

# Educational Values of Chess and Its Role in Education

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## **ABSTRACT**

*Chess has a unique and strong brand attribute, in that it is generally perceived that playing chess and being smart are connected. This can be very positive driver for young children, who, rather than being intimidated as many adults are, embrace the notion. As children get older, a stigma, or nerd factor attaches to "being smart." But in the second and third grade, kids want to be thought of as smart. It is also an important age for developing an attachment to school. If kids associate school and learning with fun, they will most likely develop a stronger attachment to school.*

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It's not about Kings, Queens, and Rooks, but rather, quadrants and coordinates, thinking strategically and foreseeing consequences. It's about lines and angles, weighing options and making decisions. Chess might just be the perfect teaching and learning tool. Since 2000, America's Foundation for Chess (AF4C) has been working with 2nd and 3rd grade students and their teachers to promote the use of chess as an educational tool. The goal of the First Move™ curriculum is to use the game of chess as a tool, to increase higher level thinking skills, advance math and reading skills, and build self-confidence.

Research shows, there is a strong correlation between learning to play chess and academic achievement. In 2000, a landmark study found that students who received chess instruction scored significantly higher on all measures of academic achievement, including math, spatial analysis, and non-verbal reasoning ability (Smith and Cage, 2000).

While studies have shown chess to have a positive impact on kids in elementary, middle and high school, AF4C targeted second and third graders as the evidence, and certainly our experience, suggests it's the ideal age. Eight and nine year-old minds and thinking skills are developing rapidly, and chess teaches higher level thinking skills such as the ability to visualize, analyze, and think critically.

If you teach an adult to play chess, they quickly comprehend where they should and shouldn't move pieces to capture or avoid capture. Young Kate knew the names of the pieces and how they moved, but initially moved her pieces randomly. Soon she was saying, "If I move my piece here, you could capture it, right? Then I'm not going to move there." You can almost see the mental changes taking place.

To be referred to as "the perfect teaching tool," chess would have to do much more than be age appropriate, and it does. As our classrooms become increasingly diverse, being able to reach all children becomes increasingly challenging. Chess levels the playing field as it crosses all socio-economic boundaries. It is a universal game, with worldwide rule consistency. Age, gender, ethnic background, religious affiliation, size, shape, color, and language don't matter when playing chess. Everyone is equal on the chessboard. Students who are English language learners find success with chess, because they don't face language barriers on the chessboard. Principal Jeff Newport commented, "We have 34 different languages spoken at our school, and chess is now the one we have in common."

Many schools have after-school chess clubs that create a mix of fun, competition and learning. Predominantly the members are boys. An unintended consequence of these programs is that they often leave some kids behind who are not drawn to the competitive aspect of the game. By integrating chess into the classroom, we are able to reach all children and provide them with the benefits of learning through the game of chess. These benefits include the fact that students who wouldn't have thought to join the chess club on their own, are more apt to join after having been exposed to chess in their classroom. In Philadelphia, where 20 schools have implemented First Move™ during the school day, participation in chess club after-school increased in several schools that already had a chess club, and five schools created a new club in response to student demand.

The First Move™ curriculum was developed by a curriculum professional, and designed specifically to connect with National and State academic standards. For example, while learning about the chessboard, students are taught that each square has a name/location. You can find each square by using coordinates, a set of numbers, letters or a number and a letter, that tell you the exact location of something. On the chessboard, each square is located at the intersection of a file (vertical line) and rank (horizontal line). As they learn, students begin to talk in chess terms, i.e. "I am moving my c3 Knight to e4." This helps their chess game, and it also meets the Washington State Standards for math (1.5.1 and 5.3.1). "Chess will never show up on the Washington Assessment of Student Learning [test]" says Kent Ferris, Lafayette Elementary School, "but the confidence, focus, and academic skills our students are gaining through becoming analytical players will pay measurable benefits in the years ahead." Principal Michelle Hartman was concerned about her 3rd grade class because they were considered a "high-risk" group. At the end of the school year she noted, "Chess has really made a difference for these kids, and their test scores help prove it."

In any classroom, there are disparate levels of prior knowledge on any given topic; chess is no different. Teachers find some of their students already know how to play chess. This becomes an opportunity to place those children in leadership roles as teaching assistants for their classmates. The reason isn't clear, but in many interviews with children in the First Move™ program, they express their desire to teach others to play chess. Superintendent Reece Blincoe from Stockdale ISD reported his delight when his family gathered on the living room floor so his 3rd grade daughter could teach them all to play chess, based on the lessons she had learned during the school day in the First Move™ program.

