

**Teaching the Fourth "R" (Reasoning)
Through Chess**

by

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Why spend time studying chess? Schools are anxious to cut budgets wherever they can, and we must be prepared with well-researched answers, if we are to grow. Bradford schools continue to validate chess as a method for improving students' reasoning skills.

For years, school children in the Soviet Union, Belgium, East Germany, Zaire, and other countries have been taught chess as a way of improving basic reasoning as well as math and verbal skills. Finally, almost half a century after the Soviets, chess is being introduced formally in our public schools from Freeport, New York, to San Francisco, California.

There are many studies that substantiate the value of chess in the schools. While control groups in the Zaire (1973-74) and Belgium (1975-76) experiments received no type of enrichment or special training to improve reasoning and problem solving, our ongoing Bradford, Pennsylvania (1979-83) control groups are all provided with activities and enrichment experiences designed to improve critical thinking skills. The results of the experiment are checked annually with the Watson-Glaser Critical Thinking Appraisal.

The results: *Chess exceeds all other thinking development programs used (e.g., Future Problem Solving, Dungeons and Dragons, independent study, Problem Solving with Computers, creative writing etc.).*

The following is a brief summary of the four year project that I directed in Bradford, PA.

Summary of the EXPLORE Program's 1979-1983 experiment on the development of thinking skills: Robert Ferguson, Coordinator of Gifted Education (EXPLORE), provided gifted students in grades 7-9 a variety of special activities including chess, Dungeons & Dragons, Olympics of the Mind, Problem Solving with computers, creative writing, independent study, etc. Groups varied in size, hours per week, and duration. Most students in the project switched topics either quarterly or semi-annually. This program began as a part of a federally funded ESEA Title IV-C Project in 1979.

The goal of the project was to provide challenging experiences through enrichment activities that would stimulate thinking. The intent was to monitor student achievement by administering pre and post thinking tests. No hypothesis related to chess (or any other activity) existed prior to the evaluation of the pre and post thinking test scores.

To judge the program's impact on thinking skills, students in grades 7-9 completed the Watson-Glaser Critical Thinking Appraisal and the Torrance Tests of Creative Thinking at the beginning of the project. Alternate forms of the tests were administered at the end of each subsequent school year.

Since the Watson-Glaser Critical Thinking Appraisal was developed as a measure of critical/analytical thinking achievement at the secondary level and beyond, no normative samples are available at this time for 7th and 8th grade levels: therefore, the project director elected to use the norms table for grade 9 to determine percentile rankings for all

students. Because of variations in form difficulty, interpretation of the raw scores has been facilitated through the procedure of equi-percentile equating of forms YM and ZM. For this reason, percentile scores rather than raw scores were used to determine the following statistics for the project groups.

	<u>9th Grade Norms</u>	<u>All Project Groups*</u>	<u>All Chess Groups</u>
Standard Deviation	11.0	15.04	11.72
Standard Error	4.2	2.7	6.71

* These figures include the students participating in chess.

1. NATURE OF THE PROGRAM

A. DESCRIPTION

1. Program Title: TEACHING THE 4TH "R" REASONING

2. Describe the program: This program is based upon the types of learning and activities described in Resazull's Enrichment Triad Model as being appropriate for gifted children. The areas of the model include general exploratory activities (Type I). group training in development of thinking and feeling processes (Type II). and individual and small group investigations of real problems (Type III). The program allows students to select an interest area and pursue it through independent and/or group study. Students have considerable freedom in this selection but must structure their experiences around appropriate problems and then work to solve those problems. These special activities have included Future Problem Solving, Olympics of the Mind, Problem Solving with Computers, Creative writing, debate and chess to name a few.

3. State the major objectives of the program: The goal of the project is to provide challenging experiences through activities that stimulate thinking and problem-solving.

4. Describe briefly the origin of the program: The program was created in response to the interest and needs of our students as identified on personal interest inventories. Gifted students need to be challenged by activities that enable them to operate cognitively and affectively at complex levels of thought and feeling: therefore, the gifted program staff researched alternative methods and wrote a successful Title VI - C Grant proposal incorporating a variety of activities - including the development of critical and creative thinking and problem-solving.

5. Identify the instructional staff assigned to the program: The secondary coordinator for gifted education, Robert Ferguson, was employed in April 1978 to create and implement a program for the identified gifted students. He is a certified program specialist, who has developed programs for industry and business as well as education. His credentials include a master's degree in education, certificates in supervisory training and business management, member of the Outstanding Young Men of America, Vice-President of EDCOT (Education for the Communities of Tomorrow), published articles on critical thinking and his research, founder of the U.S.A. Junior Chess Olympics Program,

senior level tournament director accreditation from the U.S. Chess Federation, traveled throughout the United States, Canada, and Europe, member of the Bradford Area Chamber of Commerce H.S. Business Symposium committee, life member of U.S. Chess, member and building representative for BAEA, PSEA, NEA, participant on a number of scholastic committees including the development of analytical and critical thinking.

