PEDAGOGICAL ACADEMY:
SCIENTIFIC NOTES

PRESCHOOL EDUCATION

UDK 373.21:159.95

DOI https://doi.org/10.5281/zenodo.15502394

Assessment of the long-term impact of chess lessons in preschool age on the further development of logical thinking and academic success

Oleksandr Shymanskyi,

Specialist in Physical Education and Sports, Principal,

Leadership Development Club LEV, Bila Tserkva, Ukraine,

https://orcid.org/0009-0005-2625-6797

Accepted: 09.05.2025 | Published: 24.05.2025

Abstract. *Logical thinking is integral to a person's cognitive development. It allows them to process information clearly and consistently, helping them conclude, understand why certain events occur, and find solutions to problems. The* ***article aimed*** *to investigate the impact of chess training in preschool on developing logical thinking and children's academic success in later education.* ***Methods.*** *To achieve this goal, the following theoretical methods were employed: analysis of scientific sources, comparative analysis, methods of generalization, and systematization of knowledge regarding the role of chess in children's cognitive development.* ***Results.*** *The study revealed that logical thinking is one of the key components of cognitive development, determining a person's ability to process information rationally and in a structured manner. The primary characteristics of logical thinking include consistency, objectivity, and reliance on evidence. Developing logical thinking is considered one of the priority areas in forming the intellectual potential of preschool*

children. Among the most common means to achieve this objective are various types of games (competitive games, role-playing games, board games), puzzles, construction sets, and programming tools. Specific characteristics distinguish each of the listed means and have the potential to influence the formation of logical thinking. A comparative analysis of approaches to the formation of logical thinking has shown the high effectiveness of chess classes, which occupy a leading place among other methods of intellectual development. Unlike puzzles or construction sets, chess requires the child to solve problems and consider the consequences of their actions, predict the opponent's moves, and adapt their strategy in real time. Implementing innovative approaches to chess education that align with modern educational trends and consider preschoolers' age-specific characteristics is becoming particularly relevant. One such approach is the use of interactive digital platforms that combine play, learning, and technology. An effective tool for organizing systematic chess lessons within the digitalization of preschool education is Gambitius. This platform merges the classic chess game with a vibrant interface that fosters logical thinking in an interactive environment. ***Conclusions.*** *Thus, the systematic integration of chess into preschool education, particularly through digital technologies, can be a powerful instrument for developing children's intellect, ensuring a seamless transition from preschool to primary education, and promoting future educational success.*

Keywords: *preschool education, academic performance, cognitive development, intellectual games, digital technologies.*

.

PEDAGOGICAL ACADEMY:
SCIENTIFIC NOTES

Оцінка довготривалого впливу занять шахами в дошкільному віці на подальший розвиток логічного мислення та успішність у навчанні

Шиманський Олександр Олександрович,
спеціаліст з фізичної культури і спорту, керівник
Клубу розвитку лідерства ЛЕВ, м. Біла Церква, Україна,
https://orcid.org/0009-0005-2625-6797

Анотація. *Логічне мислення є важливою частиною когнітивного розвитку особистості, що дозволяє чітко та послідовно обробляти інформацію, допомагає робити висновки, розуміти причини певних подій та знаходити розв'язання проблем.* ***Метою*** *статті було дослідити вплив занять шахами в дошкільному віці на розвиток логічного мислення та академічну успішність дітей у подальшому навчанні.* ***Методи.*** *Для досягнення поставленої мети були використані наступні теоретичні методи: аналіз наукових джерел, порівняння підходів формування логічного мислення, а також методи узагальнення і систематизації знань про роль шахів у когнітивному розвитку дітей. В* ***результаті*** *дослідження було встановлено, що логічне мислення є одним із ключових компонентів когнітивного розвитку особистості, що визначає здатність людини раціонально і структуровано обробляти інформацію. Основними характеристиками логічного мислення є послідовність, об'єктивність та доказовість. Показано, що розвиток логічного мислення є одним із пріоритетних напрямів у формуванні інтелектуального потенціалу дітей дошкільного віку. Найпоширенішими засобами досягнення цієї мети є ігри (ігри-змагання, сюжетно-рольові, настільні), головоломки, конструктори, інструменти програмування, які вирізняються специфічними характеристиками та мають свій потенціал*

