10 *Statewide Replication in Illinois of the Johns Hopkins Study of Mathematically Precocious Youth*

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Abstract

After the successful pilot testing of a program modeled after the SMPY approach, Illinois began in 1978 a statewide mathematics search using as a selection criterion for educational facilitation a score of 420 or better on the School and College Ability Test-Mathematics. Special fast-paced mathematics classes were established in areas where there were enough high scorers. Although these classes varied in number of students and amount of material covered, a large percentage of their participants completed the program successfully. Because of this success a verbal program was begun in 1979. Following brief descriptions of the verbal and mathematics classes, several problems and concerns encountered in the functioning of the classes are presented. The author concludes with the positive implications of such a program.

After approximately ten years of research under the direction of Dr. Julian C. Stanley at The Johns Hopkins University, the Study of Mathematically Precocious Youth program has firmly established itself as a viable approach to working with highly gifted children in the field of mathematics. The evidence of student growth in this program is compelling and has been well documented (Stanley, Keating, & Fox 1974; Keating 1976; Stanley, George & Solano 1977; George, Cohn, & Stanley 1979; Fox, Brody, & Tobin 1980; Bartkovich & George 1980).

In 1977 the state of Illinois utilized federal funds from PL 93-380 to

pilot the Hopkins project at two sites within the state, the northern suburban area of Chicago (Bethalto) and the southern metro-east area of Chicago (Niles). The results (see table 10.1) of that pilot activity were highly successful and thus led the way to a statewide effort toward identifying and serving highly gifted children (Van Tassel 1977).

The pilot replication was considered successful for several reasons. Foremost, of course, was that a large number of gifted students were identified and then subsequently facilitated in their education. But, in addition, the pilot program demonstrated that different geographical regions of the state had sufficient talent pools to warrant regionalized identification procedures and that there was adequate student/parent interest. Furthermore, school officials were made cognizant of the potential of the identified students to handle a more accelerated mathematics class; in the following year, they allowed their junior-high-school students to take high-school-level mathematics course-work (ibid.). Press coverage of the event was somewhat remarkable and included a front-page story in the Sunday edition of the *Chicago Tribune.*

Based on the success of the project in three pilot sites, the state agency decided to copy the SMPY talent-search concept (George & Solano 1976) on a statewide basis. In July, 1978, the Illinois Office of Education negotiated with the nine Gifted Area Service Centers (regional service delivery units) to implement a mathematics talent search for their respective regions of the state. Most centers limited participation to the public schools within each region that were currently participating in the state gifted program. This included 465 districts in the state of Illinois and the city of Chicago.

Program Implementation

A portion of state funding in Illinois has been set aside since 1971 to fund nine regional centers for facilitating the education of the gifted. Each center is staffed by two full-time professionals in the field. Historically, the major role of the centers has been to provide technical assistance in program development for the gifted to the districts participating in the state-funded program. Thus natural linkages were already in place to regionalize the math talent search, since each center already had responsibility for and contact with between forty-five and ninety-five districts in their geographical area through district-designated program coordinators. Further, as a part of its contract, each center had the potential to carry out the talent search and the follow-up educational facilitation work by utilizing existing staff.

Beginning in 1978 this network of Area Service Centers became organized to implement the program statewide. The implementation was accomplished through the following processes:

1. Area Service Centers solicited names of students in participating

TABLE 10.1. Results of the Illinois Pilot Program and the SMPY January, 1978, Program

	Bethalto (Dec., 1977)	Niles (Oct., 1977)	SMPY (Jan., 1978)
	Identification Phase		
Percentile used for cut-off score for talent search	96	98	97
Grade level(s) included in talent search	7th & 8th	7th	7th
Number of students nominated for testing as part of talent search	85	510	3,333
Number of students taking test	7th grade 43 8th grade 34	320	2,798
Highest SAT-M score[a]	760	780	790
Lowest SAT-M score	290	260	220
Mean SAT-M score[b]	7th grade 406 8th grade 501	390	432
Mean SAT-V score[b]	358	338	374
Median SAT-M score	450	380	Males 427 Females 396
Median SAT-V score	340	330	Males 363 Females 366
	Development Phase		
Number of students eligible for fast-math class	35	55	
Number of students taking class	25	48	
Number of students completing class	24	35	
Mean score on ETS Algebra I (reference)			
Pre-test	18.4	18.3	
Post-test	33.4	35.8	
Mean score on ETS Algebra II (reference)	Not given	33.6	
Mean score on ETS Algebra III (reference)	Not given	30.9	

