

Application of the Gambitius Online Platform in Combination with Chess Methodology to Intensify the Development of Logical Thinking in Children Aged 4–6

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Abstract. The modern system of preschool education requires practical tools for developing children’s cognitive potential, particularly logical thinking, as the basis for intellectual growth and preparation for schooling. In this context, the issue of using innovative methods that combine didactic orientation, game motivation and technological interactivity is relevant. The chess methodology has proven to be effective in stimulating thinking, attention, memory and emotional and volitional spheres, and the Gambitius online platform opens up new opportunities for its interactive implementation, taking into account the age characteristics of children aged 4–6. The article aims to substantiate the feasibility of the integrated use of the chess methodology and the Gambitius online platform to intensify the process of developing logical thinking in preschool children. The study uses theoretical analysis of psychological and pedagogical literature, comparative generalisation, and a functional-analytical approach to characterise the potential of digital educational platforms. It has been established that the chess methodology has significant potential to develop logical thinking through the formation of analytical, strategic and predictive skills, increasing concentration and self-regulation. The Gambitius online platform, by integrating elements of chess training into the digital environment, provides game engagement, adaptability and self-directed learning, which significantly enhances the developmental effect. It is substantiated that the combination of these components contributes to the formation of flexible thinking in preschoolers and the ability to analyse, plan, make decisions, and develop soft skills. Further research may focus on experimentally testing the effectiveness of the implementation of the Gambitius integrated system and chess methodology in the educational process of preschool institutions, developing individualised educational routes taking into account the peculiarities of children’s development, as well as preparing methodological recommendations for teachers on the integration of digital chess platforms into the content of preschool education.

Keywords: preschool education, digital technologies, interactivity, cognitive competence, strategic thinking.

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Застосування онлайн-платформи Gambitius у комплексі з шаховою методикою для інтенсифікації розвитку логічного мислення дітей 4–6 років

Анотація. Сучасна система дошкільної освіти потребує ефективних інструментів для розвитку когнітивного потенціалу дітей, зокрема логічного мислення як основи інтелектуального зростання та підготовки до шкільного навчання. У цьому контексті актуальним є питання використання інноваційних методик, що поєднують дидактичну спрямованість, ігрову мотивацію та технологічну інтерактивність. Шахова методика довела свою ефективність у стимулюванні мислення, уваги, пам'яті та емоційно-вольової сфери, а онлайн-платформа Gambitius відкриває нові можливості для її інтерактивного втілення з урахуванням вікових особливостей дітей 4–6 років.

Метою статті є обґрунтування доцільності комплексного використання шахової методики та онлайн-платформи Gambitius для інтенсифікації процесу розвитку логічного мислення в дітей дошкільного віку.

У дослідженні застосовано методи теоретичного аналізу психолого-педагогічної літератури, метод порівняльного узагальнення, а також функціонально-аналітичний підхід до характеристики потенціалу цифрових освітніх платформ.

З'ясовано, що шахова методика має значний потенціал як засіб розвитку логічного мислення завдяки формуванню аналітичних, стратегічних і прогностичних навичок, підвищенню рівня концентрації та саморегуляції. Онлайн-платформа Gambitius, інтегруючи елементи шахового навчання в цифрове середовище, забезпечує ігрову залученість, адаптивність і самостійність навчання, що значно посилює розвивальний ефект. Обґрунтовано, що поєднання цих компонентів сприяє формуванню в дошкільнят гнучкого мислення, здатності до аналізу, планування, прийняття рішень і розвитку soft skills.

Подальші дослідження можуть стосуватися експериментальної перевірки результативності впровадження інтегрованої системи Gambitius і шахової методики в освітній процес дошкільних закладів, розроблення індивідуалізованих освітніх маршрутів з урахуванням особливостей розвитку дітей, а також на підготовки методичних рекомендацій для педагогів щодо інтеграції цифрових шахових платформ до змісту дошкільної освіти.

Ключові слова: дошкільна освіта, цифрові технології, інтерактивність, когнітивна компетентність, стратегічне мислення.

