THE USE OF DIGITAL TOOLS AND ARTIFICIAL INTELLIGENCE IN CHESS LESSONS: AN EXPLORATORY STUDY OF STUDENTS' PERCEPTIONS

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ABSTRACT

This article describes a classroom experience in which digital tools and artificial intelligence were incorporated into school chess lessons and examines how students perceived that experience. The study was carried out at Yerevan Basic School No. 143 named after Movses Khorenatsi. During the teaching period, students worked with interactive digital materials, AI-based tools, videos, and project assignments, including activities created with Canva. At the end of the experience, students completed a questionnaire. The database contained 80 responses, although the number of valid responses to individual questions ranged from 77 to 78.

Overall, students responded very positively to the technology-enriched chess lessons. Among those who answered the relevant questions, 94.8% said that they liked or very much liked the lessons; 88.3% reported that digital tools made the chess material much easier and clearer; and 83.1% said that the computer program immediately pointed out an incorrect move and helped them understand the mistake. Project work in Canva or a similar format was described by 81.8% of respondents as very interesting and helpful for remembering the lesson.

At the same time, the study did not include a control group, pre- and post-testing of knowledge, or standardized measures. The findings should therefore be interpreted as evidence of students' perceptions and learning experience rather than as proof of a causal effect of the technologies themselves.

Keywords: *chess education, digital tools, artificial intelligence, interactive learning, project-based learning, student engagement*

INTRODUCTION

The rapid development of digital technologies and generative artificial intelligence is changing not only the resources available in education, but also the ways in which teachers and students can organize their work. Digital environments can provide rapid feedback, present information in different formats, support more individualized tasks, and give students a more active role in the learning process. At the same time, international guidance emphasizes that AI in education should be used in a human-centred, age-appropriate, and pedagogically meaningful way. The teacher's role remains central, while issues such as data protection and the reliability of AI-generated responses also need to be taken seriously (UNESCO, 2023).

Chess provides a particularly suitable setting for experimenting with digital technologies. It is governed by clear rules, moves unfold in a visible sequence, and the consequences of a decision can often be checked immediately. Digital platforms can therefore respond directly to a student's choices. Earlier studies of chess education in Armenian schools have shown that students' attitudes, motivation, and forms of learning activity are related to achievement in chess. Interactive teaching strategies have also been identified as an important way of encouraging active participation and the practical use of knowledge (Gevorgyan, Manukyan, & Sargsyan, 2023; Gevorgyan et al., 2024). Studies using game-based formats and chess mini-games likewise suggest that such approaches may help sustain students' interest.

Against this background, what matters is not simply which technology is brought into the classroom, but what students actually make of it. A digital tool that makes an assignment more complicated or becomes an end in itself may add little to learning. By contrast, timely feedback, visualization, interactive practice, and creative project work can meaningfully complement a conventional chess lesson.

AIM AND RESEARCH QUESTIONS

The aim of the study was to describe the experience of enriching chess lessons with digital tools and elements of AI and to explore students' attitudes toward these lessons.

More specifically, the study addressed the following questions:

5. How did students evaluate the technology-enriched chess lessons overall?
6. Did they feel that digital materials helped them understand chess content and analyse their mistakes?
7. How did students perceive project-based activities?
8. Would they like to take part in similar activities in the future?
9. What broader skills did students themselves associate with these lessons?

THEORETICAL AND PEDAGOGICAL BACKGROUND

The educational value of a digital technology depends less on how new the tool is than on the pedagogical function it serves. In a chess lesson, technology can provide immediate feedback, make positions easier to visualize, allow students to experiment, support creative products, and help the teacher differentiate tasks. Studies of chess teaching in Armenian schools suggest that students' attitudes, game-

related and problem-solving activities, and interactive strategies are associated with the effectiveness of chess learning (Gevorgyan, Manukyan, & Sargsyan, 2023; Gevorgyan et al., 2024). Research on chess mini-games also suggests that playful and innovative formats can help sustain beginners' interest and engagement (Corpuz et al., 2024; Gevorgyan et al., 2024).

Quick and visible feedback. A digital chess environment can point out an inaccurate move, offer an alternative, and give the student an opportunity to try again. This becomes especially valuable when the learner does not merely see that a move was wrong, but begins to understand why it was wrong.

Interactive and active learning. Digital exercises move students from the role of observers to that of active participants. Armenian research on chess education has linked interactive strategies with active participation, problem solving, cooperation, and reflection.

Project-based and creative activity. Canva and similar platforms make it possible to present chess content as a poster, presentation, or video. In this type of task, students do more than reproduce information: they select, organize, and present it.

