 376.1-057.874:616.89-008.434.5

159.946.3-057.874

Saša Stepanović , Vladimir Ilić

College of Human Development, Belgrade

Abstract. *Specific learning disabilities, such as dyslexia, dysgraphia, and dyscalculia, present considerable challenges for younger school-aged children. This paper examines how to effectively identify and address these disabilities to enhance academic achievement and social skills. The key research questions focus on the effects of specific learning disabilities on emotional and social development, the most effective treatment approaches, and the impact of innovative teaching methods. The research methodology includes descriptive, analytical, and comparative analysis of scientific studies and practical research. The theoretical section explores factors affecting the treatment of learning disabilities, while the methodological part examines the role of early diagnosis in academic and social success. Additionally, the study assesses innovative educational approaches aimed at improving teaching practices for children with learning disabilities. The results indicate that early diagnosis and multidisciplinary support significantly enhance both academic performance and emotional well-being. The study highlights the crucial role of teachers and parents in fostering an inclusive and supportive educational environment. The research concludes that implementing innovative educational practices enables flexible and adaptive teaching, catering to the needs of children with learning disabilities. These methods not only improve academic skills but also enhance emotional stability and social development. The findings underscore the necessity of educating teachers and parents about specific learning disabilities and integrating innovative teaching strategies to promote personalized and inclusive learning.*

Keywords: *learning disabilities, early diagnosis, treatment, innovative teaching methods, academic success, emotional impact*

1. THE CONCEPT OF SPECIFIC LEARNING DISABILITIES

Specific learning disabilities have received considerable attention from experts and researchers in recent decades. One of the central issues in contemporary research is the early detection of these difficulties, as timely diagnosis enables early intervention, which significantly improves developmental and educational outcomes (Obradović et al., 2011). Despite its importance, this topic remains insufficiently discussed in educational practice.

Schools often lack an adequate number of specialized professionals whose work would focus exclusively on the identification, assessment, and support of children with specific learning disabilities.

To adjust the pace, methods, and forms of instruction to the individual capacities of students, and to select and apply adequate alternative or compensatory learning strategies aimed at fostering the optimal development of each learner timely recognition of learning difficulties by subject teachers is essential. It is important that poor academic performance is not misinterpreted as a result of laziness or lack of effort; instead, educators should explore the possible presence of a learning disability and intervene appropriately and without delay. Therefore, high-quality teacher education and professional development in the field of recognizing specific learning disabilities are crucial (Obradović, Bjekić, & Zlatić, 2011).

In previous educational systems, as well as in the current one, reading and writing have formed the foundation of nearly all learning processes. Children with specific learning disabilities do not acquire these skills with the same ease as their typically developing peers, which often results in learning barriers and lower academic achievement. Furthermore, children with developmental difficulties have historically been placed in segregated classrooms or groups, thereby limiting their opportunities for interaction, communication, and participation in a natural peer environment. These challenges highlight the importance of examining the effectiveness of prevention, identification, and intervention practices related to specific learning disabilities (Stepanović & Živković, 2020).

Understanding the nature of developmental deviations in areas such as communication, language, speech, reading, writing, and broader learning processes, and recognizing the unique needs of children with specific learning disabilities, contributes to protecting their rights and ensuring educational equity. Approaches that value children's individual interests, needs, and abilities align with the principles of the Convention on the Rights of the Child (1989), particularly regarding the child's right to participation, inclusion, and individualized support.

1.1. Diagnostic Criteria for Specific Learning Disabilities

The most widely accepted definition used by researchers and practitioners in many countries is the one provided by the International Classification of Diseases and Related Health Problems (ICD-10). According to this classification, specific learning disabilities are defined as disorders characterized by distinct and significant impairments in the acquisition of academic skills (Lazarević, 2019). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5), published by the American Psychiatric Association, offers a broadly adopted and increasingly utilized definition of specific learning disorders, one that has been accepted by professional associations dedicated to the rights and support of individuals with learning disabilities (Ilić & Stepanović, 2024).

The term used in DSM-5 is specific learning disorder, diagnostically defined as "difficulties in learning and using academic skills, as indicated by the presence of at least one of the following symptoms that have persisted for at least six months, despite the provision of interventions targeting these difficulties." The DSM-5 criteria (abbreviated) include: inaccurate or slow reading; difficulty reading words; challenges in understanding the meaning of written text; difficulties with spelling; deficits in written expression; difficulty understanding the meaning of numbers, recalling numerical facts, or performing calculations; and difficulties with mathematical reasoning. Academic skills are substantially and measurably below what is expected for the individual's chronological age and significantly interfere with academic, occupational, or daily functioning. School records, grades, and

teacher evaluations commonly indicate below-average performance. Many children may also avoid activities that involve reading, writing, or mathematics. Although difficulties typically begin during the school years, in some cases they become evident only when academic demands increase, and symptoms may be recognized much later (Stepanović, 2024).

These difficulties cannot be more accurately explained by intellectual disability, visual or hearing impairments, other mental or neurological disorders, adverse psychosocial conditions, insufficient proficiency in the language of instruction, or inadequate teaching methods (Lenček, 2017).

It is estimated that approximately 30% of children exhibit learning or behavioral difficulties. For learning disabilities specifically, the difficulties must be clearly expressed, and their prevalence is believed to be below 3% of the school-age population. Specific learning disabilities cannot be attributed to intellectual disability, neurological disorders, or inadequate upbringing. Their causes remain insufficiently defined, although contemporary research suggests that they stem from abnormalities in cognitive processes, most often related to some form of biological dysfunction (Golubović, 2004).

Early detection and diagnosis of specific learning disabilities at the beginning of schooling are of great importance, as this developmental period allows for highly reliable identification. In the diagnostic procedure for specific learning disabilities, four models are most frequently applied (Proctor & Prevatt, 2003; Sparks & Lovett, 2009; Weis & Syke, 2012): the discrepancy model, the low achievement model, the DSM-IV model, and the comprehensive cognitive assessment model.

2. TYPES OF SPECIFIC LEARNING DISABILITIES

Each type of learning disability is characterized by a distinct set of symptoms and features that manifest differently in every individual. Since each person is unique and requires an individualized approach, specific learning disabilities must be viewed as separate clinical entities whose characteristics should be clearly understood in order to grasp the nature of the difficulties and their impact on the individual. Learning disabilities may occur independently, although they more commonly appear in combination with one another. Importantly, none of these disabilities imply an inability to learn. Symptoms may range from mild to moderate or severe, while children who exhibit these difficulties typically possess average or above-average intelligence.

With appropriate intervention, the use of targeted instructional modifications and accommodations, adapted assessment procedures, and consistent support from teachers, parents, and therapists, children with learning disabilities can achieve good educational outcomes, and some may even excel academically (Stepanović, 2019).

2.1. Dyslexia

The International Dyslexia Association defines dyslexia as a neurobiological specific learning disability characterized by inaccurate or non-fluent word recognition, poor spelling, and weak decoding skills, arising from deficits in phonological awareness and unexpected in relation to the child's cognitive abilities and the quality of instruction. Secondary consequences may include reduced reading comprehension and limited reading experience (IDA, 2002).

Dyslexia occurs despite normal intelligence, adequate vision and hearing, systematic instruction, and generally favorable learning conditions. It represents a clear discrepancy

between actual and expected reading performance for a child's mental age (Golubović, 2000) and is often accompanied by dysgraphia and dyscalculia.

The disorder is usually identified in the early school years, when reading and writing skills begin to develop. Children with dyslexia typically have average or above-average intelligence and may show creative and distinctive problem-solving styles. Early developmental irregularities can precede later reading problems but are often overlooked by parents.

Common manifestations include reversing letters or syllables, substituting or omitting letters or words, and describing letters as "moving" or "flipping." Handwriting is often messy, with frequent omissions or substitutions and difficulty expressing ideas clearly in writing (Stepanović, 2018a).

Symptoms may also include disorientation in time and space and challenges with sequencing. While some of these signs may appear in children without dyslexia, in dyslexia they are more frequent, pronounced, and persistent.

A core feature is slow and non-fluent reading. Children with dyslexia require significantly more time to read, which reduces comprehension in longer texts. They often struggle to connect letters with sounds due to weak phonemic awareness and may read visually similar words instead of the correct ones, although some still infer general meaning from context (Stepanović, 2018b).

2.2. Dysgraphia

Most definitions describe developmental dysgraphia as a handwriting disorder emphasizing motor difficulties in writing. Children may struggle to form letters, regulate pressure, or write at an age-appropriate speed, resulting in slow, uneven, and often illegible handwriting. Due to linguistic deficits, they may omit letters, produce incomplete words, or alter written characters. Symptoms appear as a specific combination of signs that vary in type and severity (Lazarević, 2012). Dysgraphia includes several forms: some children write illegibly with irregular letters, while others write legibly but extremely slowly or with unusually small script. Switching to print may lead to inconsistent use of upper- and lowercase letters. Across all forms, writing requires excessive effort and time.

Dysgraphia is a learning disorder involving impaired writing or acquisition of writing skills despite normal intelligence, intact sensory abilities, appropriate instruction, and favorable social conditions (Golubović, 1998). Common specific difficulties include problems linking phonemes to graphemes, substituting visually or phonetically similar letters, persistent mirror writing, structural errors (insertions, additions, transpositions), omissions of letters or words, and difficulty maintaining writing direction (Pavlić-Cottiero, 2007). Non-specific difficulties include slow writing, disorganized written work, poor legibility, and challenges with spelling, grammar, and syntax.

Dyslexia and dysgraphia often co-occur, though dysgraphia may appear independently. Children with dysgraphia make frequent writing errors at the level of letters, syllables, or whole sentences. Many also struggle with pencil grip, placing letters and words on the line, and maintaining spacing. Difficulties often include illegible handwriting, poor spelling, trouble translating ideas into written form, problems organizing thoughts, and limitations in storing and retrieving written information (Berninger & Wolf, 2009).

Writing depends on coordinated motor activity and visual-motor integration. Dysgraphic difficulties commonly manifest as deficits in concentration, organization, fine motor skills, and challenges keeping pace with classroom tasks.

2.3. Dyscalculia

According to the International Association for Dyscalculia and DSM-5, dyscalculia is a neurodevelopmental disorder of biological origin marked by significant difficulties in acquiring mathematical skills that fall substantially below age expectations. These problems appear early, persist for at least six months, and cannot be explained by intellectual disability, neurological conditions, or motor impairments. Mathematical difficulties belong to the category of specific learning disorders. As Golubović (2004) notes, developmental dyscalculia typically occurs independently and is not linked to lexical or linguistic abilities. It involves delayed and impaired acquisition of mathematical knowledge, with arithmetic skills markedly below what is expected for the child's age, cognitive capacity, and schooling level. Core deficits involve basic arithmetic operations such as addition, subtraction, multiplication, and division.

Long-term research enabled Sharma (2001) to classify common errors in students with dyscalculia into groups such as paraphrastic substitutions, perseverations, mirror errors, slowness, incorrect spatial placement, visual errors, procedural errors, poor memory, and difficulty recognizing number sequences. Problem-solving difficulties may reflect impaired logic, weaknesses in planning, perseveration of ineffective strategies, and inability to perform basic operations. Dyscalculia is also associated with deficits in counting, calculating, time and spatial orientation, and memory.

Diagnosis requires an individual assessment including evaluation of intellectual functioning, mathematical skills, and pre-mathematical abilities. Standardized tools such as the WISC and mathematical achievement tests compare the child's performance with age norms. Quantitative dyscalculia involves difficulties in counting and calculation, while qualitative dyscalculia is reflected in problems understanding instructions and following task sequences. Mathematical difficulties usually become evident after school entry, and parents often report typical early psychomotor development (Golubović, 2004). Dyscalculia is not a temporary condition but a neurological disorder for which the student is not responsible.

3. METHODS AND RESEARCH RESULTS

3.1. Subject of Research

The subject of this research is the examination of the causes, manifestations, and consequences of specific learning disabilities in younger school-age children

3.2. Objective of the Research

Specific learning disabilities are increasingly recognized as a significant challenge among younger school-age children. Therefore, the objective of this research is to emphasize the necessity of a broader professional understanding of this topic, so that practitioners, primarily speech therapists and pedagogues, can continuously benefit from relevant scientific findings. Such knowledge contributes to improving their professional practice and the methods they apply when supporting children with specific learning disabilities, ultimately enhancing the children's ability to acquire school-related skills.

A central objective of the research is to highlight the importance of the timely diagnosis and intervention for children who experience difficulties in reading, writing, arithmetic, and speech. Early identification and treatment enable faster and more effective professional support, increasing the likelihood of successful mastery of academic material. Additionally,

the research aims to examine the ways in which specific learning disabilities influence the child's emotional functioning, behavior, and interactions within their broader environment.

3.3. Research Objectives

The research objectives derived from the general research aim are as follows. On the basis of these objectives, relevant scientific studies will be identified and analyzed:

- To investigate risk factors, including genetic, neurological, and social influences that contribute to the development of learning disabilities in younger school-age children.
- To analyze educational methods used when working with children who have specific learning disabilities.
- To examine the impact of specific learning disabilities on the psychosocial development of the child.
- To explore and analyze support strategies available to teachers and parents who work with children with specific learning disabilities.

3.4. Hypothetical Frameworks

General hypothesis:

- Children with specific learning disabilities require multidisciplinary support due to psychological, behavioral, and emotional challenges, with teachers and parents playing a key role in this process.

Specific hypotheses:

- Children with specific learning disabilities, in addition to psychological and behavioral challenges, often experience insecurity and insufficient support from their environment.
- Teachers and educators are adequately trained to work with children with specific learning disabilities and to recognize these difficulties at an early stage.
- Collaboration with parents is an essential factor in the treatment of children with learning disabilities and in the successful integration of students with these disabilities into the wider community.
- A significant number of younger school-age children have specific learning disabilities, and this number has been steadily increasing over the years.
- Among specific learning disabilities, dysgraphia is the most common, and boys are more frequently affected than girls.
- In developmental dyslexia, difficulties occur exclusively in reading, while oral and written language remain preserved.

3.5. Research Method

To achieve the objective of this research, the following methods were applied:

- Descriptive method
- Analytical method
- Comparative method
- Theoretical–methodological method

4. INTERPRETATION OF THE RESEARCH

Scientific research relevant to this thesis emphasizes early detection, diagnosis, and intervention in specific learning disorders (SLD), with a focus on the roles of speech therapists, pedagogues, and parents. SLD constitute a group of developmental disorders with diverse symptoms and causes requiring multidimensional analysis.

Research by Todorović (Ministry of Science and Technology Project No. 1341, 2003) highlights that specific developmental disorders include numerous childhood difficulties unrelated to intellectual disability, brain injury, educational neglect, or emotional problems. These disorders appear early and may involve deficits in speech, reading, writing, arithmetic, or motor coordination.

A major contribution is the study by Krstić, Povše-Ivkić, and Radojković (2008), which examined developmental dyslexia in younger school-age children. The authors found frequent psychomotor underdevelopment, poor motor-test performance, heightened restlessness, inconsistent lateralization, and deficits in cognitive organization. Half of the children showed speech difficulties, 15% had dysgraphia, and nearly 40% demonstrated behavioral problems.

Ilić-Stošković, Nikolić, and Milivojević (2011) investigated perceptions of academic failure among students with special needs. Children with SLD often lacked adequate environmental support and experienced feelings of inferiority and insecurity, confirming the presence of psychological and emotional vulnerability.

Further research by Ilić-Stošković, Nikolić, and Janjić (2019) demonstrated that deficits in phonological processing, orthographic knowledge, and fine-motor coordination negatively affect spelling and written expression, consistent with findings by Flanagan and Alfonso (2011).

The study “Characteristics of Reading and Spelling in Children with Dysgraphic Handwriting” (Golubović, Ječmenica, Panić & Žikić, 2020) found dysgraphic handwriting in 13.8% of younger students. Of these, 53.8% had graphomotor dysgraphia and 46.2% linguistic dysgraphia. Common issues included improper pencil grip, inadequate posture, and frequent spelling errors. The authors stressed the importance of evaluating written content even when handwriting quality is poor.

Rizvić (2006) examined reduced learning ability and attention deficits, emphasizing collaboration between speech therapists, teachers, and children with developmental disorders. His findings underscored the influence of sociological, emotional, and psychological factors on student functioning and provided recommendations for improving practice.

Research on dysgraphia and SLD more broadly points to increasing prevalence and the need to consider developmental, social, and educational factors contributing to these trends. Continuous monitoring and systematic investigation are recommended.

Teachers and educators play a central role in identifying learning disabilities. Obradović, Zlatić, and Vučetić showed that preschool educators in Serbia lack adequate preparation for early detection of SLD. Similarly, Obradović and Krstić concluded that teachers’ intuition is insufficient for recognizing SLD and must be supported by structured professional training.

A study conducted by students of the Faculty of Philosophy in Osijek, together with teachers and speech therapists, examined reading and writing difficulties among students from grades 3 to 8 diagnosed with dyslexia and dysgraphia. It also assessed the extent to which teachers adhered to pedagogical principles and appropriate evaluation criteria when grading their written assignments.

5. DISCUSSION OF RESEARCH RESULTS

The study by Todorović (Study No. 1) identifies factors unrelated to the development of SLDs and shows that these difficulties appear early, although their exact causes remain insufficiently explained. Many children with SLD exhibit disturbances in temporal–spatial perception, while those with dyslexia or dysorthographia often demonstrate deficits in spatial and rhythm perception, as well as emotional and behavioral difficulties. These findings highlight the importance of recognizing subtle developmental deviations as early indicators of SLDs. Reports from an elementary school in Niš (“Teacher Tasa”) showing that 50% of preschool children have speech difficulties further support the assumption that many school-aged children may display characteristics of SLDs.

The research by Krstić, Povše-Ivkić, and Radojković confirms that dyslexia is frequently accompanied by broader neurodevelopmental difficulties. Their results show high rates of psychomotor underdevelopment, increased restlessness, inconsistent lateralization, and deficits in cognitive organization. Speech difficulties were present in half of the sample, dysgraphia in 15%, and behavioral problems in nearly 40%. These findings support the hypothesis that SLDs involve complex motor, cognitive, and emotional vulnerabilities.

The study by Ilić-Stošić, Nikolić, and Janjić demonstrates that phonological awareness and spelling performance are strongly influenced by fine- and gross-motor skills. Children with coordination disorders showed significantly lower achievements than typically developing peers, confirming that orthographic competence depends on the integration of motor, linguistic, and cognitive processes (Flanagan & Alfonso, 2011). Early motor experiences—such as climbing, crawling, and jumping—were shown to contribute to later academic abilities, including spelling.

Recent dysgraphia research increasingly focuses on qualitative handwriting features, such as grapheme formation, spatial alignment, letter-size consistency, and pencil grip. Even with adequate instruction, children with dysgraphia rarely reach age-appropriate handwriting fluency, showing irregular spacing, inconsistent letter size, and poor spatial organization, reflecting motor-linguistic deficits rather than a lack of motivation.

The study by Golubović et al. (2020) found dysgraphic handwriting in 13.8% of younger students (53.8% graphomotor, 46.2% linguistic). Among the sample, 28% displayed improper pencil grip, 7% were left-handed, and 30% had inappropriate posture. Dysgraphia was more prevalent in boys (69.1%) than girls (30.9%). These findings confirm that dysgraphia is among the most common SLD subtypes and more frequent in boys.

Rising prevalence rates of SLDs have prompted concerns about developmental and environmental influences. One possible factor is reduced fine-motor development due to increased use of digital devices instead of traditional play that promotes graphomotor skills.

Another group of studies emphasizes the central role of teachers and parents in supporting children with SLDs. The research by Obradović, Zlatić, and Vučetić (2011) shows that although preschool educators understand conceptual definitions of SLDs, they are not adequately trained for early detection and often misinterpret early signs as isolated language difficulties. This refutes the assumption that educators are adequately prepared to identify SLDs in early childhood.

Similarly, the study Intuition and Knowledge of Teachers in Identifying Specific Learning Disabilities (Obradović & Krstić) found that more than 60% of children classified as having harmonious development still showed discrepancies between academic achievement and general intelligence. Although teachers recognized some inconsistencies, accuracy varied, demonstrating that intuition alone is insufficient and must be supplemented with structured assessment tools and specialized training.

6. CONCLUSION

Specific learning disabilities represent significant challenges for children, both in everyday functioning and in interactions with their social environment throughout development. The beginning of formal schooling introduces additional complexity, as the educational system requires the acquisition and application of skills that the child may not have previously developed. For this reason, early observation and timely identification of potential difficulties or disabilities are crucial, even in children with typical psycho-physical development. Although signs of learning disabilities may appear earlier, they are most commonly identified when a child enters elementary school.

This study, through theoretical and methodological analysis, formulates relevant conclusions regarding specific learning disabilities in younger elementary school children and highlights the most effective approaches for supporting these learners. Before implementing any instructional or therapeutic method, early diagnosis and recognition of the specific difficulty are essential. Early intervention enables speech therapists, educators, and parents to plan, coordinate, and systematize their approaches, thereby maximizing the child's developmental and academic progress.

Inclusive education plays a central role in supporting children with learning disabilities, developmental difficulties, or behavioral challenges. When adequately implemented, inclusive practices significantly enhance the effectiveness of speech therapy and help children master academic skills and curriculum content. This contributes to better school performance, improved social participation, and a higher overall quality of life. Inclusion also facilitates the child's integration within the peer group and the broader social environment. Collaboration among parents, teachers, speech therapists, and other school professionals is key to ensuring effective support and enabling the child to overcome learning challenges.

