

| Research Article / Araştırma Makalesi |

Pre-service Teachers' Preferences and Experiences Regarding Mind and Intelligence Games

Öğretmen Adaylarının Akıl ve Zekâ Oyunlarına Yönelik Tercih ve Deneyimleri

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Keywords	Abstract
Mind and intelligence games	This study aims to examine pre-service teachers' preferences for and experiences with mind and intelligence games. The study employed a phenomenological research design and included 19 pre-service teachers studying at a faculty of education. Data were collected through semi-structured interviews and analyzed using content analysis. The findings indicate that participants preferred games based on motivation, higher-order thinking, and contextual factors. The games were found to enhance problem-solving, strategic thinking, and planning skills cognitively; promote enjoyment, self-confidence, excitement, happiness, and relaxation affectively; and foster interaction, collaboration, empathy, and a sense of competition socially.
Pre-service teachers	Although participants reported certain cognitive and social challenges during gameplay, they emphasized that the use of these games as instructional tools increased motivation and contributed positively to learning processes. Overall, the study demonstrates that mind and intelligence games support both cognitive and affective development and can serve as effective tools in teaching and learning contexts.
Cognitive development	
Affective experiences	
Educational contexts	
Anahtar Sözcükler	Öz
Akıl ve zeka oyunları	Bu çalışma, öğretmen adaylarının zekâ ve akıl oyunlarına yönelik tercihlerini ve deneyimlerini incelemeyi amaçlamaktadır. Araştırmada fenomenolojik desen kullanılmış ve bir eğitim fakültesinde öğrenim gören 19 öğretmen adayıyla çalışılmıştır. Veriler yarı yapılandırılmış görüşmeler yoluyla toplanmış ve içerik analizi ile çözümlenmiştir. Bulgular, öğretmen adaylarının oyunları motivasyon, üst düzey düşünme ve bağlamsal etkenler doğrultusunda tercih ettiklerini göstermektedir. Oyunların bilişsel açıdan problem çözme, stratejik düşünme ve planlama becerilerini geliştirdiği; duyuşsal açıdan eğlence, özgüven, heyecan, mutluluk ve rahatlama sağladığı; sosyal açıdan ise etkileşim, iş birliği, empati ve rekabet duygusunu desteklediği belirlenmiştir. Katılımcılar oyun sürecinde bazı bilişsel ve sosyal zorluklarla karşılaştıklarını ifade etmekle birlikte, bu oyunların öğretim sürecinde materyal olarak kullanılmasının motivasyonu artırdığını ve öğrenme süreçlerine olumlu katkı sağladığını vurgulamışlardır. Sonuç olarak, akıl ve zekâ oyunlarının hem bilişsel hem de duyuşsal gelişimi desteklediği ve öğretim süreçlerinde etkili bir araç olarak kullanılabileceği ortaya konmuştur.
Öğretmen adayları	
Bilişsel gelişim	
Duyuşsal gelişim	
Eğitsel bağlamlar	

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Introduction

In today's knowledge society, students are expected to move beyond being passive recipients of information and to develop as critical thinkers, problem solvers, and creative individuals. This transformation is grounded in pedagogical perspectives that emphasize the integration of cognitive and motivational dimensions of learning, drawing on constructivist and sociocultural theories, flow theory, and frameworks related to 21st-century skills (Dewey, 1938; Vygotsky, 1978; Csikszentmihalyi, 1990; Trilling & Fadel, 2009). Traditional instructional methods are often deemed insufficient, particularly for students who struggle with attention or exhibit low motivation; this situation underscores the growing need for innovative approaches that are both engaging and conducive to deep learning.

In response to this need, mind and intelligence games have emerged as an innovative approach that can support active and meaningful learning experiences. Mind and intelligence games are generally described as activities that involve strategic thinking, planning, logical reasoning, attention, and problem-solving (Gobet & Campitelli, 2006; Güneş & Yünkül, 2021). These games typically include activities such as chess, Sudoku, mangala, tangram, and various logic- and puzzle-based games. Previous studies suggest that engaging in such games may contribute to the development of cognitive skills such as reasoning, problem-solving, and attention (Aliyari et al., 2021; Sala & Gobet, 2016; Blanch, 2022). In addition to cognitive benefits, these games may also support affective characteristics such as persistence, motivation, and self-regulation (Ryan & Deci, 2000; Güneş, 2024). Furthermore, gameplay environments can encourage focused engagement and intrinsic motivation, which are closely related to flow experiences in learning processes (Csikszentmihalyi, 1990; Kiili, 2005).

Recent meta-analytic studies indicate that brain training and intelligence games yield improvements in cognitive functioning, processing speed, and working memory (Soma et al., 2025). Effect sizes vary from small to moderate, depending on the duration and design of the interventions. These findings suggest that mind and intelligence games may offer cognitively stimulating learning environments that support the development of higher-order thinking skills. In educational contexts, such potential has drawn increasing attention to the use of these games as instructional tools. Integrating mind and intelligence games into teacher education may therefore contribute not only to pre-service teachers' cognitive development but also to their pedagogical preparedness.

This study aims to examine pre-service teachers' preferences for and experiences with mind and intelligence games through a phenomenological lens. It seeks to contribute to understanding the cognitive, affective, and pedagogical implications of game-based learning within the context of teacher education.

Theoretical Foundations

This study examines mind and intelligence games from four primary theoretical perspectives: constructivist learning, sociocultural theory, executive functions, and flow theory. The constructivist learning theory posits that individuals actively construct knowledge. Within this framework, mind and intelligence games provide interactive environments that actively engage learners in the problem-solving process, fostering skills such as hypothesis generation and testing (Dewey, 1938).