Introduction

In today's context of rapid development of digital technologies and growing interest in innovative approaches to preschool education, there is an urgent need to find effective methods to stimulate young children's intellectual development. One of the priorities is the development of logical thinking as an important component of cognitive competence, which provides the prerequisites for successful learning in the future. Traditional teaching methods do not always fully meet the modern requirements of interactivity, flexibility and individualisation of the educational process. In this context, combining classical methods, including chess, with the capabilities of online platforms opens up new prospects for improving the effectiveness of developing logical thinking in preschool children. The Gambitius online platform, which combines a game-based learning experience with elements of strategic thinking, appears to be a potentially effective tool for harmoniously combining play, learning, and digital technologies. However, the lack of in-depth research confirming the effectiveness of using such a platform in combination with the chess methodology for children aged 4–6 years necessitates a scientific analysis of this problem and justification of the feasibility of its implementation in preschool education.

The issue of developing logical thinking in preschool children is a subject of constant attention of scientists, educators and psychologists, given its crucial role in ensuring intellectual readiness for further education. At the same time, despite thorough research on certain aspects of the issue, the current scientific discourse shows fragmentation of the study of certain areas, particularly insufficient development of the integration of traditional game methods with digital educational technologies. The publications of I. Kulish and S. Goy [1] focus on logical thinking as an important component of senior preschoolers' preparation for school. The authors substantiate the expediency of using exercises on classification, generalisation and inference.

Game methods as an effective means of forming logical and mathematical competences of preschool children are considered by T. Zhuravko [2]. The researcher proves that the use of tasks with game elements contributes to the activation of intellectual activity, forming mental operations of comparison, analysis, and synthesis.

Scientists E. Prykhodko and T. Bohdan [3] focus on the role of logical thinking in the general mental development of children aged 5-6 years. In particular, the authors mostly operate with generalised conclusions without specifying the means, including innovative ones, on the psychological and pedagogical conditions for forming logical operations in preschool age.

The game of chess as a universal tool for intellectual development is considered by M. Sarnavsky [4]. The scientist demonstrates the positive impact of chess activities on the formation of such qualities as determination, analytical thinking, and the ability to predict consequences.

V. Kluck's study [5] thoroughly analyses the psychological factors that influence the formation of logical thinking in children aged 4–6. The author outlines the stages of development of thinking activity, emphasising the importance of an individual approach.

The pedagogical conditions for developing logical thinking, in particular the creation of an intellectually enriched environment, the use of problematic tasks, and the stimulation of cognitive activity, are substantiated by O. Yemchyk [6]. At the same time, this approach focuses mainly on traditional forms of work, without considering modern digital educational products.

An interesting perspective is offered by N. Kalyuzhka [7], who studies mathematical problem solving to form logical thinking in primary school students. Her findings may be relevant for the preschool environment with proper adaptation.

Additional perspectives are outlined in the publication by T. Markivska and T. Shanskova [8], which examines the impact of problem-based learning on critical thinking. The study is mainly concerned with primary school age. However, it outlines the methodological principles of working with cognitive difficulties that can be used with preschoolers to develop meaningful digital content.

Thus, despite considerable attention to developing logical thinking in preschool, most studies focus on traditional methods. The issue of integrating digital educational platforms, such as Gambitius, with the chess methodology in the context of developing logical thinking in children aged 4–6 remains virtually unexplored. It is this gap that this study aims to fill.

The purpose of the article is to theoretically substantiate the effectiveness of using the Gambitius online platform in combination with elements of the chess methodology to intensify the development of logical thinking in preschool children (4–6 years old).

Objectives of the article:

- 1) to explore the potential of the chess methodology as a means of developing logical thinking in preschool age;
- 2) to consider the functionality of the Gambitius online platform in the context of children's cognitive development;

3) To substantiate the feasibility of integrating the Gambitius platform with elements of chess methodology into the system of preschool education.