Opportunities for individualization. Generative AI and chess-analysis programs can help teachers differentiate assignments, formulate explanations for different levels, and prepare additional materials more quickly. Their output, however, still requires teacher review and pedagogical adaptation.

The wider literature on AI-supported learning is also useful for interpreting this classroom experience. A systematic review of 72 studies by Lo, Hew, and Jong (2024) suggests that ChatGPT and similar tools can support student engagement, but may also create risks of over-reliance and more passive learning. Meta-analyses published in 2025, mainly in higher-education settings, generally report positive effects on motivation, engagement, and learning outcomes. At the same time, they emphasize that the results depend on the subject, the teaching strategy, and the specific way in which AI is used (Deng et al., 2025; Chen & Cheung, 2025).

Although these findings cannot simply be transferred to primary-school settings, they strengthen an important point: AI is better understood as part of a broader pedagogical design than as an independent factor that automatically produces better learning.

Another important possibility offered by generative AI is support for self-regulated learning. The systematic review by Xia and colleagues (2026) highlights such processes as setting individual goals, searching for and combining information, using problem-solving strategies, and receiving feedback. These processes fit naturally with chess learning, where students analyse games, identify the reasons for mistakes, and plan their next moves. At the same time, UNESCO (2023) recommends that generative AI in school settings be used according to human-centred and age-appropriate principles, with attention to data privacy and with teachers retaining responsibility for the pedagogical and ethical validation of content.

METHOD

The study was conducted at Yerevan Basic School No. 143 named after Movses Khorenatsi following a period in which digital and AI-supported tools had been incorporated into chess lessons.

The set of tools described in the study included the use, or potential pedagogical use, of Google AI Studio and Gemini/NotebookLM-type AI tools for lesson planning, preparing learning materials, and developing individualized assignments. Canva was used for visual and project-based activities, while videos and other interactive digital resources were incorporated into the lessons.

The questionnaire consisted of eight substantive questions. Students selected one response for the first six questions, while the final two allowed multiple responses.

The database contained 80 questionnaires. Because some responses were missing, the actual number of valid responses for individual questions was either 77 or 78.

The analysis was descriptive and was based on frequencies and percentages. Since the sample was a convenience sample from a single school and the questionnaire was administered only after the teaching experience, no statistical generalizations were made about the wider student population.

RESULTS

Students' overall evaluation of the lessons was very positive. Of the 77 students who answered this question, 60 (77.9%) selected **"I liked it very much,"** while 13 (16.9%) selected **"I liked it."** Taken together, these two positive categories accounted for 94.8% of responses. Three students (3.9%) rated the lessons as "normal," and one student (1.3%) said that they did not like them.

Table 1. Main Results of the Student Questionnaire

Indicator	N	Main positive response	%
Overall evaluation of the lessons	77	Liked it very much	77.9
Digital tools helped students understand the lesson better	77	Much easier and clearer	88.3
The program helped students understand an incorrect move	77	It immediately showed my mistake and helped me understand it	83.1
Experience of project work	77	Very interesting and helped me remember the lesson better	81.8
Willingness to do similar projects in the future	78	Yes, definitely	83.3

When students were asked which activity they found most interesting, 43 of 78 respondents (55.1%) chose interactive computer games and exercises. Eighteen students (23.1%) chose creating their own project, while 15 (19.2%) selected watching and analysing famous chess games. Two additional responses included all of the suggested options.

This pattern suggests that activities requiring students to act and respond immediately were particularly attractive. At the same time, project-based and analytical formats also appealed to a substantial proportion of the group.

Students also rated the educational usefulness of the digital tools highly. Of 77 respondents, 68 (88.3%) said that videos and interactive exercises made the lesson **"much easier and clearer,"** seven (9.1%) said that they helped somewhat, and only two (2.6%) noticed no difference.

When asked about understanding incorrect moves, 64 students (83.1%) said that the program immediately showed the mistake and helped them understand it. Twelve (15.6%) said that the program

was helpful, but that the explanation was not always clear, while one student (1.3%) noticed no difference compared with an ordinary lesson.

This minority response is worth paying attention to. Immediate digital feedback is not necessarily meaningful feedback. Showing a student that a move is wrong is one thing; helping the student understand why it is wrong is another. The latter still depends heavily on the quality of the explanation and, in many cases, on the teacher's intervention.

Project work received similarly positive evaluations. Of 77 respondents, 63 (81.8%) said that the project was very interesting and helped them remember the lesson better. Eleven students (14.3%) found it interesting but somewhat difficult, two (2.6%) regarded it as an ordinary assignment, and one (1.3%) found it boring and difficult.

