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PROGRAM PROVISIONS IN MICHIGAN JUNIOR HIGH SCHOOLS FOR SUPERIOR STUDENTS IN MATHEMATICS

by
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of the requirements for the degree of
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University of Michigan
1961

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CHAPTER I

INTRODUCTION

There is currently a great deal of interest in this country in the education of superior students. Some schools have been giving considerable attention to superior students for many years. Others recently have increased their attention because of the recognition of need to provide more adequately for pupils of superior ability.

Data in the area of special programs for superior students in junior high school mathematics are limited. It is hoped that this study will add to knowledge in this field by reporting what is being done in Michigan; determining the reactions of principals, teachers, and students closely associated with programs in Michigan; and ascertaining the academic achievement in algebra of selected superior eighth grade students enrolled in accelerated programs.

Definition of Terms

It is necessary that certain terms used throughout this study be defined for clarification as to exact meaning.

Junior High School

A junior high school was considered for the purpose of this study to be any public school which housed grade seven and/or eight as part of a secondary unit.

Special Mathematics Program

A special mathematics program was considered for the purpose of this study to be any mathematics class which separated superior students from other students at their grade level for the purpose of giving them a program different in content from the program given to the other pupils at the same grade level.

Superior Students

For the purpose of this study any students that a school selected for a special enriched or accelerated program were considered to be superior. It was not the purpose of this study to set standards for the selection of pupils for special programs.

The Problem

In examining the special junior high school mathematics programs for superior students in Michigan several aspects were examined. Four hypotheses were made at the beginning of the study.

Statement of the Problem

It was the purpose of the study to:

(A) Identify the various special mathematics programs provided for superior seventh and eighth grade pupils in all public junior high schools in Michigan during the school year 1959-1960.

(B) Ascertain the relationship between the principals' perceptions of the effectiveness of the special programs in which they were involved in schools which accelerated students into algebra at the end of the first semester of the eighth

grade, and the respective perceptions of the principals, teachers, and students in schools which accelerated pupils into algebra for the entire eighth grade.

(D) Ascertain the achievement level attained by students in the selected schools at the end of the eighth grade on standardized algebra achievement tests.

Hypotheses

The following conjectures were made at the beginning of the study:

(A) The variance of the means of the Principals', teachers', and students' perceptions, as determined on a 5 point rating scale, will not generally reach the .05 level of significance when they are compared group to group.

(B) The variance of the means between the principals', teachers', and students' perceptions, as determined on a 5 point rating scale, in the schools which accelerate students into algebra at the end of one semester of the eighth grade, and the respective principals', teachers', and students' perceptions, as determined on a 5 point rating scale, in the schools which accelerate students into algebra for the entire eighth grade will not generally reach the .05 level of significance.

(C) The perceptions of the effectiveness of the special mathematics programs for superior students in the selected schools will generally be above the 2 point level on a 5 point rating scale on which the number 4 indicates the most favorable perception and zero indicates the least favorable perception. This will be true of the perceptions of the principals, teachers, and students involved.

(D) The mean standard score on the Seattle Algebra Test, and the mean scaled score on the Cooperative Algebra Test for eighth graders in the selected schools, accelerated into one-half year of algebra and a full year of algebra, respectively, will correspond to at least the seventy-fifth percentile rank on national norms in each school.

Research Methods

There were three basic steps taken in the research for this study. These included a questionnaire, an opinionnaire and a testing analysis.

The Questionnaire

A questionnaire was sent to the principals of all junior high schools in Michigan to identify schools which offered special mathematics programs for superior students in the seventh and/or eighth grade. For those schools which had special programs the questionnaire asked for survey data relating to:

(A) The number of students involved

(B) The grade levels involved

(C) Identification of the specific programs as basically enrichment or acceleration

(D) The procedures employed in the establishment of the specific programs

(E) The methods used, and the standards set, for the selection of pupils participating in the special programs.

The Opinionnaire

Five schools which accelerated eighth graders into algebra for the entire year and three schools which accelerated

eighth graders into algebra for the last half of the year were selected for further study.

Each of these schools was visited personally by the author, at which time the principals, teachers of the special classes, and students in the special classes were asked to fill in an opinionnaire. The opinionnaire sought to discover the perceptions of these people as to the effectiveness of the special mathematics programs.

