

**Ranko Rajović<sup>1</sup>**  
University of Primorska,  
Faculty of Pedagogy, Koper  
Department of Educational Neuroscience

**Vuk Rajović<sup>2</sup>**  
University of East Sarajevo,  
Faculty of Pedagogy, Bijeljina

Original scientific paper  
UDC: 371.3  
<http://doi.org/10.5937/IstrPed2602167R>

---

## DIDACTIC GAMES FROM THE PERSPECTIVE OF STUDENT MOTIVATION AND LEARNING EFFECTS

**Abstract:** The aim of this study was to examine the effects of the didactic game “Cases and Cases” on fifth-grade students’ achievement and motivation in Serbian language grammar instruction. The research employed a quasi-experimental pretest–posttest design with a control and an experimental group, involving a total sample of 38 students. Both groups completed initial and final knowledge tests on grammatical cases as well as a motivation questionnaire, while the experimental group learned through the didactic game and the control group through traditional teaching methods. The results indicated that the groups were comparable at baseline; however, after the intervention, the experimental group demonstrated a significant improvement in achievement and an increase in motivation, whereas no significant changes were observed in the control group. The findings suggest that integrating didactic games into grammar instruction can enhance learning outcomes, student engagement, and attitudes toward learning, although further research with larger samples and longer intervention periods is needed to confirm the generalizability of the results.

**Keywords:** academic achievement; didactic games; game-based learning; grammatical cases; grammar instruction; primary education; student motivation.

### 1. Introduction

Grammar learning in primary education represents the foundation of language development, enabling students to understand and apply morphological and syntactic structures in communication. Within the educational system, mastering grammatical cases occupies a central role; however, practice has shown that students often experience difficulties in acquiring this content and demonstrate low levels of motivation when instruction is based on traditional methods such as rote memorization and repetition of rules (Huyen & Nga, 2003; Partovi & Razavi, 2019). Contemporary educational approaches seek to improve the learning process through methods that encourage active student participation and greater engagement in classroom activities. The idea of learning through activity is grounded in pedagogical theories that emphasize the importance of experience and practical work, while Montessori highlighted play and active participation as natural ways of acquiring knowledge (Montessori, 1912). Contemporary research further confirms that activities based on play and experiential learning can contribute to greater student engagement, more active information processing, and more effective acquisition of educational content (Plass et al., 2015; Qian & Clark, 2016).

---

<sup>1</sup> ranko.ntc@gmail.com;  <https://orcid.org/0000-0002-5319-0958>

<sup>2</sup> vuk.rajovic@ntcucenje.com;  <https://orcid.org/0009-0001-4844-9099>

In this context, the application of didactic games is recognized as a potentially effective approach that may contribute to a better understanding of grammatical content and increased student motivation for learning.

In line with such approaches, didactic games are increasingly viewed as a way to improve the teaching process and enhance students' interest in learning. Based on these considerations, this study examines the effects of the innovative didactic game "Cases and Cases" on the achievement and motivation of fifth-grade students, with the aim of determining its pedagogical potential in mother tongue instruction.

### **1.1. Learning Through Play in Contemporary Pedagogy**

In contemporary education, increasing emphasis is placed on teaching methods that actively involve students in the learning process and encourage greater engagement during classroom activities. The idea of learning through activity is strongly grounded in both classical and contemporary pedagogical approaches that emphasize the importance of experience, practical work, and active student participation in the learning process. Montessori highlighted play and work as natural forms of learning that foster the development of attention, independence, and cognitive abilities, while contemporary research confirms that activities based on experiential and active learning can contribute to greater student engagement, more effective information processing, and longer retention of knowledge (Montessori, 1912; Murty et al., 2023; Plass et al., 2015).

In contemporary literature, the concept of learning through play has evolved through the approach known as game-based learning (GBL), which refers to the use of structured game-based activities for achieving educational goals. Such an approach enables the connection between theoretical knowledge and practical application, thereby encouraging active student participation, problem-solving, and deeper understanding of educational content (Plass et al., 2015; Qian & Clark, 2016). Recent studies indicate that game-based activities can positively influence motivation, attention, working memory, and long-term retention of information, particularly when students actively participate in collaborative and experiential forms of learning (Alhamdan et al., 2025; Murty et al., 2023).

The theoretical foundations of learning through play can also be viewed from a constructivist perspective, according to which students actively construct knowledge through interaction with their environment. Piaget emphasized that through activity and manipulation students develop cognitive structures and understanding of the world, while Vygotsky highlighted the importance of social interaction and cooperation in the learning process, particularly through the concept of the zone of proximal development, in which students can achieve higher levels of understanding with appropriate support (Piaget, 1962; Vygotsky, 1978).

Empirical research also demonstrates that educational and board games can represent an effective environment for knowledge development because they encourage active participation, decision-making, and cooperation in the problem-solving process (Berland & Lee, 2011). Furthermore, analyses of educational board games suggest that this approach can positively affect cognitive processes and student motivation, as it enables the integration of theoretical knowledge with experiential learning (Rughiniş & Rughiniş, 2013).

Based on the above, learning through play can be viewed as an integrative pedagogical approach that connects cognitive, social, and motivational dimensions of learning, creating an environment in which students actively participate in the process of knowledge construction and develop a deeper understanding of educational content.

## **1.2. Cognitive Aspects of Learning Through Play**

The cognitive effects of learning through play can be explained through theories of active and constructivist learning, according to which students actively construct knowledge through experience and interaction with their environment. Piaget's theory of development emphasizes the importance of manipulation and activity in the formation of cognitive structures, while Vygotsky highlights the social nature of learning and the role of cooperation in the developmental process, particularly through the concept of the zone of proximal development (Piaget, 1962; Vygotsky, 1978).

