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ABSTRACT

A program to facilitate instruction for mathematically and scientifically gifted junior high students was described. Compared were nine educational alternatives for the gifted such as homogeneous grouping and early admission to college in terms of educational goals such as allowing for individual differences. Thirty-five scorers in a science fair competition were evaluated individually and detailed analyses of seven of the students' test scores and backgrounds were given. It was recommended that the students take college courses, or enter college early. It was reported that family background of the students usually involved bright parents though not all parents were college educated or in professional occupations. No obvious differences in college class participation between college students and the junior high students were found, and no grade of less than B was reportedly received by a student taking a college course. Mathematical knowledge appeared to derive from independent study or from working math puzzles. Briefly noted was a Saturday class in algebra, geometry, and trigonometry for a group of 22 mathematically gifted sixth graders. To stimulate the highly talented, schools were encouraged to identify advanced students, provide additional testing and counseling, and allow flexible scheduling and program planning. (DB)

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Subject ---------- Educational facilitation for mathematically and scientifically precocious youth

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Educational Facilitation for Mathematically and Scientifically Precocious Youth [1]

Lynn H. Fox and Julian C. Stanley

The Johns Hopkins University

How can we best serve the individual educational needs of youths who are mathematically and scientifically precocious? Last spring at AERA Mr. Keating and Dr. Stanley reported two cases of radical acceleration from eighth grade to college in a single bound. We do not feel that this is the ideal solution for most of the talented students we have identified. We would like to share with you the results of our study of highly talented youth and our explorations of a number of alternatives for facilitating their educational development.

We believe that the major task is to create a flexible program for each of these students which allows for individual differences, enriches experiences, increases opportunities, and when appropriate, telescopes the amount of time spent in school. Table 1 summarizes the various goals and indicates how a variety of alternative methods of facilitation appear to satisfy these requirements.

Insert Table 1

We believe that the majority of these students need bridging mechanisms which will help them make a gradual transition from junior high school to college. This typically involves using a variety of the educational techniques described in Table 1. Thus, a student who is highly advanced

[1] Based on a paper presented at the AAAS Annual Meeting, WAshington, D.C., 28 December 1972, soon to be published in J.C. Stanley, D.P. Keating, and L.H. Fox (Eds.), Mathematical Talent: Discovery, Description and Development.

Table 1: The effectiveness of nine alternatives for the educational facilitation of extremely gifted youth in relation to six educational goals.

Method of Facilitation	Goals[1] 1	2	3	4	5	6
Homogeneous grouping	—	—	—	—	?	—
Special school	?	?	—	?	?	?
Enrichment	—	—	+	—	—	—
Grade skipping	+	—	+	—	?	+
Advanced courses	+	?	+	+	+	+
College courses	+	+	+	+	+	+
College correspondence courses	+	+	+	+	—	+
College credit by examination	+	+	+	+	—	+
Early admission to college	+	+	+	+	+	+

[1]Goal 1: Opportunity for learning stimulating material.

Goal 2: Opportunity for self-paced study.

Goal 3: Practical for small number of students.

Goal 4: Allows for individual differences

Goal 5: Allows for social involvement with both age and intellectual peers.

Goal 6: Shortens number of years towards earning college degree.

and motivated in mathematics and science and slightly less advanced in other subject areas might accelerate by one year from the eighth grade to the tenth grade and take advanced course work at the high school in mathematics and science. During the eleventh grade he may find it best to take his mathematics and science courses at the college level on either released time from school at a local college or in the evenings or by correspondence. At the end of the eleventh grade, the student, his parents, and the schools can decide whether he is ready for early admittance to college or should continue a balanced program of high school and college courses.

Recently, many colleges have initiated early admissions programs as well as time-sharing programs with local high schools. This new approach to the transition from high school to college is especially appropriate for the gifted when the criterion for participation is not rigidly structured by age and grade, but is determined more realistically by the level of competence a student has obtained in each of the subject areas. Programs such as the three-year B.A. which Dr. Stark will discuss are likely to be attractive to the type of student with whom we are working.

Let us consider specifically some of these educational alternatives in terms of the group of high scorers in our competition. As Mr. Keating noted, we see a great deal of difference in cognitive abilities among this very able group of students. While almost all of the students we identify via college-level tests of mathematics aptitude and achievement tend to be very high on measures of abstract reasoning, they are not all equally high on measures of science knowledge, verbal aptitude, space relations, or mechanical comprehension. There are also differences in personality, interests, maturity, and home backgrounds. Some of these differences seem more critical than others when one is trying to plan educational programs for particular individuals.