Materials and methods

The study used an interdisciplinary approach, combining the theoretical foundations of preschool pedagogy, child psychology, chess teaching methods and digital educational technologies, was used. The theoretical basis is formed by the works of domestic and foreign authors devoted to the cognitive development of preschool children, the mechanisms of forming logical thinking, and the pedagogical potential of the chess game. Particular attention is paid to modern developments in the digitalisation of education, particularly to the study of the effectiveness of online platforms to develop intellectual abilities in young children.

The comparative-analytical method was used to characterise the specifics of the chess methodology in the context of the educational process in preschool, as well as its compliance with the age and individual characteristics of children aged 4–6 years. The functional and structural approach made it possible to explore the possibilities of the Gambitius online platform in the formation of logical thinking and identify its components, functions, and features that influence the cognitive sphere of children.

Results

The formation of logical thinking in preschool children, in particular at the age of 4–6 years, is one of the important tasks of cognitive development, which directly affects the further success of educational activities and the overall intellectual preparedness of the child. At this stage of development, there is a transition from visual-action and visual-figurative thinking to elements of verbal-logical thinking, which necessitates the creation of favourable conditions for the purposeful stimulation of mental processes. According to N. Vahanova [9, p. 46], according to the concepts of J. Piaget, children of this age are in the phase of preoperational thinking, which is characterised by a gradual ability to operate with symbols and representations in the absence of specific objects, as well as the first attempts at generalisation, classification and establishment of cause and effect relationships.

Within the psychological and pedagogical approach, logical thinking is seen as the highest form of cognitive activity, which involves the ability to analyse, compare, classify, abstract, generalise and hypothesise [10, p. 30]. These operations are still being formed for children aged 4–6 years, but there is active formation through play activities, speech practices and observation. Speech is an important factor in the development of logical thinking, as it is through speech that a child begins to structure thoughts, formulate cause-and-effect conclusions, and argue his or her position. At this age, internal speech is actively developing, a prerequisite for indirect mental activity. An essential aspect of psychological and pedagogical support for developing logical thinking is considering the child's leading activity – play. It is in the form of play that the most natural involvement of the child in thinking processes that require solving problematic tasks, forecasting, and determining the right decisions is ensured. Game situations containing elements of logical modelling stimulate the development of the ability to reason, generalise and analyse conditions. In particular, role-playing, didactic, and educational logic games effectively activate thinking, as they combine the child's emotional interest with cognitive activity.

Equally important is the individualisation of the educational process, which considers the pace of mental development of each child, his or her interests, and the level of development of basic cognitive functions such as attention, perception, and memory. With this in mind, a special role is played by systematically organising a logical and intellectual educational environment, which should be variable, accessible, and motivationally rich. It is also advisable to use such

tools in educational practice that facilitate integrating cognitive and gaming activities, particularly digital platforms containing logical tasks and exercises in an interactive format.

Thus, the formation of logical thinking in children aged 4–6 is a complex multidimensional process that requires a holistic approach based on a combination of psychological patterns of age development, pedagogical principles of individualisation of learning and modern didactic tools. The effectiveness of this process depends largely on creating a stimulating environment that promotes the child's independent cognitive activity through play, speech, interaction and comprehension of logical connections in the world around him or her.

In the context of the modern search for effective means of cognitive development of preschool children, the use of chess methodology as a tool for forming logical thinking is gaining more and more attention. Chess, as a strategic game with a high level of intellectual load, has a significant pedagogical and developmental potential, especially in the context of the purposeful use of its elements in the system of preschool education. Chess activity contains a complex set of cognitive operations – analysis, synthesis, abstraction, prediction, and evaluation of possible options for action- that directly correspond to the structure of logical thinking. In this context, the methodology of teaching chess to preschool children should be adapted to their age and mental development.

According to leading experts in the field of pedagogy and psychology, the chess game is a unique environment for the development of a child's intellectual independence, his/her ability to logically analyse situations, develop strategies and predict consequences [12, p. 115]. Even the basic skills of playing chess allow one to develop the ability to concentrate attention, spatial orientation, and sequential thinking, which are fundamental prerequisites for logical thinking. For children aged 4–6, it is especially important to adapt the chess material to the game form, which is the leading activity in this age group. It is through the game model that a gentle integration of complex logical structures into the child's cognitive space is possible.