Learning through play encourages processes of cognitive elaboration, that is, the active integration of new information with prior knowledge, which contributes to deeper understanding and longer retention of educational content (Webb, 1989). Collaborative activities, which are an integral part of games, enable students to explain content to one another, thereby further deepening the learning process (Slavin, 1996).

Contemporary research confirms that game-based activities can contribute to the development of higher cognitive functions, including planning, problem-solving, and flexible thinking (Gillies, 2016). In addition, games facilitate the connection between theoretical knowledge and concrete experience, contributing to more effective acquisition of content and greater applicability of acquired knowledge (Rughiniş & Rughiniş, 2013).

Based on the above, learning through play can be understood as an environment that promotes active information processing and the development of cognitive abilities, thereby contributing to deeper and more lasting acquisition of educational content.

## **1.3. Social Dimension and Cooperative Learning**

Board games in the educational context can be viewed as a form of cooperative learning in which students collaboratively solve tasks, exchange ideas, and actively participate in the process of knowledge construction. According to the theory of cooperative learning, collaboration contributes to deeper information processing and better academic achievement, as students develop understanding of educational content through discussion, explanation, and mutual support (Slavin, 1996; O'Donnell, 1985).

Collaborative activities also contribute to the development of communication skills, social competence, and a sense of group belonging, which positively affects overall classroom dynamics and the quality of the teaching process (Johnson & Johnson, 2003). In an environment that encourages interaction and joint problem-solving, students have the opportunity to exchange perspectives and construct knowledge through the social context of learning.

In the context of language instruction, cooperative activities may contribute to a more functional use of grammatical structures in communication, as students actively apply learned rules through interaction, which simultaneously increases their engagement and motivation for learning.

## **1.4. Motivation and Learning Through Play**

Motivation represents one of the key factors influencing successful learning, and research indicates that game-based activities can significantly increase students' interest and engagement. Self-Determination Theory emphasizes that feelings of autonomy, competence, and relatedness contribute to the development of intrinsic motivation, which represents an important prerequisite for meaningful and lasting learning (Deci & Ryan, 1985; Ryan & Deci, 2020).

Learning environments that incorporate elements of play provide students with clear goals, immediate feedback, and a sense of progress, which can contribute to a positive learning experience and greater persistence in task completion (Reeve, 2012). Neuropsychological approaches further suggest that motivational processes during game-based activities stimulate engagement and focus, thereby facilitating the process of knowledge acquisition (Kim, 2013). In addition to cognitive and motivational effects, game-based activities also have a broader influence on students' socio-emotional development. Research indicates that this approach can contribute to the development of self-confidence, cooperation, and a positive classroom climate, which further supports the learning process (Denham et al., 2015; Granic et al., 2014; Nugraha et al., 2018).

Based on the above, it can be concluded that the integration of game elements into teaching influences not only knowledge acquisition, but also the motivational and socio-emotional dimensions of learning, creating a stimulating environment for active and engaged learning.

### **1.5. Research Subject and Aim**

The subject of this research refers to the application of didactic games in Serbian language instruction, with a particular focus on the effects of the didactic game "Cases and Cases" on the achievement and motivation of fifth-grade primary school students in the acquisition of grammatical content.

The aim of the study was to examine the effects of the didactic game "Cases and Cases" on students' achievement and motivation in grammar instruction. In addition, the study aimed to determine whether the implementation of game-based activities could contribute to greater student engagement and a more positive attitude toward learning grammatical content.

### **1.6. Research Hypotheses**

Based on the theoretical framework and previous studies on the effects of learning through play, the following research hypotheses were formulated:

H1: Students in the experimental group will achieve statistically significantly better results on the final knowledge test compared to students in the control group.

H2: Following the implementation of the didactic game, students in the experimental group will demonstrate a statistically significant increase in motivation for learning grammatical content.

H3: The implementation of the didactic game "Cases and Cases" will contribute to greater student engagement and a more positive attitude toward learning compared to traditional teaching methods.

## **2. Methodology**

### **2.1. Research Design**

The study was conducted using a quasi-experimental pretest–posttest design with a control and an experimental group, with the aim of determining the effects of implementing a didactic game in grammar instruction on students' achievement and motivation.

The independent variable in the study was the implementation of the didactic game "Cases and Cases," while the dependent variables included students' achievement levels on knowledge tests and their level of motivation for learning grammatical content.

Such a design enabled the comparison of results between groups, as well as insight into the changes that occurred following the instructional intervention.

## **2.2. Sample**

The study included a total of 38 fifth-grade primary school students. The sample was convenience-based and was formed according to the availability of classes in the school where the research was conducted.

The students were divided into two groups:

- an experimental group (20 students), in which instruction was conducted through the implementation of the didactic game;
- a control group (18 students), in which the same educational content was taught using traditional teaching methods, including frontal instruction, oral explanation of grammatical rules by the teacher, textbook-based exercises, and individual task solving, without the implementation of the didactic game.

Prior to the implementation of the experimental program, students demonstrated approximately equal levels of prior knowledge on the initial test, which enabled the comparability of results between the experimental and control groups.

The study was conducted in accordance with basic ethical principles, and the data were collected anonymously and used exclusively for research purposes.

## **2.3. Research Instruments**

Three main instruments were used for data collection, constructed in accordance with the research objectives and the curriculum for the fifth grade of primary school.

### **2.3.1. Initial Knowledge Test (Appendix 1)**

The initial Serbian language knowledge test was designed with the aim of determining students' baseline level of knowledge regarding grammatical cases prior to the implementation of the experimental teaching model. The test was constructed in accordance with the curriculum for the fifth grade of primary school and adapted to the students' age.