We reported all test score results to students and their families and encouraged them to discuss these results with the students' counselors and teachers. We analyzed each student's profile, and discussed with the parents some ways of facilitating the student's educational progress. Table 2 shows test score data for seven of the thirty-five highest-scoring boys on the 4 March 1972 mathematics and science tests.

Insert Table 2

For each student we tried to construct a picture of the whole person. Our recommendations to the parents were based on several considerations: the individual's profile of cognitive abilities, his interests and maturity, and the opportunities available to him in his school situation. To illustrate the decision-making process more fully, let us consider each of the seven students in Table 2.

Case A. We see that student A has an extremely high SAT-Quantitative score (99th percentile of high school seniors) but only a relatively modest SAT-Verbal score (70th percentile for high school seniors). His relatively low verbal abilities are reconfirmed by his low score on the Concept Mastery Test. His Raven's Progressive Matrices score of 33 of 36 items indicates excellent reasoning ability. The fact that his math achievement score is 110 points lower than his aptitude score (69th percentile of high school seniors who have 7 semesters or more of math) reflects on the fact that he has had no formal instruction in algebra or beyond. The mathematics which he does know he has apparently taught

Table 2: Test score data for seven of the high scorers on Science Fair tests.

Student	Grade	SAT Verbal	SAT Math	CEEB Math Achievement	Raven's Advanced	Science	CMT	Holland	AVLSV	Type of School
A	8	460	740	630	33	38	39	I	TER	Private
B	8	530	550	470	33	66	49	I	TAS	Public
C	7	530	710	730	32	68	50	I	TER	Public
D	8	740	620	520	31	59	95	I	T SR P	Public
E	7	450	690	520	35	43	65	I	SRA	Private
F	8[1]	310	660	600	—	39	38	R	ETR	Private
G	9[1]	560	790	770	33	54	75	I	TEA	Public

[1] Already accelerated one year.

Key to tests:

SAT-Verbal: Scholastic Aptitude Test. Highest possible score is 800. Average score for high school senior boys is 390 and for typical SAT candidate is 463. (Educational Testing Service).

SAT-Math: Scholastic Aptitude Test. Highest possible score is 800. Average score for high school boys is 422 and for SAT candidates 510. (Educational Testing Service).

CEEB Math Achievement: Highest possible score is 800. A score of 600 is the 59th percentile for high school seniors who have at least seven semesters of mathematics. (Educational Testing Service).

Raven's II: Raven's Progressive Matrices Advanced form. Highest possible score is 36. A score of 21 is the 95th percentile ~~of college freshmen~~ for 14 year olds. (Psychological Corporation).

Science: Sequential Tests of Educational Progress, Form 1A. The highest possible score is 75. A score of 61 is the 99th percentile for high school seniors. (Educational Testing Service).

CMT: Concept Mastery Test. A score of 55 is probably typical of graduates of state colleges. (Psychological Corporation).

Table 2: Test score data for seven of the high scorers on Science Fair tests. (Continued).

Key to tests: (Continued).

<u>Holland</u>: A one-page occupational check list from the Holland Self-Directed Search Vocational Inventory. The letters represent the category of jobs most often checked by the student. The categories are: I -- investigative; R -- realistic; C-- conventional; A -- artistic; E -- enterprising; S -- social.

<u>AVLSV</u>: Allport-Vernon-Lindzey Study of Values. The three letter combination represents the highest, second highest, and lowest of six values: A -- aesthetic; E -- economic; P -- political; R -- religious; S -- social; T -- theoretical.

himself by working the math puzzles in the Scientific American for the past three years. His interests are theoretical and investigative.

Case A's relatively low verbal score and lack of formal instruction in mathematics make it unlikely that he is ready for a college level mathematics course. However, his high math aptitude, reasoning ability, and theoretical interest make it indeed seem plausible that he could do well in a beginning computer science course. A's parents should try to work with the school to see if A can begin studying more advanced courses in mathematics.

Case B. While B's scores of 530 (84th percentile for high school seniors) and 550 (81st percentile for high school seniors) on the SAT are probably as good as average entering freshmen at many state colleges, we did not recommend that B take any college level courses at this time. We did suggest that B should take as much advanced math and science as could be arranged between now and the eleventh grade. B should definitely apply for early admission to college at the end of the 11th grade.