Vygotsky's (1978) sociocultural theory emphasizes that learning is inherently a social activity. Mind and intelligence games facilitate learning through peer interaction and collaboration within the zone of proximal development. This creates a rich experience that enhances both individual and social learning skills among pre-service teachers. The executive functions framework offers a strong theoretical basis for understanding the cognitive effects of these games. Mind and intelligence games may engage these components of executive functions by requiring attention, working memory, and cognitive flexibility during gameplay (Diamond, 2013; Aliyari et al., 2021).

Finally, Csikszentmihalyi's (1990) flow theory provides a compelling explanation for the motivational aspects of gameplay. Flow refers to a state of complete focus and intrinsic motivation that arises when there is a balance between an individual's skills and the level of challenge. For pre-service teachers, experiencing flow not only enhances learning during gameplay but also fosters the desire to design similar learning environments for their future students.

From the perspective of teacher education, integrating mind and intelligence games into pre-service teacher training may support the development of pedagogical and instructional competencies. Game-based learning environments allow pre-service teachers not only to experience cognitive and motivational aspects of learning but also to reflect on how such approaches can be applied in classroom practice. Studies conducted in teacher education contexts indicate that engaging with game-based activities can enhance prospective teachers' engagement, instructional creativity, and awareness of student-centered learning environments (Rodríguez-Ferrer et al., 2023). Therefore, examining pre-service teachers' experiences with mind and intelligence games may provide important insights into how such tools can be integrated into teacher education programs and future teaching practices.

Cognitive Effects of Mind and Intelligence Games

Research on the cognitive effects of mind and intelligence games has increased significantly over the past two decades, with chess and Sudoku emerging as primary areas of focus. Sala and Gobet's (2016) meta-analysis reported a small positive effect of chess instruction on academic achievement. More recent analyses by Blanch (2022) indicate that chess training strengthens problem-solving and reasoning skills, though the transfer of these skills to other domains remains limited.

Studies on Sudoku and logic puzzles suggest that these games improve attention, working memory, and numerical reasoning abilities (Aliyari et al., 2021). Individuals with higher working memory capacity tend to perform better in these games, and regular gameplay may further enhance memory performance. However, the evidence for far-transfer effects remains limited (Hampshire et al., 2019), highlighting the importance of explicitly defining transfer goals when designing cognitive or strategy-based games.

21st-Century Skills and Pedagogical Potential

Qian and Clark (2016) indicate that game-based learning supports the development of 21st-century skills, including problem-solving, critical thinking, creativity, and collaboration. These competencies are increasingly emphasized in contemporary education as essential skills that enable learners to adapt to rapidly changing social, technological, and professional environments.

According to the Partnership for 21st Century Learning (P21) framework, 21st-century skills include competencies such as critical thinking, problem-solving, creativity, collaboration, and communication. In educational contexts, these skills are considered key learning outcomes that prepare students for both academic success and future professional life. Mind and intelligence games may contribute to the development of several of these competencies by encouraging strategic thinking, problem-solving, decision-making, and collaborative interaction among learners. In this sense, such games can provide meaningful learning environments that support the development of higher-order thinking and interactive learning processes associated with 21st-century skills.

Applications in the Context of Türkiye

In Türkiye, since 2012, the Ministry of National Education (MoNE) has incorporated the "Mind and Intelligence Games" course into the curriculum, and in 2023, this module was restructured into six learning domains: reasoning-processing, verbal, memory, strategy, geometric-mechanical, and intelligence questions. In addition, digital tools such as the "Intelligence Games Implementation Training Course" and the GriCeviz platform have been developed (MoNE, 2022), and a substantial number of teachers have been trained. However, improvements are needed regarding the validity of assessment and evaluation, accessibility of materials, and time management in these implementations.

Güneş and Yüncül (2021) noted that intelligence games contribute to students' cognitive, affective, and social development. Nevertheless, there is a need for a systematic examination of pre-service teachers' subjective experiences. Güneş (2024) examined teachers' perspectives on intelligence games and emphasized the need for further training and support to enhance the effectiveness of these practices. Güneş and Güneş (2024) investigated pre-service teachers' experiences with intelligence games and demonstrated that these experiences shape their pedagogical approaches. However, existing studies have largely focused either on teachers' perspectives or on general experiences of pre-service teachers, without examining in depth the factors influencing their preferences for mind and intelligence games and how these preferences

relate to their perceptions of using such games in instructional settings. Therefore, this study seeks to extend the existing literature by exploring both the preferences and experiences of pre-service teachers and by examining how these experiences shape their views on integrating mind and intelligence games into future teaching practices.

Furthermore, a study examining social studies teachers' perspectives on educational games indicated that these games enhance students' historical empathy, decision-making, and analytical thinking skills (Bostan & Turan, 2023). Similarly, research on the impact of mind and intelligence games by instructors revealed that these games improve students' problem-solving, logical reasoning, and strategic planning abilities (Kul & Kel, 2021). These findings highlight the importance of intelligence games in education and the necessity of developing teachers' attitudes toward these games.

The literature indicates that mind and intelligence games support cognitive and affective development; however, limited attention has been given to how pre-service teachers perceive, prefer, and experience these games within teacher education contexts. Although the module has been implemented on a large scale in Türkiye, research focusing on pre-service teachers' preferences for mind and intelligence games, the factors influencing these preferences, and how they interpret these experiences in relation to their future teaching practices remains limited. Therefore, examining both the preferences and experiences of pre-service teachers may provide deeper insights into the pedagogical potential of mind and intelligence games in teacher education.

