

The Cognitive and Educational Benefits of Chess

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ABSTRACT

Chess, a strategic game known for its intellectual challenge, has garnered increasing attention for its cognitive and psychological benefits. This paper explores the impact of chess on students' cognitive development, particularly in fostering problem-solving, critical thinking, and executive functioning. Drawing on current empirical research and psychological theories, the study discusses how chess enhances memory, attention, metacognition, and cognitive flexibility. Additionally, the paper examines the role of chess in inclusive education for neurodivergent learners and advocates for its integration into school curricula. Findings suggest that chess is a low-cost, high-impact tool for promoting essential cognitive and educational outcomes, particularly in the context of an evolving digital age that demands critical thinking and adaptability.

1. Introduction

Many call Chess the 'game of kings' because it is a sport that also challenges the mind, promoting important changes in psychological growth and education. Scholars believe that India began playing chess over a thousand years ago, and today it is loved and played internationally. It is popular because playing it is easy, but understanding all its strategies requires lots of thought, and that's something its players love. There are 64 squares on a checkered board, and each player moves 16 pieces as the game goes back and forth between them. You need to know the exact movements of each piece: pawn, knight, bishop, rook, queen, and king. The goal is to surround and capture the opponent's king, needing both



stratagem, planning, and knowledge about space. This game's rules and strategic richness have made it an excellent object for investigating how memory, attention, planning, and problem-solving work in our brains. In today's society, schools put more effort into teaching people how to think deeply, deal with change, and study fields from different perspectives. For this reason, chess has enormous value. By analysing scientific studies and teaching theories, this paper examines why chess should be introduced into education more widely. It investigates the ways chess helps improve memory, concentration, advanced thinking, and decision-making in learners and how it is used to assist everyone in the classroom.

2. Literature Review

Scholars have started paying more attention to the links between chess and cognitive development, wanting to know how learning chess can support education and development. Sala and Gobet, who did a review of 24 studies, suggest that chess instruction can cause students to perform a little to moderately better in math and cognitive tasks. What we found is that while chess may not work miracles, it does provide reliable benefits in many areas of learning. Several researchers have said the same thing. Sala, Gobet, Trincherro, and Ventura (2017) carried out a new study to see how learning chess influences student achievements. Results showed that chess practice played a helpful role in improving math, reading, and memory skills. It was stressed by the authors that good and standardized training was vital in ensuring these outcomes were seen. In 2016, Burgoyne and her co-authors looked at how intelligence affects a person's chess expertise. The study showed that chess skill and cognitive ability are related, though motivation, training, and environment are also very important factors. This proves that chess helps education, as though some skill isn't required, constant practice can teach useful abilities. Kazemi, Yektayar, and Abad (2012) also studied the way learning chess improves metacognitive skills and problem-solving skills in math. The study demonstrated that students got much better at planning and evaluating after playing chess. That's why researchers think that chess encourages thinking on a higher level and teaches valuable strategies for success in life and school.

Bart's study was centred on understanding how chess improves our skills by looking at executive function and self-regulation. According to his results, playing chess uses the part of the brain called the prefrontal cortex, which is related to planning, short-term memory, and avoiding uncontrolled actions. As a result, educational programs have to be carefully tailored for students with ADHD and related areas of deficit.



Chess is strongly backed in literature for its usefulness in therapeutic and inclusive situations. As an example, Barrett and Fish (2011) looked at chess as a classroom strategy for students with emotional and behavioral disorders. Being structured helped the game limit distractions in class, enhance attention, and encourage students to work with members of their group effectively. In the same way, Demily and Franck (2008) believe chess helps with cognitive retraining in people with autism spectrum disorders. When teaching chess to children, ZPD, developed by Vygotsky, has been applied to find how their learning benefits from working with a partner. As reported by Campitelli and Gobet (2004), working together with others improved students' performance on solving problems. It fits with what Vygotsky thinks, that having social contact helps youngsters learn. The results of these studies support our understanding of the different benefits of chess, like thinking deeply, managing tasks, helping all learners, and working in groups. The uniformity across research, method, and subjects demonstrates that chess supports different types of learners.