The Testing Analysis

In the same eight schools in which the opinionnaire was circulated, standardized algebra achievement tests were given by the teachers of the special classes near the end of the eighth grade and the tests were sent to the author of this study for correction and analysis.

Organization of the Study

Chapter II contains a review of authoritative writings related to this study. Basically it deals with the identification of superior students, special programs for superior students in general, and special programs for superior students specifically in mathematics.

Chapter III deals with the results of the questionnaire which was submitted to the principals of all the junior high schools in Michigan.

Chapter IV deals with the results of the opinionnaire and the testing analysis in the eight selected schools. In addition it gives a description of the schools involved, and tests the four hypotheses stated earlier in this chapter.

Chapter V contains conclusions made from the results of this study and recommendations for further study.

CHAPTER II

REVIEW OF RELATED STUDIES

Interest in the education of superior students has been intensified in recent years. Although there have been articles and books published for many years on the subject, the number has increased substantially during the last decade. The articles and books reviewed in this chapter are those which relate to the identification of superior students, special programs for superior students generally, and special programs for superior students in mathematics specifically.

Identification of Superior Students

The term "superior" was used advisedly throughout this study. It was stated in the previous chapter that a student would be considered "superior" if he were determined to be so by the school which he attended. However, it was important to examine studies about this type of student to clarify the commonly accepted meaning of the term "superior student," to identify generally accepted characteristics of this student, and to ascertain the methods used most commonly by schools for the identification of these pupils.

The Dictionary of Education in its definition of "Child, Superior" states that it is "a broader term than gifted child."[1] Baker makes a distinction between "the rapid learning," who he says, "include from 20 to 25 per cent of the school population,"[2] and the mentally gifted whose I. Q. restrictions are so severe that he can see "only about 1 per cent falling in this rigid classification."[3]

Baldwin, on the other hand, writing in 1924 on "Methods of Selecting Superior or Gifted Children," states, "In this chapter 'Gifted' and 'superior' are considered almost synonymous terms."[4] Witty[5] states that the term "gifted" is interchangeable with similar expressions such as "rapid learner," "more capable learner," and "high ability children."

The Encyclopedia of Educational Research states that:

> The term "gifted children" has traditionally been applied to those of superior intelligence as measured by standard psychological tests. Since the term is quantitative and does not imply any particular level, cut-off points may be established as matters of convenience. By custom and tradition it has been the habit of psychologists to apply the term "gifted" to

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[1]Carter V. Good (ed.), Dictionary of Education (New York: McGraw-Hill, 1945), P. 68.

[2]Harry J. Baker, Introduction to Exceptional Children (New York: the MacMillan Company, 1954), P. 273.

[3]Ibid, P. 282.

[4]Bird T. Baldwin, "Methods of Selecting Superior or Gifted Children," The Twenty-third Yearbook of the National Society for the Study of Education (Report of the Society's Committee on the Education of Gifted Children), Part I, Bloomington, Illinois: Public School Publishing Company, 1924), p. 25.

[5]Paul A. Witty and Samuel W. Bloom, "The Education of the Superior High School Student," The Bulletin of the National Association of Secondary-School Principals, XXXIX (January, 1955), p. 15.

those children with Stanford-Binet I. Q.'s of 140 and above, and to those whose intelligence is equally high as measured by other standard intelligence tests.[6]

The article goes on, however, to list a number of different standards used by various authorities:

> The procedures in identification of the group remain about the same regardless of the exact level of demarcation. Different researchers have preferred a variety of cut-off points. Thus I. Q. level 140 was used by Terman, 130 by Baker and by Hollingsworth, 125 by Danielson and by Norris, and 110 by Bentley. It may be noted that the characteristics of the group will change significantly as the degree of selection is increased.[7]

Witty suggests that the term "gifted" be used to refer to a child whose "performance in a worth-while type of human endeavor is consistently remarkable."[8] He also expresses concern over the use exclusively of verbal I. Q. tests to identify superior students, because of unfavorable socio-economic circumstances in the background of some of these students.[9]

Worcester appears to be in agreement with Witty:

> The terms above average and gifted are not precise ones. If we think in terms of I. Q.'s, a child of an I. Q. of 115 or above will be roughly speaking in the top 16 per cent, (one-sixth of the population). Giftedness has frequently been thought of in terms of I. Q.'s of above 130, although some writers have used a higher and some a lower point. Most writers would include in the gifted group not over 5 per cent of the population, and some would limit it to 3 per cent or even one per cent. In these days, usually included in these advanced groups are those who show exceptional

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[6] Encyclopedia of Educational Research (New York: The MacMillan Company, 1960), p. 584.