Students were also asked whether they would like to take part in similar projects in the future. Of the 78 students who answered this question, 65 (83.3%) said that they definitely would, 12 (15.4%) said that they would if the topic was interesting, and only one student (1.3%) did not want to repeat the experience.

The multiple-response questions give a somewhat richer picture of what students would like to see in future lessons. Of the 78 respondents, 57 (73.1%) wanted more chess games and online competitions with classmates. Two slightly different formulations with the same meaning in the database were combined for this calculation. Forty-five students (57.7%) wanted more creative projects, 28 (35.9%) wanted films or videos about famous chess players, and 27 (34.6%) wanted more team or group work.

Students also identified several possible outcomes that went beyond the immediate chess content. Fifty of the 78 respondents (64.1%) said that the lessons helped them think more logically. Forty-eight (61.5%) felt that they had become more attentive to details, 44 (56.4%) believed that they had become better at using computers and new programs, and 42 (53.8%) said that they were better able to plan their own moves.

These findings need to be interpreted carefully. They reflect students' own perceptions of change; they are not objective measurements of improvement in logical thinking, attention, digital competence, or planning.

DISCUSSION

The most noticeable feature of the findings is not simply that students responded positively to "technology." Their strongest responses concerned things that were immediately useful to them: understanding the material more easily, seeing a mistake quickly, interacting with the task, and creating something of their own.

This pattern is consistent with earlier Armenian research on interactive chess education, where information technologies, different approaches to problem solving, group work, and reflection have been treated as components of active learning strategies (Gevorgyan et al., 2024). It is also in line with research on chess mini-games, where innovative game-based formats were associated with stronger student interest (Corpuz et al., 2024).

The results concerning feedback are particularly interesting. More than four out of five students reported that the program helped them identify and understand an incorrect move. Chess may be especially well suited to this kind of digital support because feedback can be linked to a concrete decision made by the learner. A student can return to the position, compare alternatives, and reconsider the reasoning behind a move.

Yet the responses also reveal an important limitation. For 15.6% of students, the program was useful but its explanation was not always clear. This suggests that the educational value of automated feedback depends not only on its speed or technical accuracy, but also on whether it can be understood by the learner. The teacher therefore continues to play an important mediating role.

The findings on project work point to a somewhat different function of technology. Here, its value seems to lie less in automated feedback and more in giving students a way to reorganize and communicate what they have learned. Creating a visual project requires students to select information, decide what is important, structure it, and present it to others. In that sense, technology becomes a tool for working with knowledge rather than simply receiving it.

The study also fits into the broader body of research on chess education in Armenian schools, where students' attitudes and forms of learning activity have been considered important components of effective teaching. Previous work on interactive strategies has emphasized active participation, problem solving, cooperation, and reflection. In the present small-scale study, interactive exercises and project work received particularly high evaluations, providing a practical classroom example that complements this line of research.

At the same time, the findings should not be taken to mean that AI or digital technologies objectively improved students' chess knowledge or cognitive abilities. The questionnaire primarily measured attitudes, perceived usefulness, and self-reported skills.

It is therefore more accurate to say that students showed a high level of acceptance of technology-enriched chess lessons and perceived these lessons as useful. This distinction is important. Enjoying an educational experience and learning more from it may be related, but they are not the same outcome.

The broader literature on AI-supported education points in the same direction. Systematic reviews and meta-analyses suggest that the effects of generative AI on engagement and learning depend on how tasks are designed, students' level of preparation, the quality of feedback, and the teacher's role in mediating the learning process (Lo et al., 2024; Deng et al., 2025; Chen & Cheung, 2025).

The most defensible interpretation of the present findings, therefore, is that digital and AI-supported tools helped create a learning environment that students experienced as engaging and useful. Whether the same tools also produced measurable gains in chess knowledge or broader cognitive skills remains an empirical question for future research.

CONCLUSION

The experience at Yerevan Basic School No. 143 suggests that chess lessons enriched with digital tools and elements of artificial intelligence were positively received by most students. Interactive exercises, rapid feedback, and project work received particularly high evaluations.

Most students reported that digital materials made chess content easier to understand, while project work made the learning experience more interesting and memorable. Students also associated the lessons with improvements in logical thinking, planning, attention to detail, and digital skills, although these findings represent self-perceptions rather than objectively measured changes.

From a practical perspective, digital tools seem most useful when they address a specific teaching need rather than simply being added to a conventional lesson. They may help explain a mistake, differentiate an assignment, visualize a chess position, support a creative project, or organize collaborative work.