In this context, this study aims to address this gap in the literature by examining pre-service teachers' preferences for and experiences with mind and intelligence games and how these relate to their perceptions of using such games in educational settings. Although previous studies have largely focused on the cognitive effects of intelligence games on students, limited research has explored pre-service teachers' experiential perspectives in teacher education contexts. Therefore, this study provides insights into the cognitive, affective, and pedagogical meanings that pre-service teachers attribute to mind and intelligence games. The findings may contribute to teacher education programs by informing the integration of game-based learning practices and by offering implications for educators and policymakers interested in the pedagogical use of intelligence games.

Accordingly, this study seeks to answer the following research question:

How do pre-service teachers experience mind and intelligence games?

In line with this objective, the following sub-questions were formulated:

1. How do pre-service teachers explain their reasons for choosing mind and intelligence games?
2. What are the sources of pre-service teachers' influence regarding mind and intelligence games?
3. According to pre-service teachers, what are the contributions of mind and intelligence games to cognitive skills?
4. According to pre-service teachers, what are the contributions of mind and intelligence games to affective skills?
5. What challenges do pre-service teachers encounter during the process of playing mind and intelligence games?
6. What are pre-service teachers' perceptions regarding the use of mind and intelligence games as instructional materials?
7. What are pre-service teachers' opinions on the implementation of mind and intelligence games in the classroom setting?

Method

This study is a qualitative study aimed at gaining an in-depth understanding of pre-service teachers' experiences with mind and intelligence games. A phenomenological design was adopted for the study.

According to Moustakas (1994), phenomenological research seeks to explore the essence and meaning of individuals' experiences regarding a particular phenomenon. This approach provides an appropriate framework for understanding participants' experiences with mind and intelligence games, the meanings they assign to these experiences, and how they perceive the cognitive, affective, and pedagogical dimensions of these games.

The primary rationale for choosing a phenomenological design is the study's focus on the question, "How do pre-service teachers experience mind and intelligence games?" This question requires understanding the subjective meaning and context of the experience rather than measuring outcomes that can be quantified through a quantitative approach.

Participants

The participants consisted of 19 pre-service teachers who were studying at a faculty of education at a public university in Türkiye during the 2024–2025 academic year. Participants were selected through convenience sampling, and criterion sampling was used to ensure that all participants had prior experience with mind and intelligence games. The main selection criterion was that pre-service teachers had experience playing mind and intelligence games. Participants were informed about the study through an announcement made within the faculty, and those who volunteered to participate and met the selection criterion were included in the study.

Table 1

Demographic Characteristics of the Participants

Variable	Category	n	%
Gender	Female	9	47.4
	Male	10	52.6
Age	18-22	14	73.7
	23-28	5	26.3
Department	Elementary School Teaching	6	31.6
	Mathematics Teaching	6	31.6
	Preschool Teaching	3	15.8
	English Language Teaching	2	10.5
	Guidance and Psychological Counseling	2	10.5
Grade Level	4th Grade	13	68.4
	3rd Grade	4	21.1
	2nd Grade	2	10.5
Frequency of Playing Games	Occasionally	11	57.9
	Regularly	5	26.3
Duration of Playing Games	Rarely	3	15.8
	More than 3 Years	8	42.1
	1 to 3 Years	7	36.8
	Less than 1 Year	4	21.1

Note. The frequency of playing mind and intelligence games was categorized based on participants' self-reported playing habits: regularly (at least once a week), occasionally (a few times a month), and rarely (less than once a month).

As shown in Table 1, the gender distribution of the participants was relatively balanced, and most participants were between 18 and 22 years of age. Most participants (68.4%) were fourth-year students, indicating that the study was conducted with a group in the final stage of teacher education who are mature in terms of pedagogical formation and subject-matter knowledge. Although participants from different grade levels were included in the study, the higher proportion of fourth-year students may be related to the convenience sampling method and the experience criterion required for participation in mind and intelligence games. The fact that 84.2% of the participants occasionally or regularly play mind and intelligence games shows that the study group has sufficient experience related to the research topic.

Data Collection Tools

A semi-structured interview form developed by the researcher was used to collect data in this study. During the development process of the interview form, the relevant literature (Csikszentmihalyi, 1990; Diamond, 2013; Kiili, 2005; Qian & Clark, 2016) was reviewed, and a theoretical framework concerning the

cognitive, affective, and pedagogical dimensions of mind and intelligence games was established. Based on this framework, open-ended questions were prepared to enable participants to express their experiences, perceptions, and opinions in depth.

To ensure the content validity of the interview form, the draft was reviewed by two faculty members specializing in curriculum and instruction and one assistant professor in educational sciences. The experts evaluated the clarity, comprehensiveness, and alignment of the questions with the research purpose. After incorporating their suggestions, the form was finalized.

A pilot implementation of the interview form was conducted with three pre-service teachers who were not included in the main study group. The initial draft of the interview form consisted of ten questions. Following the pilot study, three questions were removed due to redundancy and lack of clarity, and the final version of the interview form consisted of seven open-ended questions. The main data collection process was carried out during the 2024–2025 academic year at a faculty of education in a public university in Türkiye. The interviews were conducted in a private setting within the faculty and lasted approximately 20–30 minutes for each participant.