[7] Ibid.

[8] Loc. cit.

[9] Paul A. Witty, "Who to Identify the Gifted," Childhood Education, XXIX (March, 1953), pp. 312-316.

> talent in any area--music, art, mechanics, social leadership. All agree that evidence of superior mentality, while including intelligence as measured by tests, is not to be thought of in terms of such tests alone. The teachers' judgment and, above all, the child's actual performance must not be disregarded.[10]

In confirmation of the view of flexibility of standards for superior students, Sumpton and Luecking state "It must be recognized at the outset that any citing of characteristics common to gifted children is true of them only as a group. Within the group there will be many deviations from the expected pattern."[11]

The Dictionary of Education lists two definitions of "Child, Gifted" which focus attention on the varying views of rigidity and flexibility in the identification of gifted children. The identifications are as follows:

> Child, Gifted: (1) A child whose ability, as indicated by an intelligence test, is within the range of the upper 2 or 3 per cent of the population; (2) a child having outstanding ability in a given field, for example, music or art.[12]

In 1941, the Research Division of the National Education Association devoted an entire bulletin to "High School Methods with Superior Students." A great deal of the study focused itself on the results of a questionnaire which was sent to about 5,000 secondary school principals in the United States, inquiring about special provisions for superior students.

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[10] D. A. Worcester, The Education of Children of "Above-Average" Mentality (Lincoln: University of Nebraska Press, 1956), pp. 4-5.

[11] Merle R. Sumpton and Evelyn M. Luecking, Education of the Gifted (New York: The Ronald Press Co., 1960), pp. 42-43.

[12] Loc. cit.

The report states, "In the questionnaire, a superior student was defined as one who is distinctly above the average in general mental ability, in a specific aptitude, or in both. By 'average' was meant the average ability or aptitude of high school students in general, and not the average in a particular school."[13]

This rather loosely construed definition takes cognizance of the fact that in order to discuss programs for superior students in many schools, the ultimate standards for admission to these programs must be left up to the discretion of the individual schools depending upon the nature of the instructional program for which the students are being considered.

There are a number of methods used by schools to identify superior students. However, there is no universal agreement as to the most acceptable methods, nor is there agreement as to which methods should receive the greatest emphasis.

Witty[14], as previously stated, is concerned with too great an emphasis being put upon intelligence tests. The previously quoted National Education Association Research Bulletin, in contrast, states that, "The most satisfactory single method of identifying superior children is to use a dependable standardized intelligence examination."[15]

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[13]Research Division of the National Education Association, "High School Methods with Superior Students," National Education Association Research Bulletin, XIX (September, 1941), p. 157.

[14]Loc. cit.

[15]Op. cit., p. 159.

Passow and Brooks state that there is more to look for than intelligence per se. They indicate that, "By using procedures for determining intelligence, interests, special aptitudes, and achievement, students who require and can profit from special programs can be located."[16]

Sumpton and Luecking[17] list a number of aids to the identification of gifted children. They divide these into informal and formal methods. The informal methods are listed as parental and teacher observation. The formal methods are considered to be teachers' marks, health records, test scores, interpretation of cumulative records, and standardized test results. The types of standardized tests detailed are intelligence tests, achievement tests, aptitude tests, and sociometric tests.

Elder proposes a number of things for which the teacher should look for in using observation to identify children with high mathematical potential:

> The gifted child often has unusual, perhaps odd, interests.
>
> He has a rich associative background which is not to be confused with the social advantages possessed by some children.
>
> He has a quick understanding and a retentive memory.
>
> He has insatiable curiosity. He is not satisfied in being told How to do a problem, but demands to know Why, seeking the proof as well as the reason.
>
> He can discover and grasp several ways of solving the same problem. He will compare these methods and generalize his findings.