6. Identify the Students served or enrolled in the program: Number: 53 involved in this component of our gifted program as of 26/11/85; Grade Level(s): 1-12.27active in grades 10-12

7. Provide supplementary information and comments relevant to the program including budget, fund source, special requirements for student participation, facilities, equipment, initial, community involvement, etc.

Budget: Although annual budget requests have been submitted to the school administration, the district has not authorized and approved budget for this program but does provide occasional funding.

Fund Sources: Each year the coordinator of secondary gifted education writes several proposals to maintain the program to whatever extent possible. Current source include the Tullah Hanley Youth Foundation, the American Chess Foundation, the United States Chess Federation, local businesses, and parents of the participating students.

Special requirements for student participation: Students must be members of the district's gifted program or granted permission to participate in the activities by the coordinator.

Facilities: The program utilizes a resource room and other classrooms (as required) at Bradford Area High School.

Equipment: One Apple IIe computer, dual disk drive, monitor, mouse, printer, a variety of software, 4 chess computers, demonstration boards, sets, a wide variety of reference materials.

Initiator: The founder, creator, and implementer of the program is the coordinator of secondary gifted education.

Community involvement: A large number of community members contribute money to maintain the program and many more support our local exhibitions at the mall and school. In addition, since the research about our program was published, we have received countless letters from throughout the USA and as far away as Saudi Arabia. Individuals from nearly 3,000 miles away have visited to observe and participate in our program. Even Governor Thornburgh and President Reagan have corresponded and have noted that the chess component "... is unique in that it provides pleasure and relaxation, while also stimulating and developing the mind... There are few better ways to improve the thought processes...." President Reagan in his July 25, 1985 letter.

B. CURRENT STATUS

1. Identify the objectives sufficiently achieved: To judge the program's impact on thinking skills, students completed the Watson-Glaser Critical Thinking Appraisal and the Torrance Test of Creativity annually from 1979 through 1983. The average annual percentage of increase on the critical thinking tests over the four year period for ALL activities was a disappointing 4.56 points: however, the average annual increase for the chess group was 17.3 points. The average annual increase for gifted students not participating in the thinking development program was a -5.44. Significant growth in creative thinking, as measured by the Torrance Test of Creative Thinking, was observed. The average increase in fluency for chess participants was 19.86 as compared to 6.04 for all other thinking development programs. The average increase in raw score for flexibility for chess students was 22.76 compared to 9.49 for other groups combined. The greatest increase for all groups was originality. The average chess student gained 69.95 points and all other programs averaged an increase of 34.84. The chess component has continued to out-distance the other thinking development programs in meeting the desired objectives.

2. Identify the objectives insufficiently achieved: As mentioned above, several of the program components did not increase the students thinking skills to the desired level. The reasons for this at first appeared bewildering and the coordinator wondered if the first two years were just a coincidence. After four years of similar results, the conclusion was that the chess program was more successful because it provided a far greater quantity and variety of solvable problems.

3. Identify programs Strengths, Limitations, and recommendations for improvement:

a) Strengths: The greatest strength of this particular program is that it is not imposed upon the students. They have the freedom to choose what components they will participate in and are naturally more motivated. All choices resulted in improved thinking skills as measured by the tests and teacher observation. A major plus for the chess component is that it provides for visual, auditory, and kinesthetic modality strengths simultaneously.

b) Limitations: Many of the students scored above the 90th percentile, which held down the average increase in scores on the tests and made it difficult to evaluate some student's progress. The greatest limitations are the lack of time, money and resource persons. Not enough students have the opportunity to participate.

c) Recommendations: The annual goals and objectives for the Reasoning Program should be modified and upgraded. Since the school district has selected critical and analytical thinking as its major goal. It must begin to underwrite the expenses of this program and make a more serious commitment to the students participating. More thinking programs should be developed so that more students and interest areas can be accommodated. Beginning with our scholar program, we should integrate critical thinking skills into all courses that permit. Our long range goal should be to establish a curriculum base that is 90% at the application level and above.

CRITICAL THINKING AND CHESS

- Bell, Terrell..... Your Child's Intellect
Chi, M..... Children's Thinking What Develops? Hillsdale, NJ Erlbaum 1978
Knowledge structures and memory development, pp 73-96.
Chi compared acquired knowledge and thinking performance of
10 yr old chess players with adults.
Collins, John.....Maxims of Chess. New York: David Mckay Co., 1978
Kostyev, Aleksander.. From Beginner to Expert in 40 Lessons. London: Macmillan 1984
Schmidt, Bernard..... How to Teach Chess in the Public Schools: A Course Outline.
Raleigh, NC Schmidt, 1982.