The test included multiple levels of cognitive functioning and was focused on assessing declarative, operational, and productive knowledge of grammatical cases. The tasks referred to the recognition of the case system, morphological changes of nouns, identification of grammatical categories of nouns, understanding the function of grammatical cases within sentence context, and the correct application of noun–adjective forms according to gender, number, and case.

The initial test had the same structure and maximum number of points as the final test (88 points) and consisted of five thematic sections. The test was administered at the beginning of the study in both groups under identical conditions, in a classroom setting, during one school period (45 minutes), with students working individually.

The results of the initial testing served as the basis for comparison with the results of the final test, thereby enabling the evaluation of the effects of the didactic game “Cases and Cases” in Serbian language instruction.

### **2.3.2. Final Knowledge Test (Appendix 2)**

The final Serbian language knowledge test was designed with the aim of determining students' progress in mastering the case system following the instructional intervention. The test had an identical structure, number of tasks, and maximum number of points as the initial test; however, the examples and specific tasks were modified in order to avoid the effect of memorizing answers. Like the initial test, the final test included multiple levels of cognitive functioning, including the assessment of declarative, operational, and productive knowledge of grammatical cases. The test was administered in both groups under identical conditions, during one school period (45 minutes), with students working individually.

The results of the final test were compared with the results of the initial testing, enabling an assessment of the effects of the didactic game "Cases and Cases" on students' achievement in Serbian language instruction.

### **2.3.3. Motivation Assessment Questionnaire (Appendix 3)**

To assess the motivational aspect of learning, a questionnaire specifically designed for the purposes of this study was used, based on relevant theoretical frameworks and existing instruments for measuring learning motivation. During the construction of the questionnaire, selected items from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991), which assesses students' motivational beliefs and learning strategies, and the Intrinsic Motivation Inventory (IMI) (Ryan et al., 1983), intended for the assessment of intrinsic motivation, interest, and activity-related experiences, were adapted to the students' age and the specific instructional context.

Due to methodological requirements and the need to reduce respondent burden, only selected items from these instruments were used, while some questions were specifically formulated to correspond to the aims and conditions of the experimental study. Since no existing instrument fully matched the specific context of this research, an adapted questionnaire was developed. The questionnaire included items related to students' interest in instruction, engagement during activities, perceptions of learning through play, willingness to cooperate with peers, and subjective feelings of satisfaction during classroom activities. Particular attention was devoted to assessing changes in students' motivation and attitudes toward learning grammatical content following the implementation of the didactic game.

The aim of the study was not to validate the questionnaire, since the sample size did not allow for validation analyses. Nevertheless, a reliability analysis was conducted, demonstrating a satisfactory level of internal consistency of the instrument (Cronbach's  $\alpha = 0.767$ ), indicating an acceptable level of reliability for the purposes of this study, considering that Cronbach's  $\alpha$  values above 0.70 are regarded in the literature as satisfactory indicators of internal consistency (Tavakol & Dennick, 2011).

The questionnaire was administered before and after the experimental intervention, which enabled the comparison of changes in students' motivation in the control and experimental groups.

### **2.4. Didactic Game "Cases and Cases"**

The didactic game "Cases and Cases" was designed as a teaching tool for reinforcing and deepening students' knowledge of the grammatical case system in the Serbian language. The concept of the game is based on actively involving students in the learning process through interaction, decision-making, and solving language-related tasks.

The game “Cases and Cases” was developed within a project of the Ministry of Education, Science and Technological Development of the Republic of Serbia, based on the application of the NTC learning system in educational practice. The authors of the game are Tea Topić Laništanin, MA in Language and Literature Teaching, Dr. Nemanja Bojanić, PhD in Technological Engineering, and Dr. Vuk Rajović, MA in Primary Education and PhD in Technological Engineering.

The main objective of the game is to develop understanding of the grammatical case system, encourage the contextual use of grammatical categories, and enable students to recognize and correctly apply grammatical cases in language practice. Through a dynamic process of cooperation and competition, students practice noun declension, recognize the syntactic functions of cases, and understand the relationship between questions, forms, and meanings of grammatical cases in an engaging way.

The game includes the following components:

- a game board with a pyramid (Figure 1),
- game pieces,
- a dice,
- a deck of task cards containing different types of activities (Figure 2, Figure 3, Figure 4).