The interview form consisted of two sections. The first section includes questions regarding participants' demographic information (gender, age, department, grade level) and their game-playing habits (frequency, duration, preferred game types). The second section contains seven open-ended questions addressing the sub-questions of the study. Ethical approval for this study was obtained from the Ethics Committee of Social and Human Sciences at Balıkesir University (Decision No: 2025/09-06, Date: 26.09.2025).

Data Analysis

The data obtained from the study were analyzed using the content analysis method, one of the qualitative research approaches (Miles et al., 2014). During this process, the participants' responses to open-ended questions were read repeatedly by the researchers, and meaningful statements were identified and coded.

In line with the phenomenological perspective, participants' statements were first examined to identify significant expressions related to their experiences with mind and intelligence games. These expressions were then grouped into meaning units and interpreted to reveal the shared meanings of the phenomenon.

The resulting codes were grouped into categories based on similar meanings, and overarching themes were developed from these categories. Based on these interpretations, thematic descriptions were developed to represent the essence of pre-service teachers' experiences with mind and intelligence games, while also considering variations in participants' lived experiences. The findings are presented with direct quotations from participants' statements, which contributes to the credibility of the study.

To enhance the trustworthiness of the study, several strategies were employed. Credibility was supported by providing detailed descriptions of the participants and the research process, as well as by including direct quotations from participants in the findings section. Transferability was strengthened by presenting detailed contextual information about the study group and research setting. Dependability was ensured by clearly describing the data collection and analysis procedures. The coding process followed the coding and categorization procedures suggested by Miles et al. (2014) and was conducted independently by the researchers. Inter-coder agreement was calculated using the procedure proposed by Miles et al. (2014), and the agreement level was found to be 0.92, indicating a high level of consistency between coders. Participants' quotations were labeled as PT1 (Pre-service Teacher 1).

Findings

In this section, pre-service teachers' responses to the interview questions are presented in a structured manner in line with the research objectives.

Reasons for Pre-service Teachers' Preference for Mind and Intelligence Games

To explore the reasons why pre-service teachers prefer mind and intelligence games, participants' responses were analyzed and grouped into themes, categories, and codes. The findings obtained from the content analysis are presented in Table 2.

Table 2

Reasons for Pre-service Teachers' Preference for Mind and Intelligence Games

Theme	Category	Code	f
Preference	Motivational	Interest	5
		Enjoyment	2
		Excitement	1
		Emotional Development	1
		Patience	1
		Curiosity	1
		Brain Exercise	5
	Higher Order Thinking	Ability to Look From Different Perspectives	3
		Creativity Development	2
		Problem-Solving Skill	2
		Reasoning	1
		Planning	1
		Ability to Make Quick Decisions	1
		Risk Management	1
		Multi-Step Thinking	1
		Critical	1
		Strategy	1
	Contextual	Assessment in the Teaching Process	1
		Competition	1
		Social Interaction	1

Based on these codings, the views of pre-service teachers on their reasons for preferring mind and intelligence games are grouped under the theme of "Preference" within the categories of "Motivational," "Higher-Order Thinking," and "Contextual." When examining responses related to the Motivational category, it was found that pre-service teachers mostly prefer mind and intelligence games due to factors such as interest, enjoyment, excitement, emotional development, curiosity, and patience. Findings related to the Higher Order Thinking category show that pre-service teachers prefer these games because they support brain exercise, creativity development, the ability to look from different perspectives, problem-solving, reasoning, planning, quick decision-making, risk management, multi-step thinking, and critical thinking skills. Within the Contextual category, it is determined that mind and intelligence games are preferred for their aspects of strategy development, ability to make assessments during the teaching process, supporting a sense of competition, and increasing social interaction.

Pre-service teachers reported various reasons for preferring mind and intelligence games, emphasizing motivational, cognitive, and contextual factors. Some participants highlighted that these games are appealing because they create excitement and make the activity more engaging compared to other types of games. This finding suggests that the attractiveness of mind and intelligence games is closely related to their ability to create an enjoyable and stimulating learning environment, which may enhance students' willingness to participate in learning activities. For instance, one participant stated that *"it creates more excitement compared to other types of games"* (PT3).

In addition to motivational aspects, participants also emphasized the cognitive benefits of mind and intelligence games. They indicated that these games encourage individuals to think from different perspectives and explore multiple solutions to a problem. Such experiences appear to support flexible thinking and problem-solving processes, which are often associated with higher-order thinking skills in learning environments. As one participant explained, *"it helps me think differently by showing that there is more than one way to solve a problem"* (PT6).

Furthermore, some participants pointed out the pedagogical value of these games in educational contexts. They expressed interest in examining and researching different mind and intelligence games in

order to use them in their future teaching practices. This suggests that pre-service teachers do not only perceive these games as recreational activities but also as potential instructional tools that can support teaching processes. For example, one participant stated that *"I research and examine these types of mind and intelligence games more to use them during my teaching"* (PT9).

Factors Influencing Pre-Service Teachers' Interest in Mind and Intelligence Games

In order to identify the factors that influenced pre-service teachers' inclination toward mind and intelligence games, participants' responses were analyzed through content analysis and grouped into themes, categories, and codes. The results of this analysis are presented in Table 3.