Every difficulty, whether mild or severe—can be alleviated through consistent parental involvement and continuous cooperation between professionals and the family. Once a learning disability is identified, it is essential to begin diagnostics and intervention as early as possible, combining individualized support at school with structured assistance at home. Children with learning difficulties must feel secure in every environment, as emotional safety significantly contributes to their capacity to cope with academic demands.

Believing in each child's potential is fundamental—just as children place their trust in the adults who guide and support them.

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INOVATIVNI PRISTUPI REŠAVANJU SPECIFIČNIH SMETNJI U UČENJU KOD DECE MLAĐEG ŠKOLSKOG UZRASTA

Apstrakt. *Specifične smetnje u učenju, kao što su disleksija, disgrafija i diskalkulija, predstavljaju značajne izazove za mlađu školsku decu. Ovaj rad istražuje kako efikasno identifikovati i rešavati ove smetnje kako bi se unapredili akademski uspeh i socijalne veštine. Ključna istraživačka pitanja fokusiraju se na uticaj specifičnih smetnji u učenju na emocionalni i socijalni razvoj, na najučinkovitije pristupe lečenju i na uticaj inovativnih nastavnih metoda.*

Metodologija istraživanja uključuje deskriptivnu, analitičku i komparativnu analizu naučnih studija i praktičnih istraživanja. Teorijski deo istražuje faktore koji utiču na tretman smetnji u učenju, dok metodološki deo razmatra ulogu ranog dijagnostikovanja u akademskom i socijalnom uspehu. Takođe, istraživanje ocenjuje inovativne obrazovne pristupe usmerene na unapređenje nastavničkih praksi za decu sa smetnjama u učenju.

Rezultati pokazuju da rano dijagnostikovanje i multidisciplinarna podrška značajno poboljšavaju akademske rezultate i emocionalnu dobrobit. Istraživanje ističe ključnu ulogu učitelja i roditelja u stvaranju inkluzivnog i podržavajućeg obrazovnog okruženja.

Zaključak istraživanja je da implementacija inovativnih obrazovnih praksi omogućava fleksibilno i prilagodljivo učenje koje zadovoljava potrebe dece sa smetnjama u učenju. Ove metode ne samo da poboljšavaju akademske veštine, već takođe doprinose emocionalnoj stabilnosti i socijalnom razvoju.

Rezultati istraživanja naglašavaju potrebu za obrazovanjem učitelja i roditelja o specifičnim smetnjama u učenju, kao i integraciju inovativnih nastavnih strategija za promovisanje personalizovanog i inkluzivnog učenja.

Ključne reči: *smetnje u učenju, rano dijagnostikovanje, tretman, inovativne nastavne metode, školski uspeh, emocionalni uticaj*

Original research paper

MATH TEXTBOOKS AND LEARNING ALGEBRAIC CONTENT THROUGH DISCOVERY-BASED LEARNING

UDC 371.3::511.2-028.31

Sanja Anđelković , Nela Malinović Jovanović ,
Aleksandra Milanović 

Pedagogical Faculty in Vranje, University of Niš, Serbia

Abstract. Starting from the position that algebra teaching in primary mathematics education should be based on students' independent discovery, construction and generation of knowledge, the authors emphasize the importance of studying algebraic content in primary mathematics education as well as the methodological design of algebra teaching aimed at students' active participation in the learning process. In this context, taking into account the key role of textbooks in teachers' teaching practice, a content analysis of the textbook was carried out with the aim of investigating its role in creating conditions for discovery-based learning of algebraic content. The study was conducted on a sample of 45 first to fourth grade primary school mathematics textbooks. The elements that form the basis for discovery-based learning of algebraic content were analyzed, i.e. those that stimulate students' thinking activity, direct their attention, initiate the drawing of conclusions and contribute to the construction of knowledge at a satisfactory level. The results obtained show that in the mathematics textbooks for the first four grades of primary school, the expository approach dominates, in which the new content is presented explicitly, without any special requirements that would stimulate students' thinking activity. On the other hand, on average only a third of the tasks provide a basis for discovery-based learning. It can be concluded that examples that encourage students to discover new algebraic content are insufficiently represented in mathematics textbooks, which means that textbooks in general do not provide adequate conditions for discovery learning of algebraic content. Specifically, the research findings point to aspects that should be improved in the design of textbooks. They can help to improving the quality of textbooks through an appropriate didactic design of mathematical content and the creation of a stimulating environment for students.

Keywords: algebraic content, discovery-based learning, elementary mathematics teaching, textbook

1. INTRODUCTION

The adoption and understanding of algebraic concepts represent a foundation not only for further learning in mathematics but also for acquiring knowledge in other disciplines. Numerous studies show that younger students are capable of understanding and adopting algebraic content (Blanton & Kaput, 2005; Carpenter & Franke, 2001), and that early

Corresponding author: Sanja Anđelković

Pedagogical Faculty in Vranje, University of Niš, Partizanska 14, 17500 Vranje, Serbia

E-mail: sanjaa@pivr.ni.ac.rs

introduction of algebra positively influences later learning success (Carracher & Schliemann, 2007).

The concept of "Algebra for all", promoted in the document *Principles and Standards for School Mathematics* (NCTM, 2000), points to the importance of early algebraic education. It emphasizes the need to provide students in the lower grades of elementary school with equal educational opportunities for learning algebraic content, in order to prepare them for further schooling and more complex mathematical concepts in higher grades and high school.

However, although many researchers emphasize that algebra is a key prerequisite for understanding mathematics, a large number of students still fail to acquire that "key" (Cai, 2004; Lott, 2000; Moses & Cobb, 2001). This indicates the need to improve the approach to teaching algebra, in order to enable all students to succeed in this important area.

The document *Principles and Standards for School Mathematics* emphasizes that learning algebra encompasses three key aspects: 1) understanding patterns, relationships, and functions; 2) representing and analyzing mathematical situations and structures using algebraic symbols; and 3) analyzing changes in various contexts (NCTM, 2000: 37). From this, it follows that learning algebra should not be reduced to acquiring isolated facts and mechanically manipulating symbols, but rather it must be viewed as a distinct way of thinking (Maričić and Milinković, 2017). As Lew points out, "success in acquiring algebra depends on developed mathematical thinking abilities such as generalization, abstraction, analytical thinking, modeling, and organization" (Lew, 2004: 93). In this sense, it can be said that mastering school algebra implies "mastering a new language, methods of thinking, ways of organizing information, and perceiving reality" (Romano, 2009: 20). However, such progress is possible only if students have previously developed appropriate cognitive prerequisites.

Given the developmental characteristics of younger school-aged students, as well as the fact that learning algebra is based on processes of generalization and the use of abstract, symbolic notations, it is not surprising that a large number of students encounter difficulties in understanding it. Therefore, numerous researchers worldwide (Kieran, 1981, 2004; Sfard & Linchevski, 1994; Vergnaud, 1988, according to: Carracher et al., 2006; Knuth et al., 2006; Van Stiphout, Drijvers & Gravemeijer, 2013, et al.) have focused their attention in recent decades on identifying the specific difficulties students face when acquiring algebraic content at a younger age. The goal of these studies was to gain a deeper understanding of the nature of these problems, in order to improve the practice of teaching algebra and create optimal conditions for the development of algebraic thinking in children. The findings indicate the need to adapt the approach to teaching algebra to the cognitive abilities of students, with the gradual introduction of abstract concepts through concrete and meaningful teaching situations.

These very difficulties in understanding, as well as the complexity of algebraic content itself, require a careful selection of specific methods, procedures, and strategies in the process of methodical transformation and shaping of teaching content. Effective teaching of algebra at a younger school age implies the use of modern, active teaching methods that place the student at the center of the learning process. This primarily refers to methods that encourage independent discovery, construction, and generation of knowledge, thereby enabling students a deeper understanding of algebraic concepts. Among these approaches, discovery-based learning stands out, which involves the active participation of students in the process of acquiring knowledge, relying on their own curiosity and research, but with constant teacher support. The teacher here plays a significant role as an instigator and mentor: they set challenges, guide with questions, and create situations that encourage deeper thinking, thereby enabling students to gradually come to understanding and discover complex concepts. Although the focus is on student independence, completely autonomous learning

without professional guidance is not always achievable, especially with complex content. Therefore, teachers often use techniques such as "Socratic questions" and structured activities in small groups to support the process of discovering new ideas (Hammer, 1997). This type of learning is based on constructivist theories - it starts from the belief that individuals learn best when they actively construct their own knowledge and connect it with personal experience. Thanks to this, not only new knowledge is developed, but also critical thinking skills, curiosity, and the ability to apply what has been learned in new situations (Driver et al, 2000, according to: Kalathaki, 2015). At the heart of this approach is the student themselves, who is given the opportunity to transform or expand their previous concepts, attitudes, and experiences with understanding.

In the process of discovery- based learning, the teacher's role fundamentally changes – from an information transmitter to a mentor and coordinator of student research. The teacher is no longer at the center of the teaching process, but instead takes on the role of a guide who directs students in independently discovering new mathematical concepts, relations, and laws. To effectively support the discovery-based learning process, the teacher must create a stimulating environment where students feel free to explore, ask questions, make mistakes, and learn through their own experience. Their task is to carefully design activities that encourage curiosity and motivate students. The teacher must be able to recognize moments when it is necessary to intervene, provide guidance, or ask additional questions that lead students to discovery. At the same time, it is important not to impose solutions, but to support independent thinking and the development of logical thinking in students. This implies a high level of professional competence and methodical preparedness on the part of the teacher.

Since the teacher primarily relies on textbooks in modeling the learning process, the goal of our research focused on mathematics textbooks in the lower grades of elementary school, with the aim of determining their role in creating conditions for learning algebraic content through discovery.

1.1. The Role of Mathematics Textbooks in the Function of Learning Through Discovery

The textbook, "as a didactically designed book intended for school learning" (Španović, 2008: 63), represents the primary and most widespread source of information for students. Aligned with the curriculum and the developmental capabilities of students, the textbook serves as the main link between students and educational content, as well as between teachers and students, and directly impacts the organization and modeling of the teaching process.

In didactic-methodological literature, the textbook is generally defined as "a compulsory school book (created through a legally established procedure), whose primary task is the concretization of the curriculum, i.e., the foreseen content that students should acquire. Conceived according to the current curriculum, didactically-methodologically and graphically-visually prepared for independent learning, the textbook also refers to other sources of knowledge" (Pedagogical Lexicon, 1996: 522).

Ivić and associates discuss the narrow and broad definitions of a textbook. According to the narrow definition, in our schools, a textbook appears as a conveyor of school curriculum content, i.e., as an "operationalized school curriculum" (Ivić et al., 2008: 23). Through textbooks, teachers gained a clearer insight into curriculum requirements, and students acquired facts and information prescribed by the curriculum. Thus, its "primary function was the transmission of information, facts, and knowledge envisioned by the school curriculum" (Ivić et al., 2008: 23). According to the broad definition, in contemporary literature, a textbook refers to any book and any medium used in teaching.

However, the aforementioned authors advocate for a school concept where learning and the learner are at the center of attention, which requires a different definition of a textbook. A textbook is expected to have a developmental-formative function and to support the construction of knowledge with its didactic apparatus. Therefore, when defining a textbook, it is necessary to "shift from emphasizing the content being learned to the process of acquiring, i.e., learning that content. Another important shift is from direct transmission of knowledge to learning as the construction of knowledge" (Ivić et al., 2008: 24–25).

Thus, according to the definition of the previously mentioned authors, "a textbook is no longer merely a means for concretizing the school curriculum, nor is it a means for reproductive learning, but rather a textbook is a very specific medium that cannot be defined outside its primary function – to enable learning" (Ivić et al., 2008: 26). Therefore, "a textbook can be considered any teaching aid (or combination of teaching aids) that contains systematized knowledge from a certain field, didactically shaped for a specific level of education and a specific age of students, so that it has a developmental-formative role and participates in the construction of students' knowledge" (Ivić et al., 2008: 27).

Since learning does not imply the accumulation of knowledge, but its construction, it cannot be achieved without the activity of the learner. Therefore, the textbook must create situations that will activate the student and provide them with the opportunity to construct knowledge through independent activities. This means that instead of offering ready-made facts, the text of a modern textbook offers "didactic solutions that lead the student to independently discover the unknown, i.e., direct students to ask and answer questions, think and solve problems, i.e., place students in an active relationship with the content" (Ivić et al., 2008: 28). From this it follows that "the textbook, as the primary source of learning in school, must be constructed as a working, action book, a book that will make the student the subject of their own development, the subject of changes within themselves" (Vlahović, 2009: 1095).

What makes a mathematics textbook specific compared to other textbooks is that the largest part of its content consists of problems. "Due to its versatile role, a problem can be considered the basic structural element of a mathematics textbook in initial mathematics instruction. Through them, knowledge is acquired, consolidated, systematized, repeated, and checked" (Bozalo and Samardžić, 2016: 367). In a word, they realize the foreseen goals of the teaching process.

Therefore, the main means for creating learning situations in a mathematics textbook are problems. Introductory problems at the beginning of a teaching unit can represent "a basis for bringing students into a situation where there will be a need for new knowledge that can be obtained by perceiving the relationship between what is given and what is sought. Then introductory examples function as the main text" (Kovačević, 2011: 79). The text in the form of verbal presentation of ready-made mathematical knowledge in mathematics textbooks should be reduced to the necessary minimum. It should be more focused on "communicating terms, the correct way of expression, and the final editing of rules, definitions, and facts. Its function is to teach students mathematical language and symbolism, words that express operations and concepts, precise and concise expression of mathematical rules and regularities" (Bozalo and Samardžić, 2016: 366).

Given that this paper deals with discovery-based learning, we will focus on textbook elements that provide a basis for this type of learning. Namely, discovery-based learning can be achieved through content that directs the student to independent activity and leads them to discover new concepts, rules, algorithms, etc. These are tasks, assignments, situations that problematize the material and for which the student does not have a ready answer, but rather require them to confront the problem, formulate hypotheses, research, discover cause-and-effect relationships, connect content, study various sources of knowledge, and also apply

knowledge in practice. Therefore, content that provides a basis for discovery-based learning is not given in a ready-made form and does not suggest a solution to the problem, but rather requires mental effort from the student and encourages them to analyze, synthesize, abstract, generalize, memorize, compare, conclude, etc. Also, discovery-based learning can be achieved through individual examples that encourage students to draw conclusions about general concepts and properties.

2. METHODOLOGICAL FRAMEWORK OF RESEARCH

Since a mathematics textbook represents an indispensable link in the daily practice of teachers, the aim of the research was to examine the role of mathematics textbooks in creating conditions for learning algebraic content through discovery.

The sample of textbooks was selected from the population of mathematics textbooks for lower grades of primary school approved for publication by the Ministry of Education, Science and Technological Development of the Republic of Serbia. The research sample comprised mathematics textbooks for grades one through four of primary school, published by Eduka, Vulkan Znanje, Novi Logos, Klett, Bigz and Kreativni Centar. All textbooks were approved for publication by the Ministry of Education, Science and Technological Development of the Republic of Serbia for the 2022/2023 school year.

The research applied content analysis technique to examine whether and to what extent mathematics textbooks guide students towards discovery-based learning in acquiring knowledge and forming concepts related to algebraic content, i.e., to identify introductory examples (carriers of the content being learned) that form the basis for learning algebraic content through discovery. Thus, the emphasis was on analyzing the methodological approach in introducing algebraic content. The basic unit of analysis was the introductory content/task in the textbook through which the student becomes familiar with new content and forms concepts. Depending on which characteristic activities, i.e., forms of learning, the mentioned contents initiate in students, we singled out the following as categories of content analysis:

- Discovery based learning – content for which the student does not have a ready answer, but which requires mental effort and insight into relationships, i.e., content that directs the student to independently discover new concepts, rules, algorithms, etc.;
- Receptive learning – explicative, logically organized content given in a ready-made form that the student acquires mechanically or with understanding;
- Other forms of learning.

The instrument used in the research was a content analysis protocol, in which the results of the analysis were recorded, and it was developed for the needs of the research. Its content included the titles of textbooks and data on the number of tasks which, by teaching units, were based on discovery learning, expository approach, or other forms of learning. The content analysis was performed by the authors of the paper. Given that the research used the content analysis technique and a record sheet as an instrument, descriptive statistical procedures were used in data interpretation: frequencies and percentages.

3. THE RESEARCH RESULTS AND DISCUSSION

Starting from the fact that learning algebraic content through discovery can be achieved through tasks that guide students to independently discover new concepts, rules, algorithms, etc., we have tried to identify introductory examples – tasks in mathematics textbooks for the first four grades of elementary school that provide this opportunity, by analyzing the content.

If algebraic content is considered, the curriculum for the first grade of elementary school envisages the acquisition and development of the concept of an unknown number in equations with addition and subtraction, as well as the discovery of an unknown number exclusively through "guessing" (*Pravilnik o planu nastave i učenja za prvi ciklus osnovnog obrazovanja i vaspitanja i programu nastave i učenja za prvi razred osnovnog obrazovanja i vaspitanja*, 2017). By reviewing the analyzed mathematics textbooks for the first grade of elementary school, we found that expository presentation dominates at the beginning of the teaching unit when introducing algebraic content, while the total representation of tasks that initiate learning algebraic content through discovery is slightly more than 35% (Table 1). None of the analyzed mathematics textbooks include tasks that initiate any other form of learning when processing algebraic content. The highest representation of tasks that create a basis for learning through discovery was found in textbooks from the publishing houses Bigz and Vulkan znanje (66.6%), while a significantly lower representation of such tasks was found in the textbook from the publishing house Novi Logos, where half (50%) of the planned algebraic content was introduced through discovery. In textbooks from the publishing houses Eduka, Klett, and Kreativni centar, all algebraic content was introduced through meaningful receptive learning (Table 1).

Table 1. Representation of learning forms in the formation of algebraic concepts in mathematics textbooks for the first grade of primary school

<i>Textbooks</i>	<i>First grade</i>			
	<i>Discovery based learning</i>		<i>Expository learning</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Eduka</i>	0	0%	3	100%
<i>Kreativni centar</i>	0	0%	2	100%
<i>Novi Logos</i>	1	50%	1	50%
<i>Klett</i>	0	0%	1	100%
<i>Vulkan</i>	2	66.6%	1	33.3%
<i>Bigz</i>	2	66.6%	1	33.3%
Total	5	35.7%	9	64.3%

In the second grade of elementary school, students are introduced for the first time to the use of letters as a symbol for an unknown number and the concept of an equation. The procedure for solving equations in the second grade is based on observing dependencies and mutual connections between arithmetic operations. The curriculum plans for solving equations in parallel with performing certain arithmetic operations, so second-grade students solve equations with unknown addends, minuends, subtrahends, factors, dividends, and divisors (*Pravilnik o programu nastave i učenja za drugi razred osnovnog obrazovanja i vaspitanja*, 2018).

Globally, an analysis of the content of textbooks for the second grade of elementary school found that most algebraic content (60%) is introduced through expository presentation. The representation of content that requires learning through discovery is only

35%, while other forms of learning in the introduction of algebraic content are present in a negligible percentage of 5% (Table 2).

Algebraic content in the second grade is introduced through discovery-based learning with the highest frequency in the textbook from the publishing house Vulkan znanje (71.4%), while in the textbooks from publishers Eduka, Bigz, and Klett, only two contents are introduced with this approach. In the Kreativni Centar textbook, no teaching unit is introduced through discovery, while in the second-grade textbook from the publishing house Novi Logos, an equal representation of the approach involving discovery-based learning and the approach based on receptive learning of algebraic content was found (Table 2).

Table 2. Representation of learning forms in the formation of algebraic concepts in mathematics textbooks for the second grade of primary school

<i>Textbooks</i>	<i>Second grade</i>					
	<i>Discovery based learning</i>		<i>Expository learning</i>		<i>Other forms of learning</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Eduka</i>	2	33.3%	4	50%	1	16.7%
<i>Kreativni centar</i>	0	0%	6	100%	0	0%
<i>Novi Logos</i>	3	50%	3	50%	0	0%
<i>Klett</i>	2	28.6%	4	57.1%	1	14.3%
<i>Vulkan</i>	5	71.4%	2	28.6%	0	0%
<i>Bigz</i>	2	28.6%	5	71.4%	0	0%
Total	14	35%	24	60%	2	5%

According to the requirements of the third-grade curriculum, in addition to content involving known forms of equations within the number set up to 1000, the adoption and development of the concept of inequalities are foreseen. Besides the aforementioned, third-grade students are introduced to content from the field of algebra concerning the dependence of results on changes in components of arithmetic operations and determining the value of expressions with letters for given letter values (*Pravilnik o nastavnom planu i programu za prvi, drugi, treći i četvrti razred osnovne škole*, 2019).

An analysis of the content in third-grade mathematics textbooks revealed a generally low representation of tasks – content that requires learning algebra through discovery. However, differences among textbooks from individual publishers, regarding the representation of these tasks, are significant, ranging from 0% to 63.6% (Table 3).

Tasks that form the basis for learning through discovery are most represented in the textbook from the Eduka publishing house, with a large percentage – 63.6%. The representation of tasks-content that initiates learning through discovery in the textbook from the Novi Logos publishing house is 27.3%, while in the textbook from the Kreativni centar publishing house, slightly less than a third of algebraic content (30.8%) is introduced with a discovery approach (Table 3).

Content analysis showed that content on the dependence of results on changes in computational operation components is not present in the Bigz publisher's textbook, while 40 % of other algebraic content in this textbook is introduced through discovery-based learning.