When artificial intelligence is used, teacher oversight remains essential. AI-generated content needs to be checked, explanations need to be appropriate to students' age and level, and issues of privacy, data security, and equal access to digital resources need to be considered.

More broadly, existing research cautions against assuming that technology itself produces better learning. The educational value of AI depends on the way it is incorporated into the learning process. In the present study, digital and AI-supported tools appear to have contributed to a classroom environment that students found engaging and useful. Establishing whether they also improve chess achievement or broader cognitive skills will require a more rigorous research design.

LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Several limitations need to be considered when interpreting the findings.

First, the study was conducted in a single school using a convenience sample. The results cannot therefore be generalized to other schools or groups of students without further research.

Second, there was no control group and no pre-intervention measurement. As a result, it is impossible to separate the possible effects of the digital tools from other factors, including the teacher's style, the attractiveness of the topics, the novelty of the activities, or students' initial attitudes toward chess.

Third, the questionnaire was developed specifically for this study and is not presented as a validated scale. Most of its questions were positively worded, which may have increased the likelihood of socially desirable responses or a tendency to agree with the statements.

Fourth, the database did not contain information on students' age or grade, gender, initial chess level, or previous experience with digital technologies. These variables might have helped explain differences in students' responses.

A stronger follow-up study would ideally include at least two groups: one receiving conventional chess instruction and another receiving technology-enriched instruction. Pre- and post-tests of chess knowledge would make it possible to examine actual learning gains. Where feasible, engagement or motivation could also be assessed using a validated instrument.

It would also be useful to examine the different components of the intervention separately. An interactive chess platform, AI-supported feedback, a Canva-based project, and video materials may not have the same effect. Studying them separately would make it easier to understand which tool contributes to which outcome.

REFERENCES

Chen, S., & Cheung, A. C. K. (2025). Effect of generative artificial intelligence on university students' learning outcomes: A systematic review and meta-analysis. *Educational Research Review*, *100737*. https://doi.org/10.1016/j.edurev.2025.100737

Corpuz III, R. G. C., Corpuz, L., Shareeka, S., Sharma, A., Korovou, S., Narayan, A., Prasad, R., & Kabolo, N. A. (2024). The use of mini-games in chess education. *Main Issues of Pedagogy and Psychology*, *11*(2), 184–197. https://doi.org/10.24234/miopap.v11i2.40

Deng, X., et al. (2025). A systematic review and meta-analysis of the effectiveness of generative artificial intelligence (GenAI) on students' motivation and engagement. *Computers and Education: Artificial Intelligence*, *9*, 100455. https://doi.org/10.1016/j.caeai.2025.100455

Gevorgyan, S. R., Manukyan, S. A., & Sargsyan, V. Zh. (2023). The impact of students' attitudes and learning activities on the chess academic achievements in primary schools. *Psychological Science and Education*, *28*(5), 100–113. https://doi.org/10.17759/pse.2023280508

Gevorgyan, S. R., Ispiryan, M. M., Sargsyan, V. Zh., & Tadevosyan, H. V. (2023). Research and experience of teaching the subject "Chess" in the educational system of the Republic of Armenia. *Psychological Science and Education*, *28*(6), 121–135. https://doi.org/10.17759/pse.2023280612

Gevorgyan, S. R., Ispiryan, M. M., et al. (2024). Enhancing chess education through interactive teaching strategies: A comprehensive approach. *Psychological Science and Education*, *29*(6), 192–204. https://doi.org/10.17759/pse.2024290613

Gevorgyan, S. R., Khachatryan, H. V., Manukyan, S. A., Sarkisyan, V. Zh., & Movsisyan, N. N. (2024). The effectiveness of teaching chess and attitudes toward the subject in educational groups using a game-based approach to learning. *Counseling Psychology and Psychotherapy*, *32*(4). https://doi.org/10.17759/cpp.20243204

Liu, X., & Zhong, B. (2024). A systematic review on how educators teach AI in K–12 education. *Educational Research Review*, *45*, 100642. https://doi.org/10.1016/j.edurev.2024.100642

Lo, C. K., Hew, K. F., & Jong, M. S.-Y. (2024). The influence of ChatGPT on student engagement: A systematic review and future research agenda. *Computers & Education*, *219*, 105100. https://doi.org/10.1016/j.compedu.2024.105100

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO. https://doi.org/10.54675/EWZM9535

Xia, Q., Liu, Q., Tlili, A., & Chiu, T. K. F. (2026). A systematic literature review on designing self-regulated learning using generative artificial intelligence and its future research directions. *Computers & Education*, *240*, 105465. https://doi.org/10.1016/j.compedu.2025.105465