Case C. C's scores of 710 and 730 (99th percentiles for high school seniors) on the SAT-Q and Math Achievement are particularly remarkable since he is only a seventh grader. C has been studying independently through algebra, trigonometry and geometry with the help of his father. Although his verbal scores are not extremely high, it seemed reasonable to recommend a college mathematics course for C during the summer. It was also suggested that C's parents try to work with the schools to let him continue independent study of mathematics and release him from the regular in-grade mathematics. C's knowledge of science is also quite excellent. In our competition he won prizes for both the mathematics and science tests.

It is certainly likely that C will be ready for full-time college admission in two to three years.

Case D. D entered the science competition but not the mathematics one. Although he has high theoretical and investigative scores, he is not interested in mathematics. His verbal scores of 740 and 95 on the SAT-V and CMT are certainly spectacular for a thirteen-year-old eighth-grader. We suggested that D will probably be ready for college in a year or two. We offered D the opportunity to take a college course in the summer in either computer science or astronomy.

Case E. E is another seventh grader, but he has not been doing the type of independent study in mathematics that C has done. Although E's scores are impressive for a seventh grader, he needs more basic mathematics such as Algebra I. We suggested that E skip a grade and take advanced mathematics and science if possible. E will be eligible for our competition this year. We will watch closely to see to what degree he can improve his scores.

Case F. F's mathematics scores are excellent, but his verbal scores are disappointingly low. However, it should be realized that F has already skipped one year of school. His school (which is a private junior-senior combination) is already making special arrangements for F to take advanced mathematics and science. His parents already plan to have F apply for admission to college at the end of the 11th grade. Therefore, the only recommendations we needed to make were suggestions for how F might try to improve his verbal scores.

Case G. G had already been accelerated one year and was in an advanced ninth grade program at a local high school. G has learned most of his mathematics from independent study while in the seventh grade. G has been referred to us prior to our Science Fair testing, and he was already taking a computer science course at Hopkins that semester. His high SAT-Q and math achievement scores confirmed what we already knew about him. We recommended that G take some college mathematics and science cor es during the summer and plan on entering college in the fall or following year.

The most unusual recommendation we made was to suggest that some students might benefit from taking a college course. Twenty-four of the winners, near-winners, and eight high scoring girls were offered the opportunity of taking a college course at either Towson State College or The Johns Hopkins University in math, science, or computer science in the summer. Ten students did take college courses that summer. Nineteen students were not considered ready for college level work. With the exception of one girl, all twenty-four students who were offered the opportunity to take a college course scored above 600 on SAT-Math, and seven scored above 700. The mean SAT-Verbal score for the group offered college courses was about a standard deviation above the mean of the group not offered courses. The group offered courses also scored higher on the STEP science test, the Concept Mastery Test, and the CEEB Math achievement test, but not on the Raven's Progressive Matrices test or the tests of mechanical comprehension. Mean scores for some of the cognitive tests for each of the three groups are shown on Table 3.

Insert Table 3

Table 3: Number and mean score for 43 winners and near-winners of mathematics competition.

Test* Taken	Group Taking College Courses				Group Offered but Declined College Courses				Group Not Offered College Courses			
	Male		Female		Male		Female		Male		Female	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
SAT-Verbal	9	570	1	610	12	590	2	530	14	492	5	468
SAT-Math	9	701	1	600	12	671	2	555	14	626	4	558
CEEB Math Achievement	9	630	1	---	11	609	2	510	13	525	3	477
Science	9	56	1	53	12	52	2	43	14	49	5	41
CMT	9	64	1	61	11	70	2	54	14	52	1	48
Raven's ABCDE	9	58	1	55	11	56	2	57	10	57	5	51
Raven's II	9	31	1	23	11	30	2	29	10	31	4	26
MCT, AA	8	46	1	35	10	38	--	---	13	41	4	29
MCT, CC	8	39	1	20	11	33	--	---	13	35	3	28

*Key to tests:

SAT-Verbal: Scholastic Aptitude Test - Verbal. Highest possible score is 800. Average scores for high school senior boys and girls are 390 and 393 respectively. Typical SAT candidates score 463 and 464 respectively. (Educational Testing Service).