[a] All SAT scores are converted from the SCAT with the exception of the data reported from SMPY. Scores above 740 are extrapolated.
[b] Mean SAT-M and SAT-V scores for college-bound twelfth-grade males are 491 and 428, respectively.

districts of the Illinois Gifted Program who scored at the ninety-fifth percentile or higher on a standardized achievement test in mathematics.

2. These students were invited to take a test comparable to the College Board's Scholastic Aptitude Test, the School and College Ability Test Form 1C-Mathematics (SCAT-M) and -Verbal (SCAT-V) (ETS 1955), at a specific place and time scheduled by the center.

3. Those students scoring 420 or better on SCAT-M were invited to participate in a special fast-paced mathematics class in their regional area.

4. Special classes were set up as the talent search revealed enough students in the same geographical area.

5. In regions where special classes were not established, special intervention strategies were shared with appropriate school personnel.

Data from the first two years of the search can be seen in tables 10.2 and 10.3. It should be noted that over 6,000 students were tested in this period; thirty-four special courses were structured as a direct result of the

TABLE 10.2. 1978–79 Illinois Talent-Search

Coordinating Center	Number of Students Tested[a]	Cut-Off Score on SCAT-M Utilized for Facilitation	Number Qualifying	Top Score on SCAT-M	Facilitation Offering (classes)
City of Chicago	1011	450	376	800 (2)	5 algebra I, II, and computer programming; 7 special math seminars for all tested
Area I: north	800 (97%)	500	100	780	2 at Niles West (algebra I & II)
Area I: south	388	500	31	590	2 enrichment for 8 weeks
Carthage	175	450	30	800	no classes; individual acceleration
Illinois State University	79	400	31	580	none
Benton	166	420	52	650	none
Belleville	100	470	24	760	1 8th-grade algebra I at community college
Northern Illinois University	156	450	28	740 (2)	1 regional algebra I & II
University of Illinois	140	500	30	740	none
Total	3,015		702		11

[a] All regions utilized a ninety-fifth percentile cut-off on standardized achievement to derive students tested – except region I: north.

TABLE 10.3. 1979–80 Illinois Talent-Search

Coordinating Center	Number of Students Tested[a]	Cut-Off Score on SCAT-M Utilized for Facilitation	Number Qualifying	Top Score on SCAT-M	Facilitation Offering (classes)
City of Chicago	487 (7th)	420	49	720	3 algebra I & computer programming; 1 (advanced) geometry & computer programming
Area I: north	800 (97%)	470	90	780	1 algebra I & II, geometry, & part of trigonometry
Area I: south	515	420 Math 420 Verbal	100 25	720 Math 580 Verbal	1 pilot verbal Latin I; 3 7th-grade algebra I & II; 2 8th-grade algebra II & geometry
Carthage	225	450 Math	32	760	1 7th-grade algebra, geometry, & logic
Illinois State University	298			800	none
Benton	160	420	40	640	3 8th-grade algebra I (2 in district and 1 at a junior college)
Belleville	125	450	70	800	3 8th-grade algebra I
DeKalb	262	440	74	700	4 8th-grade algebra I & II
Rantoul	159	430	106	640	1 8th-grade algebra I & II
Total	3,031		586		23

[a] All regions utilized a ninety-fifth percentile cut-off on standardized achievement to derive students tested – except region I: north.

testing. Awards ceremonies were held regionally in all areas. In addition, in June, 1979, the Illinois Office of Education sponsored a statewide awards luncheon for students scoring 600 or better on the SCAT-M. The following year, in June, 1980, a four-day residential program for students scoring 500 or better on SCAT-M was held on the campus of Illinois State University.