In the Klett publishing house's textbook, algebraic content is introduced exclusively through receptive learning. In addition, by reviewing this textbook, we found that it does not include content related to introducing the dependence of the sum on changes in addends and the dependence of the difference on changes in the minuend and subtrahend.

Also, by analyzing the content of mathematics textbooks for the third grade, we found that in two out of five analyzed textbooks, content related to determining the value of expressions with variables is not present. The fact that content prescribed by the curriculum does not exist in certain textbooks is concerning, especially considering that this content is connected and mutually conditioned by other algebraic content, especially that related to equations and inequalities.

Table 3. Representation of learning forms in the formation of algebraic concepts in mathematics textbooks for the third grade of primary school

<i>Textbooks</i>	<i>Third grade</i>					
	<i>Discovery based learning</i>		<i>Expository learning</i>		<i>Other forms of learning</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Eduka</i>	12	63.3%	7	36.8%	0	0%
<i>Kreativni centar</i>	4	30.8%	6	46.1%	3	23.1%
<i>Novi Logos</i>	3	27.3%	8	72.7%	0	0%
<i>Klett</i>	0	0%	4	57.1%	3	42.9%
<i>Bigz</i>	2	40%	3	60%	0	0%
Total	21	38.1%	28	51%	6	10.9%

Algebraic content studied from the first to the third grade of elementary school is reinforced and expanded to the set of natural numbers in the fourth grade.

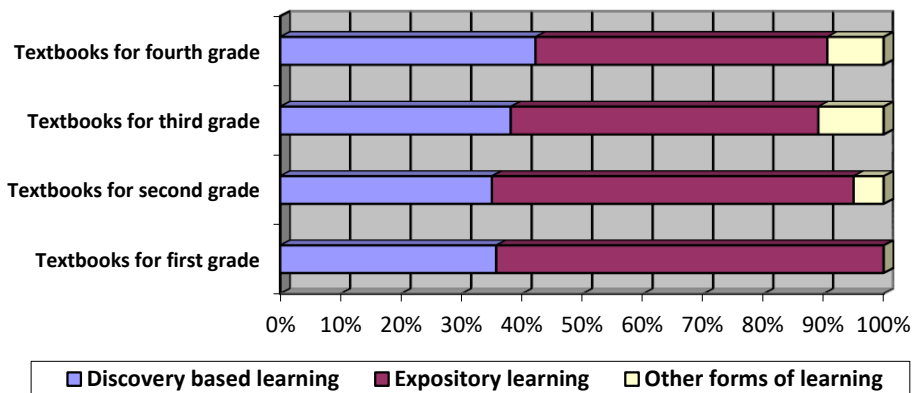
An analysis of the content of mathematics textbooks for the fourth grade indicates differences in the approach used to introduce algebraic content. Most of the algebraic content in textbooks from the publishing houses Bigz and Kreativni centar is introduced exclusively through tasks that guide students to discover new concepts, rules, etc., which otherwise define the discovery-based learning approach. On the other hand, in Klett publisher's textbooks, only two (14.3%) out of 14 contents (Table 4) were introduced with this approach.

The representation of tasks-content that initiate discovery-based learning in the Novi Logos publishing house textbook is 23%, while in the Eduka publishing house textbook, slightly less than half of the algebraic content (47%) is introduced with an approach based on discovery-based learning. Thus, in two textbooks (Novi Logos and Klett), when introducing algebraic content, the dominant approach is one where content is introduced through receptive learning (Table 4).

Table 4. Representation of learning forms in the formation of algebraic concepts in mathematics textbooks for the fourth grade of primary school

<i>Textbooks</i>	<i>Fourth grade</i>					
	<i>Discovery based learning</i>		<i>Expository learning</i>		<i>Other forms of learning</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Eduka</i>	8	47%	9	53%	0	0%
<i>Kreativni centar</i>	7	70%	2	20%	1	10%
<i>Novi Logos</i>	3	23%	8	61.6%	2	15.4%
<i>Klett</i>	2	14.3%	10	71.4%	2	14.3%
<i>Bigz</i>	7	70%	2	20%	1	10%
Total	27	42.2%	31	48.4%	6	9.4%

Finally, when considering the contribution of the analyzed mathematics textbooks to learning algebraic content through discovery (Figure 1), it can be observed that textbooks for the fourth grade contribute the most to this function, followed by textbooks for the third grade, and least by textbooks for the second grade.

**Figure 1.** Presentation of forms of learning in the formation of algebraic concepts in mathematics textbooks by grade level

Thus, the largest number of tasks that promote learning through discovery is in the fourth grade, where there is also the smallest difference in the representation of different types of tasks (Figure1). If we consider the total number of tasks we identified in the analyzed mathematics textbooks, based on the obtained results, we can say that in textbooks from the first to the fourth grade, only approximately every third task (36.7%) represents a task based on learning through discovery, while more than half of the analyzed tasks (58.9%) in the textbooks are tasks based on expository presentation.

4. CONCLUSIONS

Introducing students to the content of algebra and successfully forming initial concepts in this area represents an important task in mathematics education. The quality of forming these concepts largely depends on the methodological approach applied in the learning process. One of the most effective approaches in this regard is discovery-based learning, which encourages an active role for students in the process of forming mathematical concepts.

Algebraic content, by nature generalized and abstract and accompanied by symbolism, often presents a challenge for students, especially at a younger school age. Therefore, it is crucial that these concepts are not transmitted in a pre-formulated manner, but that the student is put in a situation where, independently, through active exploration, observation of patterns, and connecting phenomena, they discover mathematical relationships and regularities. Discovery-based learning implies that the student gradually, through tasks that encourage thinking, arrives at conclusions and rules. Knowledge acquired in this way is of higher quality and more lasting, because it is the result of the student's thought activities, and not the reproduction of others' solutions. Successful introduction of algebraic concepts requires carefully designed activities that guide students through the discovery process – from concrete examples, through observing patterns, to formulating general rules.

Our research results show that the analyzed textbooks are dominated by an expository approach where, at the beginning of a teaching unit, knowledge is explicitly presented without any special requirements that would encourage students' thought activity. On the other hand, on average, only a third of the tasks create a basis for learning through discovery. Therefore, it can be concluded that examples encouraging students to discover new algebraic content are insufficiently represented in mathematics textbooks, meaning that textbooks generally do not provide adequate conditions for learning algebraic content through discovery.

The previously presented results of the textbook analysis partially confirm the view of Prof. Vlahović, who emphasizes that the textbook currently in use "...serves the positivist, objectivist, i.e., instructionist concept of teaching/learning. It is a solution that keeps the student in the position of a passive recipient of others' thoughts, with or without understanding" (Vlahović, 2009: 1092).

Although it is significant that there are differences among publishers in the representation of tasks that encourage students to acquire algebraic content through discovery, the question arises whether these differences stem from the textbook's style itself or from the specific nature of algebraic content. By analyzing other teaching topics in textbooks where a lower representation of discovery tasks in the field of algebra was observed, we determined that within those topics, there are still tasks that encourage learning through discovery. This indicates that the observed difference is more likely a consequence of the nature of the algebraic content itself. Nevertheless, this question requires deeper analysis and consideration in future research.

The analysis results can serve as a basis for textbook authors to conceptualize teaching materials in which content encouraging students to independently discover new concepts and formulate their own conclusions will be more represented. This will significantly contribute to raising the quality of textbooks through appropriate didactic shaping of mathematical content and creating a stimulating educational environment for students.

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UĐZBENICI MATEMATIKE I UČENJE ALGEBARSKIH SADRŽAJA PUTEM OTKRIĆA

Apstrakt. *Polazeći od stava da nastava algebre u početnom matematičkom obrazovanju treba da se temelji na samostalnom otkrivanju, konstrukciji i generisanju znanja od strane učenika, autori u radu ističu značaj izučavanja algebarskih sadržaja u ranoj nastavi matematike, kao i metodičku organizaciju nastave algebre usmerenu na aktivno učešće učenika u procesu učenja. U tom kontekstu, uzimajući u obzir ključnu ulogu uđzbenika u nastavnoj praksi učitelja, sprovedena je sadržajna analiza uđzbenika s ciljem ispitivanja njegove uloge u stvaranju uslova za učenje algebarskih sadržaja putem otkrića. Istraživanje je sprovedeno na uzorku od 45 uđzbenika matematike od prvog do četvrtog razreda osnovne škole, pri čemu su analizirani oni elementi koji pružaju osnovu za učenje algebarskih sadržaja putem otkrića, tj. koji podstiču misaonu aktivnost učenika, usmeravaju njihovu pažnju, iniciraju izvođenje zaključaka i doprinose konstrukciji znanja do zadovoljavajućeg nivoa. Dobijeni rezultati ukazuju na to da u uđzbenicima matematike za prva četiri razreda osnovne škole dominira ekspozitorni pristup u kojem se novi sadržaji izlažu eksplicitno, bez posebnih zahteva koji bi podstakli misaonu aktivnost učenika. S druge strane, u proseku, tek trećina zadataka stvara osnovu za učenje putem otkrića. Stoga se može zaključiti da su primeri koji podstiču učenike na otkrivanje novih algebarskih sadržaja nedovoljno zastupljeni u uđzbenicima matematike što znači da uđzbenici uglavnom ne obezbeđuju adekvatne uslove za učenje algebarskih sadržaja putem otkrića. Rezultati istraživanja konkretno, ukazuju na aspekte koje bi trebalo unaprediti prilikom koncipiranja uđzbenika, te mogu doprineti unapređenju kvaliteta istih kroz odgovarajuće didaktičko oblikovanje matematičkih sadržaja i stvaranje podsticajnog okruženja za učenike.*

Ključne reči: *algebarski sadržaji, učenje putem otkrića, početna nastava matematike, uđzbenik*

TOPIC

Integration of Technology in Education

Exploratory research

CHATGPT AS A TOOL FOR INNOVATING THE TEACHING PROCESS

UDC 371.3.:004.8

Aleksandra Milanović¹ , Jelena Maksimović² , Sanja Anđelković¹ ,
Boris Kožuh³ 

¹Pedagogical Faculty in Vranje, University of Niš, Serbia

²Faculty of Philosophy, University of Niš, Serbia

³Faculty of Phylosophy, University of Ljubljana, Slovenia

Abstract. *Innovation in the educational process involves the use of modern digital technologies at all stages of its implementation. The educational system is constantly exposed to changes and pressures to be innovative and aligned with societal changes, while also being adaptable to the needs of the individual. As the most current issue in this context, artificial intelligence stands out with the potential it offers for the teaching and learning process. Since artificial intelligence is a complex concept, the paper emphasizes ChatGPT as a segment of artificial intelligence, a language model suitable for use in innovating the teaching process. The aim of the paper is to highlight that the adequate and competent use of ChatGPT is one of the ways to innovate teaching practices. Using the method of theoretical analysis, we address three research tasks: 1. We highlight the importance of using ChatGPT in the preparation, implementation, and evaluation phases of the teaching process by teachers; 2. We identify potential ways of using ChatGPT to innovate teaching practices; 3. We conduct a comparative analysis of two lesson plans for the same teaching unit: one proposed by ChatGPT and the other created by competent experts and offered to teachers as supplementary material alongside the textbook. The paper concludes with implications for further research, emphasizing the need for empirical studies within this issue.*

Keywords: *ChatGPT, artificial intelligence, learning, teacher, lesson*

INTRODUCTION

Although it has only been available to the public for a few years, ChatGPT, as a segment of artificial intelligence, is being intensively used in all areas of life- most commonly as a tool for communication, text translation, data generation, summarization, and analysis of large amounts of information. “Artificial intelligence is a branch of computer science that aims to create machines- that is, robots and systems- capable of performing tasks that require human intelligence to execute” (Bowling & Wagner, 2023: 4). So far, the development path

of artificial intelligence and its tools is known, which leads to the assumption that its future development will continue at the same or an even faster pace.

This assumption is supported by the fact that with the emergence of ChatGPT, almost every field has seen some level of improvement, simplification, and modernization of work. Artificial intelligence has entered the sphere of education with the intention of staying there. Thus, teachers, schools, and ministries have the task of organizing educational work in a way that does not hinder students but instead enables them to use artificial intelligence. According to the authors (*ibid.*), this is the only way to prepare younger generations for the future.

ChatGPT is a language model based on artificial intelligence, capable of producing original outputs while recognizing all languages. It is built on machine learning and holds great potential for enhancing the educational process (Neefe, 2023; UNESCO, 2023; Sadeghinejad & Najmaei, 2023). It operates thanks to artificial intelligence and was released to the public on November 30, 2022 (Atlas, 2023; El-Seoud & Ayman, 2023). ChatGPT was developed using existing information and data from internet-based sources, which allows it to provide answers, instructions, or guidance on virtually any topic. For this reason, the model has, in recent years, been widely used by professionals from various fields. The focus of our research is to examine the contribution of ChatGPT in innovating teaching practices. This topic is justified by the fact that, in today's modern society, students often surpass teachers in the use of new technologies, artificial intelligence, and its tools.

The aim of this paper is to improve and positively influence the understanding of the role that ChatGPT, as an artificial intelligence tool, plays in the innovation and modernization of teaching practices. At first glance, teaching practice is typically associated with primary, secondary, and higher education. However, it is important to note that educational processes also take place in preschool institutions- albeit according to different criteria than in the previously mentioned levels of education.

Therefore, as a potential direction for future research, following the examination of ChatGPT's role in contemporary teaching, the investigation of the impact of artificial intelligence tools on early childhood education emerges as a relevant and timely topic.

In this paper, we first examine ChatGPT as a tool for innovating the teaching process, with the aim of increasing its adaptability to students, their needs, and interests. We then analyze the potential application of ChatGPT in the educational process. Finally, we present implications and ideas for future research. Regarding the sources used and the research sample, it can be concluded that the majority of the studies referenced are theoretical in nature, focusing on the analysis and evaluation of the effectiveness of ChatGPT usage by both teachers and students across all levels of education.

This research is theoretical in nature, primarily because we still lack a comprehensive overview and body of literature that would allow for an empirically grounded examination of ChatGPT's impact on teaching practices. The contribution of this study lies in its potential to inform teachers and practitioners about the possibilities, significance, and potential drawbacks of (not) using ChatGPT in educational practice. It aims to provide practical examples of how this tool can be implemented, all with the goal of strengthening, innovating, and modernizing teaching practices. The study may also be of considerable value to researchers in the field of education.

CHATGPT – A TOOL FOR INNOVATING TEACHING PRACTICE

ChatGPT, a language model developed by OpenAI, is designed to generate human-like text (OpenAI Team, 2022 in Domenech, 2023; Črček & Patekar, 2023). It uses natural,

human language, which allows users to communicate in their preferred language. However, in practice, the most reliable use of ChatGPT has proven to be in English.

It contributes to creating an inclusive and dynamic environment for students, enhancing and complementing traditional teaching methods by providing support to both students and teachers (El-Seoud & Ayman, 2023). Authors (Domenech, 2023; Farrokhnia, Banihashem, Noroozi & Wals, 2023; Črček & Patekar, 2023) highlight content creation and student assistance as the most prominent capabilities of ChatGPT. It is also recognized as a useful tool for idea generation, summarizing and paraphrasing texts, proofreading, and completing assignments. In educational practice, it offers a wide range of possibilities for all participants involved. Data searching can be carried out through ChatGPT, which can provide brief and concise overviews and insights into specific topics that may be worth elaborating on with students- suggesting that its use facilitates easier access to information. It is also a suitable tool for creating quizzes as well as questions and tests for knowledge assessment, provided that precise instructions and explanations are given regarding the purpose of the request. Additional and more detailed explanations of certain topics or phenomena can also be obtained by consulting ChatGPT. This can be particularly useful when a teacher assesses that a specific issue has not been sufficiently addressed in the available literature.

Another useful application of ChatGPT is its support for students. A student can request assistance in drafting a written assignment, receive guidance for finding specific information and answers, and even ask ChatGPT to evaluate their completed work in order to improve it and prepare higher-quality content. ChatGPT can serve as a personal guide for students- easy to communicate with and capable of delivering responses in just a few seconds. Students are familiar with technology and everything it brings. In fact, they often stay one step ahead of teachers when it comes to exploring new tools and benefits that facilitate learning and access to information through digital technologies and artificial intelligence (Zhou & Li, 2023). This type of use of ChatGPT enhances and supports students' ability to learn independently, encourages personalized learning, and helps boost motivation and the engagement of introverted students in the learning process (El-Seoud & Ayman, 2023; Farrokhnia et al., 2023; Zhou & Li 2023).

Studies on the use of ChatGPT in educational practice highlight several drawbacks. In addition to the advantages ChatGPT can offer in the teaching process, it is essential to understand the risks associated with its improper or unskilled use. These risks affect both teachers and students, making it necessary to investigate, test, verify, and only then use the information provided by this tool. However, as previously mentioned, ChatGPT is still an insufficiently researched technology, and it can be assumed that the list of potential risks will continue to grow. While it is well-suited for subjects in the social sciences, its support is more limited in mathematics due to its restricted understanding of specific notations (Domenech, 2023; Farrokhnia et al., 2023). Uncritical use of ChatGPT by students can lead to a lack of understanding of the subject matter, difficulties in assessing the quality of responses, weakening of higher-order thinking skills, reduced human interaction, and dependency on artificial intelligence (El-Seoud & Ayman, 2023; Farrokhnia et al., 2023).

Proper integration of ChatGPT into teaching practice is supported by the fact that it is well-suited for creating personalized teaching materials, generating questions and assignments, designing discussions and creative writing tasks, as well as assisting in classroom organization, assessment, and the development of students' digital skills. On the other hand, inadequate integration can lead to the spread of incorrect information, create student dependency on technology, reduce direct communication and interaction with the teacher, and raise concerns about data protection and digital security.

USING CHATGPT FOR THE PREPARATION, IMPLEMENTATION, AND EVALUATION OF THE TEACHING PROCESS

Innovative and adaptive teaching practice involves a flexible way of organizing and conducting the educational process in accordance with the needs, abilities, and interests of students. Today's students are often one step ahead of their teachers when it comes to embracing technology and all the innovations it brings to the learning process. In this context, we can say that modern teaching cannot be characterized as such without a competent teacher who is open to innovative approaches to content and to the student.

The complete teaching process goes through several phases, from preparation to the evaluation of student achievements (Vilotijević, 2001). Taking into account the didactic triangle, where the student, teaching content, and teacher are equally important elements of the teaching process, we can add a phase involving the teacher's reflective approach to their effort and the activities they managed to carry out during the lesson. Each phase of the teaching process can and should be supported by digital technology. Digital technology has been the driving force of innovation and adaptability in teaching over recent decades. Its rapid development and advancement continuously highlight the need for research and study on the use of digital tools and artificial intelligence tools for educational and scientific purposes.

The teacher, as the creator, organizer, implementer, and evaluator of the teaching process, has the responsibility to, alongside all existing duties and tasks, stay informed about trends and innovations brought by modern technology, to observe their students, and to identify what could facilitate and bring the learning process closer to them. It depends on the teacher whether and to what extent artificial intelligence will be integrated, as it offers numerous possibilities for all stages of the teaching process. There is no strictly prescribed guideline for the use of ChatGPT by teachers, researchers, or practitioners; on the contrary, this language model is openly accessible to everyone, with the possibility of adapting its resources to specific teaching content (Cooper, 2023). Due to its ability to understand and generate text, complete sentences, or fully complete assignments (Atlas, 2023), ChatGPT can be used in various ways within the teaching process.

When it comes to planning and preparing the teaching process, teachers can seek assistance from ChatGPT. This help may consist of information, creative ideas, and recommendations for starting a lesson. Beginning teachers, due to a lack of pedagogical experience, can request support in creating lesson plans (Farrokhnia et al., 2023; Domenech, 2023; Mondal, Marndi, Behera, Mondal, 2023). However, it is essential that they have the knowledge and experience to revise and adapt the lesson plan proposals generated by ChatGPT.

Besides content adaptation (Mondal et al., 2023), ChatGPT can be used in teaching for written communication and individualized learning, as it provides data and information that each individual can request (Atlas, 2023). The main part of the lesson can be supported by the teacher's use of ChatGPT to find creative ideas for student activities, as well as to categorize topics that should be discussed during class (Mondal et al., 2023). According to students' abilities and interests, the teacher can request suggestions and thus successfully conduct individualized instruction. Personalized learning implies adapting content and learning guidelines to meet the individual preferences and capabilities of students. Both teachers and students can seek assistance from ChatGPT—teachers for creating individualized and differentiated assignments, and students for asking how to improve segments of the learning process where they encounter obstacles and difficulties (Bowling & Wagner, 2023; Atlas, 2023).

There are even more possibilities for using ChatGPT to evaluate lessons. Schönberger (2023) notes that this tool is suitable for generating ideas to create quiz questions as well as tests for assessing students' knowledge. It is also useful for finding interesting suggestions to initiate student discussions on specific topics, prompts for role-playing games, and creating individualized homework assignments for students. ChatGPT is well-suited for generating multiple-choice questions, as this type of question facilitates both formative and summative assessment. In evaluating student achievement, positive effects include identifying weak points. It can assist teachers in providing immediate feedback (Mondal et al., 2023).

Assessment of student achievement stands out as a teaching stage where ChatGPT can greatly ease the teacher's workload by automatically evaluating students' answers (Domenech, 2023). One possible use of ChatGPT by teachers is adaptive testing- a testing method that provides an assessment of students' abilities while completing tasks, which can be especially helpful if a student struggles with a particular subject or assignment. Additionally, in self-learning, a student can independently request questions based on their level of content understanding to enhance the self-learning process; this represents another aspect of adaptive testing. A third possibility within adaptive testing is using ChatGPT to generate multiple-choice questions to assist with understanding more extensive texts (Atlas, 2023).