SAT-Math: Scholastic Aptitude Test - Mathematics. Highest possible score is 800. Average scores for high school senior boys and girls are 422 and 382 respectively. SAT candidates score 510 and 466 respectively. (Educational Testing Service).

CEEB Mathematics Achievement: Highest possible score is 800. A score of 600 is the 59th percentile of high school seniors who have taken at least seven semesters of mathematics. (Educational Testing Service).

Science: Sequential Tests of EducationalProgress, Form 1A. The highest possible score is 75. A score of 61 is the 99th percentile for high school seniors tested in the spring. (Educational Testing Service).

CMT: Concept Mastery Test. Few norms exist for this test. However, from Dr. Stanley's experience with the CMT, it seems likely that the average graduate of a state college would earn a total score of not more than 55 on it. (Psychological Corporation).

Table 3: (Continued). Number and mean score for 43 winners and near-winners of mathematics competition.

*Key to tests: (Continued).

Raven's ABCDE: Raven's Progressive Matrices Test. A test of non-verbal reasoning. The maximum score is 60. a score of 53 is the 95th percentile for 14 year olds. (Psychological Corporation).

Raven's II: Raven's Progressive Matrices, the advanced adult form. The highest possible score is 36. A score of 21 is the 95th percentile for 14 year olds. (Psychological Corporation).

MCT, AA: Bennett's Mechanical Comprehension Test, Form AA. Highest possible score is 60. A score of 40 is the 20th percentile for engineering freshmen. (Psychological Corporation).

MCT, CC: Bennett's Mechanical Comprehension Test, Form CC. Highest possible score is 60. A score of 37 is the 25th percentile for Princeton freshmen. (Psychological Corporation).

Mean differences between those who attended college courses and those who declined were small on cognitive measures. There was a slight trend for the group who attended college to score higher on the mathematical aptitude test, the math achievement test, the science test, and tests of mechanical comprehension, and to score slightly lower on the verbal tests than the group who declined.

Sixty percent of the group who took college courses had both high theoretical values as measured by the Allport-Vernon-Lindzey Study of Values and high investigative occupational preferences as measured by a one-page checklist from John Holland's Self-Directed Search. Only forty percent of the group who declined the opportunity were both theoretical and investigative. Students who took college courses had slightly higher aesthetic values and slightly lower social values than the rest of the winners and near-winners.

Table 4 presents some selected characteristics of the group. Parents of the winners and near-winners and the eight girls do appear to be very bright themselves. However, not all of the parents had college educations or were employed in professional occupations. About 74 percent of the students had at least one parent who had graduated from college, and about 50 percent of the fathers were in occupations which typically require college degrees.

Insert Table 4

Talent seems to exist everywhere. Students come from both public and private schools and are located in rural as well as metropolitan areas.

Table 4: Selected characteristics of the 43 winners and near-winners of the mathematics and science competition

		Father's Occupation		College Education		Birth Position		
Students	No.	Professional	Business or Other	Both Parents	At Least One Parent	1st Born or Only Child	Not 1st Born	Attending Public School
Total	43	21	22	17	32	23	20	33
Taken College Courses	10	7	3	3	8	5	5	9
Offered but Declined College Courses	14	8	6	9	11	9	5	10
College Courses Not Offered	19	6	13	5	13	9	10	14

The most extreme recommendation made to students in our program was the suggestion that they might enjoy a college course. How successful are junior high school students in college courses? Table 5 shows the courses taken and grades earned for ten of the competition winners and near-winners and four other students we discovered prior to the testing. The evidence is overwhelming. Students with high mathematical aptitude and motivation do very well in college courses taken for credit, and report that they enjoy them very much. No student or parent has reported any negative feelings about the college experience.

Insert Table 5

Systematic observations of some of the students in the college classroom, which are soon to be reported by Keating, Weigand, and Fox, showed no obvious differences in class participation between able junior high school boys and regular college students. The regular college students were no more or no less aggressive or eager in class participation. Indeed, neither the teacher or regular college students were aware of the great age difference which existed among the students. The "young" students were most apt to be recognized for their superior talents than for their youth.

It is interesting at this point to ask just how junior high school students become so knowledgeable in mathematics when they had not had formal instruction in algebra or geometry or trigonometry in school. Our investigations thus far suggest that the students we identify as being highly advanced in their mathematics knowledge differ from

Table 5: Educational Progress Report for students taking college courses during the 1972 calendar year.