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[16] A. Harry Passow and Delton J. Brooks, Jr., "Mathematics and the Gifted Student - Some Problem Areas," The Bulletin of the National Association of Secondary-School Principals, XLIII (May, 1959), p. 66.

[17] Op. cit., pp. 43-63.

> He has a longer attention span than the others in the class. He is interested in challenging units of work rather than short specific assignments.
>
> He dislikes large amounts of routine and drill. He may neglect dull, practice homework assignments.[18]

Justman indicates that the techniques used for identifying gifted students need considerable refinement:

> Lack of precision in defining giftedness is related to the difficulties inherent in identifying gifted children. While it is true that considerable progress has been made in this area, and that intellectual ability can be assessed with a fair degree of adequacy, there is still much more that remains to be done.[19]

He goes on to explain his reasons for believing that "there is much more that remains to be done:"

> In spite of the progress that has been made, considerably more research is needed. Workers in the field now accept the point of view that giftedness is not unitary, but multidimensional, and that identifying the potentially gifted individual involves developing means for assessing each of the many dimensions. This, in itself, is not an easy problem to solve, but there are many others. The ways in which the many facets of giftedness interact to produce the potentially gifted individuals must then be studied, and the process through which potential talent becomes functioning talent must be determined. The research task is far from over.[20]

It would appear that the ultimate process of identification of superior students, as is the definition of who the superior students are, must be left to the individual schools operating special programs for these students and depend upon the type of program. Although there are guideposts to be followed, the pattern is flexible.

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[18]Florence L. Elder, "Providing for the Student with High Mathematical Potential," The Mathematics Teacher, L (November, 1957), pp. 502-503.

[19]Joseph Justman, "Some Unmet Problems in the Education of the Gifted," Exceptional Children, XXVI (April, 1960), p. 439.

[20]Ibid., pp. 439-440.

Witty and Bloom cite an example which has bearing upon this:

> For many years, Berkley, California, had a rather formal procedure for identifying superior students. After a long-term evaluation of this procedure, the Committee on Children with Special Abilities abandoned this plan. The identification of superior pupils is now left to the initiative and discernment of the individual teacher.[21]

Special Programs for Superior Students

It would be of little value for a school to identify its superior students unless it were to attempt to make some special provisions for them once they were identified. The need for and importance of such provisions is well documented.

Importance of and Need for Special Programs

In 1959 the Presidents' Science Advisory Committee made the following recommendation:

> Still more programs should be devised by which exceptionally able students can proceed at a pace commensurate with their abilities. Such students should be given formal recognition, locally and nationally. They should be treated as young people who will have exceptional opportunities and corresponding responsibilities. All this should be done without separating them unduly from their less able companions, setting them apart and making them appear peculiar.[22]

Cutts and Moseley draw upon an historical argument to advocate special programs for superior students.

> From the time of Socrates and before, thoughtful teachers have reasoned that the salvation of civilization depended on educating the brightest to become

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[21] Op. cit., p. 19.

[22] Presidents' Science Advisory Committee, Education for the Age of Science (Washington, D. C.: U. S. Government Printing Office, 1959), p. 14.

> leaders. Plato called education "the one sufficient thing," and proposed that the most intelligent and capable children be trained to become the guardians of his Republic, Sir Thomas More said that in his Utopia "all children are instructed in learning" and some are chosen to be scholars, namely those "in whom from their very childhood they have perceived a fine wit, a unique ability, and a mind apt to good learning.
>
> We in the United States have far surpassed the designs of the philosophers in establishing and maintaining universal schooling. But we have fallen far short of the ideal of identifying our bright and talented children and providing them with an education adapted to their capacity. As a result we are faced with dire shortages of teachers, scientists, and other professionally trained people.[23]

The National Education Association's Educational Policies Commission published a booklet in 1950, which gives an argument for a thorough and extensive education for the gifted and points up the relationship of these students to their fellow pupils.