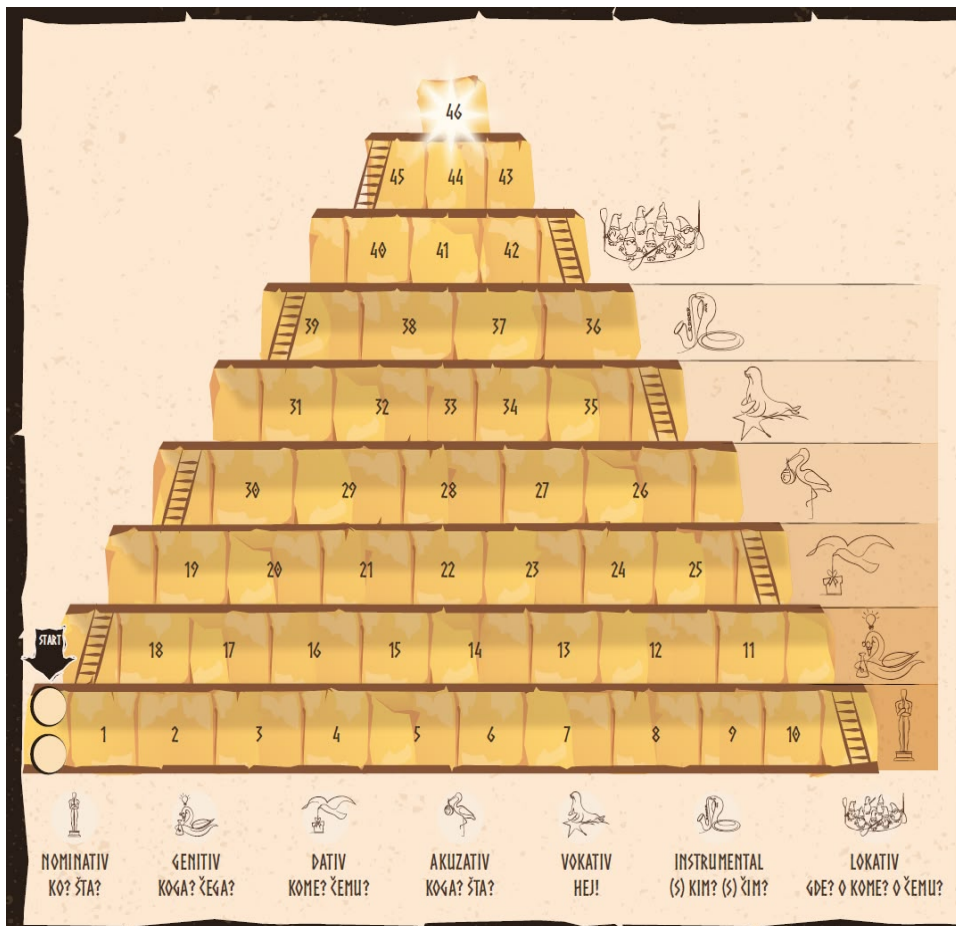


Figure 1. Game Board of the Didactic Game “Cases and Cases”

Source: Authors of the game: Tea Topić Laništanin, MA in Language and Literature Teaching; Dr. Nemanja Bojanić, PhD in Technological Engineering; and Dr. Vuk Rajović, MA in Primary Education and PhD in Technological Engineering, within the project of the Ministry of Education, Science and Technological Development of the Republic of Serbia based on the NTC learning system (Document No. 610-00-01315/2021-07; Decision No. 1618-0/2021).

The cards are divided into three categories according to difficulty level:

1. Morphological cards – require players to transform the word from the card into the grammatical case corresponding to the field on which the game piece is located (Figure 2).



Figure 2. Example of a First-Level Difficulty Card

2. Contextual cards – contain a sentence in which the player is required to identify the word in a specific grammatical case (Figure 3).



Figure 3. Example of a Second-Level Difficulty Card

3. Analytical cards – enable the assessment of students' understanding of the functions of grammatical cases within a sentence.



Figure 4. Example of a Third-Level Difficulty Card

In addition to the standard task cards of varying difficulty levels, the game also includes joker cards, which represent a special category of instructional materials. These cards are shuffled together with the other cards in the deck, and players do not know when they will draw them, thereby introducing an element of unpredictability into the course of the game.

The design of the joker cards is aligned with the thematic setting of the game, which is placed within the context of Ancient Egypt. Each card contains a stylized hieroglyph symbolically representing the name and ordinal number of a grammatical case. When a player draws a joker card instead of a regular task card, another player shows them the symbol, and the task is to identify which grammatical case is represented and which questions correspond to that case. A correct answer allows the player to move forward by the number of fields corresponding to the ordinal number of the grammatical case, while an incorrect answer requires the player to move the same number of fields backward. The symbols chosen for the grammatical cases represent associative visualizations of case names and originated from children's ideas developed during the work of Serbian language and literature teacher Tea Topić Laništanin. The application of associative connections within the game is based on the principles of divergent thinking and functional association of information, which play an important role in the learning process and long-term knowledge retention (Gojkov et al., 2015). Thus, in order (on the game board, on the right side of the pyramid):

1. **Nominative** – an Oscar statue holding a spear (the Oscar nomination as an association with the word *nominative*, and the spear as an association with the number 1).
2. **Genitive** – a swan genius (*genius* as an association with the word *genitive*, and the swan as an association with the number 2, since its shape resembles the number 2).
3. **Dative** – a swallow carrying a gift (*gift* as an association with the dative case, and the swallow as an association with the number 3, since children often draw a swallow in a shape resembling the number 3).
4. **Accusative** – a stork holding an aquarium in its beak (*aquarium* as an association with the word *accusative*, and the stork as an association with the number 4 because its standing posture resembles the number 4).
5. **Vocative** – a seal holding a starfish (the seal as an association with the word *vocative*, and the starfish as an association with the number 5 because it has five arms).

6. **Instrumental** – a snake playing a saxophone (the saxophone as an association with the instrumental case, and the snake as an association with the number 6 because its shape resembles the number 6).
7. **Locative** – dwarfs rowing on a water lily (*water lily* as an association with the word *locative*, and the dwarfs as an association with the number 7, referring to the seven dwarfs from the story of Snow White).

An example of a joker card for the dative case shows a swallow carrying a gift (Figure 5).



**Figure 5.** Example of a Joker Card for the Dative Case

The game was most often implemented in pairs. Students took turns rolling the dice and moving their game pieces across the fields on the pyramid-shaped game board. During each turn, the other player drew a card and presented the task. A correct answer enabled the player to advance a certain number of fields, while an incorrect answer required moving backward, depending on the difficulty level of the task. The winner was the player who first reached the final field at the top of the pyramid, marked with a star.