Table 3

Factors Influencing Pre-service Teachers' Interest in Mind and Intelligence Games

Theme	Category	Code	f
Interest	School-Based	Interest That Began at University	9
		Teacher Influence	6
		Interest That Began in Primary School	
		Interest That Began in Middle School	4
		Community Influence	3
	Environment-Based	Interest That Began in High School	1
		Certificate Program	1
		Friend's Recommendation	5
		Family Influence	3
		Individual Interest	2

The views of pre-service teachers on the factors influencing their interest in mind and intelligence games were grouped under the theme of "Interest," within the categories of "School-Based" and "Environment-Based." Responses related to the School-Based category showed that pre-service teachers' interest in mind and intelligence games mostly began during their university years. In addition, teacher influence, interest that began in primary school, middle school, and high school, and participation in certificate programs also supported this interest. Findings related to the Environment-Based category showed that friends' recommendations, family influence, and individual interest played significant roles in shaping pre-service teachers' interest in mind and intelligence games.

Pre-service teachers indicated that their interest in mind and intelligence games was influenced by various school-related and environmental factors. Several participants reported that their initial exposure to these games occurred during their educational experiences, particularly through school activities or institutional opportunities. This finding suggests that educational settings can play an important role in introducing and sustaining interest in mind and intelligence games among learners. For example, one participant explained that their interest began during their university years after encountering a student club related to mind and intelligence games, stating that *"in the first year of my university, I heard there was a Mind and Intelligence Games Club. The name caught my attention, and since then I have been interested"* (PT3).

In addition to school-based influences, participants also emphasized the role of their social environment in shaping their interest in these games. Some reported that friends played an important role in introducing them to mind and intelligence games. This indicates that peer interaction and informal social networks may contribute to the dissemination and popularity of such games among pre-service teachers. As one participant stated, *"I started based on a friend's recommendation"* (PT6).

Furthermore, early school experiences were also mentioned as influential factors in shaping participants' interest in mind and intelligence games. Exposure to these games during earlier stages of schooling appears to have created long-term interest and familiarity with such activities. One participant noted that their interest started during middle school through a school-based initiative, explaining that *"it started in the mind and intelligence games room opened by our guidance counselor in 8th grade"* (PT9).

Overall, these findings suggest that both institutional opportunities and social interactions play a significant role in shaping pre-service teachers' interest in mind and intelligence games.

Perceived Cognitive Contributions of Mind and Intelligence Games

To examine pre-service teachers' views on the cognitive contributions of mind and intelligence games, participants' responses were analyzed through content analysis and organized into themes, categories, and codes. The results obtained from this analysis are presented in Table 4.

Table 4

Pre-service Teachers' Views on the Contributions of Mind and Intelligence Games to Cognitive Skills

Theme	Category	Code	f
Cognitive	Thinking	Problem-Solving Skill	12
		Multidimensional Thinking	7
		Strategic Thinking	6
		Planning Skill	4
		Fast and Effective Thinking	3
		Analytical Thinking	2
	Application	Decision-Making Skill	2
		Mental Clarity	3
		Transfer to Daily Life	2
		Increase in Attention and Concentration	1

The views of pre-service teachers regarding the contributions of mind and intelligence games to cognitive skills have been grouped under the theme of "Cognitive," within the categories of "Thinking" and "Application." Responses related to the Thinking category indicate that pre-service teachers express that mind and intelligence games especially improve problem-solving skills, multidimensional and strategic thinking, planning, analytical thinking, fast and effective thinking, and decision-making skills. Findings related to the Application category reveal that mind and intelligence games support cognitive processes such as transfer to daily life, mental clarity, and increased attention and concentration.

Pre-service teachers emphasized that mind and intelligence games contribute to the development of various cognitive skills, particularly multidimensional thinking and strategic planning. Participants indicated that these games encourage individuals to approach problems from different perspectives and to evaluate alternative solutions. This finding suggests that such games may support flexible thinking processes by requiring players to analyze different possibilities and anticipate potential outcomes. For example, one participant stated that *"it plays an important role in developing different perspectives"* (PT4).

In addition to these cognitive processes, some participants highlighted that the skills developed during gameplay may also be transferred to real-life situations. Planning ahead and anticipating possible consequences during games appear to create opportunities for applying similar reasoning strategies in everyday decision-making contexts. As one participant explained, *"in games like chess, since we think and plan one or two moves ahead, this kind of planning is also applied in daily life"* (PT1).

Participants also noted that such games contribute to faster and more effective thinking processes. The time pressure and strategic demands of gameplay may require players to make quick yet reasoned decisions, which can strengthen mental flexibility and responsiveness. One participant expressed this view by stating that *"it contributes seriously to thinking, especially benefiting faster and more effective thinking styles"* (PT11).

Overall, these findings indicate that mind and intelligence games are perceived by pre-service teachers as activities that foster higher-order cognitive processes, including strategic thinking, planning, and flexible problem solving.

Perceived Affective Contributions of Mind and Intelligence Games

To explore pre-service teachers' views on the affective contributions of mind and intelligence games, participants' responses were analyzed using content analysis and organized into themes, categories, and codes. The findings obtained from this analysis are presented in Table 5.

Table 5*Pre-service Teachers' Opinions on the Contributions of Mind and Intelligence Games to Affective Skills*

Theme	Category	Code	f
Affective	Individual	Fun	9
		Self-confidence	4
		Excitement	4
		Happiness	3
		Feeling of Comfort	3
	Interactional	Sense of Competition	10
		Socialization	7
		Empathy	5
		Cooperation	5

Pre-service teachers' views on the contributions of mind and intelligence games to affective skills were grouped under the theme of "Affective," within the categories of "Individual" and "Interactional." Responses related to the Individual category showed that pre-service teachers perceived mind and intelligence games as activities that foster fun, self-confidence, excitement, happiness, and a sense of comfort. Findings related to the Interactional category showed that these games encouraged socialization, enhanced cooperation, empathy, and a sense of competition.