впливу на формування логічного мислення. Порівняльний аналіз підходів до формування логічного мислення у дітей засвідчив високу результативність шахових занять. На відміну від головоломок чи конструкторів, шахи вимагають від дитини не лише розв'язувати задачі, а й враховувати наслідки своїх дій, передбачати рухи суперника та адаптувати свою стратегію в реальному часі. Особливої актуальності набуває впровадження інноваційних підходів до навчання шахам, які відповідають сучасним освітнім тенденціям і враховують вікові особливості дошкільнят. Одним із таких підходів є використання інтерактивних цифрових платформ, що поєднують гру, навчання та технології. Ефективним інструментом для організації систематичних занять шахами в умовах цифровізації дошкільної освіти є платформа Gambitius, що поєднує класичну гру з яскравим інтерфейсом, що забезпечує розвиток логічного мислення в інтерактивному середовищі. ***Висновки.*** *Таким чином, систематичне впровадження шахів у дошкільну освіту, зокрема із застосуванням цифрових технологій, може стати потужним інструментом розвитку інтелекту дітей, забезпечуючи безперервність переходу від дошкільної до початкової освіти та сприяючи подальшим успіхам у навчанні.*

Ключові слова: *дошкільна освіта, академічна успішність, когнітивний розвиток, інтелектуальні ігри, цифрові технології.*

Problem statement. Forming logical thinking at preschool is essential in children's cognitive development. During this period, basic skills are laid that will later be used in learning and everyday activities. Preschool age is characterized by intensive development of cognitive abilities, the ability to analyze, compare, classify information, and solve simple problems. Creating a favorable environment at this stage plays a key role in stimulating the development of logical thinking. In this

context, selecting the most effective educational tools to develop children's cognitive abilities is essential. One such tool is chess, which requires constant attention and the ability to plan and predict the possible results of one's actions.

Analysis of recent research and publications. Forming logical thinking in children is a key aspect of cognitive development, attracting scientists' attention in psychology and pedagogy. K. Suiatynova noted in her article that logical thinking is the basis for success in education and life. Therefore, researching effective methods and techniques for developing critical thinking in preschoolers is essential to modern pedagogy [1]. According to S. Matviienko [2], developing logical thinking in children is the main requirement for ensuring continuity between preschool and primary education in terms of forming logical-mathematical competence. The author also indicated that in the modern educational process, it is advisable to use various methods and technologies to develop cognitive skills.

E. Relkin, L. de Ruiter, and M. Bers [3] studied the impact of the programming curriculum on the development of computational thinking in children. The authors emphasized that educational initiatives to develop computer literacy in early and primary school children should consider the specifics of their cognitive development.

As noted by O. Shynkaruk and N. Chyzhevska, at the age of 4-6 years, children develop cognitive abilities intensively, as well as socio-emotional, speech, and physical spheres [4]. During this period, involvement in intellectual sports, particularly chess, contributes to the child's comprehensive development. R. Rudenskyi argued that board games are a means that ensures an organic transition from the social role of a preschooler to a new one - a younger schoolchild [5].

In their study, E. Mărăcine and N. Mihăilescu analyzed the impact of chess classes on the intellectual development of children aged 11-12. The results of testing on mathematical calculations, logical and analytical thinking, and text

comprehension showed significantly better results in chess students, which indicates the game's positive effect on cognitive functions [6]. A study by T. Ahranjani has demonstrated that regular chess instruction increases IQ, language, math, and reading skills. Chess competitions, especially those with time constraints and chess clocks, teach players to make quick decisions under pressure. This skill can be helpful in stressful academic situations such as exams [7].

A study by C. Nanu et al. [8] found that parents consider chess an effective tool for developing cognitive skills in children. However, parents who know how to play chess were more likely to focus on the game's positive effects, suggesting that personal experience influences the assessment of the educational value of the game.

Highlighting previously unresolved parts of the general problem. Despite a significant number of studies highlighting the role of chess in preschool education, several aspects of this problem require further study. In particular, there is no comparative analysis of chess with other methods of developing logical thinking, such as using puzzles, logical games, or programming, which limits understanding of how chess is more effective than alternative approaches.