In addition to pair work, the game was also implemented as a team activity, in which the entire class represented one team, while the teacher represented the opposing team. The game board was displayed on the classroom board, and students jointly made decisions and provided answers to the presented tasks.

## 2.5. Research Procedure

The research was conducted through three phases with the aim of examining the effects of implementing the board game “Cases and Cases” on the knowledge and motivation of fifth-grade students in the field of grammar (grammatical cases).

### 2.5.1. First Phase of the Research

The study began with instructional lessons during which students from both classes studied the teaching unit on grammatical cases using conventional teaching methods. The instructional activities were focused on introducing and developing a basic understanding of grammatical cases as a grammatical category.

Following the introductory part, students completed the initial knowledge test with the aim of assessing their baseline level of understanding of the case system. The testing lasted one school period and was conducted under identical conditions in both classes, ensuring the comparability of results.

### **2.5.2. Second Phase of the Research**

The second phase lasted two weeks and included four instructional lessons devoted to the presentation and revision of the material. At the beginning of this phase, students completed the motivation questionnaire during the first part of the lesson, while the remaining time was dedicated to introducing the didactic game “Cases and Cases,” its rules, and materials.

In the control group, instruction was organized through conventional grammar activities, including oral revision, analysis of examples, and solving exercises. In the experimental group, students acquired the instructional content through the implementation of the board game, with continuous active participation during the lessons.

During this phase, the effects of the game on student engagement, cooperation, and interaction during the instructional process were monitored, as well as changes in students’ motivation and achievement, based on the results of the knowledge tests and the motivation questionnaire.

### **2.5.3. Third Phase of the Research**

Following the completion of the experimental phase, final knowledge testing was conducted. The structure of the test was identical to the initial test, with certain examples modified in order to enable the measurement of students’ progress.

At the same time, the motivation questionnaire containing the same items was re-administered in order to compare the results and determine possible changes in students’ interests and attitudes following the implementation of the game. The scientific contribution of the study is also reflected in the construction and adaptation of an instrument for assessing student motivation in the context of grammar instruction through a didactic game. The instrument was developed on the basis of relevant theoretical approaches to motivation and existing models for measuring motivation in learning, such as the Motivated Strategies for Learning Questionnaire (MSLQ) and the Intrinsic Motivation Inventory (IMI), with adaptations to students’ age and the specific characteristics of the instructional content. In this way, the study contributes to connecting contemporary theoretical and neurodidactic approaches with the practical implementation of didactic games in Serbian language instruction.

The results of the initial and final tests, as well as the data obtained from the motivation questionnaire, were processed using the SPSS statistical software package. Quantitative analysis included the calculation of arithmetic means and standard deviations, as well as comparisons of results before and after the experimental phase.

All ethical standards were respected throughout the research process. Written consent for conducting the study was obtained from teachers, parents, and the school administration, ensuring the anonymity and confidentiality of students’ data.

## 2.6. Data Analysis

Statistical analyses were conducted using the IBM SPSS Statistics software package. In the initial phase, basic descriptive analyses were performed, including frequency distribution of the data, as well as the calculation of measures of central tendency and measures of dispersion, with the aim of obtaining insight into the general characteristics of the results.

In order to examine the assumptions of normality of data distribution, the Kolmogorov–Smirnov test and the Shapiro–Wilk test were conducted. The obtained results indicated that the data were approximately normally distributed, which enabled the use of parametric statistical procedures.

To determine the effects of implementing the didactic game “Cases and Cases” on students’ achievement, a mixed analysis of variance (Mixed ANOVA) for dependent data was applied. The following factors were included in the analysis:

- measurement time (initial test and final test),
- group type (control and experimental group).

The application of this analytical procedure enabled simultaneous monitoring of changes in students’ achievement within groups over time, as well as comparison of effects between the experimental and control groups, thereby providing precise insight into the influence of the didactic game on students’ level of knowledge.

## 3. Results

### 3.1. Student Achievement

The results of the knowledge assessment conducted during the first phase of the study present the initial level of achievement of students in the control and experimental groups.

**Table 1.** Results Achieved on the Initial Knowledge Test in the Control and Experimental Groups

Task	Control Group – Percentage of Successful Responses [%]	Experimental Group – Percentage of Successful Responses [%]
1	61.67	54.86
2	17.5	25.0
3	55.0	49.54
4	20.0	12.5
5	14.6	10.7
6	43.0	48.5
7	54.0	37.7
Total	47.1	41.7

The results presented in the table represent the basis for comparing changes in student achievement following the implemented instructional intervention.

Based on the data presented in Table 1, it can be observed that students in the control group achieved a slightly higher percentage of success on the initial testing (47.1%) compared to students in the experimental group (41.7%).

The results of the knowledge assessment conducted during the third phase of the research are presented through the final testing and shown in Table 3 for both the control and experimental groups.

### 3.2. Student Achievement on the Final Test

The results of the knowledge assessment conducted during the third phase of the study indicate the level of acquisition of grammatical content following the instructional intervention in the control and experimental groups.

**Table 2.** Results Achieved on the Final Knowledge Test in the Control and Experimental Groups

Task	Control Group – Percentage of Successful Responses [%]	Experimental Group – Percentage of Successful Responses [%]
1	61.25	68.98
2	22.5	50.0
3	55.83	60.65
4	31.25	26.39
5	21.07	21.03
6	35.0	68.15
7	57.0	33.33
Total	48.86	54.48

The data presented in the table enable the comparison of students' achievement following the implementation of the instructional process, as well as insight into the differences between the groups.