Pre-service teachers reported that mind and intelligence games contribute to both individual and interactional affective experiences. At the individual level, participants emphasized that these games create feelings of excitement and increase self-confidence during gameplay. Such experiences may enhance learners' emotional engagement by allowing them to take responsibility for their decisions and observe the outcomes of their strategies. For instance, one participant stated that *"I play these mind and intelligence games in groups because they create extra excitement"* (PT2). Another participant highlighted the sense of personal responsibility and confidence developed through gameplay, explaining that *"you take full responsibility for your moves by focusing entirely on your own plan"* (PT8).

Participants also emphasized the interactional dimension of these games. Some indicated that the competitive nature of mind and intelligence games increases enjoyment and engagement in the activity. Competition appears to function as a motivating factor that stimulates participation and sustained attention during gameplay. As one participant expressed, *"it feels more enjoyable because it increases competition"* (PT9). In addition, participants noted that such games can also stimulate cognitive engagement during the activity, as players remain mentally active while responding to the moves of others. For example, one participant stated that *"it contributes seriously to thinking, especially benefiting faster and more effective thinking styles"* (PT11).

Overall, these findings suggest that mind and intelligence games create emotionally engaging learning environments by combining individual feelings of competence and responsibility with socially interactive elements such as competition and shared gameplay.

Challenges Experienced During Mind and Intelligence Game Play

To identify the challenges experienced by pre-service teachers during the process of playing mind and intelligence games, participants' responses were analyzed through content analysis and organized into themes, categories, and codes. The findings obtained from this analysis are presented in Table 6.

Table 6*Problems Faced by Pre-service Teachers During the Mind and Intelligence Games Playing Process*

Theme	Category	Code	f
Challenges	Cognitive	Understanding Game Rules	6
		Complexity	5
		Need for Quick Decision-Making	3
	Affective	Focus	2
		Opponent Anxiety	3
		Failure	2
	Practical	Requirement for Repetition	2
		Access to Games	1

Pre-service teachers' views regarding the challenges encountered during the process of playing mind and intelligence games were grouped under the theme "Challenges" and categorized as cognitive, affective, and practical challenges. Responses related to cognitive challenges indicate that pre-service teachers experience difficulties such as understanding game rules, game complexity, the need for quick decision-making, and maintaining focus. Affective challenges include feelings of opponent anxiety and concerns about failure during gameplay. Practical challenges involve issues such as the need for repetition when learning games and limited access to game materials.

Pre-service teachers reported several challenges during the process of playing mind and intelligence games. Some of these challenges were related to cognitive demands, such as understanding game rules and managing complex strategies. Difficulties in interpreting rules or following the structure of certain games may create barriers for participants, particularly in group settings where multiple interactions occur simultaneously. For instance, one participant stated that "*I have difficulty in group games due to unclear rules*" (PT6). This finding suggests that the cognitive complexity of some games may initially hinder participation until players become familiar with the rules and strategies.

Participants also mentioned affective difficulties that emerged during gameplay. In particular, trying to anticipate opponents' strategies sometimes created feelings of anxiety and pressure. Such situations may arise because players are required to constantly predict others' moves while simultaneously planning their own strategies. As one participant explained, "*I struggle with guessing what the people opposite me are thinking and acting accordingly*" (PT3). This indicates that the competitive and strategic nature of these games can produce both cognitive challenge and emotional tension during gameplay.

In addition to cognitive and affective challenges, some participants pointed out practical limitations. For example, one pre-service teacher emphasized that access to game materials could be problematic, stating that "*because the games are expensive, purchasing games is a problem*" (PT10). Limited access to materials may restrict opportunities for regular gameplay and practice, which in turn may affect the continuity of engagement with mind and intelligence games.

Overall, these findings indicate that the challenges experienced during gameplay are multidimensional, involving cognitive, affective, and practical factors that may influence how pre-service teachers engage with mind and intelligence games.

Pre-service Teachers' Views on the Use of Mind and Intelligence Games as Instructional Materials

To explore pre-service teachers' opinions regarding the use of mind and intelligence games as instructional materials, participants' responses were analyzed through content analysis and organized into themes, categories, and codes. The findings obtained from this analysis are presented in Table 7.

Table 7*Pre-service Teachers' Opinions on the Use of Mind and Intelligence Games as Instructional Materials*

Theme	Category	Code	f
Teaching	Emotional	Motivation	10
		Enjoyment	6
	Academic	Permanent Learning	7
		Cognitive Development	6
		Professional Integration	2

The opinions of pre-service teachers regarding the use of mind and intelligence games as instructional materials were gathered under the theme of "Teaching," within the categories of "Emotional" and "Academic." An analysis of the responses in the Emotional category revealed that pre-service teachers prefer to use mind and intelligence games as instructional materials because they increase student motivation and add an element of fun to the classroom environment. Findings related to the Academic category indicate that these games support the retention of learning, strengthen cognitive development, and contribute to the teaching process by facilitating professional integration.

Pre-service teachers emphasized that mind and intelligence games can be used as effective instructional materials that increase students' motivation and make learning more enjoyable. Participants suggested that these games can create an engaging classroom environment by transforming learning activities into interactive and enjoyable experiences. Such environments may encourage students to participate more actively in lessons and sustain their attention for longer periods. For example, one participant highlighted the enjoyable nature of these games by stating that *"it's a great way to have fun without technology, and since I have personally experienced their benefits, I would want my students to play as well"* (PT4).