Formulation of the objectives of the article (statement of the task). The article aims to investigate the impact of chess classes on preschool-age children's development of logical thinking and subsequent success in education, as well as to substantiate the effectiveness of chess as a means of cognitive development.

Objectives of the article:

1. Analyze common means of developing logical thinking in children.
2. Conduct a comparative analysis of the effectiveness of different methods.
3. Investigate chess's impact on a child's cognitive development.

Presentation of the primary research material. Logical thinking is one of the key components of a person's cognitive development, which determines a person's ability to rationally and structuredly process information. It helps to

formulate conclusions, analyze cause-and-effect relationships, and solve problems, relying on logical patterns and principles. This type of thinking includes the ability to abstract, analyze data, synthesize information, compare, and generalize the knowledge obtained. The main characteristics of logical thinking are:

1) Consistency. Implies a logical order of thoughts, where each new statement follows the previous one. This approach eliminates arbitrariness and ensures the integrity of reasoning;

2) Objectivity. Requires detachment from subjective prejudices and emotions, which allows one to assess the situation impartially. This contributes to the formation of conclusions based on facts and logical analysis, not on personal beliefs or emotions;

3) Evidentiality. Consists of substantiating conclusions based on available facts and logical rules. Evidentiality ensures objectivity and reliability of reasoning, allowing for the avoidance of unfounded assumptions [9, p. 260].

The development of logical thinking is one of the priority areas in the formation of the intellectual potential of preschool children. Among the numerous means of achieving this goal are competitive games, story-role-playing games, stick sets and Kuizener sticks, puzzles, constructors, programming tools, chess, etc.

Each of these means has its characteristics and potential for influencing the development of cognitive processes. During the comparative analysis of methods for developing logical thinking in preschool children, it is essential to consider the pedagogical effectiveness of each approach and the correspondence of the methods to the age characteristics of cognitive development. Thus, using various programming and coding tools in preschool children's education requires special attention, since at this stage, children do not have a sufficient level of formation of reading, writing, mathematical analysis, and abstract thinking skills. Thus, one of the limiting conditions for the use of information technologies is the inability of

children to perceive abstract concepts, such as variables or algorithmic campaigns. At this age, a child's thinking may be based on the personification of objects or a "magical" understanding of phenomena, which reduces the effectiveness of traditional computerized learning tools focused on rational and logical processing of information [3]. Thus, compared to digital technologies, conventional didactic tools or intellectual games that do not require a high level of abstraction are more suitable for stimulating logical thinking at this age.

Puzzles that require active use of logical thinking and the ability to solve complex problems are an effective tool for stimulating the formation of neural connections and the development of analytical skills in children. They encourage the search for solutions through careful logical analysis, contributing to the development of critical thinking and the ability to conduct in-depth research of information. Similarly, in particular constructors, puzzles, and logic games, educational toys play an essential role in forming logical thinking [10]. They motivate children to experiment with different solutions, developing spatial imagination and the ability to analyze complex tasks.

Using the LEGO constructor is an effective means of forming the cognitive activity of preschool children, as it contributes to the development of creative, logical, and engineering skills and stimulates interest in learning new things. The peculiarity of LEGO construction is that it, like a game, meets the interests and needs of preschool children. This constructor provides an opportunity to work with geometric bodies, to learn their colors, shapes, and sizes in practice, to learn the correct names of parts, and to improve the perception of spatial relationships [11]. Despite the numerous advantages of the LEGO constructor as a tool for developing cognitive and spatial skills, its effectiveness in forming logical thinking has many limitations. First, construction does not always require a clearly defined algorithm

of actions - children can act intuitively, relying on imagination rather than logical sequence.

Unlike LEGO or other game techniques, board games provide consistent training of logical operations in a structured and purposeful form. An essential feature of such games as an interactive form is that the game process unfolds simultaneously in two dimensions: absolute and conditional game. The latter is determined by strict rules that organize the game; their violation or ignoring leads to the loss of the integrity of the game and the destruction of its structure [5, p. 88]. One of the main advantages of board games is that they act as a complex tool for developing cognitive mental processes, such as thinking, memory, imagination, perception, and attention. Each game aims to stimulate different mental abilities, allowing individual processes to develop in their pure form during the game, ensuring the child's comprehensive development.