A group of authors (Gimpel, Ruiner, Scoch, Schop, Hall, Eyman, Röglinger, Vandirk, Lämmermann, Urbach, Mäde, & Decker 2023) discusses specific possibilities for using ChatGPT in all phases of teaching and provides recommendations for instructors in higher education. Considering the development of technology and the decreasing age at which students begin using modern technology, we believe that these recommendations can also be applied to teaching in secondary and even primary schools. There are five recommendations:

1. First, clearly define realistic learning objectives and create prompts accordingly so that ChatGPT can provide effective responses.
2. It is essential to understand students' learning styles and, based on that, use ChatGPT to create learning materials.
3. Support students in learning by creating engaging quizzes; in this case, a transcript of the teacher's lecture can be provided to ChatGPT, but the teacher must verify the responses received.
4. Teach students how to use ChatGPT, as its use requires both technical and ethical skills.
5. Apply rules for using artificial intelligence tools. Prior knowledge of the subject matter is necessary to obtain higher-quality results through ChatGPT. Spannagel (2023, cited in Gimpel, Henner et al., 2023) lists the following guidelines for using ChatGPT: all students should be allowed to use some AI tool according to the content requirements; students are solely responsible for their results and answers since the accuracy of data from ChatGPT can be questionable; and students are obliged to report the tool they use.

Atlas (Atlas, 2023) highlights ways in which ChatGPT can be applied in teaching by providing examples, among which we distinguish activities related to both students and teachers:

1. Automatic grading
2. Personalized teaching
3. Assistance in research
4. Support in the classroom
5. Text translation
6. Writing and development of communication skills

7. Creation of lesson plans and curricula
8. Creation of quizzes and exam questions
9. Conversation simulation

All presented ways of using ChatGPT in education must continue to be carefully monitored, researched, and teaching methods aligned with its further development and improvement. The teaching profession is not earned merely by obtaining a diploma; on the contrary, it demands continuous effort and vigilance from teachers regarding everything happening in society and the time in which they live and work. A competent teacher who integrates ChatGPT into their teaching practice is essentially preparing students for the jobs of the future (ISTE 2023, cited in Bowling & Wagner, 2023). By combining the possibilities offered by artificial intelligence tools with the human factor and its capabilities, we achieve a superior, high-quality, very reliable, information-supported, and efficient outcome in the teaching and learning process (Halaweh, 2023). ChatGPT is a suitable tool for innovating teaching, enhancing the learning experience, and fostering interaction between students and teachers. It holds significant potential for changing and improving learning and teaching methods and techniques (Montenegro-Rueda, Fernández-Cerero, Fernández-Batanero, López-Meneses, 2023).

COMPARATIVE ANALYSIS OF LESSON PREPARATION FOR THE SUBJECT “THE WORLD AROUND US”

Taking into account the possibilities of using ChatGPT in teaching practice, this part of the paper deals with a comparative analysis of two lesson plans prepared with the aim of investigating the potential that ChatGPT offers specifically in written lesson planning. The goal of this section is to examine, and subsequently confirm or refute, the effectiveness of this artificial intelligence tool in the preparation and planning of a lesson. The selected teaching unit is for the subject “The World Around Us” for the first grade of elementary school. For analysis, we used a lesson plan that teachers receive as part of the accompanying materials for the subject “The World Around Us,” published by Eduka and authored by Ivana Juhas in 2023.

We chose the lowest grade of the first educational cycle due to the simplicity of the teaching content, as the emphasis in this part of the paper is on the analysis and comparison of the lesson plan provided by ChatGPT. The initial lesson plan, based on which we requested recommendations and suggestions for creating a lesson plan, is given in the table below.

Table 1. Daily Lesson Plan for the Subject “The World Around Us” (Jyxac, 2024)

<p>Teaching topic: IMMEDIATE ENVIRONMENT Subtopic: DIVERSITY OF NATURE Serial number: 34 Teaching unit: WATER</p>	<p>Day and date: <hr/> Place of realization: classroom Type of lesson: lesson development (or lesson processing)</p>	<p>Forms of work: frontal, group work, individual Methods of work: monologic, dialogic, illustrative-demonstrative, practical work Teaching aids: textbook, digital textbook, notebook, work tools, materials for work</p>
<p>Lesson objectives</p>	<p>To enable students to observe, distinguish, and name the basic properties of water.</p>	

Educational standards			
General outcome (the student will)	Operationalized outcomes (the student will)	Key terms: Properties of water.	
		Serbian language: Speaking, Guided and free conversation; Music culture: Listening, Sounds from nature and the environment	
– participates in conducting simple experiments to examine natural phenomena; – collaborates with peers in joint activities	– recognizes and names the basic properties of water; – lists who needs water; – explains what would happen to living beings without water; – conducts simple experiments and explains the observations	Teacher's literature <i>1. Методика наставе природе и друштва, Лазаревић Ж. и Банђур В, Учитељски факултет, Београд, 2001.</i> <i>2. Банђур Вељко, Благданић Сања, Практикум из методике наставе природе и друштва, Београд, 2007.</i> <i>3. Приручник за свет око нас за први разред, Едука, Београд, 2018.</i>	Student literature <i>1. Ивана Јухас, Свет око нас, уџбеник за први разред основне школе, Едука;</i> <i>2. Ивана Јухас, Јасмина Игњатовић, Мудрица – збирка задатака за свет око нас за први разред основне школе, Едука;</i>

LESSON PROCEDURA		
Activities	Teacher	Student
Introduction part	Homework: Discussion about the experiment.	Drawing conclusions.
	Motivational activity: Sounds of water in nature The teacher plays an audio recording (babbling of a river, falling rain, sound of sea waves). Students are asked to recognize and name the sounds. Question: What is common to all the sounds you heard?	They listen to the sounds. They recognize and name the source of each sound. They discover what connects all the sounds: Water.
	Highlighting the lesson objective: Water The teacher writes the title on the board.	They write the title in their notebooks.
Main part	Learning objective/Content introduction: Using illustrations and the content from the textbook, page 58 , the teacher introduces and explains the key concepts: List who needs water. What would happen to plants if they didn't have enough water? What would happen to animals in that case? Why do we say that water is a liquid? Water is a liquid. It flows and spreads. Without water, there is no life. It is essential for all living beings. Water is also found inside the bodies of living	They listen to the teacher. They observe the illustrations. They respond: - People use it for drinking, cooking, and washing. - Plants need it to grow; some plants live in water. - Animals use it for drinking, bathing, and for some, it serves as a habitat. - Water is a liquid because when free, it flows and spreads. - People use water for personal hygiene, cleaning spaces, washing, sports, and recreation...

	<p>organisms. Some animals and plants live in water.</p> <p>The teacher instructs the students to look at the pictures in the textbook and list the ways in which people use water.</p>	
	<p>Group work:</p> <p>Group 1: Properties of water- experiment from the textbook, page 58.</p> <p>Group 2: Water is a liquid- experiment from Mudrica, first task on page 49.</p> <p>Group 3: Shape of water- experiment from Mudrica, second task on page 49.</p> <p>The teacher divides the students into groups and gives them instructions for their tasks.</p>	<p>They form groups.</p> <p>They examine the task and requirements.</p> <p>They investigate the properties and draw conclusions.</p> <p>They present their work and findings.</p> <p>They carry out an analysis.</p>
Final part	<p>Systematization: Mind map</p> <p>The teacher hands out mind maps to the students, through which they will present what they have learned about water.</p>	They draw conclusions and present them using the mind map (through drawings and words).
Assessment of learning outcomes achievement	<p>Identifies and names the basic properties of water; Lists who needs water;</p> <p>Explains what would happen to living beings without water;</p> <p>Conducts simple experiments and explains the observations.</p>	
Monitoring student progress and activity	<p>Formative assessment</p> <p>Classroom activity: oral responses, voluntary participation, connecting learning content with examples from the immediate environment</p> <p>Work during class: work at the board, independent task completion</p> <p>Accuracy of work: number of correct tasks, application of key learning content in task execution</p>	Sumative
Evaluation	<p>Teacher:</p> <p>The success of the lesson is assessed using a checklist based on the achievement of indicators and standards for lesson implementation.</p>	<p>Student:</p> <p>Students draw one of three smiley faces on a piece of paper</p> <p>☺ – I understood everything and found the lesson interesting</p> <p>☹ – I didn't understand some parts and need additional explanation</p> <p>⊖ – I didn't understand and found the lesson uninteresting</p>
Teacher's observations on the lesson delivery		

Based on the provided lesson plan, queries were formulated for ChatGPT with a focus on the main parts of the lesson in the following steps:

1. We addressed ChatGPT with the command: "Create a lesson plan for the subject The World Around Us for the first grade of primary school, for the unit Water."
2. First, we requested the identification of the lesson objective. We emphasized the flow of the lesson as follows: For the introductory part, we needed activity suggestions for both the teacher and the students. Then, suggestions for motivational activities for both teacher and students. The introductory, main, and closing parts of the lesson needed to be elaborated in detail.
3. After that, we asked ChatGPT to recommend activities for the main part of the lesson, both for the teacher and the students.
4. The third part of the lesson is the closing part, so we requested recommendations for the systematization of content for the specified unit.
5. Finally, as part of the comparison, we included the evaluation of the lesson, where we asked ChatGPT for recommendations regarding student activities that would provide the teacher with feedback on the effectiveness of the conducted lesson.

Then, we asked which forms of work would be advisable to organize, which teaching methods to use, and what teaching materials would be needed. The result is as follows:

Table 2. Lesson plan prepared by ChatGPT

<p>Lesson topic: IMMEDIATE ENVIRONMENT Subtopic: DIVERSITY OF NATURE Serial number: 34 Lesson unit: WATER</p>		<p>Day and date: _____</p> <p>Location: classroom</p> <p>Type of lesson: lesson development</p>	<p>Work forms:</p> <ol style="list-style-type: none"> 1. Individual work- coloring books, drawings, short descriptions. 2. Pair work- conducting simple experiments. 3. Group work- making posters (e.g., „Where can water be found?“). <p>Frontal work- introductory motivation and guiding activities.</p> <p>Work methods:</p> <ol style="list-style-type: none"> 1. Demonstration- simple experiments (e.g., water evaporation, dissolving salt in water). 2. Conversation (guided dialogue)- questions and answers about children’s everyday experiences with water. 3. Observation- observing the states of water (ice, steam, liquid) live or via videos/pictures. 4. Role play / simulation- e.g., „The journey of a water drop through nature.“
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			<p>5. Illustrative work method- drawing rain, rivers, seas, etc.</p> <p>6. Fieldwork (if possible)- visiting a nearby stream, fountain, or water tap.</p> <p>Teaching aids:</p> <p>1. Glass of water, ice, kettle for steam (or video of evaporation).</p> <p>2. Interactive board/presentation (if available in the classroom).</p> <p>3. Plasticine/paper for shaping drops and clouds.</p> <p>4. Songs, stories, or children's films about water (e.g., „The little drop travels the world”).</p> <p>5. Quiz questions or digital tools like Kahoot (in schools with technical capabilities).</p>
Lesson objectives	Students will learn the basic properties of water, the forms in which it appears in nature (liquid, solid, gaseous states), and the importance of water for the life of humans, plants, and animals.		

LESSON FLOW		
ACTIVITY	TEACHER	STUDENTS
Introduction	Homework: Discuss the experiment at home.	Drawing conclusions.
	<p>Teacher's activity:</p> <ul style="list-style-type: none"> - Greets the students and creates a friendly atmosphere. - Asks questions related to the students' everyday experiences: <ol style="list-style-type: none"> 1. „Where do you see water around you?” 2. „What do we do with water at home?” - Briefly shows a bottle of water, an ice cube, and a covered cup with hot water (steam). - Announces that today they will talk about water, how we recognize it, and why it is important. 	<p>Student activity:</p> <ul style="list-style-type: none"> - Actively participate in the conversation. - Describe where they see water (bathing, drinking, cooking, rain, etc.). - Connect their experiences with the concepts introduced by the teacher (ice, steam, water). - Show interest and attentively follow the demonstration.

	<p>Motivational part of the lesson</p> <ul style="list-style-type: none"> - Plays a short animated video (2–3 minutes) about „The Journey of a Water Droplet Through Nature” or reads a short story in which a water droplet transforms from rain to river, then to steam. - Asks questions after the video/story: <ol style="list-style-type: none"> 1. „What happened to the water droplet?” 2. „How did it change?” - Gives the task: „Imagine you are also a water droplet- where could you travel to?” 	<p>Student activity:</p> <ul style="list-style-type: none"> - They carefully watch the video or listen to the story. - Participate in the discussion about the droplet- recognizing the changes it undergoes. - Imagine themselves as the droplet and respond creatively (e.g., „I would travel to the sea”; „I would fall on a plant,” etc.). - Begin to connect water with natural phenomena (rain, river, steam...).
Man part	<p>1. Demonstration of a simple experiment (focus: properties of water):</p> <p>Shows a glass of water and places various objects in it (a pebble, plastic cap, leaf) so that students can see what floats and what sinks.</p> <p>Dissolves sugar in water to demonstrate that water can dissolve substances.</p> <p>Shows ice and steam- illustrating the three states of water.</p> <p>2. Guided discussion with demonstration:</p> <p>Asks questions such as:</p> <p>„Why do you think some objects float?”</p> <p>„Where else have you seen steam?”</p> <p>„When does water turn into ice?”</p> <p>3. Group / pair work:</p> <p>Organizes students into small groups.</p> <p>Each group receives a task (e.g., drawing the three states of water or circling all places where water is found in a picture).</p> <p>4. Writing key terms on the board:</p> <p>Water- liquid, ice- solid, steam- gas.</p> <p>Floats / sinks, dissolves.</p>	<p>1. Observation and Reasoning:</p> <p>Actively follow experiments and share their observations.</p> <p>Discuss the differences in the properties of water that they notice.</p> <p>2. Joint Identification of Water Properties:</p> <p>Respond to the teacher’s questions. Recognize different states of water in demonstrations and in their own environment.</p> <p>3. Group Work:</p> <p>Collaborate in small groups- draw or paste pictures showing water in different forms (e.g., rain, river, snow).</p> <p>Circle pictures in worksheets (e.g., what uses water, what doesn’t).</p> <p>4. Presentation of Their Work:</p> <p>Briefly present their group work (e.g., „We drew steam coming out of a cup.”).</p> <p>Ask questions to other groups, developing curiosity and critical thinking.</p>
Final part	<p>Consolidation:</p> <p>Goal: Students review and reinforce basic information about water: its states, properties, and importance.</p> <p>1. Quiz/Review Questions:</p> <p>The teacher asks simple questions, such as:</p> <ul style="list-style-type: none"> - „In what form is water when it’s frozen?” - „What happens to water when we boil it?” - „What sinks in water, and what floats?” 	<p>Students:</p> <p>1. Participate in the quiz:</p> <ul style="list-style-type: none"> - Answer questions clearly and concisely. - Explain their answers when needed. <p>2. Play the „True or False” game:</p> <ul style="list-style-type: none"> - Engage physically (by showing thumbs up or down)- learn actively through play. <p>3. Match pictures with concepts:</p>

	<p>- „Why is water important for people and plants?”</p> <p>2. Interactive Game: ‘True or False’: The teacher reads statements, and students show thumbs up or thumbs down:</p> <ul style="list-style-type: none"> - „Water can be in the form of steam.” - „Ice is the liquid state of water.” - „All objects float on water.” - „Plants need water to grow.” <p>3. Concept Matching: On the board, the teacher matches images with terms:</p> <ul style="list-style-type: none"> - Steam → gas - Ice → solid - Faucet → water in liquid form 	<ul style="list-style-type: none"> - Come to the board and match pictures with the correct terms. - Evaluate their peers’ answers and provide comments.
<p>Recommended Activities for Evaluation and Feedback</p>	<p>1. Mini-quiz/„Pick a Card” The teacher observes how accurately students respond and how well they understand the concepts.</p> <p>2. Worksheet with Short Tasks By reviewing the worksheets, the teacher gains direct insight into the level of understanding.</p> <p>3. „Complete the Sentence” (oral or written) Student responses reveal how they formulate thoughts and whether they connect the concepts.</p> <p>4. Game: „One Student- One Question” The teacher quickly and individually assesses each child’s understanding.</p> <p>5. Self-evaluation through Drawing Through children’s drawings, the teacher evaluates which aspects were remembered and which remained in focus.</p>	<p>1. Mini-quiz/„Pick a Card” Students draw a card with a question (or picture) and answer it. Examples: „Draw water in the form of steam,” „What sinks in water?” „Why do we drink water?”</p> <p>2. Worksheet with Short Tasks Tasks may include: Matching pictures and terms (e.g., ice- solid, steam- gas). Circling correct statements. Drawing one state of water.</p> <p>3. „Complete the Sentence” (oral or written) Example sentences: “Water is important because _____.” “Ice is water that is _____.”</p> <p>4. Game: „One Student- One Question” Each student gets a simple question from the teacher (e.g., “Where did you see water today?”).</p> <p>5. Self-Evaluation through Drawing Students draw how they see water or what they learned about water today.</p>
<p>Assessment Criteria: Level of Achievement and Description: High Level- The student clearly explains the properties of water, recognizes multiple sources, understands the importance of water, and suggests ways to protect it. Intermediate Level- The student distinguishes basic states of water, names several sources, and partially understands its significance. Basic Level- The student recognizes water and can give one example of its use or source. Additional support is needed.</p>		

By conducting a comparative analysis of two lesson plans- one created with the help of the AI tool ChatGPT- we determined that both plans are equally operational. The plan generated via ChatGPT includes all the necessary elements for successful lesson implementation. It contains all essential didactic-methodological data (title of the lesson unit, lesson type, educational goal, teaching methods, forms of work, teaching aids). The lesson is structured into three phases (introduction, main part, and conclusion), with detailed and planned activities for students and teacher actions in each phase. It also includes arrangements for managing both subjective and objective learning conditions, as well as methods for assessing achieved outcomes, all of which contribute to successfully reaching the lesson goal and promote more efficient and rational teaching.

Each phase of the lesson contains all necessary structural components. For example, in the introductory part, psychological preparation of students is carried out, which also motivates them and creates the necessary interest for active participation in the upcoming work. Additionally, the introductory phase includes content preparation in the form of reviewing students' prior knowledge and experiences directly related to the content of the lesson unit being covered.

In the main part of the lesson, the lesson objective was operationalized by positioning students as active participants in the learning process. Specifically, through an experiment, students took on the role of researchers, creating a situation that motivated them to seek answers and independently discover and draw conclusions about the properties of water. Thus, the emphasis was not on mere presentation of ready-made knowledge, memorization, or reproduction of content, but on students' independent mastery of the material.

In the concluding part of the lesson, the assimilation of the content covered during the main part was checked through a quiz and an interactive game, which are effective ways to obtain feedback on the level of content acquisition.

The lesson plan also includes recommended activities for evaluating the achievement of the lesson objectives, as well as criterion-based indicators of knowledge that describe the knowledge students are expected to have at each level.

Summatively, the lesson plan generated via ChatGPT can serve for successful lesson implementation without serious shortcomings. The only noted drawback is the extensive amount of recommended activities, which makes it impractical to carry out all of them within a single class period.

CONCLUSION

Although ChatGPT offers many advantages in education, it is important to use it with caution and only when it can genuinely enhance teaching. In educational practice, it is most effective when used as a supplement rather than a replacement for traditional teaching and human interaction. The use of ChatGPT in education should be balanced and responsible to avoid potential problems and to preserve the value of human interaction and creative learning.

Teachers should not turn their backs on modern technology or fear using ChatGPT for teaching purposes, but digital competence, awareness, pedagogical knowledge, and methodological experience are essential. These skills enable teachers to innovate and enrich their work rather than damage or diminish its quality through its use.

For readers of this paper, it is useful to highlight how the European Commission (European Commission, 2022, as cited in Bowling & Wagner, 2023) emphasizes the importance of ethical considerations:

1. Privacy- Preserving privacy is of great and crucial importance because AI tools like ChatGPT rely on large amounts of data available in various databases. In some contexts, these tools may have access to sensitive information about the students themselves. Teaching students to protect their data privacy is a primary task, as sharing data is not a final process; once data is shared, it can often be further distributed within chains of information linked to users on the internet.
2. Bias and Fairness- The information provided by AI depends on the datasets it is trained on and has access to, which are based on existing data collections. Students need to learn how to recognize inaccurate, risky data or misinformation, which are not uncommon. Regarding fairness and equality, it is very important that all students have equal access to the internet. Socio-economic inequalities negatively affect educational equity, especially when education involves the use of modern technologies, the internet, and artificial intelligence.
3. Student-Teacher Relationship- It is equally important to maintain this relationship when organizing and conducting the teaching process, as the emotional, social, and moral aspects of teaching cannot be replaced by the use of AI tools. Although there are claims that these aspects can be partly supplemented, this is still in its early stages.
4. Dependence- Long-term reliance on AI tools adversely affects critical thinking skills, self-assessment, and problem-solving abilities of users, in our case, students.

Artificial intelligence has a huge impact on learning, writing homework, and completing other tasks related to teaching. ChatGPT in the educational process represents both a risk and a challenge that needs to be thoroughly researched and examined qualitatively and quantitatively, but its use should certainly not be feared.