> The educational experiences for gifted students should depend on two major considerations. First, because they are human beings, citizens, consumers, and prospective parents, they need a good general education, not unlike what is needed by all their fellow students, to equip them to deal competently with themselves, their environment, and their fellow men. Second, in addition, because they are the potential leaders in the professions, in business, and in other fields in a contracted world at an advanced stage of technological development, they need a wide acquaintance with the record of human experience, familiarity with foreign cultures and languages, and basic training in the tools of concepts of modern science.[24]

There are, however, arguments against special programs for superior pupils. Witty states that "Some educators assert

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[23]Norma E. Cutts and Nicholas Moseley, Teaching the Bright and Gifted (Englewood Cliffs, New Jersey: Prentice-Hall, 1957), p. 237.

[24]Educational Policies Commission, Education of the Gifted (Washington, D. C.: National Education Association, 1950), pp. 86-87.

that recourse to special classes is undemocratic since this practice endangers and encourages class distinction."[25]

Hildreth details this argument as follows:

> The chief argument against separate schools and classes for the gifted is that the policy is undemocratic. Questions such as the following are frequently asked: Is not such a school undemocratic because of a tendency to exaggerate class distinctions, the attitude that "we are better than others?" Aren't gifted children better off in heterogeneous, cosmopolitan, or unselected groups where they rub elbows with children of all intellectual levels? Is it fair to give the gifted some educational advantages that others do not have? Don't they become conceited "showoffs?"[26]

It should be emphasized that these arguments do not reflect the author's personal feelings, for she offers her own refutation of them.

> Answering these arguments, it is unrealistic to insist that equal opportunity must always take the form of identical experience. Equal education for all children in a democracy must be interpreted as equivalent opportunity in terms of each child's needs and capacities. There is no sacrifice of democratic ideals if "five-talent" children are given special training that will develop their capacities to the fullest degree; on the contrary, differentiated education is consonant with the principles of democratic living. By giving the gifted special training everyone will benefit from higher standards of living in the community, better government, better professional services.[27]

Nor does Witty present only one side of the coin. He writes, "On the other hand, the advocates of special classes assert that the gifted child is not challenged by the work

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[25]Paul Witty, "Educational Provisions for Gifted Children," School and Society, LXXVI (September 20, 1952), p. 181.

[26]Gertrude Howell Hildreth, Educating Gifted Children (New York: Harper and Brothers, 1952), p. 257.

[27]Ibid.

in a typical classroom which contains a large number of pupils of widely differing abilities."[28]

If a quantitative analysis of current literature has any significance, the "undemocratic" argument has lost whatever hold it once may have held.

In 1947, Santayana wrote as follows regarding the number of special programs for gifted children:

> Only four states - California, Wisconsin, Oregon, and Pennsylvania - have some degree of legislative authorization for organizing special classes for the mentally gifted, and only two states provide special financial aid. The problem of the bright child is conspicuously unsolved. Not more than thirty or forty school systems are giving any special recognition to the gifted child beyond permitting an accelerated progress through the medium of special promotion, or "skipping."[29]

It should be emphasized that this article was written thirteen years ago, and that indications are that many more school systems are now engaged in such programs. For example, it will be discovered in Chapter III of this report that there are more than forty junior high schools in Michigan alone, which are engaged in special programs for superior students in one specific subject field.

Acceleration

Many authorities go beyond Santayana's recognition of need for special programs and give strong recommendations for acceleration.

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[28] Loc. cit.

[29] S. George Santayana, "The Intellectually Gifted Child," The Clearing House, XXI (January, 1947), p. 263.

Reporting in The Twenty-Third Yearbook of the National Society for the Study of Education in 1924, Baldwin[30] states that gifted students who are large for their age should be accelerated to finish school one, two, or three years early. Terman and DeVoss[31], reporting in the same yearbook, strongly advocate acceleration of gifted students so that they may finish school early. In 1954, thirty years after the publication of the aforementioned article, Terman and Oden report on a follow-up study begun in 1924:

> The facts obtained in the thirty year follow-up of our large gifted group prove conclusively that children of 135 I. Q. or higher who are accelerated one, two, or even three years are usually more successful in later life than equally bright children who are held in the lock step.
>
> Acceleration is especially desirable for those who plan to enter a profession that calls for graduate study. Other advantages are that the accelerated find their schoolwork more challenging and their earlier graduation enables them to marry earlier (which on the average they do).[32]

Worcester presents a defense of acceleration, based on historical precedence.