The analysis of the results showed that there was no statistically significant difference between the control and experimental groups on the initial testing ( $p > 0.05$ ), indicating their initial comparability. Following the instructional intervention, the experimental group demonstrated more pronounced progress, increasing its success rate from 41.7% to 54.48%, while the control group showed a smaller increase in results, from 47.1% to 48.86%.

In order to examine changes in achievement between the initial and final measurements, a paired-samples t-test was conducted within the groups.

**Table 3.** Results of the Paired-Samples t-Test for the Initial and Final Tests by Group

Group	M_initial [%]	M_final [%]	$\Delta$ (final-initial)	t (paired)	df	p	Cohen's dz
Control	47.1	48.86	+1.76	-0.941	19	0.359	0.210
Experimental	41.73	54.48	+12.75	-4.820	17	<0.001	1.136

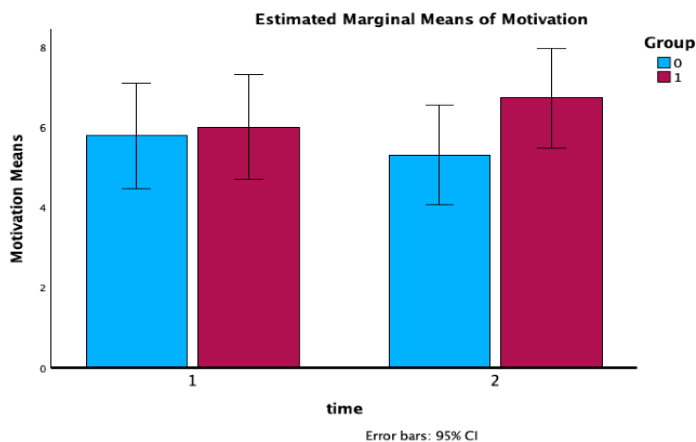
The results presented in the table provide the basis for assessing changes in student achievement during the instructional intervention.

### 3.3. Student Motivation

The results of the motivation questionnaire indicate changes in the overall level of student motivation following the implementation of the instructional intervention.

**Table 5.** Overall Change in Motivation in the Control and Experimental Groups

Group	Initial test (mean)	Final test (mean)	Change
Control	3,10	2,85	-0,25
Experimental	3,13	3,68	+0,55

**Figure 6.** Mean Values of the Dependent Variable (Motivation)

The results presented in Table 5 indicate that a slight decrease in motivation was recorded in the control group (-0.25), while an increase in motivation (+0.55) was observed in the experimental group following the implementation of the didactic game. Figure 6 presents a graphical representation of the repeated-measures analysis of variance (ANOVA), indicating different changes in motivation depending on the measurement time and group membership.

#### 4. Discussion

The aim of this study was to examine the effects of the didactic game “Cases and Cases” on students’ achievement and motivation in grammar instruction. The obtained data showed that there were no significant differences between the groups at the beginning of the study, while after the intervention a significant improvement in achievement and an increase in motivation were recorded in the experimental group.

The observed results can be explained through the constructivist approach to learning, according to which knowledge develops through active experience and interaction with the environment. Piaget emphasized the importance of activity in the formation of cognitive structures, while Vygotsky highlighted the role of social interaction and the zone of proximal development in the learning process (Piaget, 1962; Vygotsky, 1978). The didactic game used in this study provided precisely such an environment in which students developed understanding of grammatical rules through cooperation and task-solving activities.

The progress demonstrated by the experimental group is consistent with studies indicating that game-based activities contribute to more effective acquisition of educational content and improved knowledge retention (Baek et al., 2015; Huyen & Nga, 2003; Partovi & Razavi, 2019). Such effects may be explained through processes of cognitive elaboration, as collaborative activities encourage active explanation and application of knowledge (Gillies, 2016; Webb, 1989).

From the perspective of motivation, the results indicate an increase in motivation in the experimental group and a slight decline in the control group, which is consistent with Self-Determination Theory emphasizing the importance of autonomy and the sense of competence in the development of intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2020). The interactive nature of the game provided students with immediate feedback and a sense of progress, which represent key elements of a motivating learning environment (Cordova & Lepper, 1996).

The findings may also be interpreted from the perspective of cooperative learning, according to which collaborative problem-solving contributes to deeper information processing and better academic achievement (Johnson & Johnson, 2009; Slavin, 1996). During the game, students exchanged ideas and participated in discussions, which likely contributed to a better understanding of grammatical structures, as also confirmed by contemporary studies on the effects of cooperative learning strategies (Semiz et al., 2024).

In addition to cognitive and motivational effects, the results can also be interpreted from the perspective of socio-emotional development, since game-based activities contribute to a positive classroom climate and a sense of belonging (Denham et al., 2015; Granic et al., 2014; Nugraha et al., 2018). Such an environment may indirectly influence student engagement and their willingness to participate in classroom activities. Contemporary neurodidactic approaches further emphasize that activities involving play, novelty, associative thinking, and active student participation may stimulate positive emotions during learning, thereby contributing to greater student motivation and engagement in the instructional process (Lazarević et al., 2024).

In a broader pedagogical context, the results confirm that the integration of game elements into instruction may contribute to the development of higher cognitive functions and a more active role of students in the learning process (Gee, 2003; Prensky, 2001). During game-based activities, students were not focused solely on reproducing grammatical rules; instead, through cooperation, decision-making, and problem-solving, they actively applied knowledge in different situations. Such activities stimulate processes of attention, working memory, cognitive flexibility, and information integration, which may contribute to deeper understanding of educational content.

Contemporary research indicates that game-based learning contributes to greater student engagement, more active information processing, and better knowledge retention, as students develop more functional forms of knowledge through interaction and experiential learning (Estrada-Plana et al., 2024; Gee, 2003; Vita-Barrull et al., 2024). The findings of this study are consistent with such results, given that the experimental group demonstrated greater improvement in achievement and more positive changes in motivation compared to the control group.