Teachers need to accept, inform themselves, and learn how ChatGPT can be used in various ways. Considering the rapid development of artificial intelligence and the fact that the first paper on its use in teaching was published as recently as November 2022, ChatGPT is no longer a novelty. If a teacher feels some skepticism or resistance toward using ChatGPT in teaching, it is advisable to explore and understand how and for what purposes students might use ChatGPT (Domenech, 2023). There are several reasons for this, primarily to maintain the quality of the teaching process, keep pace with modern society, and connect with new generations of students who are increasingly oriented toward modern technologies rather than books as sources of information or teachers as transmitters of knowledge. Teachers who do not resist modern technology and all its aspects will certainly have a more effective influence on students' honesty, moral behavior, and ethical approach when using ChatGPT in their schoolwork. It is important to have open conversations with students, show them the potential uses and benefits, but also point out the risks of uncritical use of ChatGPT. It would be helpful for teachers to assign a task to students to complete during class, and then have them complete the same task at home using ChatGPT. This way, teachers demonstrate their own competence in using ChatGPT, show students that it is a powerful tool that must be used wisely, and can explain through multiple examples how students should think and to what extent they can seek help and guidance from ChatGPT. Otherwise, teachers can expect cheating on exams and tests, as well as homework that students have completed without truly understanding the content, since ChatGPT does the work but students fail to grasp the material.

We can conclude the paper with reflective questions for teachers that arose during the research: Do you approve of the use of ChatGPT?; Have you discussed the use of ChatGPT for schoolwork with your students?; Have you encountered assignments and answers submitted by students that were created using ChatGPT?; Are you satisfied with your current

level of knowledge regarding the application of artificial intelligence and its tools for educational purposes?; Do you consider yourself competent enough to support the ethical use of ChatGPT by students?. Answers to these questions would provide insight into the current state of teachers' awareness, competence, and familiarity with the concept, significance, advantages, and disadvantages of using or not using ChatGPT in teaching practice.

An implication for further research could be investigating the impact of ChatGPT use on peer learning, since, as the author (Atlas, 2023) points out, it is possible that students improve their skills and learn from each other because ChatGPT facilitates collaboration and provides opportunities for peer support in multiple ways.

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CHATGPT KAO ALAT ZA INOVIRANJE NASTAVNOG PROCESA

Apstrakt. Inovacija u obrazovnom procesu podrazumeva upotrebu savremenih digitalnih tehnologija u svim fazama realizovanja istog. Obrazovnim sistem stalno je izložen i promenama i pritiscima da bude inovativan i usklađen sa društvenim promenama, a s druge strane adaptivan za potrebe pojedinca. Kao najaktuelnija problematika u ovom smislu izdvaja se veštačka inteligencija sa potencijalom koji pruža za proces poučavanja i učenja. Kako je veštačka inteligencija kompleksan pojam, u radu akcenat stavljamo na ChatGPT kao segment veštačke inteligencije, jezički model koji je pogodan za korišćenje u cilju inoviranja nastavnog procesa. Cilj rada je ukazati da adekvatna i kompetentna upotreba ChatGPT-a jeste jedan od načina inoviranja nastavnog rada. Metodom teorijske analize odgovaramo na tri istraživačka zadatka: 1. Ističemo značaj upotrebe ChatGPT- u u fazi pripreme, realizacije i evaluacije nastavnog procesa od strane nastavnika; 2. Izdvajamo potencijalne načine korišćenja ChatGPT-a za inoviranje nastavnog rada; 3. Vršimo komparativnu analizu dveju priprema za istu nastavnu jedinicu: jednu koju predlaže ChatGPT sa drugom koja je urađena od strane kompetentnih stručnjaka i koja je učiteljima ponuđena kao propratni materijal uz udžbenik. Rad završavamo implikacijama za dalji istraživački rad uz naglasak da postoji potreba za empirijskim istraživanjima u okviru ove problematike.

Ključne reči: ChatGPT, veštačka inteligencija, učenje, nastavnik, nastavni čas

Professional article

STE(A)M LEARNING AND TEACHING OF NATURAL AND SOCIAL SCIENCES – EXAMPLES OF GOOD PRACTICE AT THE PEDAGOGICAL FACULTY IN VRANJE

UDC 371.3.:3/5

Marija Dejković¹ , Dragana Stanojević¹ , Yanka Stoimenova² 

¹Pedagogical faculty in Vranje, University of Niš, Serbia

²Faculty of Pedagogy, South-West University “Neofit Rilski”, Blagoevgrad, Bulgaria

Abstract. *More than two decades have passed since the school system underwent significant changes in response to the shortcomings of traditional teaching. The goals introduced by the concept of modern schooling can be broadly defined as increasing students' cognitive engagement in the process of knowledge acquisition, fostering independent learning and reasoning, and improving the transferability of acquired knowledge. In this regard, numerous innovative learning approaches emphasize these or similar objectives. This paper presents one such innovative system – STEAM, which integrates disciplines deemed essential for future careers (science, technology, engineering, arts, and mathematics). The paper provides both a theoretical overview, supported by the latest research findings, and examples of good practice implemented at the Pedagogical faculty in Vranje. Additionally, the study explores the potential that this learning approach offers in the teaching of Natural and Social Sciences, considering the integrative nature of this subject*

Keywords: *Primary education, Natural and Social Sciences teaching, STEM education, integration, teacher, student*

1. INTRODUCTION

Among the abundance of teaching strategies that have been promoted for years as innovative, many are unjustly labeled as such, as they lack substantial innovation. For decades, we have been hearing about the modern school and the changes it has brought changes that emerged as a response to the shortcomings of traditional education. These changes are driven by numerous objectives, which can be summarized as increasing student engagement in the learning process, fostering more independent knowledge acquisition, and improving the transfer of learned content. These goals are common to all so-called 'innovative' models. Project-based, problem-based, programmed, exemplary, team-based, developmental, environmental, integrative, and many other teaching methods find their theoretical foundation in the ideas of the greatest pedagogical thinkers from as far back as the 17th, 18th, and 19th centuries.

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When it comes to Nature and Society classes (or more generally speaking), two innovative teaching strategies have been gaining significant traction in recent years: integrative teaching and STEM education. All too often, an equal sign is placed between STEM and integrative teaching. The connection is more than evident. Both STEM and integrative teaching imply a multidisciplinary approach that is, linking different aspects of a problem into a logical whole. Both integrative teaching and STEM promote learning that involves recognizing cause-and-effect relationships, deeper understanding of phenomena, logical thinking, applying acquired knowledge to everyday life situations, and place great emphasis on equipping students with the ability to adapt to the diverse demands that future jobs will require. However, while integrative teaching is an approach to studying a specific problem, STEM represents a comprehensive instructional system and precisely defines the disciplines necessary for students, future workers, to meet the challenges of the 21st century. Through hands-on activities, research work, and experimental concepts, students manage to combine STEM disciplines, using technology to present their solutions and experimental results.

If we were to seek a theoretical justification for STEM education, we would undoubtedly find its foundation in Gestalt learning theory, which emphasizes the principle of wholeness and contextual understanding, with problem-solving as the most effective learning method.

The gestalt theory emphasizes that the essence of learning lies in understanding and perceiving relationships within organizational wholes. Subjects and phenomena should be understood as tightly interconnected entities rather than as a collection of isolated details. It is essential for educators to recognize the importance of students' perceptual reactions to their environment and to continuously guide them towards perceiving wholes. (Вилотијевић, 1999: 185)

Basic education offers numerous opportunities for implementing STEM activities. Although this may seem very complex, we will later attempt to provide some examples that demystify such claims.

The term STEM is an acronym that consolidates four recognized fields considered indispensable for future work tasks. These are: natural sciences (S), technology (T), engineering (E), and mathematics (M). Sometimes, in the literature, the term STEAM is also used, where the letter A stands for art, because according to many authors, such an approach makes no sense unless art is also included.

Thus, STEM or STEAM implies a completely innovative approach to learning, a changed perspective on the child, and methods by which the child should acquire new knowledge and skills through the integration of the mentioned fields. This type of integration of different knowledge areas is also reflected in the accelerated development of technology and the continuous progress and changes in working methods and occupations that gain dominance. "By combining science, technology, engineering, and mathematics, STEM education helps us solve the problems that the world faces today." (Ибраева & Шаушекoва, 2023: 276) A research-based approach, active attitude toward learning, project work and experiments, teamwork, adaptation, and learning through real-life situations, critical thinking, and creativity are skills of the 21st century, and STEM education particularly emphasizes these skills.

One variation of STEM teaching also includes reading, and recently, the term STREAM has appeared in the literature, where the letter R stands for reading. "STREAM education represents an innovative approach that actively involves students in various cognitive and physical activities. Students are empowered, gain autonomy in the learning process, and have the opportunity to determine the direction of their research. However, this process requires time and detailed structuring to ensure it is implemented in a way that benefits students. STREAM is a key approach in developing students capable of responding to the needs of the current workforce, which does not yet exist, as well as in solving complex problems that their generation will face. This approach enables the formulation of complex and critically analytical solutions to these problems. Providing a STREAM program creates opportunities for content development, as well as for the holistic development of the child and their ability to navigate in a complex and challenging world, especially at a young age." (Wynne, 2025: 19)

Besides the fact that STEM education involves completely shifting students out of their familiar frameworks, it is also necessary for teachers to fundamentally change their teaching habits and assume the role of a kind of creative mentor who encourages significant cognitive engagement and problem-based learning among students.

Although such learning is most often associated with older students, all the aforementioned skills need to be developed from early childhood. It can be confidently said that the STEM approach is highly suitable for students from the first to the fourth grade, and even for preschool children. Naturally, it is necessary to gradually introduce younger children to such activities through mini-projects and research ventures appropriate to their age. Constructing various mathematical shapes, objects, modeling volcanoes, building simple robots, micro-gardens, and other similar activities are very suitable for preschoolers and younger elementary students. Through creating micro-gardens, students will have the opportunity to engage in science (learning about the conditions necessary for plant growth, types of soil, parts and appearance of plant parts, etc.) as well as technology. They will also develop habits of observing, noticing, concluding, and recording what they observe.

2. STE(A)M EDUCATION WORLDWIDE

There is a large number of studies worldwide that highlight numerous benefits of this way of working. We will highlight some of the more significant ones.

Ibraeva and Shaušekova (Ибраева & Шаушекoва, 2023) conducted an experiment involving 110 participants aged 6 to 9 years, within the "Lego Education" center in Kazakhstan. The aim was to determine the level of research skills and readiness to solve practical problem tasks. After analyzing the results of the experiment, the authors concluded that the group of students applying the STEM learning model (experimental group) showed significantly better results compared to the control group, i.e., the level of research skills increased substantially among students exposed to the experimental factor. "Based on the analysis of qualitative and quantitative results of pedagogical observation of the experimental group, it can be concluded that the students' research skills ($\chi^2 = 8.733$; $p = 0.013$) and level of awareness ($\chi^2 = 6.545$; $p = 0.038$) significantly increased following the implementation of the educational experiment." (Ибраева & Шаушекoва, 2023: 276)

The effects of the STEM approach on student achievement were also examined through a meta-analysis conducted by Asrizal, Dainal, and Usmelidi (Asrizal et al., 2023). "The research included studies from 2012 to 2022. These studies measured the impact of the STEAM approach on student achievement, provided enough data to calculate effect size

(sample size, mean, standard deviation, and t-value), and involved science instruction, but did not include research in preschool education." (Asrizal et al., 2023: 1651) After analyzing twenty studies, the authors concluded that STEM has a moderate effect on student achievement (effect size of 0.71). STEM studies are most prevalent in South Korea, and it is also interesting to note that this way of learning does not produce the same effects at different educational levels, being most effective in elementary school age.

A very interesting qualitative case study conducted in Canada (Bertrand & Namukasa, 2020) involved 103 participants, of whom 19 were adults, while the remaining participants were students. The study included data collection through document analysis, participant observation during lessons, and interviews. "The curricula provided to the researchers by representatives of each of the STEAM programs demonstrated that students acquired character-building skills that are transferable to other real-life contexts, such as tertiary education and the labor market. Focus group participants described these skills as 21st-century skills. They include skills learned outside the content of the STEAM curriculum itself." (Bertrand & Namukasa, 2020: 46) In all the groups involved in the research, the initial phase of work involved activities that stimulate motivation and interest in a specific topic. At all research locations, participants had the opportunity to discuss their work. Participants also documented the stages of creating their "product" and presented them through video advertisements and presentations. Additionally, they frequently expressed their ideas through sketches, drawings, or storytelling. One of the most significant conclusions of this research related to the development of creativity, imagination, critical thinking, and problem-solving, with perseverance being most frequently mentioned as a key skill during interviews.

A detailed analysis of 72 publications published between 2011 and 2020 by Li and Wong (Li & Wong, 2023) indicates the widespread research activity in the field of STEM education. This analysis primarily focuses on the possibilities of individualization in STEM education. "The results show a general trend of increasing numbers of relevant publications in this field over the past decade, which aligns with the broader development of personalized instruction overall. Furthermore, the studies cover a wide range of countries, educational levels, disciplines, and education systems. These studies serve as a useful resource for researchers and practitioners regarding the latest developments in individualized teaching in STEAM education and complement the existing literature on related topics." (Li & Wong, 2023: 198)

The results also reveal areas within personalized learning in STEAM education that should receive more attention in the future. A particularly important conclusion is that most studies focus on only one discipline within STEAM, which highlights the need for more research on interdisciplinary and integrative approaches to learning through STEAM, to examine how individualization can be effectively applied in this context. Moreover, a significant number of studies address the individualization of teaching primarily through the use of technology. Additional research is needed on the integration of personalization with pedagogical approaches and elements that are common in STEAM, such as activities focused on solving real-world problems, project-based learning, and learning in authentic environments. The authors also emphasize that research in areas not covered by this study, such as learning outcomes and challenges, should be considered to provide a more comprehensive overview of the current state of individualization in STEAM education.

3. STE(A)M WORKSHOPS AT THE PEDAGOGICAL FACULTY IN VRANJE

At the Pedagogical Faculty in Vranje, STEAM workshops have been conducted for over three years as part of an extracurricular activity called "Little Researchers." These workshops

are designed for both younger elementary students, from first to fourth grade, and preschoolers, depending on the topic being addressed. Their implementation involves final-year students specializing in teacher and educator training, under the mentorship of faculty teachers. Over the course of three years, dozens of workshops have been held, primarily in the scientific field of Methodology of Teaching Nature and Society. The goal of these workshops is to introduce children from an early age to the world of science and familiarize them with concepts from physics, chemistry, biology, ecology, and other sciences, which provides an excellent foundation for future subject teaching in higher grades of elementary and secondary school. Through activities such as constructing, modeling, note-taking, observing, drawing conclusions, recognizing connections, and making observations, students develop skills necessary for life and future work. The following section will present three examples of STEAM workshops conducted at the Pedagogical Faculty in Vranje.

Example 1. *The Good Tree* Workshop

STE(A)M Disciplines:

- Natural sciences (biology, ecology, chemistry, physics),
- Mathematics,
- Art (visual and musical arts, literature).

Student Activities:

- Familiarization with the literary and artistic values of the story *The Good Tree*.
- Observing characteristics of different types of trees (hornbeam, pine, spruce, birch, chestnut, linden...).
- Recognizing the species of a tree by its appearance “by its shape” using leaf impressions.
- Identifying parts of a tree and their functions.
- Observing the reaction caused by mixing a basic and an acidic substance through the experiment “Apple Volcano”.
- Noticing that apples float in water and reasoning about substances that prolong the freshness of apples.
- Observing cross-sections of apples, dividing apples into halves, quarters, and eighths.
- Making impressions of apples on a substrate and observing the shapes.
- Listening to and analyzing the composition *Let Someone Plant a Tree*.
- Collecting folk sayings about apples.
- Discussing the importance of trees.
- Planting a tree.



Example 2. Workshop: Bread – The Migration of the Slavs

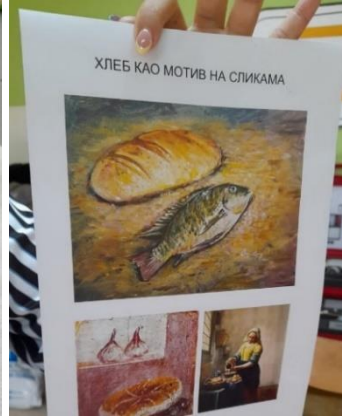
STE(A)M Disciplines:

- Natural sciences (biology, chemistry, geography) + history,
- Arts (sculpting, visual arts, musical arts).

Student Activities:

- Researching the history of the Serbian people,
- Examining maps and identifying the migration route of the Slavs to the Balkan Peninsula,
- Investigating their way of life (occupations, clothing, customs, beliefs...),
- Analyzing the meaning of Slavic names and their differences compared to names of other origins,
- Singing and dancing to *Dodole* songs (rain invocation rituals),
- Exploring the significance of bread in Slavic culture,

- Researching different types of bread,
- Learning about the properties of yeast,
- Understanding the concept of fermentation through experimentation,
- Kneading bread dough,
- Sculpting and coloring dough...



Example 3. Workshop: Beehive

STE(A)M Disciplines:

- Natural sciences (biology, ecology),
- Mathematics,
- Technology,
- Engineering
- + Physical education (various forms of movement).

Student Activities:

- Researching bees, different species of bees, and the social organization of honeybees,
- Examining a beehive and identifying its parts and structural design,
- Exploring the interior of a beehive through a specially designed model,
- Observing bee behavior on honeycombs,
- Identifying the queen bee, worker bees, and drones,
- Learning about basic beekeeping equipment,
- Becoming familiar with bee products (honey, propolis, pollen),
- Examining an acacia flower, identifying its parts, and tasting its nectar,
- Focusing on the shape of honeycomb cells (hexagon),
- Investigating other possible shapes for honeycomb cells (circle, triangle, square),
- Imitating the bee dance (different movement patterns) as a form of communication...



4. CONCLUSION

The implementation of STEM workshops at the Faculty of Education in Vranje has yielded dual benefits: for the participating students as well as for the university students, future teachers and educators who had the opportunity to practically apply and observe the effects of this teaching approach. This serves as an excellent foundation for their future independent work.

Although conducting research on such a small sample, as well as on a sample consisting of students who voluntarily attended the workshops, may not be statistically significant, their curiosity, motivation, creativity, and eagerness to return to similar activities are clearly evident. This alone indicates that STEM education holds promise in educational practice, but only with serious and thorough planning and preparation on the part of teachers.

The findings suggest that while broader studies would be needed for definitive conclusions, the observed engagement and enthusiasm demonstrate the potential of hands-on, interdisciplinary learning. For this potential to be fully realized, however, educators must invest deliberate effort into structured and well-designed instructional strategies.

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STE(A)M UČENJE I NASTAVA PRIRODE I DRUŠTVA– PRIMERI DOBRE PRAKSE NA PEDAGOŠKOM FAKULTETU U VRANJU

***Apstrakt.** Prošlo je više od dve decenije kako je škola pretrpela velike promene a koje su nastale kao reakcija na nedostatke tradicionalne nastave. Ciljevi koje nam je koncept savremene škole doneo u najkraćem se mogu odrediti kao: povećanje misaonog angažovanja učenika u procesu sticanja znanja, što samostalnije učenje i donošenje zaključaka, kao i bolji transfer naučenog. U tom smislu, mnogo je inovativnih pristupa učenju koji u prvi plan ističu upravo ove ili slične ciljeve. U radu je prikazan jedan od inovativnih sistema – STEAM, koji integriše oblasti definisane kao neophodne za zanimanja kojima će se buduće generacije baviti (prirodne nauke, tehnologija, umetnost, inženjering i matematika), kako kroz teorijski osvrt i prikaz rezultata najnovijih istraživanja, tako i kroz primere dobre prakse na Pedagoškom fakultetu u Vranju. Takođe, jedno od usmerenja je i da se prikažu mogućnosti koje ovakav način učenja pruža u nastavi prirode i društva, uzimajući u obzir integrativni karakter ovog nastavnog predmeta.*

***Gljučne reči:** razredna nastava, nastava prirode i društva, STEM nastava, integracija, učitelj, učenik*

Review article

INTERDISCIPLINARY LEARNING IN THE ERA OF GLOBALIZATION: STEAM APPROACH IN MUSIC EDUCATION

UDC 37.013:001.1::78

Tatjana Milosavljević Đukić¹ , Teodora Kragović² ,
Aleksandar Stojadinović¹ , Ana Spasić Stosić¹ 

¹Pedagogical Faculty in Vranje, University of Niš, Serbia

²Faculty of Arts, University of Priština in Kosovska Mitrovica, Serbia

Abstract. *In the era of globalization, education focuses more on the development of interdisciplinary competences that enable students to successfully face the complex challenges of modern society. This paper investigates the application of the STEAM approach in the teaching of Musical Culture, with a emphasis on its role in the context of the globalization of education. STEAM (Science, Technology, Engineering, Arts and Mathematics) combines technical and creative aspects of learning, emphasizing the importance of integrating the arts into traditional STEAM disciplines. Musical Culture, as part of this approach, provides a platform for innovative pedagogical practices that combine musical creativity with scientific and technological principles. The main goal of the paper is to explore how the STEAM approach can foster the development of global competencies, such as creativity, critical thinking, collaboration and technological literacy. The methodology of the paper includes a literature review, case studies and examples of good practice in the field of STEAM education and Musical Culture. Activities such as music programming, instrument construction, and sound-wave experiments enable students to explore links between science, technology, and mathematics. These activities not only integrate physical and technological concepts, but also allow students to explore interactions between different disciplines and develop creative and analytical skills. Research results show that a STEAM approach to music education has the potential to transform traditional pedagogical methods, enabling students to successfully cope with contemporary challenges. In addition, this approach encourages innovation and develops the skills necessary for success in a technologically and economically dynamic environment. Additionally, it highlights interdisciplinary learning as a response to technological and labor-market changes. The conclusions of the paper indicate that the STEAM approach in music education represents a significant tool for the transformation of education in the era of globalization. The implications of the research include the need to strengthen infrastructure, improve teacher training, and promote partnerships between schools, the private sector, and non-governmental organizations to enable the wider application of this model.*

Keywords: *steam approach, interdisciplinary learning, musical culture, globalization, technology, innovations*

Corresponding author: Tatjana Milosavljević Đukić

Pedagogical Faculty in Vranje, University of Niš, Partizanska 14, 17500 Vranje, Serbia

E-mail: tatjanamdj74@gmail.com

1. INTRODUCTION

The era of the Fourth industrial revolution has brought many changes into the world, including education. Global challenges such as accelerated digitization, climate change, economic inequality and the crisis of functional literacy have a significant impact on teaching. In this context, traditional forms of teaching increasingly lose their relevance and there is a need for education that develops interdisciplinarity and applicable knowledge, but also nurtures critical thinking and creativity. The mentioned requirements from the goals of sustainable development (UNESCO, 2020) indicate the need for new pedagogical approaches such as STEAM education. This model of education is a holistic model that connects science, technology, engineering, mathematics and the arts in order to solve real problems. Art, especially music, takes on the role of a mediator in STEAM education. It connects concrete and abstract, rational and emotional, local and global learning experience.