In addition to their motivational value, participants also indicated that mind and intelligence games can support academic learning and improve the permanence of knowledge, particularly when teaching abstract subjects. The use of game-based materials may help make abstract concepts more concrete and understandable by allowing students to experience ideas through active participation. As one pre-service teacher explained, *"when teaching an abstract subject in mathematics, I would use materials like these games because they enhance retention"* (PT5). Similarly, another participant emphasized the motivational impact of these games by stating that *"these games increase motivation for learning"* (PT2).

Overall, these findings suggest that pre-service teachers perceive mind and intelligence games not only as entertaining activities but also as instructional tools that can support motivation, active participation, and meaningful learning in classroom settings.

Pre-service Teachers' Views on the Implementation of Mind and Intelligence Games in Classroom Settings

To examine pre-service teachers' opinions regarding the implementation of mind and intelligence games in classroom settings, participants' responses were analyzed through content analysis and organized into themes, categories, and codes. The findings obtained from this analysis are presented in Table 8.

Table 8*Opinions on the Effects and Challenges of Implementing Mind and Intelligence Games in the Classroom*

Theme	Category	Code	f
Effect	Learning	Development of Problem-Solving Skills	6
		Increase in Concentration	4
	Affective	Socialization	5
		Enjoyment	5
		Classroom Management	7
	Implementation	Stress of Losing	4
		Accessibility Issue	3
		Student Differences	2

The opinions of pre-service teachers regarding the effects and potential challenges of implementing mind and intelligence games in the classroom were collected under the theme of 'Effect,' within the categories of 'Learning,' 'Affective,' and 'Implementation.' An analysis of responses in the Learning category revealed that pre-service teachers believe these games enhance problem-solving skills and increase students' concentration. Findings related to the Affective category indicate that the games support socialization and add an element of enjoyment to the classroom environment. Responses in the Implementation category address factors encountered during classroom application, such as classroom management challenges, stress related to losing, accessibility issues, and student differences.

Pre-service teachers emphasized that mind and intelligence games can contribute to students' cognitive and social development in classroom environments. Participants suggested that these games may support students' attention and concentration by creating interactive and engaging learning experiences. The structured nature of gameplay, which requires players to focus on rules, strategies, and outcomes, may help sustain students' cognitive engagement during lessons. For example, one participant noted that *"it is directly effective in terms of students' concentration in the lesson"* (PT3).

In addition to cognitive benefits, participants also highlighted the social contributions of these games. Gameplay often involves interaction, communication, and shared problem-solving, which may foster socialization among students and strengthen peer relationships in classroom settings. As one participant stated, *"it helps children socialize with one another"* (PT7).

However, some participants also pointed out potential challenges that may arise during classroom implementation. In particular, the competitive nature of certain games may lead to negative emotional reactions among younger students if the activity is not carefully structured. As one participant explained, *"another challenge is that students who lose at the elementary level may feel upset"* (PT10). This suggests that while mind and intelligence games may offer important pedagogical benefits, teachers need to manage competitive elements carefully and create supportive classroom environments during gameplay.

Overall, these findings indicate that the educational value of mind and intelligence games in classroom settings depends not only on the games themselves but also on how teachers structure and facilitate the learning process.

Discussion

This study examined pre-service teachers' experiences with mind and intelligence games using a phenomenological approach, revealing several important themes. The findings suggest that participants perceive that mind and intelligence games may enhance problem-solving, strategic thinking, and planning skills. This interpretation is consistent with previous research on chess education. For example, Blanch's (2022) meta-analysis reported improvements in problem-solving and reasoning skills associated with chess instruction. The current study suggests that similar cognitive benefits may also be perceived in other mind and intelligence games. Some participants reported that they were able to transfer the skills gained to daily life. However, previous large-scale studies have reported limited evidence for far transfer (Hampshire et al., 2019). This difference highlights the distinction between perceived transfer and empirically measured transfer. It remains unclear whether participants' subjective perceptions correspond to measurable

performance outcomes; therefore, these findings should be interpreted cautiously, considering possible influences such as social desirability or recall bias. Similarly, Sala and Gobet's (2016) meta-analysis reported limited transfer to academic achievement under certain conditions. These studies highlight the importance of examining the relationship between perceived cognitive benefits and measurable learning outcomes in future research.

Participant responses suggested that mind and intelligence games may support multidimensional thinking, strategic planning, and executive functions. This finding is consistent with Diamond's (2013) executive function theory, which defines executive functions in three core components: inhibitory control, working memory, and cognitive flexibility. The qualitative codes obtained in this study reflect all three components. Meta-analyses by Soma et al. (2025) indicate that brain training games may improve cognitive functioning, processing speed, and working memory. Aliyari et al. (2021) reported that Sudoku and similar puzzle games may improve attention and focus. This aligns with the "increase in concentration" code identified in the current study and highlights the neuro-pedagogical significance of games in supporting prefrontal cortex functions. Similarly, studies conducted in the context of Türkiye also suggest that mind and intelligence games may contribute to the development of cognitive skills such as problem-solving, reasoning, and strategic thinking among learners and pre-service teachers (Kul & Kel, 2021; Güneş & Güneş, 2024).