3. Cognitive Development Through Chess

3.1 Memory and Attention

Again and again, the game of chess has been seen to strengthen both memory and attention. Those playing the game should recall the rules, what has taken place previously, and what may happen ahead in the game. Requiring both short-term and working memory at once supports the growth of networks that control attention and remembrance. Burgoyne and colleagues discovered that people who play chess have stronger working memory skills than those who do not.

Focusing becomes easier for children thanks to playing chess. Because the game encourages you to pay attention for so long, you learn to sort out what is important from what is not. Such skills are necessary for winning in school, since students need to be attentive for quite a while in class. Because players in chess do similar activities over and over, it supports the ability to focus on tasks, which helps with both reading comprehension and tests at school.

3.2 Metacognition

Playing chess is a great way to enhance people's metacognition. Every decision made in chess should be examined, looking at what's happening on the board and also how you think. They should keep in mind to think about the motivation for their move and what consequences it will lead to. These questions encourage people to recognize their abilities, plan well, and reflect, which are essential in metacognition.



Kazemi et al. (2012) uncovered that chess players tended to oversee and control their mental activities. Because of this awareness, students can handle their learning, update their study habits, and do better in their schoolwork. In general, chess allows learners to see how they make decisions and learn from those decisions.

3.3 Cognitive Flexibility

Cognitive flexibility describes the ability to change your thoughts or ways of doing things as your situation changes. A chess player has to regularly adjust their strategy because of the opponent, think carefully about their reply, and recover as soon as possible from surprise setbacks. Being forced to deal with surprise situations in this game sharpens your mind.

Bart (2014) argued that these challenges activate the prefrontal cortex and help this part of the brain adjust to pressure, think ahead, and decide well. They help individuals solve problems and deal with conflict in daily life, which makes them important everywhere.

4. Critical Thinking and Problem-Solving

4.1 Logical Reasoning and Strategic Planning

Noticing the consequences of your actions in chess helps you sharpen your ability to reason smartly, predict what will happen, and evaluate alternatives—all main skills in critical thinking. People in these games notice patterns, judge dangers, and plan moves well ahead. You use similar abilities in subjects such as mathematical sciences, natural science, and philosophy. Thinking ahead and pressing on encourages students playing chess to become more determined. Most actions that give us instant rewards fail to teach patience and looking into the future, but chess does. Since distractions are common and attention spans are decreasing, these lessons hold great value now.

4.2 Risk Assessment and Decision-Making Under Uncertainty

Doing this in chess can help develop a person's planning, ability to control their attention, and adaptability. People playing chess must use foresight, which helps them plan and update their strategies when they encounter different or new facts, as real life often changes and is unpredictable. Being mentally flexible benefits students with better results in math, science, reading, and essay assignments. Moreover, considering your decisions and what you learn from each outcome helps you notice your



thinking habits. With this skill, students can learn about their talents and weaknesses, switch to better learning habits, and direct their learning more skillfully. Developing this way of thinking helps people learn well in learning and continues to benefit them for years. The game instills in students a respect for rules, the skill to foresee what others might want, and teaches them how to cope when they have lost, improving both their feelings about winning and the way they behave in sports. Social skills become important when people learn together as a group and work towards success using interaction, empathy, and negotiation. In short, chess benefits your brain and your emotions and helps you in different situations besides chess. The education allows students to do school tasks with ease and also handle any life challenges bravely. Bringing chess into schools is a cost-effective and powerful way to help learn essential 21st-century skills.

5. Chess in Educational Settings

5.1 Curriculum Integration and Academic Performance

These past few years, many countries have included chess lessons in schools. Chess became a necessary subject for all second to fourth graders in Armenia. The outcomes were impressive: better grades, more students who participated, and better use of critical thinking skills. Chess-based education is increasing in India, with Tamil Nadu leading the way, as chess clubs and school tournaments become more frequent there.

In their study, Kazemi et. al found that less than six sessions of chess improved students' mathematical reasoning. If chess is brought into teaching, teachers find that students are encouraged, behave well, and work closely with others in the class. Chess is an affordable game, so it remains a good choice in schools that do not have much.