Education in the era of globalization “focuses more and more on the development of interdisciplinary competences that enable students’ to successfully face the complex challenges of modern society. Interdisciplinary and transdisciplinary learning in schools has become an growing and increasingly popular area of interest for educational reform. This leads to a discussions about Science, Technology, Engineering, Arts and Mathematics (STEAM) which is shifting educational paradigms toward art integration in science, technology, engineering and mathematics (STEM) subjects” (Bertrand & Namukasa, 2020: 43).

Research has shown that the integration of art into STEM teaching significantly increases the success of students’ in natural sciences, especially among bilingual students, when STEAM units are implemented before standard STEM activities (Hughes et al., 2022). The contemporary STEAM paradigm, in addition to students’ outcomes, also emphasizes the necessity of precisely defined teacher competencies – from pedagogical design to managing cross-curricular projects. This leads to the development of the STEAMComp Edu framework with 41 core competencies (Spyropoulou & Kameas, 2024). The STEAM approach improves the cognitive, affective and social scope of students, but also indicates the heterogeneity in implementation and the need for standardized models (Amanova et al., 2025).

Apart from the theoretical nature, this work also features an analytical review of relevant literature in the field of STEAM education. A special review is given to the role of musical contents in interdisciplinary teaching. In this sense, this work relies on the method of review of thematic literature and comparative analysis of examples from practice. Attention is paid to digital tools that integrate musical contents with natural sciences, technology and mathematics. The sources used in this work are scientific articles with open access, publications indexed in relevant databases, as well as reports on pedagogical initiatives and educational programs. In this way, without relying on primary empirical research, it is possible to see the potential and challenges in the integration of musical contents into the STEM approach.

2. STEAM APPROACH IN TEACHER’S CLASSROOM

STEAM education represents the inclusion of art in the STEM concept. Art, as the fifth component of the mentioned concept, enables connecting scientific and technical knowledge with creative and cultural aspects of learning. The STEM approach tends to develop analytical thinking, and the STEAM model expands the mentioned foundation. The STEAM approach supports students’ to analyze problems from different artistic perspectives - music,

visual arts, design, drama, etc. In the academic literature, there is a difference between multidisciplinary (parallel study of several subjects), interdisciplinary (interconnecting content in order to solve problems) and transdisciplinary approach (integrating the knowledge of different disciplines into a new context that goes beyond the boundaries of individual subjects) (Yakman & Lee, 2012). For example, students can explore the concept of frequency (physics), which is also covered in music lessons through the analysis of sound waves. In this way, the teaching of natural sciences and Musical Culture are interwoven in a common educational experience.

“Transdisciplinary approaches to STEAM education are highly valued by both the teacher and the student because they allow the student to view the problem or design process from multiple angles or different perspectives that can be applied to a real-world context” (Constantino, 2018, according to Bertrand & Namukasa, 2020: 44). “According to Bilkstein (2013) educators should avoid “quick demonstration projects” that are aesthetically pleasing to the students but require little effort. Instead they should promote “multiple cycles of design” so that students create complex solutions and products, design “powerful interdisciplinary projects” that narrow the gap between disciplines, “contextualize the learning in STEAM” (Bilkstein, 2013, according to Bertrand & Namukasa, 2020: 43). By applying the STEAM approach in the classroom, teachers support a creative climate. In order to maintain such a climate, teachers should nurture and promote activities that connect the nature of different teaching subjects. In addition, this approach will contribute to mutual respect, flexibility and creativity (Harris & de Bruin, 2018).

The STEAM framework suggests incorporating the arts into curricula and fosters creativity, critical thinking and interdisciplinary learning. In STEAM education, musical contents are a medium for learning technology. Digital tools, music production, and editing software allow students to master technology and develop creative thinking. Thus, musical art, an integral part of STEAM education, interacts with its other components (science, technology, engineering, and mathematics) complementing and enriching learning in these areas. Musical contents stimulate students creativity and emotional development. By experimenting with sound, students develop their musical style and express their own emotions through the creation of music. In addition, musical contents provide a unique opportunity to comprehend mathematical and physical concepts. The study of the physical phenomena of acoustics reveals the physical features of sound and sound waves that underline music phenomena.

Musical Culture, in addition to developing students’ musical abilities, significantly improves students’ cognitive abilities. By integrating musical contents into STEAM disciplines, students explore different concepts and learn to connect music with other disciplines, for example: “For teaching science, music acoustics has several advantages: first, many of its important phenomena (e.g. sound, vibration, harmony) are familiar and regarded as pleasant. Some (e.g. pressure waves) can be sensed and produced with no additional hardware, and sometimes (e.g. frequency ratios) with precision high enough to allow relatively subtle evaluation of models” (Wolfe et al., 2013: 668). Integrating musical contents into STEAM curricula encourages students’ creativity, contributes to more permanent learning and creates a holistic educational experience.

Digital applications (STEAM) used in Musical Culture subject can improve the teaching process, students musical abilities and provide them a multisensory experience:

CHROME MUSIC LAB – is a digital platform that enable learning and creating music. Using this online resource students “can play with these Music Lab Experiments and create their music and they might not even realise or connect their actions with mathematics. But, engaging them in these Experiments through some activities (which explicitly emphasise

mathematical terms and concepts) can help them understand their actions as a ‘mathematical activity’. To add, an inquiry based approach can let them develop insights into the mathematical aspect of their Music Lab activities. It will also help them understand and visualize what mathematics lies in making their musical composition” (Mishra, 2021: 168–169).

SCRATCH MUSIC – is an application that enable mathematical concepts (fractions, proportions, patterns, angles) to be “heard” through the visualization of rhythm. It teaches students the basics of computation, develops algorithmic thinking and can be used as a means of developing students’ musical abilities. This application enable recording of any musical instruments. The application can be connected with a computer keyboard so that the students’ can record the sound of any musical instruments without eliminating the acoustic sound of the chosen instruments (Julia, et al., 2019).

iMuSciCa – is a platform that integrates 3D design with physical simulation of instruments. Students’ can “design 3D graphical models of predefined virtual instruments without requiring any advanced skills. Specifically, the environment provides six predefined instrument models including circular and square shaped membranes, a two string monochord, a guitar, atromba marina (bass monochord) and a xylophon” (Kristis et al., 2020: 741–742). It connects music with the laws of acoustics and the engineering cycle of *design – model – simulate – print*. By using this platform, students’ get the opportunity “to explore different phenomena and laws of physics, geometry, mathematics and technology through creative music activities, to examine them from various view points and to increase integration among various curriculum subjects” (Kristis et al., 2020: 738).

GROOVE PIZZA – is a web application which translates geometric shapes into drum patterns illustrating symmetry and metrical structures. It allows students’ to “to program drum rhythm patterns on a circular grid for creative music making and learning. This visualization scheme supports the creation of fun rhythm patterns using mathematical concepts such as shapes, angles and patterns” (Holland et al., 2019 according to Özer & Demirbatır, 2023: 11).

UPISketch – is an open access platform that enables the creation – “drawing” of melodies without knowing musical notation. In this way, it introduces the coordinate system as a sound network. The process of creating new melodies can advance quickly “by learning a few features concerning navigation in the page and manipulation of he drawn gestures” (Bourotte & Kanach, 2019: 255).

In Musical Culture lessons, the mentioned applications and platforms can be powerful pedagogical tools. They can support interdisciplinary learning, develop critical thinking, break down technical barriers and help collaboration in the teaching of music. Based on all that has been said, teachers “should develop interdisciplinary lesson plans that combine music with mathematical and scientific concepts, using project-based learning to create engaging experiences” (Semenikhina et al., 2024: 81).

2.1. The pedagogical value of digital STEAM tools in music teaching

Digital tools like *Chrome Music Lab*, *Scratch Music*, *Groove Pizza*, *UPISketch* and *iMuSciCa*, turn classes into an interactive workshop by combining image and sound. It is important to highlight the pedagogical value of these tools in the STEAM vertical. When students “color” beats in *Chrome Music Lab*, they simultaneously learn math concepts (fractions, proportions, etc.) and computational thinking through repetitions and loops. Instant audio-visual feedback increases creativity, efficiency and motivates them to learn further (Ningsih & Sukmayadi, 2023). In *Scratch Music* algorithmic blocks become “notes”

that are played in real time and through which students' understand the structure of the form (introduction, stanza, chorus) and thus acquire basic engineering competencies (Özer & Demirbatır, 2023). In *iMuSciCa-u* students' model virtual instruments in 3D by applying physics, geometry, mathematics and technology (Kristis et al., 2020) into designing. *Groove Pizza* allows seeing rhythms as geometric figures on a circular grid. The visualization scheme helps students to hear the "symmetry" and connect mathematics with musical meter (Holland et al., according to Özer & Demirbatır, 2023). *UPISketch* facilitates artistic-mathematical transfer. Even without knowledge of musical notation, younger students' will understand the concepts of function, slope and interval when "drawing" lines in the XY coordinate system and listening to the results (Bourotte & Kanach, 2019).

Research shows that this multisensory way of learning increases students' interest and engagement, improves musical literacy, but also develops critical thinking because students simultaneously "see" mathematical relationships and "hear" their sound representation (Özer & Demirbatır, 2023). Such multisensory, project-oriented practice, in addition to encouraging the development of musical abilities, raises musical literacy, and achieves the key goals of STEAM education - the creation of digital and critical competencies necessary for sustainable innovation (Deák & Kumar, 2024). In this way, Musical Culture subject becomes a "living laboratory" in which students' experiment, express themselves creatively and learn to solve different problems, and teachers effectively integrate science, technology, engineering and mathematics into their artistic practice.

Within STEAM, interdisciplinary learning builds bridges between traditional subjects. Students' simultaneously apply mathematical and physical concepts to engineering tasks, which encourages better communication and greater curiosity (Özer & Demirbatır, 2023; Deák & Kumar, 2024). By integrating musical contents into STEAM lessons, abstract concepts such as frequency and fractions are more easily communicated through sound, become "tangible", and the principles of acoustics are directly connected to the design and 3D modeling of instruments (Ningsih & Sukmayadi, 2023). In order to successfully implement musical contents in STEAM lessons, it is necessary to carefully design project cycles. In this way, students' will be able to approach problems from a scientific, technological, mathematical and artistic point of view, but also develop competencies for solving different problems in an authentic and practically applicable way (Boice et al., 2024).

Digital tools that connect musical contents with other STEAM areas provide opportunities for students' to explore science concepts in interactive, visual and auditory environments. Tools like *Chrome Music Lab*, *Scratch Music*, *iMuSciCA*, *Groove Pizza* and *UPISketch* connect musical production with mathematical concepts (fractions, symmetry, rhythmic sequences), physical principles (frequency, resonance, amplitude) and algorithmic thinking (block coding). For example, *Chrome Music Lab* enables students to "hear" and "see" different musical patterns at the same time, which develops abstract thinking through synesthetic experience (Ningsih & Sukmayadi, 2023). *Groove Pizza* visualizes the rhythm as geometric shapes, which contributes to a better distribution of proportions and angles. *Scratch Music* introduces basic coding concepts through audio, while *iMuSciCA* connects music, physics and 3D modeling and allows students to create their own virtual musical instruments. *UPISketch*, on the other hand, it is a powerful tool that is extremely easy to use. It allows students without formal musical background to create music through mathematically supported templates. The mentioned tools show that digital technology in the teaching of Musical Culture subject can be used not only as a tool, but also as an integrative pedagogical platform that helps the development of interdisciplinary competences.

2.2. Challenges, limitations and future directions

Musical contents in STEAM education has the potential to be a mediator between theoretical and empirical, abstract and concrete, logical and emotional knowledge. Students' can develop not only musical abilities and creativity, but also cognitive abilities such as spatial-temporal reasoning, pattern recognition, but also symbolic thinking - crucial for mathematics and physics (Schellenberg, 2006). For example, the analysis of rhythmic structures contributes to a better understanding of fractions, and sound waves can help to understand frequency, acoustics and amplitudes in physics. In addition, music encourages the development of emotional and social intelligence, self-reflection and cooperation, which is important for project teaching and solving various complex tasks in a group. In this context, Musical Culture is no longer an independent subject, but an integral part of interdisciplinary education aimed at the overall development of students.

Although research shows that STEAM teaching improves the cognitive, affective and social outcomes of students, the authors warn that the current implementations are diverse and that it is necessary to adopt standardized pedagogical frameworks that will put digital competences at the service of sustainable innovations (Deák & Kumar, 2024). It is necessary to focus attention on supporting teachers. When teachers get time for collective planning, mentoring support and resources - like in a one-year program *GoSTEAM@Tech*— create locally relevant interdisciplinary lessons and significantly deepen understanding of STEAM (Boice et al., 2024).

For structuring digital competences, it is recommended to rely on *DigCompEdu* (Redecker & Punie, 2017), but also on frames like *STEAMComp Edu* which describes 41 key competencies that a STEAM teacher should possess. The researchers suggest that future work should include:

(1) development of instruments for measuring musical creativity and algorithmic thinking in the STEAM context,

(2) longitudinal monitoring of the effects of digital tools on different age groups and

(3) building sustainable networks for professional development that will provide teachers with the technical and pedagogical support necessary throughout the year.

In this way, consistent and contextually adapted application of STEAM education will be ensured.

Despite the popularity of the STEAM approach, implementation in practice faces challenges. One of the biggest problems is the unpreparedness of teachers for interdisciplinary work. Many teachers feel that they are not sufficiently skilled in areas that are not their primary profession. This is especially noticeable when using digital tools or in art forms such as music (Boice et al., 2024). Also, the lack of time in the curriculum, limited institutional support and insufficient material resources further complicate the realization of STEAM projects. Research shows that teachers who have the resources, mentoring support, and time for collaborative planning within a professional development program create contextually appropriate lessons, but also significantly improve their own understanding of STEAM (Boice et al., 2024). The following are highlighted as priority recommendations:

(1) development of standardized teacher competencies in STEAM education;

(2) establishment of professional networks and communities of practice;

(3) availability of open educational resources and examples of good practice;

(4) building multidisciplinary teams in schools and

(5) evaluating the impact of the STEAM approach on student achievement and motivation (Deák & Kumar, 2024).

3. CONCLUSION

“Future STEAM education trends will likely emphasize project-based learning and technology integration, aligning academic content with students’ experiences. International conferences and online communities dedicated to music in STEAM education can facilitate knowledge sharing among educators, fostering the creation of innovative curricula that reflect diverse cultural contexts. As scholars continue to explore the integration of musical contents into STEAM curricula, problem-solving through purposeful professional development is essential. Ongoing dialogue around these practices will contribute to developing educational approaches worldwide, ensuring that music remains a vital and enriching component of STEAM education” (Semenikhina et al., 2024: 81).

In conclusion, the future development directions of STEAM education in music will be focused on technology-based project-based learning. Teaching content related to students’ everyday experiences will facilitate the solving of various problems through visualization, sound and code. Online communities and international conferences dedicated to music in STEAM are becoming key venues for sharing good practices. They encourage the creation of curricula that respond to global challenges and respect cultural specificities (Deák & Kumar, 2024). Research has shown that targeted professional support for teachers is key to sustainable implementation. In order to build stable competence frameworks and reduce heterogeneity in practice, mentoring, collective planning and available digital resources are necessary (Boice et al., 2024). “Ongoing dialogue around these practices will contribute to developing educational approaches worldwide, ensuring that music remains a vital and enriching component of STEAM education” (Semenikhina et al., 2024: 81).

In the domain of Musical Culture subject, STEAM education represents an innovative and perspective model that develops critical thinking, encourages creativity, cooperation, and also enables a better understanding of complex phenomena. By introducing musical contents into interdisciplinary teaching scenarios, students get the opportunity to look at science, technology and mathematics from new creative perspectives. Trends in STEAM education in the future will most likely rely on project-based learning, augmented reality, and locally relevant topics that encourage student engagement. International conferences, online communities and open platforms will be important for the exchange of knowledge between researchers and teachers, enabling the emergence of a curriculum that supports pedagogical innovation and cultural diversity. In order for music to remain a vital part of the STEAM approach, it is necessary to support and invest in the continuous professional development of teachers, instruments for monitoring outcomes, but also to form interdisciplinary teams that will carry out reform processes (Semenikhina et al., 2024; Boice et al., 2024). The transformative role of Musical Culture subject in the education of the 21st century can only be realized through systemic support and joint learning.

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INTERDISCIPLINARNO UČENJE U ERI GLOBALIZACIJE: STEAM PRISTUP U MUZIČKOM OBRAZOVANJU

Apstrakt. U eri globalizacije obrazovanje se sve više fokusira na razvoj interdisciplinarnih kompetencija koje omogućavaju učenicima da se uspešno suoče sa kompleksnim izazovima savremenog društva. Ovaj rad istražuje primenu STEAM pristupa u nastavi Muzičke kulture, sa posebnim akcentom na njegovu ulogu u kontekstu globalizacije obrazovanja. STEAM (nauka, tehnologija, inženjering, umetnost i matematika) objedinjuje tehničke i kreativne aspekte učenja, naglašavajući značaj integracije umetnosti u tradicionalne STEAM discipline. Muzička kultura, kao deo ovog pristupa, pruža platformu za inovativne pedagoške prakse koje spajaju muzičku kreativnost sa naučnim i tehnološkim principima. Glavni cilj rada je istraživanje kako STEAM pristup može podstaći razvoj globalnih kompetencija, kao što su kreativnost, kritičko razmišljanje, saradnja i tehnološka pismenost. Metodologija rada obuhvata analizu literature, studije slučaja i primere dobre prakse iz oblasti STEAM obrazovanja i Muzičke kulture. Uočeno je da aktivnosti poput programiranja muzike, kreiranja instrumenata uz pomoć savremenih tehnologija i eksperimenata sa zvučnim talasima pružaju učenicima mogućnost da istraže veze između nauke, tehnologije i matematike. Ove aktivnosti ne samo da integrišu fizičke i tehnološke koncepte, već omogućavaju učenicima da istraže interakcije između različitih disciplina i razviju kreativne i analitičke veštine. Rezultati istraživanja pokazuju da STEAM pristup u muzičkom obrazovanju ima potencijal da transformiše tradicionalne pedagoške metode, omogućavajući učenicima da se uspešno nose sa savremenim izazovima. Pored toga, ovaj pristup podstiče inovacije i razvija veštine neophodne za uspeh u tehnološki i ekonomski dinamičnom okruženju. Dodatno, naglašava značaj interdisciplinarnog učenja kao odgovora na tehnološke promene, ekonomiju zasnovanu na znanju i zahteve savremenog tržišta rada. Zaključci rada ukazuju na to da STEAM pristup u muzičkom obrazovanju predstavlja značajan alat za transformaciju obrazovanja u eri globalizacije. Implikacije istraživanja uključuju potrebu za jačanjem infrastrukture, unapređenjem obuke nastavnika i promocijom partnerstava između škola, privatnog sektora i nevladinih organizacija kako bi se omogućila šira primena ovog modela.