A unique contribution of this study is that pre-service teachers perceived mind and intelligence games not only as tools for individual development but also as learning experiences that may enhance professional competencies. Participants' intention to integrate these games into future lessons under the theme of "teaching process assessment" aligns with Kiili's (2005) experiential gaming model, which emphasizes the challenge-skill balance, meaningful choices, and feedback loops in game-based learning. Research by Rodríguez-Ferrer et al. (2023) suggests that game-based learning may increase attention, satisfaction, and engagement in teacher education. The findings of the present study support these arguments by providing qualitative insights into pre-service teachers' experiences with mind and intelligence games. Similarly, Güneş (2025) reported that mind and intelligence games may strengthen problem-solving and strategic thinking skills, with game competitions potentially influencing motivation and participation. Güneş (2024) suggested that games may enhance attention, collaboration, and social interaction in classroom settings. Güneş and Güneş (2024) further demonstrated that pre-service teachers experience games as opportunities for both individual and professional development and intend to integrate them into lesson plans.

The motivational findings align with Csikszentmihalyi's (1990) flow theory. Participants' statements related to "enjoyment," "excitement," and "attention capture" reflect core components of the flow experience, including concentration, intrinsic motivation, and altered perception of time. According to Ryan and Deci's (2000) self-determination theory, satisfying the needs for autonomy, competence, and relatedness may support deep learning.

Affective contributions suggest that mind and intelligence games may be effective at both individual (self-confidence, enjoyment, excitement) and social (competition, collaboration, socialization) levels. Vygotsky's (1978) sociocultural theory emphasizes the central role of social interaction in learning. Interestingly, competition was perceived both as a source of motivation and stress. From the perspective of flow theory, competition may support learning when it maintains a balance between challenge and skill, whereas excessive competition may lead to anxiety and reduced performance. Zelazo et al. (2003) also highlight individual differences in executive function development in early childhood.

Qian and Clark (2016) noted that game-based learning enhances 21st-century skills such as problem-solving, critical thinking, creativity, and collaboration. The current study appears to confirm and extend these findings from the perspective of pre-service teachers. Participants indicated that mind and intelligence games may support not only cognitive skills but also social and affective competencies, such as empathy, collaboration, self-confidence, and emotional regulation, in line with 21st-century learning frameworks (P21, 2019).

In Türkiye, the implementation of the Ministry of National Education's Intelligence Games Module since 2012 has increased the visibility of mind and intelligence games in educational settings (MoNE, 2013). Participants emphasized school-related support factors, including teacher influence, elementary school

experience, and material accessibility. Challenges such as material access and time management reflect implementation difficulties also noted in official MoNE documents (MoNE, 2023).

In summary, the findings suggest that constructivist learning, executive functions, flow theory, and 21st-century skills frameworks are complementary. Pre-service teachers' experiences suggest that mind and intelligence games may be integrated into teacher education as a multidimensional pedagogical tool.

Recommendations for Practitioners

1. Teacher education programs may consider offering elective or mandatory courses in which mind and intelligence games are addressed both theoretically and practically. In these courses, pre-service teachers may actively engage in playing games and gain experience through classroom micro-teaching applications.

2. Since participants indicated that competition and emotional reactions may arise during gameplay, teachers may design learning environments that balance competition with collaboration. Such practices may help maintain students' motivation and create a supportive classroom atmosphere.

3. School administrations and policymakers may support the effective implementation of mind and intelligence games by providing material resources, appropriate physical spaces (e.g., "intelligence game rooms"), and in-service training programs.

Recommendations for Researchers

1. Since participants reported that mind and intelligence games improve cognitive skills such as problem-solving, strategic thinking, and planning, future research may employ experimental or quasi-experimental research designs to objectively examine the extent to which these games influence cognitive development in different educational contexts.

2. The findings indicate that mind and intelligence games generate both positive emotions (e.g., enjoyment, motivation) and challenges (e.g., stress related to competition and losing). Future research may explore how these affective experiences influence students' engagement, persistence, and learning outcomes in game-based learning environments.

3. Participants expressed strong intentions to use mind and intelligence games in their future teaching; however, they also reported challenges related to material accessibility and classroom management. Therefore, future studies may investigate how institutional resources, classroom conditions, and teacher training influence the effective integration of mind and intelligence games into instructional practices.

Conclusion

The main conclusion of this study is that pre-service teachers perceive mind and intelligence games as providing significant cognitive, affective, and pedagogical benefits. Participants reported improvements in problem-solving, strategic thinking, executive functions, concentration, motivation, and social-emotional skills. They also expressed the intention to apply these games in their future teaching practices, confirming the practical relevance of game-based learning in teacher education.

CRedit authorship contribution statement

A.M.G. and E.Y. conceptualized the study and designed the research. A.M.G. conducted the data collection and performed the qualitative analysis. E.Y. supervised the interpretation of the data and provided methodological guidance. Both authors contributed to the writing, review, and final approval of the manuscript.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This study was funded by the Balikesir University Scientific Research Projects Unit (Project No. 2022/044).

Ethics Approval and Consent to Participate

Ethical approval for the study and the data collection instruments was obtained from the Ethics Committee of Social and Human Sciences at Balikesir University (Decision No: 2025/09-06, Date: 26.09.2025). Participants were informed about the purpose of the study, participation was voluntary, and confidentiality and anonymity were ensured throughout the research process.

Declaration of AI Usage Statement

The authors declare that generative artificial intelligence tools were used only for limited language editing and wording suggestions. In this study, ChatGPT (accessed on 20.10.2025; version: GPT-4) was used for language editing and phrasing support. All conceptualization, data collection, analysis, interpretation, and final writing decisions were carried out by the authors. The outputs obtained from AI tools were carefully reviewed in accordance with ethical and academic standards. AI tools are not credited as authors, and the authors are solely responsible for the content of the article.

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