Chess belongs to the category of strategic board games. This game is also considered an intellectual sport that develops logical thinking, memory, attention, the ability to plan strategically, and analysis. Chess performs several essential functions:

1) cognitive - consists of actively expanding the worldview, forming the skills of logical thinking, memorization, comparison, generalization, forecasting the results of activities, as well as orientation in space, which is of significant importance for further education at school;

2) educational - manifests itself in the formation of purposefulness, endurance, strong-willed qualities, the ability to concentrate for a long time, the development of self-criticism, independent decision-making, and the ability to overcome difficulties;

3) physical - stimulates the child to maintain physical activity, necessary to ensure endurance and efficiency during intellectual load;

4) corrective - is of particular importance for children with hyperactivity, helping to reduce the level of psycho-emotional tension, form concentration and self-regulation of behavior.

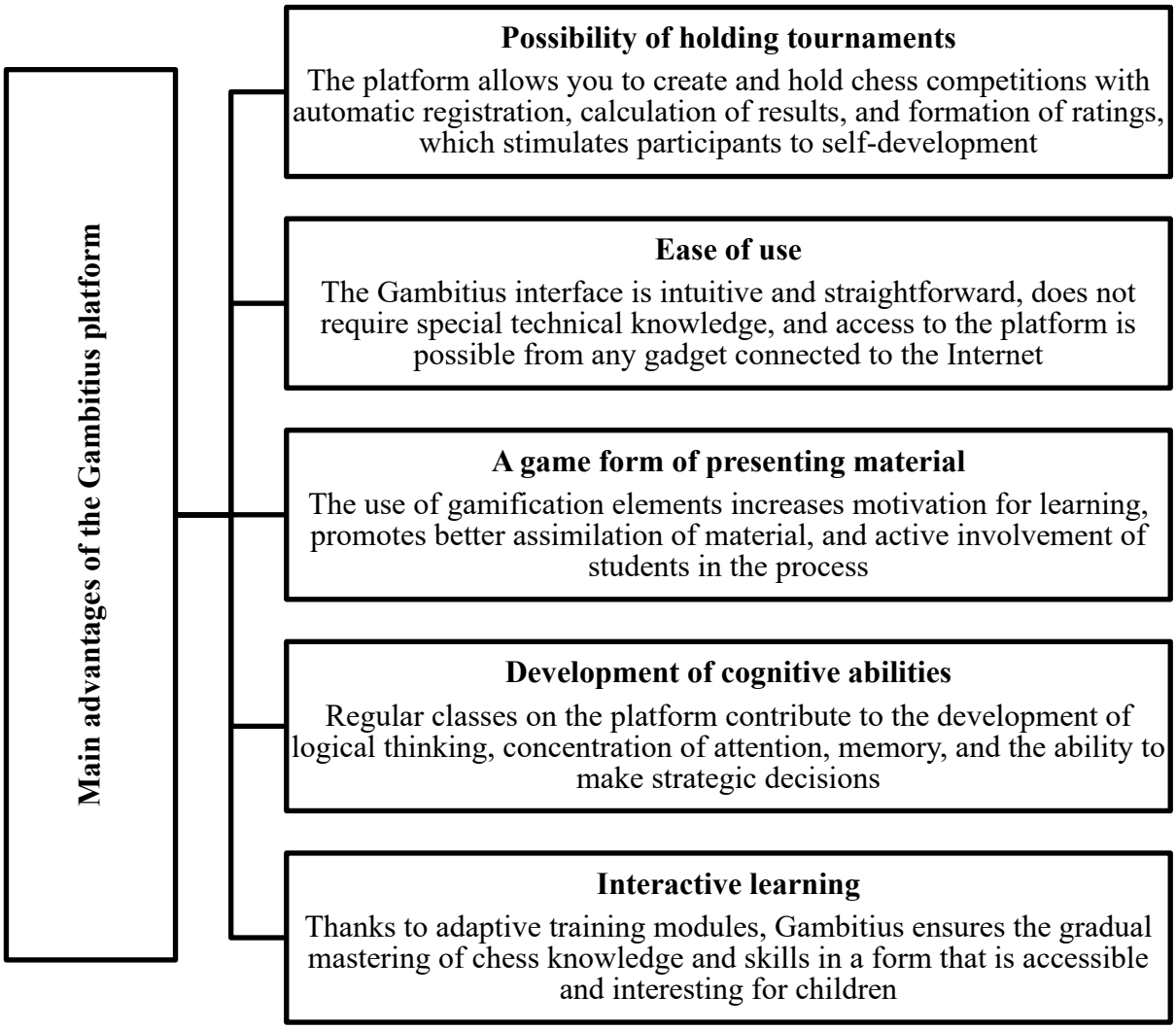
Despite the significant educational potential of traditional intellectual games, particularly chess, modern pedagogical practice is actively expanding through digital tools and platforms. Digital educational games form an effective interactive environment that combines gaming activities with the educational process, contributing to children's cognitive development. Such games are distinguished by a high level of attractiveness for preschoolers, which allows them to work focused for a longer time, develop research and problem-solving skills. The atmosphere created by digital educational resources is usually relaxed and positive, which reduces stress levels and helps increase motivation to learn. The use of bright visual elements, musical accompaniment, and animation effects activates the imagination, expanding the child's involvement and interaction with the content, which, in turn, positively affects their cognitive activity [12].