The use of such techniques as fairy-tale modelling of chess situations, the use of images of chess pieces with personification, and role-playing exercises that reflect the basic rules and logic of the game has significant methodological potential [13, p. 145]. For example, acting out mini-stories with the interaction of pieces contributes to the formation of cause and effect relationships, and creating tasks to find the right move develops the skills of analysing options and choosing the best solution. It is important to note that teaching chess at the preschool age does not imply complete mastery of the game technique, but it should primarily contribute to the formation of basic logical thinking structures, such as sequence, comparison, exclusion, and generalisation.

Pedagogical practice shows that the systematic use of elements of chess methodology in the educational process allows us to observe positive dynamics in the development of children's cognitive functions: the ability to concentrate improves, attention span increases, verbal thinking is activated, and the ability to argue their own opinions increases [14, p. 145]. The chess technique also contributes to the development of the emotional and volitional sphere, as children learn to overcome difficulties, control impulsive reactions, work under time constraints and take responsibility for their decisions. These factors create a powerful basis for the formation of intellectual maturity and preparation for learning activities in school.

Summarising the above, it is advisable to systematise the main components of the influence of chess methodology on the development of logical thinking in preschool age. Table 1 demonstrates how different elements of the chess game contribute to the formation of cognitive, emotional, volitional and motivational characteristics that are fundamental to a child's intellectual development.

Table 1

The potential of chess methodology as a means of developing logical thinking in preschool children

Component	The nature of the impact on logical thinking	Application examples	Expected developmental effect
Spatial thinking	Formation of ideas about the location of objects in space, orientation on the plane	Working with a chessboard, moving pieces vertically and horizontally	Improved spatial awareness and ability to predict movements
Analysis and synthesis	Analysing the situation by isolating its elements, identifying the main	Analysing a chess position, estimating the number of pieces, determining a strong move	Developing an analytical approach to situations, strengthening logic
Cause and effect relationships	Awareness of the consequences of actions, logical forecasting	In particular, it will be discussed if the piece is placed on a certain field	Developing skills of forecasting and thinking in terms of conditions
Rules and sequences	Understanding of action algorithms, "if-then" logic	Observance of the rules of movement of figures, consistent execution of moves	Strengthening logical and algorithmic thinking
Comparison and generalisation	Identifying similarities and differences, classifying	Comparing shapes by properties, generalising tactics	Development of categorical thinking, ability to operate with concepts
Independent decision-making	Thinking in terms of choice, critical approach to the situation	Choosing the best course among several possible ones	Development of independent thinking and intellectual initiative
Emotional and volitional self-regulation	Controlling emotions in the process of logical analysis	Reaction to losing or difficulty during the game	Development of willpower, endurance and self-control
The motivational sphere	Stimulating interest in thinking through play	Gamified process of learning to play chess	Increase cognitive activity and internal motivation

Source: author's own development

Thus, the potential of the chess methodology as a means of developing logical thinking in preschool age lies in its ability to harmoniously combine game motivation, structured intellectual activity and emotional and volitional self-regulation. This approach meets modern educational demands for the development of flexible thinking in children, the ability to solve problems and make decisions based on analysis and forecasting. The introduction of an adapted chess methodology into preschool practice can serve as an effective means of not only cognitive but also holistic personal development of a child. An important step towards realising this potential is the use of digital tools that can transmit pedagogical content in a form that is accessible and attractive to children. In this context, the Gambitius online platform is an innovative solution that integrates elements of chess methodology into the environment of

game and educational interaction [15]. Taking into account the cognitive development needs of children aged 4–6, it combines a didactic focus with a motivationally attractive form of presenting educational material. The basis of its work is the gradual formation of skills: from a basic introduction to chess pieces and the principles of their movement to the gradual complication of tasks aimed at developing logical thinking, analytical skills and strategic planning.