Ključne reči: steam pristup, interdisciplinarno učenje, muzička kultura, globalizacija, tehnologija, inovacije

Original research paper

THE APPLICATION OF DIGITAL TECHNOLOGY IN THE TEACHING OF NATURAL AND SOCIAL SCIENCES

UDC 371.214:004
37.013:001.1

Siniša Stojanović¹ , Ljiljana Mitić¹ , Veritsa Arsov² 

¹Pedagogical Faculty in Vranje, University of Niš, Serbia

²Faculty of Pedagogy, South-West University “Neofit Rilski”, Blagoevgrad, Bulgaria

Abstract. *This paper presents the results of a study on the possibilities and scope of applying digital technology in the teaching of Natural and Social Sciences. The first part of the research is based on a theoretical analysis of the learning outcomes and content of the subject Natural and Social Sciences for the fourth grade of primary school, as defined by current curriculum documents. The second part consists of empirical research aimed at examining teachers' experiences and opinions regarding the use of digital technology in this subject area. As part of the same objective, an analysis was conducted of the written lesson plans available to teachers within the textbook sets they use for lesson implementation. The findings of these research efforts suggest that the subject Natural and Social Sciences offers considerable potential for the appropriate didactic and methodological integration of digital technology in achieving the prescribed learning outcomes. Furthermore, teaching practice is predominantly characterized by the use of technological aspects and resources of digital technology, as opposed to software-based and informational components.*

Keywords: *Digital technology, teaching of Natural and Social Sciences, curriculum content, educational goals and learning outcomes*

INTRODUCTION

The digitalization of teaching and education implies changes in these processes through the application of a wide range of systems, technical devices, tools, and educational software that use information in the form of numerical binary code, which can be represented as a sequence of two numerical symbols, typically 0 and 1. Relevant literature states that digital technologies encompass computers, smartphones, digital cameras, software programs, digital television, and so forth (Новковић Цветковић, 2025: 204). According to the same source, the application of digital technology is grouped into several sectors: computers, mobile devices, data transmission systems, software and applications, and digital resources. Other sources define digital technology as encompassing information and communication technologies, as well as various electronic, digital, and Android-based devices and activities (digital toys, tablets, cameras, computers, smartphones, the internet) (Pavlović Breneselović,

Corresponding author: Siniša Stojanović

Pedagogical Faculty in Vranje, University of Niš, Partizanska 14, 17500 Vranje, Serbia

E-mail: sinisast@pfvr.ni.ac.rs

2012). From the aforementioned conceptual framework, it follows that the process of digitalization consists of two fundamental aspects: digital technology or electronic devices, and digital materials, that is, information converted into digital format. The variety of elements that comprise digital technology indicates a high level of development, with a tendency toward continuous progressive change and improvement. Furthermore, professional methodological literature highlights the existence of a significant volume of digitized materials related to natural and social reality, which can be efficiently stored, preserved, and presented in various ways. Among these, Google Classroom is frequently mentioned, as it allows teachers to create an online classroom where they can manage documents required by their students for further learning and work. These documents are stored in Google Docs, Google Sheets, and other Google applications. In addition to Google Classroom, many textbook publishers have made their materials available on digital platforms (e.g., the publishing house *Eduka*, which offers textbooks on three different platforms: Mudl, EdukaDigital, and Mozaik) that include advanced Learning Management System (LMS) features, allowing teachers to create their own classrooms using pre-designed teaching materials, multimedia, and interactive knowledge assessments (Видосављевић, 2022). Moreover, numerous digitized contents can be listed as the result of individual and team efforts by teachers and professional associations (Живковић, 2020).

However, the application of digital technology in teaching *Nature and Society* must be analyzed within the framework of a realistic didactic-methodological context, which in this case consists of the teaching objectives, learning outcomes, and content.

Learning outcomes are achieved through the interplay of content, teaching and learning methods, and student activities-sometimes within a single topic, but most often across multiple topics. This paper starts from those outcomes whose formulations explicitly point to the need for developing digital competencies, both for gathering and presenting necessary information and for ensuring students' safety in the digital environment. In this regard, within the thematic unit *Human Beings – Natural and Social Beings*, certain contents include the term *digital safety*, such as: "Digital safety and the consequences of excessive use of information and communication technologies; inappropriate content." These contents serve to support the achievement of the following outcomes: planning one's daily activities and time spent using ICT devices; being able to seek help when encountering inappropriate content in the digital environment. Within the methodological guidelines, these outcomes are further clarified, emphasizing that *digital safety* represents a new aspect of safety culture introduced in the fourth grade, which comprises two key dimensions. The first refers to the amount of time students spend using digital technologies (often at the expense of physical activity, learning, and socializing), i.e., to equipping students with the ability to plan their activities and time spent using ICT, while taking into account the potential consequences of excessive use of information and communication technologies, both for physical health and for relationships with others. The second dimension pertains to security threats in the digital environment-namely, students' encounters with inappropriate content on the internet and their appropriate responses (how and from whom students can seek help).

In addition to the above, the methodological guidelines for program implementation also list cross-curricular learning outcomes that more specifically point to the application of digital technology: by the end of the grade, the student will be able to find and select the necessary information from various sources (written, visual, digital) (Pravilnik o programu nastave i učenja za četvrti razred osnovnog obrazovanja i vaspitanja, „Sl. Glasnik RS-Prosvetni glasnik“, br. 11/2019 i 6/2020). It is also emphasized that students should be equipped to independently explore and analyze natural and social phenomena and processes.

In addition, the methodological guidelines recommend the use of a broader range of literature and other sources of information: printed, audio-visual, and electronic media. In the same document, under the section *Implementation of Teaching and Learning*, it is stated that the primary goal of teaching is not merely the transmission of subject content, but the construction and development of knowledge as the foundation for acquiring various skills. It is evident that the document repeatedly emphasizes students' direct engagement in research activities, which is methodologically justified given the multidisciplinary nature of the content. However, within the topic *The Past of Serbia*, there is no recommendation to search digital sources of information in addition to written, material, or oral sources.

Numerous studies have identified the advantages of applying digital technology in the implementation of *Nature and Society* content.

One of the earliest studies in this field showed that the use of educational computer software in teaching enhances its quality: students acquire new knowledge more quickly through their own cognitive engagement, demonstrate greater attention, follow lessons more effectively, and participate more actively in the learning process. Multimedia content captures students' attention and engages all their senses, which makes it easier to maintain discipline in the classroom (Mandić, 1995: 400–409).

More recent research has shown that computer-assisted learning through educational software contributes to the acquisition of higher-quality knowledge compared to instruction in which educational software is not used (Cekić-Jovanović, Ristanović i Bandur, 2014: 259–273).

One such study examined the use of the software *We Are Naturalists*, which was specifically developed for that purpose. It covers the topic *My Homeland* within the subject *Nature and Society*. The multimedia educational computer software *Naturalists* (hereinafter referred to as ECS *Naturalists*) was created using the *PowerPoint* program (hereinafter PPT). The researchers opted for PPT presentations for several reasons. Primarily, because working with this program and creating presentations is relatively simple and does not require advanced computer skills, making it accessible to any teacher with basic digital literacy to produce similar (semi-)programmed materials that can modernize the teaching process and allow for more frequent use of digital resources. Among other advantages, *PowerPoint* enables drawing lines and creating animations, which can assist both teachers and students in dealing with very dry, complex, abstract, yet essential teaching units.

The study was conducted as an experiment with parallel groups. The results confirmed the main hypothesis: there were statistically significant differences in the quality of knowledge between students who acquired *Nature and Society* content through traditional teaching methods and those who acquired the same content through the use of ECS *Naturalists* (Цекић-Јовановић, 2020).

There are also other studies that support the application of digital technology in teaching in general, as well as specifically in *Nature and Society* instruction. Further enumeration of these studies would exceed the primary research scope of this paper.

Based on the analysis of the aforementioned theoretical frameworks and the presented research studies, the methodological framework for this study has been established.

METHOD

The primary aim of the research in this study is to examine the possibility and extent of digital technology application in teaching *Nature and Society* in the 4th grade of elementary

school. For these reasons, a descriptive method and theoretical analysis were applied in the research. Within these methods, content analysis and surveys were used as techniques.

Using the first technique, an analysis was conducted of written lesson plans from the publisher of the *Eduka* textbook set, which are used by the surveyed teachers (a total of 72 teaching units). The basic unit of analysis was the recommendation for the application of digital technology in the implementation of a specific teaching unit.

The surveys of teachers and students aimed to verify the practical application of digital technology in the delivery of *Nature and Society* content. The study involved 50 teachers from the territory of the city of Vranje and 100 students attending schools where these teachers are employed.

RESULTS

The research results are grouped into two main sections. First, the findings related to the analysis of written lesson plans are presented, followed by the results of the teacher and student surveys.

Analysis of written preparations for teaching implementation

This section of the paper presents the results of the analysis of 72 daily lesson plans for the 4th grade, published by *Eduka*, whose textbook sets are used by the surveyed teachers. Out of a total of 45 instructional (content delivery) lessons, the textbook authors recommend the use of computers and beam projectors in 42 lessons, primarily during the introductory part of the class, for the purpose of displaying audio, visual, and audiovisual materials, associations, mini-quizzes, crosswords, and similar content. Additionally, the use of PowerPoint presentations is recommended in three instructional lessons (*National Parks of Serbia*, *Separation of Components in Mixtures and Solutions*, and *Cultural Monuments of Medieval Serbia*) and in one revision lesson (*Electricity and Magnetism*). After the emotional-motivational and cognitive preparation of students, during the main part of the lesson, students are typically directed to work using textbooks, worksheets, maps, and other materials. Alongside these tools, the analyzed lesson plans also reference the use of other “traditional” static visual aids (images, sketches, geographic maps, models). In other types of lessons, for example at the beginning of the school year during one revision class (reviewing third-grade material), the presentation of a video recording on *habitats and living communities* is recommended. Likewise, in one revision lesson, the use of a video clip with ecological content is suggested in the introductory phase. In the final, 72nd lesson — a systematization lesson (*Familiarizing with the Life and Work of Prominent Serbian Figures of the 19th and 20th Centuries*) — students are encouraged to listen to a “popular” interpretation of Branko Radičević’s poem *I Sing by Day, I Sing by Night*. As part of the teaching materials offered by the *Eduka* publisher, teachers are provided with five PowerPoint presentations (*Electricity and Magnetism*, *The Formation of the Modern Serbian State*, *Cultural Monuments of Serbia*, *National Parks of Serbia*, and *Separation of Mixture Components*). The same textbook package also includes additional lesson plans authored by other educators. However, in all the analyzed lesson plans, in addition to “traditional” teaching aids, the use of the *digital edition* of the *Nature and Society* textbook for fourth grade, available on the *Mozaik* platform, is also recommended. Given the insufficient technical equipment in many schools for using and projecting internet-based content, the actual extent and intensity of using electronic textbooks during classroom instruction remains an open question.

Results of a survey of teachers and students

The first question in the questionnaire referred to the use of computers, without differentiating between phases of the teaching process or the typology of lessons. All respondents (N = 50) answered this question affirmatively. The extent of digital technology use in teaching was first considered in relation to predominantly traditional teaching aids. Respondents were asked to rate the frequency of use for each listed teaching aid by selecting one of the following values: 3 – regularly/often, 2 – occasionally, and 1 – rarely. Based on the index of scale values, the following ranking was obtained for the frequency of use of the listed teaching aids.

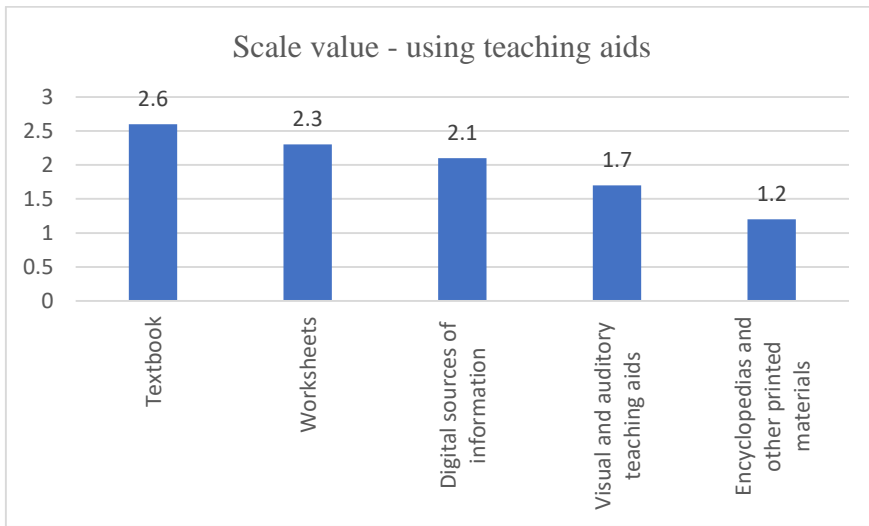


Figure 1. Frequency of use of teaching aids in the implementation of nature and society content

The results presented in the chart indicate that textbooks and worksheets, as components of the textbook package, are the most frequently used teaching aids. Digital sources of information rank third in terms of frequency of use. The subsequent phase of the research focused on examining the application of digital technology in teaching. Based on the core theoretical framework and the results of the analysis of daily lesson plans, the study identified the following digital teaching tools from a broad spectrum of devices and digital resources: electronic textbooks, PowerPoint presentations, applications, CDs and DVDs, and the use of the internet in teaching.

Table 1. Use of Digital Technology in *Nature and Society* Instruction

Digital Teaching Tools	N	%
PowerPoint	20	40%
CD/DVD	10	20%
Internet	10	20%
Applications	3	6%
Electronic Textbook	7	14%

The results presented in the table show that the surveyed teachers most frequently use *Microsoft PowerPoint*, a user-friendly graphical program for creating multimedia educational content.

Building on the previous question, the use of PowerPoint presentations was further examined in relation to the type of lesson. The majority of respondents (71%) reported using PowerPoint primarily during content delivery, 26% during revision, and only 3% during knowledge or learning outcomes assessment.

Table 2. Use of PowerPoint Presentations by Lesson Type

Lesson Type	PPT
Content Delivery	71%
Revision and Consolidation	26%
Knowledge/Outcome Assessment	3%

The relevance of using PowerPoint presentations was further examined in relation to specific teaching content or subject areas. The highest percentage of respondents believe that PowerPoint is most appropriately applied in the following areas/topics: *Natural and Social Features of Serbia*, *The Past of Serbia*, and *Human Beings – Natural and Social Beings*.

Table 3. Use of PowerPoint Presentations in Relation to the Specificity of Teaching Content

Subject Areas	Use of PPT
Natural and Social Features of Serbia	46%
The Past of Serbia	28%
Human Beings – Natural and Social Beings	26%

Based on the learning outcomes of *Nature and Society*, the subsequent questions examined the possible engagement of students in preparing content using PowerPoint presentations. Seventy-one percent of the surveyed teachers responded affirmatively to this question. Additionally, 83% of respondents believe that students are further interested and motivated by this type of engagement in the teaching process.

Some of the questions, or their parallel forms, were also posed to the students. The following table presents the results of the investigation into students' use of digital technology.

Table 4. Use of Various Digital Tools by Students

Digital Tools	N	%
PowerPoint	20	20%
CD/DVD	10	10%
Internet	30	30%
Applications	15	15%
Electronic Textbook	35	35%

In contrast to teachers, a significantly higher percentage of students use the internet and electronic textbooks when acquiring new instructional content. Considering that most teachers use PowerPoint presentations during content delivery, students were asked to evaluate which topics or subject areas are suitable for this type of presentation.

Table 5. Use of PowerPoint Presentations by Teaching Topics

Teaching Topics	%
Natural and Social Features of Serbia	34%
The Past of Serbia	33%
Human Beings – Natural and Social Beings	33%

The table shows that all the listed topics were rated almost equally as suitable for instruction using PowerPoint presentations. The next question examined which method of content presentation students found most engaging.

Table 6. Students' Preference for Methods of Content Presentation

Method of Content Presentation	N	%
Knowledge Quiz	50	50%
Short Film	30	30%
Animations	17	17%
Theory	1	15%
Σ	100	100%

It is evident that students prefer forms of content presentation that involve greater participation on their part, including elements of competition.

In response to the question, "Do you receive assignments to create PowerPoint presentations on your own?" only 33% of students answered affirmatively, which is significantly lower compared to the teachers' responses. However, nearly the same percentage of students as teachers (87%) positively assess the motivational value of this type of engagement in teaching.

DISCUSSION AND CONCLUSIONS

The results of the qualitative analysis of the *Regulations on the Curriculum and Program* for the fourth grade, in the subject *Nature and Society* (including learning outcomes and content, methodological guidelines for their implementation, and the realization of teaching and learning), indicate a properly established didactic-methodological framework for delivering the prescribed content. Primarily, this is evident in the recommendations concerning the purposeful use of teaching aids aligned with the specificities of the content and learning outcomes. This reflects both the scientific rigor and the currency of the document. The currency is demonstrated by the inclusion of a separate section dedicated to digital competencies and student safety. Methodological consistency relates to the clarification of the principle of life relevance, which ensures this program's high sensitivity to the context in which students live, i.e., openness to content drawn from students' environment and flexibility to accommodate the characteristics and features of the diverse environments in which children in Serbia reside. Moreover, the program emphasizes the need for students' direct engagement in the real social environment and the application of such forms of work that involve observations, experiments, demonstrations, and the like. The geographic map as a teaching aid remains indispensable within the thematic area of *Natural and Social Features of Serbia*. In the thematic area of *Natural Resources of Serbia* (energy sources, clean water, clean air, fertile soil, minerals, biological diversity), teachers are encouraged to motivate students to participate in local environmental protection initiatives. It has already been mentioned that there are learning outcomes and content that explicitly stress strengthening students' digital competencies from both an educational and safety perspective, particularly regarding excessive use of ICT technology and security threats in the digital environment during free time. However, in the program sections that highlight the need for students to independently search, record, note, and present information, recommendations for the application of digital technology are lacking. Considering the increasing scope of digitization of original historical documents, it would be methodologically appropriate to direct students' research activities toward searching digitized historical sources and documents within libraries and historical archives. Such an approach would contribute to strengthening students' digital competencies and the culture of intellectual work, which is a significant task of intellectual education.

The empirical part of the research demonstrated that the use of printed textbooks and worksheets still dominates in teaching. Such research findings can, among other reasons, be explained by the fact that these materials have long been theoretically established, empirically verified, and are relatively accessible and easy for widespread use in teaching and schools. Additionally, the concept of textbook packages follows the structure and logic of the curriculum frameworks, ensuring systematic and clear instructional work. Nevertheless, teachers use computers primarily as tools for storing and presenting digitized content, most often through PowerPoint presentations, due to the relative simplicity of their creation and application. A higher level of digitalization in teaching (electronic devices, educational software) requires better-equipped schools, that is, the availability of IT and computer resources to all teachers simultaneously, without scheduling conflicts, arrangements, or the setting of various work priorities. For these reasons, such tools are less frequently used. Besides these objective difficulties, the use of digital resources requires a higher level of teacher competencies. Furthermore, digital technology is considerably less applied in the verification phase of the teaching process compared to the content delivery phase. In the knowledge assessment part, practical activities and the application of control tasks and tests prevail. Teachers' responses indicate almost equal use of digital tools across

all thematic areas. Considering that in the fourth grade content is covered that involves geographical and temporal distance relative to the well-known principle of immediate environment, the obtained results indicate a sound didactic-methodological reflection on the use of digital teaching aids by teachers. It is noticeable that within the topic of *Materials*, which predominantly involves the use of demonstrations and experiments, the application of digital tools was not mentioned.

Unlike teachers, students show a closer affinity to the use of electronic textbooks compared to “traditional” ones, which can be explained by their greater engagement with these tools in everyday activities. It is important to emphasize that both teachers and students equally assess the appropriateness of all thematic areas for the application of digital educational technology. Both groups believe that the use of digital technology contributes to more effective teaching and possesses significant motivational value.

The results of the analysis of written lesson plans for direct teaching implementation show that most recommendations for the use of digital technology are primarily concentrated on lessons involving the presentation of new instructional content. Generally, the use of computers and interactive projectors is recommended for presenting digitized audiovisual materials, primarily during the introductory part of the lesson, serving as a stimulating tool for the emotional, motivational, and cognitive preparation of students. During the main part of the lesson, students are directed to work with texts in textbooks or worksheets. Other, relatively static artificial and natural visual teaching aids are used in a smaller number of lessons. In this regard, there is a high level of agreement between the results of the teacher survey and the findings from the analysis of written lesson plans.

Further research in this area should be directed toward collecting more precise information on the conditions and effects of digital technology use in teaching, both at descriptive and experimental levels. More comprehensive research findings also require a qualitative approach, especially within action research frameworks. Such an approach would significantly promote the intensified use of digital educational technology and, ultimately, improve the teaching process.

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PRIMENA DIGITALNE TEHNOLOGIJE U NASTAVI PRIRODNIH I DRUŠTVENIH NAUKA

Apstrakt. U radu su prikazani rezultati istraživanja o mogućnostima i obimu primene digitalne tehnologije u nastavi predmeta *Priroda i društvo*. Prvi deo istraživanja zasniva se na teorijskoj analizi ishoda učenja i sadržaja predmeta *Priroda i društvo* za četvrti razred osnovne škole, definisanih važećim nastavnim planovima i programima. Drugi deo rada obuhvata empirijsko istraživanje usmereno na ispitivanje iskustava i stavova učitelja u vezi sa primenom digitalne tehnologije u ovoj nastavnoj oblasti. U okviru istog cilja sprovedena je i analiza pisanih priprema za časove koje su učiteljima dostupne u okviru udžbeničkih kompleta koje koriste u realizaciji nastave. Dobijeni rezultati ukazuju na to da predmet *Priroda i društvo* pruža značajan potencijal za adekvatnu didaktičko-metodičku integraciju digitalne tehnologije u ostvarivanju propisanih ishoda učenja. Takođe, nastavnu praksu pretežno karakteriše upotreba tehnoloških aspekata i resursa digitalne tehnologije, u odnosu na softverske i informacione komponente.