Fast-Math Classes

Statewide, the fast-math classes varied to some extent in the number of students served and the amount of material covered. The northern suburban area of Chicago classes covered the most: algebra I and II in the seventh-grade and plane and solid geometry and trigonometry in the eighth-grade year. High schools in the area provided Advanced Placement Calculus, Level AB, and two universities (Oakton Community College and Northwestern) provided linear algebra, calculus II, and differential equations to complete the sequence.

The southern suburban area of Chicago offers algebra I and II in the seventh and the eighth grade, respectively, with high schools providing two additional years of mathematics instruction. Prairie State College then offers the students advanced mathematical instruction in their junior and senior years of high school.

Other areas of the state, including Chicago, facilitate through fast-math classes only at the eighth-grade level in algebra I, along with some exposure to other mathematics. Thus students begin their high-school sequence with algebra II and thereby save one year of traditional instruction.

For the northern and southern suburban areas of Chicago, 65 percent of the students continue with the fast-math program beyond the first year. Approximately 18 percent enroll in university mathematics courses while still in high school. Where facilitation occurs in the eighth grade only, 80 percent of the students successfully complete the program. The ETS Algebra Cooperative Tests are utilized to confirm proficiency and placement decisions.

1979–80 Pilot Verbal Program

Because of the great success in mathematics, a pilot class in the verbal area was begun for the 1979–80 school year. The students met for two hours of instruction per week. In twenty-six sessions they completed the high-school Latin I text, *Latin for Americans* (Ullman, Henderson, & Henry 1968).

Students were exposed to the following routine during the two hours of instructional time: Latin vocabulary work, review of new concepts from the preceding week, homework discussion, introduction of new concepts, practice and application of new concepts, sight translations, discussion of Roman myths, and assignment for the next week. Assignments consisted of learning vocabulary and doing exercises in the new material covered. A second text, titled *Myths and Their Meanings* (Herzberg 1978), was utilized for enrichment purposes. The class was grouped into three sections to provide for individualization of progress.

A proficiency examination developed by high-school Latin teachers in the area was given to the students at the end of the course, in June. Placement and credit options were then discussed with those high schools to which the students would matriculate. Table 10.4 is an overview of the student progress in the pilot program. Twelve of the fourteen students completed the program. Ability on the SCAT-V did not seem to relate strongly to later performance in the class, but it must be kept in mind that there was little variance in SCAT-V scores (see table 10.4). The best predictor of class success was related to motivational factors surrounding completion

TABLE 10.4. Latin Pilot Class: Selection Scores and Results, 1979–80

Student	Sex	Pre-SCAT (Sept., 1979) V	M	Post-SCAT-V (June, 1980)	Proficiency Test (% Correct)	Recommendation
1	M	530	720	610	84	Pass to Latin II (class grade: *A*)
2	M	500	380	610	51	Qualify for regional program (combined Latin I, II) (class grade: *C*)
3	F	460	480	570	70	Pass to Latin II (class grade: *A*)
4	M	460	380	610	67	Pass to Latin II (class grade: *B*)
5	M	460	350	450	50	Qualify for regional program (combined Latin I, II) (class grade: *C*)
6	M	430	340	450	76	Pass to Latin II (class grade: *B*)
7	M	420	470	520	54	Qualify for regional program (combined Latin I, II) (class grade: *C*)
8	M	420	450	540	59	Qualify for regional class in Latin II (class grade: *B*)
9	F	420	390	460	65	Qualify for regional program (combined Latin I, II) (class grade: *B*)
10	F	420	340	470	51	Qualify for regional program (combined Latin I, II) (class grade: *C*)
11	F	420	330	470	Not taken	Other options in verbal areas
12	F	420	320	560	Not taken	Other options in verbal areas
13	F	420	300	480	79	Pass to Latin II (class grade: *A*)
14	F	390		450	63	Try in Latin II (class grade: *B*)
		Mean				
		441	404	518	64	
		Standard Deviation				
		38	111	64	12	

of homework and eagerness to learn evidenced during class sessions. Also, students who showed high concentration ability succeeded in the program.

