

The Role of Chess in Modern Education

By Marcel Milat

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. Why are Russians the dominant figures in world chess?

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.

Where is chess education headed? In the United States a major scholastic effort is underway to incorporate chess into the elementary school setting by the USCF, the US Chess Trust, the AFC and thousands of teachers and volunteers. The USCF scholastic magazine School Mates has over 20,000 copies in circulation each month. Rosalyn Katz of New Jersey spearheaded a movement for scholastic chess volunteers to change the legislation for teaching chess in schools in the state of New York. Katz managed to pass to bills in senate: Bill #S452 and #A1122. The bills read :

"An act concerning instruction in chess and supplementing Chapter 35 of Title 18A of the New Jersey Statutes. Be it enacted by the Senate and General Assembly of the State of New Jersey:

- 1) The Legislature finds and declares that:
 - a) chess increases strategic thinking skills, stimulates intellectual creativity, and improves problem-solving ability, while raising self-esteem;
 - b) when youngsters play chess they must call upon higher-order thinking skills, analyze actions and consequences, and visualize future possibilities;
 - c) in countries where chess is offered widely in schools, students exhibit excellence in the ability to recognize complex patterns and consequently excel in math and science; and
 - d) instruction in chess during the second grade will enable pupils to learn skills which will serve them throughout their lives.
- 2) Each board of education may offer instruction in chess during the second grade for pupils in gifted and talented and special education programs. The department of Education may establish guidelines to be used by boards of education which offer chess instruction in those programs.
- 3) This act shall be made effective immediately.

The Province of Quebec has followed suit and also has programs in place where schools teach chess at the elementary level. Instructors are often professional chess players hired by the school board to teach part-time during the week. British Columbia has no official legislation regarding chess as an active learning tool but the author believes that it is only a matter of time until a comprehensive uniform stance is taken by the province on chess in the classroom. At present chess is taught at few schools in Vancouver, mostly under volunteer supervision. Lynn Stringer currently volunteers many hours starting chess programs in many Vancouver Island schools. As

pressure grows from parents interested in better educational programs the author expects chess programs will be introduced province-wide in the near future . This will result in a greater demand for qualified people with the necessary skills to teach chess.

Yasser Seirawan, US Grandmaster, said that, "Chess must no longer remain a civilized luxury of the leisure class in either appearance or fact; rather, chess must assume its fundamental role as a mental integrator and motivational activator. The hard scrabble nature of chess is equal to the task; are we equal to its full scholastic implementation?"

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