Although the results indicate positive effects of the game, it is necessary to consider the limitations of the study, particularly the relatively small sample size and the limited duration of the intervention, which may affect the generalizability of the findings (Etz & Arroyo, 2015; Serdar et al., 2021). Future studies should include a larger number of students and a longer implementation period in order to examine the stability of the effects and their applicability in different instructional contexts.

## 5. Conclusion

The results of the conducted study demonstrated that the implementation of innovative teaching methods, specifically the board game “Cases and Cases,” may have a positive impact on students’ achievement and motivation in Serbian language instruction. The findings indicate that the experimental group achieved better results and greater progress on the final testing compared to the control group. Within-group analysis showed that the experimental class achieved statistically significant improvement compared to the initial test, while no statistically significant change was recorded in the control group.

In addition to cognitive effects (attention, working memory, information integration, cognitive flexibility, and more effective acquisition of grammatical content), a clear increase in motivation was also recorded among students in the experimental group, while a decline in motivation was observed in the control group. Students’ responses in the questionnaire further confirmed these findings, indicating that game-based instruction encouraged the perception of learning as an interesting, dynamic, and meaningful process.

The results confirm the importance of active student participation, collaborative work, and emotional involvement in the process of acquiring grammatical content. In practical terms, the findings indicate that the implementation of didactic games may represent an effective way of improving grammar instruction, which is often perceived as abstract and less motivating.

Nevertheless, the findings should be interpreted with consideration of the methodological limitations, primarily the relatively small sample size and the limited duration of the intervention. Future studies should include a larger number of participants, a longer implementation period, and different instructional content in order to further examine the stability and generalizability of the obtained findings.

Overall, the implementation of the game “Cases and Cases” proved to be a pedagogically justified and effective approach that contributes to greater motivation, improved achievement, and more positive student attitudes toward learning grammar. These findings indicate the potential of the game as a contemporary didactic tool that may contribute to the development of a more effective and engaging instructional process.

## Ethical Considerations

Ethical standards were respected throughout the research process. Participation was voluntary and anonymous, and written consent was obtained from teachers, parents, and the school administration.

## Conflict of Interest

The authors declare no conflict of interest.

## 6. References

- Alhamdan, B., Alqurashi, F., Alfaris, H., & Alqahtani, T. (2025). The effects of play-based learning on working memory and long-term retention. *Frontiers in Psychology*, 16, Article 1536297. <https://doi.org/10.3389/fpsyg.2025.1536297>
- Baek, Y., Xu, Y., Han, S., & Cho, J. (2015). Exploring effects of intrinsic motivation and prior knowledge on student achievements in game-based learning. *Smart Computing Review*, 5(5), 368–377. <https://doi.org/10.6029/smartcr.2015.05.001>
- Berland, M., & Lee, V. R. (2011). Collaborative strategic board games as a site for distributed computational thinking. *International Journal of Game-Based Learning*, 1(2), 65–81. <https://doi.org/10.4018/ijgbl.2011040105>
- Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology*, 88(4), 715–730. <https://doi.org/10.1037/0022-0663.88.4.715>
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. <https://doi.org/10.1007/BF02310555>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press.
- Denham, S. A., Bassett, H. H., & Wyatt, T. (2015). The socialization of emotional competence. In J. E. Grusec & P. D. Hastings (Eds.), *Handbook of socialization: Theory and research* (2nd ed., pp. 590–613). Guilford Press.
- Estrada-Plana, V., Martínez-Escribano, A., Ros-Morente, A., Mayoral, M., Castro-Quintas, A., Vita-Barrull, N., Terés-Lleida, N., March-Llanes, J., Badia-Bafalluy, A., & Moya-Higueras, J. (2024). Benefits of playing at school: Filler board games improve visuospatial memory and mathematical skills. *Brain Sciences*, 14(7), Article 642. <https://doi.org/10.3390/brainsci14070642>
- Etz, K. E., & Arroyo, J. A. (2015). Small sample research: Considerations beyond statistical power. *Prevention Science*, 16(7), 1033–1036. <https://doi.org/10.1007/s11121-015-0585-4>
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. Palgrave Macmillan.
- Gillies, R. M. (2016). Cooperative learning: Review of research and practice. *Australian Journal of Teacher Education*, 41(3), 39–54. <https://doi.org/10.14221/ajte.2016v41n3.3>
- Gojkov, G., Rajović, R., & Stojanović, A. (2015). NTC learning system and divergent production. *Research in Pedagogy*, 5(1), 105–128.
- Granic, I., Lobel, A., & Engels, R. C. M. E. (2014). The benefits of playing video games. *American Psychologist*, 69(1), 66–78. <https://doi.org/10.1037/a0034857>
- Huyen, N. T. T., & Nga, K. T. T. (2003). Learning vocabulary through games. *Asian EFL Journal*, 5(4), 90–105.
- Johnson, D. W., & Johnson, R. T. (2003). Student motivation in cooperative groups: Social interdependence theory. In R. M. Gillies & A. F. Ashman (Eds.), *Co-operative learning: The social and intellectual outcomes of learning in groups* (pp. 136–176). RoutledgeFalmer.

- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365–379. <https://doi.org/10.3102/0013189X09339057>
- Kim, S. (2013). Neuroscientific model of motivational process. *Frontiers in Psychology*, 4, Article 98. <https://doi.org/10.3389/fpsyg.2013.00098>
- Lazarević, B., Stojanović, M., Pisarov, J., & Bojanić, N. (2024). Evaluating the impacts of NTC learning system on the motivation of students in learning physics concepts using card-based learning approaches. *Journal of Baltic Science Education*, 23(2), 331–351. <https://doi.org/10.33225/jbse/24.23.331>
- Montessori, M. (1912). *The Montessori method*. Frederick A. Stokes Company.
- Murty, V. P., Tompary, A., Adcock, R. A., & Davachi, L. (2023). Instructed motivational states bias reinforcement learning and memory formation. *Proceedings of the National Academy of Sciences*, 120(40), Article e2304881120. <https://doi.org/10.1073/pnas.2304881120>
- Nugraha, Y. A., Handoyo, E., & Sulistyorini, S. (2018). Traditional game on the social skill of students in the social science learning of elementary school. *Journal of Primary Education*, 7(2), 220–227. <https://doi.org/10.15294/jpe.v7i2.23475>
- O'Donnell, A. M. (1985). Effects of explicit teaching of elaboration on the learning of cooperative pairs. *The Journal of Experimental Education*, 53(4), 231–243. <https://doi.org/10.1080/00220973.1985.10806460>
- Partovi, T., & Razavi, M. R. (2019). The effect of game-based learning on academic achievement motivation of elementary school students. *Learning and Motivation*, 68, Article 101592. <https://doi.org/10.1016/j.lmot.2019.101592>
- Piaget, J. (1962). *Play, dreams and imitation in childhood*. W. W. Norton & Company.
- Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist*, 50(4), 258–283. <https://doi.org/10.1080/00461520.2015.1122533>
- Prensky, M. (2001). *Digital game-based learning*. McGraw-Hill.
- Qian, M., & Clark, K. R. (2016). Game-based learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, 63, 50–58. <https://doi.org/10.1016/j.chb.2016.05.023>
- Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149–172). Springer. [https://doi.org/10.1007/978-1-4614-2018-7\\_7](https://doi.org/10.1007/978-1-4614-2018-7_7)
- Rughiniş, C., & Rughiniş, R. (2013). Educational board games and computer simulations: An analysis of the cognitive and motivational impact. *Romanian Journal of Communication and Public Relations*, 15(2), 55–73.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, Article 101860. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology*, 45(4), 736–750. <https://doi.org/10.1037/0022-3514.45.4.736>
- Semiz, M. Ž., Antonijević, R. M., & Čutović, M. M. (2024). Contribution of cooperative learning strategies to the improvement of the quality of students' native language knowledge. *Zbornik radova Pedagoškog fakulteta, Užice*, 26, 83–100. <https://doi.org/10.5937/ZRPFU2426083S>
- Serdar, C. C., Cihan, M., Yücel, D., & Serdar, M. A. (2021). Sample size, power and effect size revisited: Simplified and practical approaches in pre-clinical, clinical and laboratory studies. *Biochemia Medica*, 31(1), 010502. <https://doi.org/10.11613/BM.2021.010502>
- Slavin, R. E. (1996). Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology*, 21(1), 43–69. <https://doi.org/10.1006/ceps.1996.0004>

- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Vita-Barrull, N., Estrada-Plana, V., March-Llanes, J., Sotoca-Orgaz, P., Guzmán, N., Ayesa, R., & Moya-Higueras, J. (2024). Do you play in class? Board games to promote cognitive and educational development in primary school: A cluster randomized controlled trial. *Learning and Instruction*, 93, Article 101946. <https://doi.org/10.1016/j.learninstruc.2024.101946>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Webb, N. M. (1989). Peer interaction and learning in small groups. *International Journal of Educational Research*, 13(1), 21–39. [https://doi.org/10.1016/0883-0355\(89\)90014-1](https://doi.org/10.1016/0883-0355(89)90014-1)

**Bibliographical notes:**

**Ranko Rajović** was born in Belgrade on 15 January 1964. He completed the Faculty of Medicine, a specialization in internal medicine, and a master's degree in neuroendocrinology in Novi Sad. He completed his doctorate in sports sciences at the Faculty of Sport and Physical Education in Niš. He is the founder of the Department of Neuroscience in Upbringing and Education at the Faculty of Education in Koper. He is the author of the NTC Learning System, which is applied in more than 20 countries worldwide and has accreditation from the ministry of education in seven countries. He is an EHF (European Handball Federation) expert in neuroscience in sport and the author of over 20 books, manuals, and games for the holistic development of the child. He is the founder of Mensa Serbia, a long-standing member and president of the International Mensa Committee for Gifted Children.

**Vuk Rajović** was born in Novi Sad on 16 August 1989. He completed his undergraduate, master's, and doctoral studies at his home Faculty of Technology. He obtained the title of Doctor of Science – Technological Engineering at the Faculty of Technology Novi Sad, University of Novi Sad, in 2021. He completed another master's degree, a master's degree in classroom teaching, in 2025 at the Faculty of Education in Bijeljina, University of East Sarajevo. His master's thesis was on the topic of didactic materials and learning through play in classroom teaching. He has participated in the implementation of projects through the competent ministries for the implementation of the NTC methodology in primary schools in the Republic of Serbia, Montenegro, and the Central Bosnia Canton (Bosnia and Herzegovina). He is the co-author of two popular science novels for children, *Branko i Stanko: U svetu atoma* and *Branko i Stanko: Put u Elementarijum*, in which the basics of physics and chemistry are presented through the novel form.



Text © 2026 The Author(s). This work is published under a licence CC BY Attribution 4.0 International. (<https://creativecommons.org/licenses/by/4.0/>)

Submitted/Received	Accepted
12 February 2026	5 May 2026