The way chess can incorporate and relate to other core subjects makes it an amazingly powerful tool. In First Move™ Teacher Training Workshops, classroom teachers learn how to develop their core curriculum using chess. Chess is one big science experiment; every time you play a game you are testing hypotheses and learning by trial and error. Chess is rooted in history and can open a door to history knowledge. Our current game of chess developed in the Middle Ages in Western Europe, though it began in India at least 1500 years ago. The King, Queen, Bishops, Knights, Rooks, and Pawns are symbolic of real groups of people in the Middle Ages and studies of them can take children into an understanding of what life was like at that time.

As children play chess, they begin to see the importance of thinking ahead, trying to figure out what their opponent might do next and what their alternatives are too. This ability to anticipate outcomes can transfer to their reading comprehension. Students can predict outcomes, and realize that characters in their stories are interconnected, just as just as they and their opponent, and the pieces on the chessboard are.

In the First Move classroom, kids aren't thinking about the benefits of chess, and how it might help them on their standardized tests, but they are thinking while having fun. Their teachers can see the benefits, however. Julie Doan, teacher at Medina Elementary says: My students are more focused—chess certainly accounts for this. In math, for instance, students who had studied chess were able to read graphs and work with charts so much more smoothly than the students I had last year, who weren't even able to read a grid prior to the lessons in math class.

According to Murray, Chess originated at the end of sixth century in India. The game was different then, elephants replacing the present day rooks and peasants replacing pawns. The "firzan" now known as the queen could only move diagonally one square at a time. Still, the basic elements of modern chess were present: the game was played on an eight by eight board with pieces and the sole goal being to checkmate the opposing king.

The game of chess has been dominated by Russians for nearly 70 years. With the exception of Bobby Fischer who won the world championship in 1972 and relinquished it in 1975 the past 11 world champions have been of Russian decent. Chess has been part of the curriculum for most Russian schools for over 40 years. Adolescents were encouraged to play chess at a very early age to increase their problem solving and reasoning skills. The gifted students were chosen and studied under the supervision of former world champion Mikhail Botvinnik.

Adrian de Groot, a psychologist in the 1960's became very interested in the use of chess as an educational tool. He began studying the thinking behavior of chess players in Russia. In particular he observed that there was a significant difference approach between those who highly skilled and experienced in chess to those who were new to the game. Initially de Groot assumed that the Grandmaster's superiority lay in their ability to organize well and to memorize concrete lines of play. What de Groot found was quite different: Grandmasters did not rely on superior memory skills. Grandmasters were not any better at recalling randomly placed pieces than novice chess players were. The Grandmaster however was able to take actual chess positions and in an astonishing 5 seconds recognize a complex chess configuration and decide on a successful move.

How were the GM's able to give accurate, well thought out evaluations in so little time? It seemed that GM's (but not novices) were able to recognize familiar configurations, and associating them with appropriate moves and plans.

Recent research in the late seventies and early eighties in the US has confirmed these findings. Researchers concluded that meaningful knowledge is stored in memory in the form of networks and patterns, and these patterns provide the roots essential for recall. Thus the expert and GM players were able to remember and recognize chunks of information. In chess these chunks are visual representations in which particular configurations are recognized. These relate to and often cue prior successful responses or pattern responses. What is an involved long sequence of decision making of information for novices, is processed by experts in "one go". It seems that other experts such as dancers, athletes and musicians operate mentally in much the same way. Responses are efficient and fast as understanding and experience are recognized and recalled in the essential structure of the activity. It seems that chess players develop complex but efficient structures for memory storage and management.

One of the essential goals of education is to teach children to think critically: students must learn to make reasoned judgments. Chess is an excellent tool to demonstrate the theme of critical thinking. During a game a player must formulate a plan of attack or defense. The formulation of a plan entails that the player must not only reflect on how similar problems are solved (searching a database of previous knowledge) but also the player must perform a systematic checking of possible combinations of moves and then arrive at an evaluation of each line. The process is a mental exercise where pieces are envisioned to be moving from square to square and the player reflects on the characteristics of the position to finally produce a reasoned outcome (move). This is precisely the definition of critical thinking. Watson-Glaser appraised the value of chess as a learning tool and showed overwhelmingly "that chess improved critical thinking skills more than the other methods of enrichment." Included in the study were future problem solving, problem solving with computers, independent study, creative writing and fantasy games like Dungeons & Dragons.