PERIODICALS

- Ball, Joe Chess Heritage Strong in Syracuse. (Syracuse Post -
Standard) 16.12.82
Barber, David Chess (Sports Month) Feb 1984 pp 2-5
Christiaen, Johan Chess & Cognitive Development. 1976
Dullea, Gerard J. Chess makes kids smarter (Chess Life) Nov 1982
Ferguson, Robert Teaching the Fourth R,. (Reasoning) through chess.
(School Mates. Chess Coach Newsletter) Fall 1983, p3.
Field, Elizabeth Chess: Matching wits for Mental Growth.
(Gifted Children Newsletter) Dec 1983 pp 1-3
Frank, Albert "Zaire Chess Experiment" 1974
Lyman, Shelby "Pupils Relish Test at Noon" (Buffalo News) 12.5.84
Menius, Arthur "North Carolina Project Enjoys Huge Success
(Chess Life) Nov. 1983 pp 13-14.
Topol, Manny "Teachers use a Game of Ideas" (Newsday) 9.5.80.

GROUP MEAN PERCENTILE SCORES AND DIFFERENCES YEAR

YEAR	ALL GROUP	CHESS	DIFFERENCE IN MEANS	GAIN FOR ALL	CHESS GAIN	POINT DIFFERENCE
79	61.52	67.33	5.81	--	--	--
80	62.36	85.6	23.31	0.84	8.34	17.5
80*	62.36	63.33	0.97	--	--	--
81	68.59	86.67	18.08	6.23	23.34	17.11
81	68.59	91.5a	22.91	--	--	--
82	62.81b	92.0ab	29.19	-5.78b	0.5ab	6.28
82	62.81b	53.5	9.31	--	--	--
83	79.75	80.5	0.75	<u>16.94</u>	<u>27.0</u>	<u>10.06</u>
TOTAL				18.23	69.18	50.95
AVERAGE ANNUAL INCREASE				4.56	17.3	12.74

* - Members of the chess group varied each year necessitating two mean scores for 80-82

a - With an average mean above the 90th %tile, growth is slowed.

b - Due to administrative problems, the supplementary enrichment activities were discontinued in November 1981 and then later reinstated in 1982. Apparently the lack of program continuity and options had a negative impact on the development of thinking skills.

ALL GROUPS = all groups including chess group for the given year.

CHESS = the mean score for the chess group for the specific year indicated.

DIFFERENCE IN MEANS = ALL GROUPS - CHESS

GAIN FOR ALL = difference in mean scores for the school year.

CHESS GAIN = difference in mean scores for the chess group for the school year.

POINT DIFFERENCE = CHESS GAIN - GAIN FOR ALL

It is evident from the above chart that chess had a definite impact on developing analytical thinking skills. No other enrichment activity was able to match chess for gain in mean score except in the 81-82 school year when the beginning mean percentile difference was nearly 23 points.

The project director was also surprised to find significant growth in creative thinking as measured by the Torrance Test of Creative Thinking. The average increase in fluency for chess participants was 19.86 as compared to 8.4 for all groups and 6.04 for all groups excluding the chess group. The average increase in raw score for flexibility for chess students was 22.76 compared to 11.8 for all groups and 9.49 for all groups without including chess pupils. The greatest increase was an astounding 69.95 points per chess student for originality. The average increase for all groups was 40.93 and 34.83 for all groups without the chess students.

Analysis of the project is complex because chess students also participated in other activities: however, after careful study it is evident that no other activity could boast the increase in thinking scores exhibited by the chess groups. For example: Although several of the chess students also studied Problem Solving with Computers (the most popular activity), the average increase for the entire computer group including chess was only 3.8 points in 1979-80 compared with 18.34 points for those who selected chess. No other combination of activities appeared to be able to match chess for developing thinking skills. This is important to note because many chess studies provide one group chess and the other nothing. Something is almost always better than nothing. The EXPLORE experiment, however, has demonstrated that chess is consistently a better tool for teaching analytical thinking skills than other recognised education programs.

I recommend that the reader review the following articles and studies for additional information:

1. Gerard J. Dullea, "Chess Makes Kids Smarter" Chess Life, Nov. 1982
2. Manny Topol, "Teachers Use a Game of Ideas", Newsday, 9 May 1980
3. Arthur Menius, "North Carolina Project Enjoys Huge Success", Chess Life, Nov. 1983 pp13-14
4. David Barber, "Chess" SportsMonth, Feb. 1984 pp 2-5
5. Johan Christiaen, "Chess & Cognitive Development" 1975-76
6. Albert Frank "Zaire Chess Experiment" 1973-74
7. "Chess is Useful as an Educational Tool" UNESCO, ??

Additional studies have been conducted in East Germany, the Soviet Union and Venezuela; however, I do not have any information on these.

If anyone can send copies of additional research or articles substantiating chess as a tool to teach thinking or other skills, I would appreciate your help in this continuing project to promote chess in the schools. Materials can be mailed to Robert Ferguson, 57 School Street, Bradford, PA, 16701, USA.