One of the main functionalities of Gambitius is adaptability. The system automatically selects tasks according to the child's level of training, ensuring individualisation of the educational process. This approach helps to maintain interest in learning and, at the same time, maintains cognitive activity at the optimal level of complexity corresponding to the area of immediate development. In addition, the platform stimulates the development of attention through the need to focus on dynamic changes on the virtual chessboard, follow instructions and choose the correct sequence of actions within a given scenario. Gambitius features interactive visualisation, which helps to form the spatial representations necessary for the operation of chess pieces in the imagination. Thanks to animation effects, voice prompts, and a brightly coloured interface, the platform is optimised for preschool children, which greatly facilitates the process of engaging them in learning situations. This multimodal presentation of content helps to activate visual and auditory memory, as well as speech development, as the platform involves the use of verbal explanations and the formulation of logical conditions.

In the structure of Gambitius tasks, it is important to develop logical analysis skills, which are implemented through exercises to identify patterns, predict the consequences of actions, and choose the optimal strategy. This type of activity develops the child's ability to logically model situations, build cause-and-effect relationships, and make informed decisions. The multi-level feedback system allows not only correcting mistakes but also analysing them, thereby deepening the understanding of the logic of actions. In addition to cognitive development, Gambitius also promotes self-organisation skills, as it involves working in the mode of independent module completion. Accordingly, this requires internal discipline, willpower and planning of your own actions. In the context of modern digital education, this becomes extremely important as it combines the development of soft skills with basic intellectual skills.

Thus, the Gambitius online platform is not only a tool for the development of logical thinking, but also a means of comprehensively developing the basic skills required in the modern educational space. Its functionalities allow implementing the principles of adaptability, game motivation, and individualised learning. The table 2 below highlights the main aspects of the impact of this platform on the cognitive and personal development of preschool children.

Table 2

The potential of the Gambitius online platform in the development of cognitive functions of children aged 4–6

Aspect	Content description	Pedagogical feasibility	Expected results
Modularity of training	The platform is structured in modules with gradually increasing complexity of content.	It allows us to implement the principle of accessibility and continuity of education in accordance with the peculiarities of children's development.	It promotes the formation of sustainable knowledge and skills in a logic-game context.

Gamified interface	Visual appeal, rewards, characters, interactive elements.	Increases motivation to perform tasks, stimulates cognitive activity.	It develops internal motivation to learn, attention and self-control.
Adaptability to the child's level	Automatic difficulty correction based on the results of the stages.	Ensures individualisation of the educational process without losing the logical sequence.	Development within the area of immediate development, preventing frustration.
Integration of emotional intelligence	Role-playing situations that require choosing or evaluating decisions.	Develops skills of reflection, empathy, and social interaction.	Increased emotional maturity and self-regulation.
Monitoring of results	A feedback system for teachers and parents, and progress analytics.	It provides an objective diagnosis of the child's developmental dynamics.	Conditions are created for targeted pedagogical correction.

Source: author's own development

Integrating the Gambitius online platform with elements of chess methodology into the preschool education system is a relevant and pedagogically sound area of innovative development of the educational environment that meets the needs of forming the foundations of cognitive and personal competencies in children aged 4–6. Modern preschool education is focused on developing flexible thinking, the ability to analyse, plan, make decisions and self-regulation, which are the basic prerequisites for successful learning in primary school. In this context, the combination of chess learning principles with the capabilities of digital technologies creates conditions for systematic and targeted cognitive activation of children.

The chess method is an effective tool for the intellectual development of preschool children, as it promotes the formation of logical operations (analysis, synthesis, comparison) and develops spatial thinking, attention, memory, anticipation, and strategy skills. However, its classical implementation requires an appropriate environment, didactic material, and a trained teacher. Accordingly, Gambitius as a digital platform helps overcome some organisational and methodological difficulties by providing age-appropriate tasks, game plot, visualisation and automated differentiation of difficulty. As a result, it provides an accessible form of learning complex intellectual content through an attractive game format.