In this context, the online platform Gambitius, which specializes in teaching children to play chess in an interactive format, is particularly relevant. The platform’s functionality includes registering participants, holding chess tournaments, teaching children the basics of chess, starting from age three, recording results, and a reward system. The program’s interface is characterized by simplicity and intuitiveness, which allows users with basic digital skills to work effectively with it. A bright, colorful interface with cute characters – from a knight to playful raccoons – instantly attracts children's attention and creates a pleasant atmosphere for learning new knowledge [13]. Intuitive navigation and structured presentation of material in the form of “steps” allow children to gradually master the game of chess, developing logical thinking, strategic planning, and concentration on tasks.

An essential advantage of the Gambitius application is its multiplatform nature [14] – access to the service is possible from any device connected to the Internet (computer, smartphone, etc.) (fig. 1).

Figure 1

Main advantages of the Gambitius platform



Source: author's development

It is worth noting that the systematic inclusion of chess games in early educational programs creates a foundation for developing key cognitive skills,

including analytical thinking, planning, decision-making, and concentration. Early contact with chess stimulates children to actively search for and analyze different solutions to problems, an essential factor for later academic achievement. Children who play chess show better academic results, particularly in mathematical and linguistic disciplines, and have an increased ability to solve complex problems [15].

Moreover, long-term observations indicate that the positive effect of chess lessons is not limited to preschool [8]. These lessons form the basis for the successful acquisition of reading, arithmetic, and logical thinking skills, and also contribute to the development of motivation and independence in the educational process. Students who have had experience with systematic chess lessons at an early age demonstrate higher academic performance in secondary education institutions, are better able to navigate non-standard situations, and more effectively master educational material.

Conclusions. The development of logical thinking, like any other process of personality formation, involves a gradual transition from simple cognitive structures to more complex ones. The most common means of developing logical thinking in preschool children were analyzed, including board games, puzzles, and programming elements. The comparative analysis made it possible to establish that playing chess has a complex effect on a child's cognitive development. It develops logical, analytical, and strategic thinking and contributes to the formation of self-control, planning, attention, and memory skills. In developing logical thinking in preschoolers, specialized online resources that combine an educational component with game elements are particularly effective. Among such platforms, Gambitius was singled out, offering a high level of interactivity and a clear and bright interface.

Thus, the systematic introduction of chess into preschool education, in particular through digital solutions, can become an effective tool for the intellectual

development of children, ensuring continuity between preschool and primary education and success in further education.

A more detailed study of the impact of chess lessons on various aspects of children's development, including social skills, emotional intelligence, and decision-making ability, seems promising.

References

1. Суятинова К. Розвиток логічного мислення у дітей старшого дошкільного віку. *Наукові праці Міжрегіональної Академії управління персоналом.* 2024. № 3(62). С. 29-33. URL: https://journals.maup.com.ua/index.php/pedagogy/article/view/4366/4680 (дата звернення: 15.03.2025).