5.2 Interdisciplinary Benefits

Chess helps students learn in several different areas. By using it in mathematics, students gain the ability to notice patterns, do geometry, and sense numbers. In language arts, talking about strategies and moves helps students with communication and writing analysis. Teachers can access social studies by studying famous matches and the historical settings that led to them. Because it is an interdisciplinary subject, it increases students' involvement and enhances their learning foundation.

6. Inclusive Education and Neurodiversity



6.1 Support for Neurodivergent Learners

Chess's well-organized style is why many neurodivergent learners find it easy to understand. Playing this game, children with ADHD find that their focus is better trained and their self-control improves. In a study published in 2014, Bart noticed that kids who frequently played chess had better powers of impulse control and attention. Because autism makes things unpredictable for children, chess creates a well-defined world and helps them stay calm and learn to socialize. The graphics and arrangement of games support learners with dyslexia or non-verbal disabilities to study complex ideas without using regular text. Therapists have found that playing chess helps children with trauma or problems with social interaction. It helps young people grow their self-esteem, deal calmly with frustration, and join in healthy competition. As a result, it is important not only for studies but also for healing and personal development.

6.2 Socio-Emotional Learning (SEL)

By playing chess, people gain important self-awareness, learn empathy, and practice sensible decision-making. Learning is about keeping calm after a loss, regulating your emotions after a win, and trying to understand what your opponent is doing. Widening their horizons by traveling teaches students skills needed for a good mindset and learning. In addition, team members in chess tournaments encourage each other, cooperate, and feel connected. The results are in line with the five main areas CASEL focuses on and emphasize the role chess can play in schools.

7. Psychological Theories Supporting Chess-Based Learning

Chess becomes a useful example of guided learning because of the Zone of Proximal Development. By being guided by peers or the use of computers, learners can accomplish tasks that are a little more challenging, helping their brains develop. The mentor and the learner's actions during chess are similar to scaffolding strategies in classrooms. In addition, Piaget's ideas about how children learn are useful in understanding chess. From ages 7 to 11, kids move to the concrete operational stage, learning how to think logically and see things from other people's points of view. By making players guess what their opponent might do, chess helps them focus on the potential results of their actions, which requires reasoning and planning. Behaviorism is significant because reinforcing our actions is fundamental in chess. Getting results in your favor can make you more willing to work harder. Because the rewards



come in simple steps and are offered often, the person remains persistent and is more likely to adopt a growth approach.

8. The Role of Chess in the Future of Education

Because our world is now highly focused on technology and AI, it is particularly important to rely on flexible, creative, and sharp thinking. It gives students a structured method for gaining and using these abilities. Because you can find chess online at Chess.com and Lichess.org, students from different cultures can reach new heights. Because of technology, AI-based tools can now provide effective feedback while a match is ongoing. They are used to find problems, propose solutions, and guess how a company will do in the future. Adaptive learning platforms are a sign of where education is heading and help create new ways to enhance personal learning. Learning in digital classrooms can become much more interactive and student-driven when chess is added. By using virtual chessboards, teachers motivate students to work with others. Chess is kept effective for students because these methods fit well into blended learning.

9. Conclusion

Beyond being a game, chess offers many educational benefits and greatly helps in all areas of a student's personal development. Studies keep showing that chess challenges help improve memory, sustained attention, problem-solving, planning, and being aware of your learning strategies. Such skills are useful in school and also help people respond confidently and clearly to challenges they face outside of school. Looking at the topic theoretically, Lev Vygotsky and Jean Piaget's theories help justify adding chess to education programs. He explains that brush-up activities like chess can teach students through teamwork and help them move past what they can do alone. Chess has shown that it works remarkably well in supporting inclusive education. Thanks to its unique qualities, children and adults with and without learning difficulties can experience learning. By playing, children gain patience, perseverance, learn to regulate their emotions, and practice social skills, both of which are important for academic growth and for being with others. As schools pay more attention to teaching critical thinking, adaptability, collaboration, and independent learning, playing chess provides a convenient and affordable way to focus on these priorities for everyone. Because it uses little, it can be very helpful in places where schools lack funds or the latest educational equipment. As a result, using chess in regular school lessons should be considered a smart investment in mental, emotional, and social learning, not only as a special activity. As



education in many parts of the world goes through changes, using chess can help students become better-rounded individuals who will succeed in the future.

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