The combination of chess components with Gambitius functionality allows for implementing several important didactic principles, including visibility, consistency, individualisation and variability. In addition, the platform supports elements of reflection and self-monitoring, which are components of self-regulated learning. In the context of modern digital pedagogy, an important factor is also the flexibility of the content – the ability to adapt the learning material to each child's development pace, which ensures that they remain positively motivated and emotionally comfortable.

The feasibility of integrating Gambitius into the preschool education system is also confirmed by the need for innovative methods that balance traditional and digital approaches. Involving children in the platform's game environment, which contains chess elements, not only stimulates cognitive interest but also lays the foundations for mathematical literacy, critical thinking, and promotes the formation of communication and social competencies (for example, in pair or group work). Thus, a holistic approach to developing a child's personality in

the context of competence-based learning, which is currently a defining feature of international educational practices, is being implemented.

Given the above, integrating the Gambitius online platform with elements of chess methodology into the preschool education system is appropriate and a strategically important solution that meets the current needs of modernising the educational process. Modern approaches to preschool education are increasingly focused on ensuring individualised and multi-level development of children, which requires the introduction of tools that combine cognitive activities with the development of critical thinking, independence and initiative. In this context, the potential of the Gambitius platform, which provides for the modular construction of educational content, interactivity of tasks, gamification elements and adaptability to the child's development level, is very promising.

At the same time, the chess methodology is an effective means of developing logical, analytical and strategic thinking, which is of direct importance for children's cognitive preparation for school. Combining these two educational vectors – digital tools and traditional intellectual games – creates a synergistic effect, thanks to which learning acquires new qualities, such as systematic, accessible, interactive and flexible.

This combination allows not only to intensify the cognitive activity of children, but also to take into account their characteristics, the pace of learning, the level of thinking skills, and the ability to reflect and self-organise. As a result, an educational environment promotes not the mechanical reproduction of information, but a deep understanding of cause and effect relationships, the development of prerequisites for making independent decisions and the formation of intrinsic motivation to learn. Thus, integrating Gambitius and chess methods meets not only modern educational challenges, but also focuses on the future – the formation of a new generation of children capable of analytical thinking, independence and effective communication in a rapidly changing information environment.

Conclusions

In the process of studying the potential of chess methodology as a means of developing logical thinking in preschool age, it was found that its expediency lies in the ability to activate several important cognitive processes, including analytical thinking, spatial imagination, the ability to model situations, predict consequences and make decisions. The chess methodology creates conditions for forming a systematic, structured approach to problem solving in children aged 4–6, promoting the development of concentration, attention, memory and emotional and volitional regulation. Its application in the educational process also has a significant developmental impact on the child's personality, increasing his or her learning motivation and independence.

Consideration of the functionality of the Gambitius online platform in the context of children's cognitive development has shown its effectiveness as an innovative digital learning tool. The platform provides age-appropriate content adaptation, gradual complexity of tasks, game attractiveness and self-control mechanisms that meet the requirements of modern pedagogy and developmental psychology. It combines interactivity, motivational intensity and didactic focus, forming the prerequisites for independent thinking, action planning and basic strategy in children.

The rationale for integrating Gambitius with elements of chess methodology into the preschool education system is based on their advantages: the intellectual and logical potential of the chess game and technological accessibility, a personalised approach and high motivational appeal of the platform. This integration allows effective implementation of educational tasks and contributes to the harmonious development of preschoolers' cognitive, emotional, and personal spheres. The introduction of such approaches is in line with the

strategic guidelines for updating the content of preschool education in the context of digitalisation and a competence-based approach.

In general, the study's results indicate the prospects and pedagogical feasibility of using the integrated format of the chess methodology and the Gambitius online platform to intensify the development of logical thinking of children aged 4–6, which opens up new opportunities for modernising the preschool educational environment.

Prospects for further research lie in a comprehensive study of the effectiveness of integrating digital educational resources (in particular, gamified platforms and mobile applications) into the process of forming logical thinking of senior preschool children. It is advisable to conduct experimental studies involving different age groups and types of preschool education institutions to identify optimal methodological approaches.

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