An important element of critical thinking in chess is the evaluation process where the strength of one's position is assessed. Beginners who play chess (and early computer programs) place significant emphasis on material -- reasoning that "the player with more material will win by sheer numbers". If only chess was that simple. Material plays a central role in winning a chess game but many more ideas are needed for a useful evaluation of a position. More advanced players find a balance: included in their evaluation processes are the ideas of central control, pawn structure, material, space, maneuverability, king safety, initiative and development of pieces. The brain has internalized these values allowing the player to make a reasoned judgment of which particular themes are critical in evaluating his or her own position.

Mathematicians have estimated that there are approximately  $10^{50}$  possible unique games of chess playable. Thus chess will never become just a repetition of previously played moves. So how can a player possibly make a decision as to which plan to choose with so many possible choices? Even with complicated evaluative techniques, choosing the best plan can be very difficult. The chess player must often must rely on intuition. The best chess players are often those who have an acute feel or intuition for which move is correct. This can be a useful



tool in education. Intuition is generally undervalued in educational terms but can be a very useful tool in both problem solving and real life applications when the steps to solve a problem are not easily apparent.

Are there links between mathematics and chess? Chess players are often considered mathematically oriented and there are obvious similarities as chess is a game of problem solving, evaluation, critical thinking, intuition and planning -- much like the study of mathematics. Studies have shown that students playing chess have increased problem solving skills over their peers. Researcher suggests that while students playing chess learn concepts through physical and visual stimuli and correlate these concepts to cognitive patterns, mathematics in the classroom usually involves only pure symbolic manipulation. Thus there seems to be some evidence to suggest that chess acts as a sort of link in connecting form (symbolic) with understanding (physical and visual). In the early 80's Faneuil Adams became president of the American Chess Foundation (ACF). Adams was convinced that chess was an excellent learning tool for the adolescent, especially the disadvantaged. The ACF embarked on the Chess in Schools Program which focused on New York's Harlem School district. Initially the program was focused on improving math skills for adolescents through improved critical thinking and problem solving skills. This was achieved as "test scores improved by 17.3% for students regularly engaged in chess classes, compared with only 4.56% for children participating in other forms of enriched activities."

Also noted was that many students social habits improved when playing chess. The game allows for students of dissimilar backgrounds to integrate with others. Many disadvantaged or special education students are becoming actively involved in chess programs as the value of chess as a social tool is further explored. Advocates of chess are hoping that some of New York's gang related problems will be solved as children and students play chess in their spare time instead of becoming involved with gang related activities. Thus chess steers youth away from trouble by keeping them off the streets as well as being a useful learning tool.

Jerome Fishman, Guidance Counselor, Queens, NY says: "I like the aspect of socialization. You get into a friendly, competitive activity where no one gets hurt. Instead of two bodies slamming into each other like football, you have the meeting of two minds. Aside from developing cognitive skills, chess develops their social skills. It makes them feel they belong. Whenever we get a child transferred from another school who may have maladaptive behavior, we suggest chess as a way of helping him find his niche. The kids become better friends when after the game they analyze possible combinations ... we have kids literally lining up in front of the school at 6:45am to get a little chess in before class."

Principal Jo Bruno , Brooklyn, NY : "In chess tournaments the child gets the opportunity of seeing more variety and diversity. There are kids who have more money than they have, but chess is a common denominator. They are all equal on the chessboard. I believe it is connected academically and to the intellectual development of children. I see the kids able to attend to something for more than an hour and a half. I am stunned. Some of them could not attend to things for more than 20 minutes." Bruno brings up the important point that chess can focus kids into concentrating on a task for long periods of time. Why is this? The author believes that many

adolescents find chess fun and exciting. This corresponds to the youths playing (learning) for long periods of time without distraction.

Dr. Stuart Margulies, a researcher for IBM, stated that he "conclusively proved that students who learned chess enjoyed a significant increase in their reading ability". Dr. Margulies does not explain why he believes there is a correlation between chess and increased reading skills but it is the author's opinion that chess develops cognitive and attention skills. Furthermore, chess forces adolescents to visualize concepts and piece movement. This may allow for better visualization (interpretive) skills when reading.

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