Student No.	Age at Time of Course	School	Course Taken	Semester Spring	Semester Summer	Semester Fall	Grade Earned	Other Notes
1	16	JHU	Intro. to Computer Science	X			A	
		JHU	Entered full-time			X		
2	13	JHU	Intro. to Computer Science	X			A	Accelerated one year in school. Now in 9th grade.
		JHU	College Algebra & Trig		X		B	
		Goucher	Mathematical Analysis I			X	A	
3	14	JHU	Intro. to Computer Science	X			A	Accelerated two years. Now in 11th grade.
4	15	JHU	Intro. to Computer Science		X		A	Lives out of state during school year. Now in 10th grade.
		Towson	Math I		X		A	
5	14	Towson	Math I		X		A	Accelerated to 10th grade.
		Towson	Math II		X		B	
6	13	Towson	Math I } Taken concurrently		X		A	Accelerated to 9th grade. Now studying calculus.
		Towson	Math II }		X		A	
7	14	JHU	Intro. to Computer Science		X		B	
8	12	JHU	Chemistry		X		B	Accelerated to 9th grade.
9	13	JHU	Intro. to Computer Science		X		A	

Table 5: (Continued). Educational Progress Report for students taking college courses during the 1972 calendar year.

Student No.	Age at Time of Course	School	Course Taken	Semester Spring	Semester Summer	Semester Fall	Grade Earned	Other Notes
10	14	JHU	Intro. to Computer Science		X		B	Accelerated. Now in 10th grade.
11	14	JHU	Intro. to Computer Science		X		B	Accelerated to 10th grade. Participates in Sat. Math class.
12	16	Towson	Math I		X		B	
13	14	Towson	Math I		X		A	Plans to enter JHU in the fall.
		Towson	Math II		X		A	
		Towson	Computer Science			X	A	
14	14	Towson	Math I		X		A	Skipped to 10th grade. Plans to enter JHU in the fall.
		Towson	Math II		X		A	
		JHU	Intro. to Computer Science			X		

their less advanced peers in one of two main ways: either they had been working independently in advanced mathematics textbooks with the help and encouragement of a teacher or parent or they had acquired their knowledge less systematically from working math puzzles such as those in the *Scientific American*.

It seems that students who have not had much formal training in mathematics are able by means of excellent mathematical reasoning power to solve math problems without having learned specific formula or technique. For example, a child who does not know the rule for dividing one fraction by another (invert the latter and multiply) may be able to reason that 3/6 ÷ 1/2 = 1, because 3/6 = 1/2 and 1/2 divided by 1/2 is 1, or that 3/6 ÷ 1/4 = 2 because 1/4 + 1/4 = 2/4 = 1/2, but he may not be able to tell you the rule or solve the problem when it becomes more complex, such as 3/5 ÷ 1/2.

Another example of the reasoning used by these types of able students is taken from a discussion with a nine-year-old boy. He didn't know the formula for the area of a triangle but knew how areas in general are computed and was able to generate the formula for the area of a triangle by reasoning that if areas of rectangles are the products of the measures of height and width, then a triangle should be half as large in area as the rectangle formed by putting together two such triangles. So he concluded that the formula for the area of a triangle would be one-half the product of the height and width of the triangle.

In order to broaden our understanding of the development of precocious achievement in mathematics we decided to select a group of sixth graders who had high mathematical aptitude as measured by the relevant subtest of a sixth grade test battery and to provide the opportunity and encouragement for rapid learning of algebra, geometry, and trigonometry. Details of this study and their implications for understanding of mathematical precocity and sex differences in mathematical achievement are soon to be published.

In general we have concluded that bright students can learn a great deal of mathematics very quickly primarily through independent study under the guidance of good teachers. These students are expected to master algebra, geometry, and trigonometry in one year. They began their studies last June, meeting only on Saturdays as a class. They are enrolled in various different schools throughout Baltimore County. A few are in the eighth grade now (two skipped the seventh grade); most are seventh graders. Table 6 shows their scores and percentile ranks on standardized algebra tests. It is clearly apparent from the test scores in Table 6 that able seventh graders can learn Algebra I with only twelve to eighteen hours of formal class instruction.