1980–81 Academic Talent Search

Buoyed by the results of the 1979 pilot program in Latin, two Illinois sites proceeded to conduct full-fledged searches for students scoring at the ninety-fifth percentile or higher on a standardized achievement test in the verbal or the mathematics areas. This yielded 625 participants for the spring testing of seventh-graders in Chicago Public Schools and 750 in the southern suburbs of Chicago. The SCAT was again utilized for identification at the second level. Arbitrary cut-off points of SCAT-M $\geq$ 420 for mathematics facilitation and SCAT-V $\geq$400 for verbal facilitation were set for purposes of recommending students for special city or regional classes. In Chicago, 320 scores qualified for facilitation in mathematics, verbal, or both, accounting for 51 percent of all students tested. In the southern suburbs of Chicago, 187 scores qualified in a similar manner, which represented 21 percent of all students tested. In Chicago, 33 percent qualified for the verbal classes and 67 percent for mathematics classes. The respective figures for the southern suburbs were 39 percent and 61 percent. For further data on these two regional talent searches, consult tables 10.5 and 10.6.

Sex differences were apparent in the talent search, paralleling what SMPY has found in its program (Benbow & Stanley 1980, 1981). For example, for every female scoring at least 500 on the SCAT-M there were 2.6 males. On the SCAT-V the proportions were almost equal.

1980–81 Facilitation Efforts

Chicago

Educational facilitation for students in the city of Chicago occurs at the eighth-grade level. Three semesters of algebra instruction including algebra I and a part of algebra II were offered through classes taught by university professors at the University of Illinois (Circle Campus) and Chicago State University. Approximately eighty students were enrolled.

In the verbal area, Chicago State University offered one writing class for eighteen students; Loyola University offered a class, serving twenty-two students, in Latin and Greek languages and cultures.

Southern Suburban Area of Chicago

The mathematics sequence offered through the regional programs provided two semesters of algebra I at the seventh-grade level and two

TABLE 10.5. 1980–81 Ranges of Scores for Chicago and Area I: South on the SCAT-M and SCAT-V

Range	Chicago (N = 625 ending seventh-graders)	Area I: South (N = 750 beginning seventh-graders)
	SCAT-M	
700–800	2	0
600–699	7	2
500–599	51	14
400–499	187	109
	SCAT-V	
700–800	0	0
600–699	4	1
500–599	10	4
400–499	92	68

TABLE 10.6. 1980–81 Academic Talent Search and Development for Two Sites in Illinois

Location, Number Tested, and Date	Qualifying Score	Number of Students Qualifying for Facilitation		Top Qualifying Score		Number of Facilitation Classes	
		M	V	M	V	M	V
Chicago N = 625 ending seventh-graders May, 1980	420 Math 400 Verbal	214	106	760	690	4 8th-grade	2 8th-grade
Area I: south N = 750 beginning seventh-graders October, 1980	420 Math 400 Verbal	114	73	680	640	3 7th-grade 2 8th-grade	3 7th-grade

semesters of algebra II in eighth grade. The after-school classes consisted of twenty-six two-hour sessions. High-school placement and/or credit allowed able students to complete calculus by the end of their sophomore year and pursue advanced mathematical topics at area colleges for the third and fourth years of high school.

The 1980 mathematics facilitation in the southern suburbs consisted of three algebra I classes and two algebra II classes. All were taught by high-school instructors with training, experience, and interest in working with gifted children. Approximately sixty-five students were enrolled in these five regional mathematics programs.

In the verbal area, three classes of Latin I were offered to eligible students. The sequence of classes was Latin I and II in the regional programs followed by Latin III and IV in the first two years of high school *or*

four years of another foreign language in high school. High-school Latin teachers acted as instructors in all three programs, which were held at geographically determined subregional sites. Approximately thirty-five students were enrolled in the Latin program.