2. Матвієнко С. Гра як засіб забезпечення наступності у формуванні логіко-математичної компетентності старших дошкільників і учнів першого класу НУШ. *Наукові записки.* 2023. № 1. С. 54-62. DOI: https://doi.org/10.31654/2663-4902-2023-PP-1-54-62.

3. Relkin E., de Ruiter L. E., Bers M. U. Learning to code and the acquisition of computational thinking by young children. *Computers & education*. 2021. № 169. DOI: https://doi.org/10.1016/j.compedu.2021.104222.

4. Шинкарук О., Чижевська Н. Характеристика розвитку здібностей дітей дошкільного віку як передумова занять інтелектуальними видами спорту. *Актуальні проблеми фізичного виховання та методики спортивного тренування.* 2024. № 1. С. 35-50. URL: https://vspu.net/apfv/index.php/journal/article/view/3 (дата звернення: 15.03.2025).

5. Руденський Р. Освітній потенціал настільних ігор для дітей старшого дошкільного та молодшого шкільного віку: історія та сучасність. *Вісник*

Черкаського національного університету імені Богдана Хмельницького. 2024. № 2. С. 87-93. DOI: https://doi.org/10.31651/2524-2660-2024-2-87-93.

6. Mărăcine E. M., Mihăilescu N. L. Study on the effects of chess practice on the intellectual/mental development of 11-12 years old children. *Health, Sports & Rehabilitation Medicine.* 2023. Vol. 24, № 4. P. 190-195. URL: https://jhsrm.org/magazine/020/05-maracine190-195.pdf (дата звернення: 15.03.2025).

7. Ahranjani T. D. Chess improves academic performance. *World Essays Journal.* 2023. № 11(1). P. 1-7. URL: http://www.worldessaysj.com/files/cd_papers/r_18_230803171131.pdf (дата звернення: 15.03.2025).

8. Nanu C. C., Coman C., Bularca M. C. et al. The role of chess in the development of children-parents' perspectives. *Frontiers in Psychology.* 2023. Vol. 14. 1210917. DOI: https://doi.org/10.3389/fpsyg.2023.1210917.

9. Кривошея Т. М., Солоненко В. В. Особливості розвитку логічного мислення дітей старшого дошкільного віку в контексті сучасних підходів. *Science in the modern world: innovations and challenges*: proc. of 2nd intnl. sci. pract. conf. (24-26 october, 2024). Toronto: Perfect Publishing, 2024. P. 259-265. URL: https://sci-conf.com.ua/wp-content/uploads/2024/10/SCIENCE-IN-THE-MODERN-WORLD-INNOVATIONS-AND-CHALLENGES-24-26.10.24.pdf#page=259.00 (дата звернення: 15.03.2025).

10. Kurniawati F., Surifah J., Tohani E., Rolina N. Enhancing logical thinking in preschoolers: the educational block media approach. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini.* 2024. Vol. 9, № 1. P. 63-72. DOI: https://doi.org/10.14421/jga.2024.91-06.

11. Вертугіна В. М., Ковальчук М. В. Формування пізнавальної активності дітей п'ятого року життя засобом LEGO. *Наукові інновації та*

передові технології. 2023. № 14 (28). С. 913-923. URL: https://elibrary.kubg.edu.ua/id/eprint/48049/1/V_Vertuhina_NIPT_14_28_2023_FPO.pdf (дата звернення: 15.03.2025).

12. Xiong Z., Liu Q., Huang X. The influence of digital educational games on preschool Children's creative thinking. *Computers & Education.* 2022. Vol. 189. DOI: https://doi.org/10.1016/j.compedu.2022.104578.

13. Шахи для дітей. *Chess for kids.* URL: https://gambitius.io/uk (дата звернення: 15.03.2025).

14. Презентація української прикладної програми GAMBITIUS. *Центр фізичного виховання та спорту МОН України.* URL: https://sportmon.org/prezentacziya-ukrayinskoyi-prykladnoyi-programy-gambitius/ (дата звернення: 15.03.2025).

15. The impact of chess on developing analytical thinking in children. *Global School of Chess - Learn Chess From The Best Chess Academy.* URL: https://gschess.com/the-impact-of-chess-on-developing-analytical-thinking-in-children/ (дата звернення: 15.03.2025).