Insert Table 6

The students who have had the greatest success with our year's program of rapid mathematics learning and enjoyed it the most are those who are both highly motivated to study mathematics and also verbally proficient at a high level. Most of the girls who participated in the program are not highly theoretical and investigative in terms of interest and have made somewhat slower progress and are less interested in the course itself and in becoming accelerated in their mathematics development. The boys who have benefitted the least from our intervention are those whose verbal abilities are low as compared with the rest of the group and the one who was poorly motivated.

Table 6: Scores on algebra tests and verbal subtests of APT and SCAT for students in the Saturday math class.

	Algebra I				APT	SCAT
	Form A		Form B			
Student	Score	Percentile 9th grade	Score	Percentile 8th grade	Verbal Score	Verbal Score
1[3]	38	99	39	97	--	43
2[3]	37	99	39	97	--	44
3	35	97	39	97	43	30
4	35	97	36	89	42	29
5[3]	34	96	32	74	56	49
6[3]	33	96	40	99	53	35
7[3]	32	93	40	99	45	20
8[1,3]	32	93	38	97	41	13
9[3]	31	89	38	97	--	25
10	31	89	37	94	52	30
11	30	89	29	43	52	36
12	30	89	37	94	45	23
13	29	87	31	49	45	25
14[2]	27	79	--	--	45	31
15	27	79	31	49	42	28
16	24	60	--	--	43	22
17[2]	23	60	--	--	44	16
18[2]	20	42	--	--	36	9
19[2]	19	36	--	--	38	16
20[2]	18	27	--	--	48	30
21	18[4]	27	32	74	46	34
22[2]	15	15	--	--	34	15

[1]3rd grade boy.

[2]Dropped the course.

[3]Math competition winners or special referrals.

[4]Test administered before entering course for late entrant.

Therefore, we feel that the selection of students for this type of rapid-learning program should be carefully determined by considerations of the students' interests, values, and motivation. Selecting students on the basis of mathematical aptitude alone does not take fully enough into account the differences in motivation and learning style which are crucial to the success of such a program. The students who are most likely to benefit from this type of independent study approach are those who are already interested in mathematics and science and who also have the necessary verbal skills to allow them to read mathematics textbooks fast with great comprehension.

We are deeply concerned that to date we have found no girls who exhibit mathematical ability at the extremely high level that a considerable number of boys do. Nineteen percent of the boys scored above the highest scoring girls in our 1972 mathematics contest. That is, forty-three boys scored above 610 on the mathematical part of the SAT, whereas only three girls scored as high as 600. Only one of the girls in our special rapid-learning mathematics program seems to have the same interest and enthusiasm as the boys, and by and large the boys in that class out-score the girls on the SAT. Helen Astin (1972) has provided us with some insights into the nature of this problem. We hope in the near future to explore this area more fully. At present we have no conclusive evidence as to whether the differences are predominantly interest or cognitively based. We hope to learn to what extent adjustments to the learning situation per se might promote greater achievement and interest among the females.

In conclusion, we realize that many educators strongly believe in the individualization of education and actively avow its importance in educational planning (Thorndike, 1911). However, the kinds of students we are discovering and studying represent a very small part of the student population, about one in 200 of the age group. Only one or two may exist in a given school system or area. Rarely do schools have programs which are presently flexible enough to encompass the needs of so rare and select a group of students. We believe that our research yields insight into the feasibility of some approaches for talented young people.

We now know that there are so many well-motivated, mature students with so much ability that they are capable of mastering a great deal of mathematics at a rapid rate. We further know that many of these able youngsters can function successfully in the college classroom for some mathematics-based subjects and are far happier and more realistically placed there than in a seventh or eighth grade math class.

It would appear that schools and school systems need not expend great effort or money to provide the necessary kinds of stimulation and opportunities for the highly talented. Only four steps are involved:

1. Identifying students who are already advanced beyond their grade level in one or more subjects;

2. Providing additional testing and counseling to prescribe a program which relies on the resources of the school and the larger community to match the level of coursework for each student to that student's abilities and interests;

3. Scheduling and arranging for the student to allow for cross-grade placement and sometimes for cross-school placement (this is the most difficult problem for many schools);

4. Providing a flexible process of individualized planning which can readily adjust and adapt to the needs of the individual as he progresses.

We feel that it is no longer necessary to ignore the needs of the gifted simply because they are few in number, nor should we assume that they can take care of themselves without any special help from educators. We hope that our research will provide some guidelines for developing realistic programs for the gifted.

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