Summary

The Illinois replication of The Johns Hopkins University's SMPY project had over 7,000 students participating during its first three years. Special regional facilitation, established by the Area Service Centers, had allowed over 650 students to take special fast-paced classes. Selection of students followed the Hopkins two-step process; cut-off points for facilitation range from the sixtieth percentile to the eightieth percentile of the combined-sex high-school sample. A pilot effort in the verbal area of Latin in 1979–80 resulted in academic talent searches to identify and facilitate those students precocious in verbal areas as well as mathematics. Appendixes 10.1 and 10.2 present step-by-step identification and facilitation protocols.

Problems and Concerns

For other states and groups interested in a replication program such as the one described here, it might be useful to share major problem areas Illinois experienced in its efforts.

1. There have been problems generated around issues of placement following and credit for work completed in the fast-paced classes. Some schools will not accept the ETS Algebra Cooperative Tests as evidence of high proficiency. Therefore, additional testing has occurred at the high-school mathematics department level in order to assure placement. Additionally, some high schools have a school-board policy prohibiting the awarding of credit for such classes.
2. In some cases, articulation of the classes with the home-school mathematics program has been difficult.
3. Lack of teachers in the junior high schools trained to meet the needs of our students is another problem area. Many cannot provide assistance even with algebra I homework.
4. The need for effective communication in this program is vital, yet it is difficult to effect because of the bureaucratic organization in school districts.

5. Since early entrance to university mathematics classes is both a natural and an intended result of the program, problems emerge in terms of tuition payments, transportation, and scheduling around other high-school subjects.

6. For Illinois, the use of the SCAT has created a problem in test administration and uniformity in procedures. Also, test security and the age of the test have been called into question. Yet control over testing procedures is deemed important for establishing facilitation efforts. On the basis of the experience in Illinois, it is recommended that the College Board's Scholastic Aptitude Test (SAT) be used, as it has been by SMPY.

Positive Implications

It is fair to assume that the replication of the Johns Hopkins model in mathematics and, later, in verbal areas has had a profound effect on the state program in Illinois and has served the needs of a large number of gifted students. Perhaps the most notable of these effects are as follows:

1. The drama associated with younger children's scoring very high on difficult tests has created a positive public-relations furor, with school districts clamoring to take credit for good results. Newspaper and television coverage has been better for this project than for any other ever attempted in the state.

2. The project has forced better articulation between junior high schools and high schools. Where little or no communication existed before, now real planning, albeit in specific areas, is occurring for these highly gifted students.

3. The project has forced practicing professionals in the field of education for the gifted to focus on serving those students who clearly demonstrate giftedness as opposed to haggling over who might be gifted in a particular district.

4. The project has displayed brilliantly the need for matching the nature of the giftedness to a specific and appropriate program intervention strategy.

5. The identification protocol provides a pool of students for whom a variety of intervention techniques could be tried.

6. Junior high schools are offering more appropriate mathematics curricula. A few are following the algebra I and II sequence at seventh and eighth grade, respectively, within their own districts. Thus mathematics acceleration becomes integrated into their regular course offerings.

7. Because of the successful mathematics intervention, experimentation in other content areas is being conducted.

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Notes

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APPENDIX 10.1: Illinois Academic Talent Search: Identification Protocol

Step 1. Find all students scoring 95 percent or higher on standardized achievement test in verbal and/or mathematics areas.

Step 2. Administer to this population an aptitude test that correlates well with the SAT.

Step 3. Share results of testing with all students taking the test; recommend special classes for those scoring better than 60 percent of college-bound seniors on a similar instrument.

APPENDIX 10.2: Illinois Academic Talent Search: Facilitation Protocol

Step 1. Set up fast-paced classes (algebra I–II) for high-scoring math students. Set up fast-paced classes (Latin I–II or other appropriate options) for high-scoring verbal students.

Step 2. For students who wish to take the classes, create a class within their geographic region, if enrollment permits.

Step 3. Administer a program of fifty-two hours of instruction in two-hour classes once a week after school in the specified content area.

Step 4. Evaluate the classes semiannually in respect to proficiency levels, attitudes, and other evidences of growth gains.

Step 5. Provide for articulation of the program with participating school districts, high schools, and local universities.