Ključne reči: digitalna tehnologija, nastava prirode i društva, nastavni sadržaji, obrazovni ciljevi i ishodi učenja

TOPIC

*Evaluation and Improvement of Educational
Quality*

Original research paper

PROMOTING THE RULES OF CONDUCT IN THE CONTEXT OF CLASSROOM MANAGEMENT

UDC 37.034:371.5
37.064.2

Nina Garștea 

Faculty of Education Sciences, “Ion Creangă” State Pedagogical University of Chisinau,
Moldova

Abstract. *This study explores classroom management, with the aim of understanding how teachers can improve the effectiveness of the educational process by managing pupils' behaviour. It emphasizes the importance of a collaborative relationship between teacher, pupils, and parents, as well as the need for responsible and balanced education. It also emphasizes the responsibility of the teacher, who must positively influence pupils through his or her management skills. It describes the definition and application of classroom management, which involves the skills of self-regulation of pupil's behaviour and the prevention of deviant behaviours. It emphasizes the importance of explicit and implicit norms within the class group and how they influence school culture. It analyzes the need to promote rules of conduct at the classroom level and effectively manage inappropriate behaviours to create a healthy learning environment. The research results show that although teachers apply rules of conduct, they are not always effectively exploited. It is found that teachers possess average classroom management skills, and a skills training program in this area is necessary. The proposed program aims to develop strategies for managing pupils' behaviours, correctly applying rules, and strengthening positive relationships between teachers and pupils.*

Keywords: *classroom management, behaviour management, the rules of conduct, classroom management skills*

1. INTRODUCTION

Increasing the efficiency of the educational process and achieving the educational ideal is a law of education, therefore searches and research in the field of classroom management of pupils will always be relevant. The analysis of educational practice highlights that one of the difficulties of working with pupils is their frequent behavioural deviations. Contemporary society requires more than ever a change of vision and mentality. In the social system of education and training, teachers must relate to those they educate, to establish cooperative relationships with pupils and their parents. They do not educate only in the classroom, but through each relational contact with children and parents, they carry out a work of growth

and development, of leadership and direction. The activity of teaching staff is carried out in front of human psychic individualities in formation. Hence the need for maximum responsibility for the teacher's behaviours and interventions.

In accordance with Competence Area 2. Learning Environment of the Standards of Professional Competence of Teachers in General Education (2016, p. 6), the teacher ensures a developmental learning environment; ensures management of the classroom and pupils behaviours; permanently monitors the activity of educational subjects, promoting appropriate/ethical behaviour; diversifies the activities of children/pupil groups in order to ensure behavioural autonomy; involves pupils in establishing behaviour and work rules, based on the learning culture (indicator 2.2.).

The efficiency of a teacher in a classroom depends on the skills acquired, his motivations and certain personality traits. The teacher, through his art, produces change, continuously influencing the pupil. To influence, he must know how, he must intuit desires and curiosities, foresee reactions and behaviors, and be prepared to anticipate them, remaining faithful to his profession. Being a model of competence, self-control, and psychological balance, the teacher becomes an educational model for his pupils.

2. THEORETICAL FRAMEWORK

There are several points of view that consider classroom management as synonymous with the theoretical and practical approach to discipline in the classroom. Classroom management involves the ability of the teacher to form in pupils the skills of self-regulation of behaviour, to prevent undesirable behaviours, to solve some behavioural problems that arise at a given time in a classroom.

A broad description of this topic can be found in R. B. Iucu (2006, p. 102), who defines classroom management as „a research field in educational sciences that studies both the theoretical perspectives of approaching the classroom, as well as its dimensional-practical structures, in order to facilitate teachers' interventions in concrete educational situations”.

I. Bulgaru, C. Langa (2009, p. 67) emphasize the importance of rewarding positive pupils' behaviours.

Classroom management, in S. Iosifescu's vision (2001, p. 34), has as essential objectives:

- improving the conditions necessary to facilitate effective learning;
- increasing the time allocated to solving learning tasks by pupils and reducing the time allocated to controlling inappropriate behaviours;
- motivating pupils for their active involvement in learning activities;
- preventing stress for pupils and teachers.

Classroom management is an interdisciplinary science at the interaction between psychology, pedagogy, sociology, philosophy, economics, communication sciences, conflict resolution sciences, etc. The ultimate objective of classroom management is to develop self-regulation skills in pupils.

Sociological arguments for approaching classroom activity from the perspective of classroom management are: instructional situations, lessons, as forms of organizing the educational process, take place in a certain social environment. Social motivation of learning, educational relationships and the construction of a social climate are areas that cannot be ignored in the process of designing, organizing and managing educational activities.

Psychological arguments elucidate the need to train participatory skills. The teacher must help pupils acquire problem-solving skills, both personal and social. The learning process

must be integrated, including learning experiences, living, communication and evaluation. The adaptation of pupils to the school environment is achieved through counselling and support from the teacher regarding social behaviours learned in school interactions and the internalization of social and psychological influences on the pupil's behaviour.

The class of pupils represents a psychosocial formation, structured according to the criterion of age peculiarities, which is defined by the existence of accentuated interpersonal relationships between all its members, by the fact that it maintains its structure for a long period of time and by the existence of common goals for the achievement of which the pupils act, both individually and through cooperation.

The mentioned elements make it necessary to have an appropriate management of the class of pupils. For example, it is known that at the level of each group, alongside the institutional norms and regulations, there is a set of norms and rules implicitly developed by the members of the group, the observance of which largely conditions the position of the individual within the group. In the situation where these implicit rules are in contradiction with the institutional ones, there is a risk that the pupil, in his desire to obtain the favorable assessment of the group to which he belongs, will ignore the institutional rules, committing disciplinary offenses of various levels of severity, mentions I. Nicola (1978, p.72).

Knowing and understanding a class of pupils involves identifying the features that define it in relation to other classes; finding the specific elements of the class in question; establishing the status that each pupil has in his class; elucidating the educational „benefits” that the teacher-pupil partnership can bring; defining the common life model acceptable for all pupils in the class.

One of the components of class management is behaviour management, which is essential for creating an orderly teaching-learning-evaluation approach, oriented towards solving tasks, which should ensure pupils more independence and autonomy in the socialization process. A behaviour management plan may include rewarding responsible behaviour; correcting and correcting irresponsible behaviour that is inappropriate for the class context; ignoring mild indiscipline behaviours that do not necessarily need to be considered; consistent control, gentle verbal reprimands, if necessary, etc. from the perspective

From the perspective of the normative dimension of classroom management, in the view of authors D. Luca and D. Croitoru (2014, p. 165) classroom norms are classified into:

- a) *explicit*: constitutive norms (arising from the characteristics of the teaching-learning process and the transmission of knowledge values) and institutional norms (arising from the presentation of the school institution as a social institution);
- b) *implicit* – hidden norms, which are built within the group, produced by the common life of the group.

There is a connection between class norms and school culture, based on the following considerations (D. Luca and D. Croitoru (2014, p. 88):

- the way in which the members of the collective perceive the explicit school norms provided for in the school regulations influences the establishment of the implicit normative culture;
- the school normative culture can exert pressure on the norms in the classroom that can lead to the division of the class, if a good connection does not appear between the two normative sectors;
- the internalization of explicit norms, so that they become the norms of the group;
- the integration of elements of the implicit normative culture in the process of favoring and consolidating the explicit normative culture;

- the emergence and perpetuation of divergences between the culture of teachers and that of pupils – at the level of pupils, the implicit culture develops a series of survival strategies, which include a multitude of elements of identification, discovery and engagement with the help of social skills, in adapting to the demands of explicit normativity.

Therefore, promoting rules of conduct at the classroom level constitutes an effective strategy for preventing unwanted behaviours during and outside of lessons, and their clear communication is essential for efficient classroom management.

3. METHODOLOGICAL AND EMPIRICAL FRAMEWORK

The aim of the research was to determine the level of possession of pupil class management skills among teachers who teach at the primary level of education (grade I).

To achieve this goal, we set the following objectives:

- ascertaining the level of knowledge and effective use of the management strategies of the class of pupils;

- the identification of a possible association (correlation) between the management strategies of the pupils' behaviour and ensuring an efficient management of the class of pupils

The following research methods were applied: psychopedagogical survey; observation; quantitative and qualitative analysis of research results. The questionnaire was used as an instrument. The development of the questionnaire started from the study of specialized literature and the identification of strategies that facilitate effective management in teacher-pupil relationships. The ability to be a good manager is a very broad concept, frequently studied and often overlapped with interpersonal skills. Research in the field highlights various or conceptually very similar skills. Pupil classroom management, carried out in an educational context, is defined in the specialized literature as the teacher/counsellor's competence to plan and organize class activity, to learn to ensure a favourable climate for instruction and education, to promote rules of conduct at the class level to counteract inappropriate behaviours. Classroom management aims to prevent *destructive, deviant behaviours and solve behavioural problems*.

The questionnaire included 6 questions, descriptors of managerial behaviour that respondents must evaluate based on their knowledge and work experience. As a result of the survey, we found the following:

- teachers identify the concept of a „good class manager” with the following response options: always having solutions to all problems (100%) and involving pupils in solving class problems (75%);
- as ways of managing school conflicts, the following were identified: discussing with the pupils involved and trying to solve the situation together with them (75%) and requesting help from the school psychologist (25%);
- teachers highlighted the following problems that pupils face and that could generate inappropriate behavior: poor financial situation of 11 pupils in 4 classes; alcohol consumption in the families of 2 pupils in a class; loud arguments in the family of a pupil;
- teachers highlighted the following causes of inappropriate behaviour at school: family disinterest in school (75%); problems in relating to other classmates (50%); family problems (25%);

- teachers can determine pupils' inappropriate behaviours, but not all of them know strategies for managing and counteracting them, so only one teacher highlighted the promotion of rules of conduct as a strategy (25%);
- teachers collaborate with the school psychologist.

Another method applied in the research was observation. Each of the 4 classrooms was observed and I attended for 4 days (one day in each classroom) all the lessons held at the school. An observation grid was used as an instrument that included four observation criteria. The results obtained are presented in Table 1.

Table 1. Observation results

Observation criteria	Teachers			
	1	2	3	4
The presence of rules of conduct	+	+	+	+
Correct formulation of 5-6 rules of conduct	-	+	-	-
Displaying the rules of conduct in a visible place	+	+	-	-
Capitalizing on the rules of conduct	+	-	-	-

The analysis of the data obtained allowed us to conclude the following:

- teachers have developed rules of conduct (100%), but these are partially used (25%);
- only some teachers (50%) have displayed them in a visible place for all pupils;
- only one teacher (25%) formulated the rules of conduct correctly, accessible to pupils, highlighting the expected behaviour.

Therefore, the data obtained showed us that teachers possess classroom management skills at an average level and led us to propose a Classroom Management Skills Training Program, focused on the following objectives:

- familiarization with positive strategies designed to establish and maintain discipline in the classroom and effective ways of implementing them, developing an itinerary in this regard;
- outlining the possibilities of articulating strategies designed to improve pupil behaviour in a coherent management system;
- applying the possibilities of building a positive teacher-pupil relationship and the influence that the quality of this relationship has on instructional activity and on the personal development of pupils;
- specifying the role of beliefs regarding control in the selection of behaviour management strategies.

To ensure the optimal achievement of the proposed objectives, the following principles must be observed:

1. Interactive theoretical preparation: each training will begin by discussing with teachers the contents necessary to ensure the epistemological basis of the formation of pupils' classroom management skills. The presentation will be made using activating strategies, followed by a self-focused reflection stage.
2. Connection with practice: throughout the activity, teachers will receive tasks to solve, will analyze cases encountered in the pedagogical practice activity, will reflect on the ways to apply the learned techniques in practice and will practice them practically through role-playing, dramatizations, teaching.
3. Modelling: proposed by socio-cognitive theories, involves observations and processes of self-regulation of activity. It is based on the observation that a large part of learning

is generated by observing the activity of others. Teachers will be guided to observe their own classroom management strategies and those of the teachers they assist and to draw parallels, to draw conclusions.

4. Reflection: will follow each important stage of the training.

The program includes strategies for combating deviant behaviour in primary grades and educational intervention strategies for difficult attention-seeking behaviour.

1. Strategies for combating deviant behaviour in primary schools

Establishing rules. Clearly communicating the rules of social and academic behaviour at the beginning of the school year is essential for effective classroom management. It is important that these rules are established together with the pupils, otherwise, children's acceptance and compliance with the rule increases. In this regard, we have developed an effective tool presented in Figure 1.

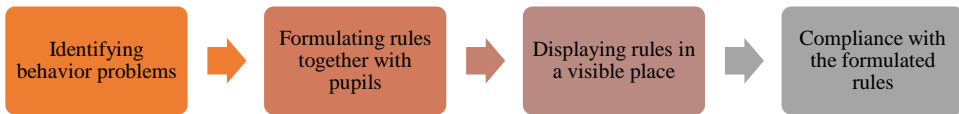


Figure 1. Roadmap for developing and promoting rules of conduct

Teachers can participate in analysing and completing a rule-setting model by highlighting expected behavior and consequences for breaking the rules, according to Table 2.

Table 2. Setting the rules

Expected behavior	Rule	Consequences for pupils who do not follow the rule
Do not use foul language in your speech.	We communicate in a decent language.	Select a text about speech culture, study it and tell it fluently, coherently in front of the class.
Do not run around the classroom during breaks.	We move around the classroom without haste, in an orderly manner.	Wipe the dust off the furniture in the classroom..
Do not scatter personal belongings.	I leave cleanliness behind me.	We stay after lessons to tidy up the classroom.

Teachers will be informed of the criteria for developing rules of conduct:

- be established at the beginning of the school year;
- be positively worded, specifying the expected behaviour;
- be written in simple language;
- the list of rules should not be long (5-6) so as not to be forgotten;
- include only the rules that you consider necessary;
- focus on specific behaviours;
- be developed together with the pupils;
- be displayed in a visible place so that the pupils can remember them;
- be discussed and explained to the pupils;
- all the consequences of not following a rule should be specified;
- the rewards for following the rules should be specified;

- the rules should be applied consistently, without making exceptions to their application;
- the consequences of not following the rules should be in accordance with the seriousness of the behaviour;
- the application of the consequences should be done without blaming the pupil - only the pupil's behaviour is discussed;
- the rules should aim to improve learning conditions in the classroom.

Personalizing the class. To personalize the class, the teacher, together with the pupils, will decide on the following aspects: taking over/inventing a name that the entire class adheres to; arranging the desks differently; using decorative elements to wallpaper the class (pupil products, materials of specific interest to pupils, etc.); personalizing the class through color.

Knowing the pupils. The teacher will demonstrate respect for the pupil through the attention he gives him. By remembering his name, preferences, aspirations, the teacher will make the pupil feel safe. Respecting fairness, granting equal opportunities for all members of the class, respecting boys and girls alike – these are just a few aspects that a teacher-manager must consider.

Creating a positive interaction framework, characterized as follows: openness to change; attractiveness and color; respecting the schedule; reinforcing desirable behaviors; using positive interaction styles.

Reinforcement is a learning situation in which the child learns that there is a relationship between behaviour and its consequences.

Modeling is a cognitive-behavioural modification that consists of presenting a sample of behaviours with the aim of training the person observing the behavior in its production.

The contingency contract is an agreement, usually written, between the teacher and the pupil that includes 3 categories of information: specification of the behavior to be formed; specification of inappropriate behaviors; description of the consequences of the two types of appropriate and inappropriate behaviors, namely behavioral reinforcements and penalties. The contract must be a result of negotiation between the teacher and the pupil.

Prompting consists of using a stimulus before and/or during the performance of a behavior, to facilitate its learning. This form of behavioral modification is used only for initiating and fixing the behavior.

2. Educational intervention strategies for difficult attention-seeking behavior

Ignoring disruptive behavior. If you don't „react”, it means that the pupil has not achieved his goal and, after a few attempts, will give up.

Eye contact. Don't say anything to the pupil, but stare at him intensely, continuing to teach the lesson (or coordinating the development of the explicitly educational activity).

Proximity. Without saying anything to the pupil, approach him during educational activities. Stay next to him until he stops disturbing his colleagues and you.

Using the pupil's name/surname. Periodically, include the pupil's name/surname in the content of the sentence: „And then, John, the fairy...” etc.

„Secret signal”. During the educational activity, without interrupting it, give the pupil a sign whose meaning is known to him.

Written observations. If you know that tomorrow, for example, you must organize in your class an educational activity and you know that pupil X may resort to such behaviors, prepare in advance several notes with similar text, such as: „Please stop”. When you observe disruptive behavior, place such a note on the pupil's desk. If the pupil continues in the same manner, place another note until he stops.

Formulation of "I" type assertions. Such sentences should contain the following parts: designate the feelings or emotions of the teacher at that moment that takes place here and

now; contain the objective description of the disruptive behavior; highlight the consequence of the disruptive behavior; express a request and, optionally, an encouragement. For example: „*Cristina, I am frustrated when you talk to Delia while I am explaining the new topic, because I am losing my train of thought. Please stop. You are a mature person, and I know you will not disappoint me*”.

As a result of the research, we propose several recommendations related to aspects of pupil classroom management:

1. Developing and implementing a classroom management system in collaboration with pupils and parents.
2. Focusing managerial measures and interventions on stimulating and developing desirable behaviors, by providing positive reinforcement and rewarding activities.
3. Actively involving pupils in the classroom management process by promoting rules of conduct, delegating responsibilities, by establishing a class council, by organizing activities together with parents, which facilitate the valorization and self-responsibility of pupils.

4. CONCLUSIONS

The class manager does not only execute central educational policy decisions, does not only administer classroom resources, does not only manage educational space and time. He has an overall vision of teaching and education, initiates educational projects, organizes teaching and educational activities, coordinates human, material and financial resources, makes decisions together with those involved in the educational process, resolves conflict situations, advises pupils with problems, directs the creative learning process of pupils, etc.

Classroom management is an essential aspect of educational activity, with a significant impact on pupil development and learning. The skills of managing pupil behavior and creating an appropriate educational environment are indispensable for ensuring a climate conducive to learning. During the research, it was found that primary school teachers possess an average level of competence in classroom management, and the development of clear strategies for promoting rules of conduct and managing conflicts is necessary to improve their effectiveness.

The research conducted highlights that primary school teachers possess classroom management skills at an average level, demonstrating both strengths and areas requiring improvement. While all teachers acknowledged the importance of rules of conduct and were able to identify inappropriate behaviours among pupils, the consistent formulation, communication, and application of these rules proved to be insufficiently developed. Observation data further revealed gaps in the correct phrasing, visibility, and practical use of classroom rules, which are essential components of effective classroom management. At the same time, teachers showed openness to collaboration with the school psychologist and displayed awareness of the social and familial factors contributing to pupils' behavioural challenges. However, the limited use of behaviour management strategies and the reliance on only a few techniques underline the necessity for targeted professional development.

Based on the results obtained, it was recommended to implement a continuous training program for teachers, focused on effective behavior management strategies and establishing a positive learning environment. In this context, the theoretical and practical training of teachers is essential, and the promotion of a positive relationship between teachers and pupils can contribute to increasing pupils' autonomy and responsibility in the educational process.

Therefore, for effective classroom management, a combination of theory and practice is necessary, providing teachers with the necessary tools to adequately respond to the challenges of the educational environment and to support the development of a productive and respectful learning climate.

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PROMOVISANJE PRAVILA PONAŠANJA U KONTEKSTU UPRAVLJANJA UČIONICOM

Apstrakt. Ova studija istražuje upravljanje učionicama, sa ciljem da se razume kako nastavnici mogu da poboljšaju efikasnost obrazovnog procesa upravljajući ponašanjem učenika. Naglašava značaj saradnje između nastavnika, učenika i roditelja, kao i potrebu za odgovornim i uravnoteženim obrazovanjem. Takođe se naglašava odgovornost nastavnika, koji svojim veštinama upravljanja mora pozitivno uticati na učenike. Opisuje definiciju i primenu upravljanja učionicom, što podrazumeva veštine samoregulacije ponašanja učenika i prevenciju devijantnog ponašanja. Ističe važnost eksplicitnih i implicitnih normi unutar razredne grupe i kako one utiču na školsku kulturu. Analizira potrebu da se promovišu pravila ponašanja na nivou učionice i efikasno upravljaju neprikladnim ponašanjem kako bi se stvorilo zdravo okruženje za učenje. Rezultati istraživanja pokazuju da iako nastavnici primenjuju pravila ponašanja, ona nisu uvek efikasno iskorišćavana. Utvrđeno je da nastavnici poseduju prosečne veštine upravljanja učionicama, te je neophodan program obuke veština u ovoj oblasti. Predloženi program ima za cilj da razvije strategije za upravljanje ponašanjem učenika, ispravnu primenu pravila i jačanje pozitivnih odnosa između nastavnika i učenika.

Ključne reči: upravljanje učionicom, upravljanje ponašanjem, pravila ponašanja, veštine upravljanja učionicom

University of Niš
Pedagogical Faculty in Vranje
2nd International Scientific Conference
Teaching, Learning and Teacher Education (TLTE)
Innovative and Adaptive Teaching Practices for Modern Education

BOOK OF PROCEEDINGS

Computer design

Darko Stojanović

Printed by

Plutos doo, Vranje

Printed in 50 copies

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

37.091.3(082)
37.091::004(082)

INTERNATIONAL scientific conference teaching, learning and teacher education (2 ; 2025 ; Vranje)

Conference theme: Innovative and adaptive teaching practices for modern education : book of proceedings / 2nd International Scientific Conference Teaching, Learning and Teacher Education (TLTE), Vranje, May 16–17, 2025. ; [organizer Pedagogical Faculty in Vranje, University of Niš, Serbia] ; [co-organizers Faculty of pedagogy, south-west University "Neofit Rilski", Blagoevgrad, Republic of Bulgaria ... [et al.]] ; [editors Aleksandar Spasić, Biljana Prodović Milojković, Sanja Anđelković]. - Vranje : Pedagogical Faculty, University of Niš, 2025 (Vranje : Plutos). - 171 str. : ilustr. ; 25 cm

Tiraž 50. - Bibliografija uz svaki rad. - Apstrakti.

ISBN 978-86-6301-065-9

а) образовање -- Информациона технологија -- Зборници б) Настава -- Методика -- Зборници

COBISS.SR-ID 182997513