> Historically, acceleration has been the most common method of adjusting to the needs of the rapid learner. Seventy-five and indeed even 50 years ago children moved through school at pretty much their own pace. When they were ready for another level they went on

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[30] Op. cit., pp. 45-46

[31] Lewis M. Terman and James C. DeVoss, "The Educational Achievements of Gifted Children," The Twenty-Third Yearbook of the National Society for the Study of Education (Report of the Society's Committee on the Education of Gifted Children), Part I (Bloomington, Illinois: Public School Publishing Company, 1924), p. 184.

[32] Lewis M. Terman and Melita H. Oden, "Major Issues in the Education of Gifted Children," Journal of Teacher Education, V (September, 1954), p. 231.

> to it. There were very few formal rules, as there are now, holding them back. It may be well to recall that our system of organizing children into grade levels arose from administrative convenience. When, because of increasing numbers we had more than could be handled in one room, we had to divide the groups - and, naturally the younger ones were put into one room and the older ones in another. With more children we had to have three rooms and so on. The result has been to make classifications increasingly rigid. In the past few decades, the lockstep for most children has become more fixed than ever before. We sentence pupils to a standard term with no time off for good behavior. This was found to be unsound procedure in penology many years ago.[33]

Acceleration may be used in ways other than having students skip grades. Strang states that "Far better than skipping a grade, however, is the kind of acceleration in which the pupil is placed in a rapid advance class, in which he completes three years' work in two years, or four years' work in three."[34]

Hildreth maintains that "One of the best arguments in favor of separate classes is that there can be acceleration without skipping. The gifted child can continue a high grade of work academically on his problems and not graduate at a premature age."[35]

The President's Science Advisory Committee[36] cites the Advanced Placement Program of the College Entrance Examination Board as a particularly outstanding program of acceleration without leaving school early.

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[33] D. A. Worcester, "Methods of Acceleration," The American School Board Journal, CXL (June, 1960), p. 11

[34] Ruth Strang, "The Mental Diet of Our Gifted Children," NEA Journal, XLIV (May, 1955), p. 265.

[35] Op. cit., p. 261.

[36] Loc. cit.

The September, 1941 National Education Association Bulletin[37] lists a number of ways in which acceleration can be accomplished. It also gives examples of schools carrying out such programs at the time the Bulletin was published.

The first method listed is that of having students carry extra subjects so that they are able to graduate in three years instead of four. The St. Louis schools are given as an example.

The second method is that of putting superior students in special rapid advancement classes so that the students can complete three years work in two years. The examples cited are the school systems of Baltimore and New York City.

The third method is skipping in the higher grades. Two examples are listed and in both cases, cooperating universities are involved. In the one case, the Louisville Public Schools and Louisville University are cited as giving examinations to outstanding students at the end of their junior year in high school to gain early admittance to the University. The University of Buffalo and the Buffalo Public Schools are considered to have a similar arrangement except that the students take an examination at the end of their senior year to gain college credit for their high school work. This latter arrangement shows a remarkable similarity to the Advanced Placement Program previously mentioned, although this program was not in operation in 1941. The Bulletin mentions that the only subject for which this arrangement is possible is English.

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[37] Op. cit., pp. 171-174.

Worcester[38] mentions the following as possible ways of accelerating pupils:

1) Grouping in the early grades (K,1,2) as a unit, allowing children to move on to the next level as soon as the requirements are met

2) Taking examinations for courses in lieu of taking the courses

3) Skipping

4) Lengthening the school year

5) Giving more material in a shorter period of time, culminating in the taking of Advanced Placement Examinations. Enrichment

Witty and Bloom make the following comments relative to what they consider to be the generally accepted viewpoint of educators toward acceleration and enrichment:

> A procedure or administrative device which may be satisfactory in one school situation may prove inadequate in another. However, some of the devices and procedures have not been well received among American educators. For example, the use of acceleration is rather generally disapproved. On the other hand, enrichment is widely endorsed.[39]

The 1941 National Education Association Research Bulletin states that "writers on the subject generally agree that enrichment of the regular curriculum is preferable to a high degree of acceleration."[40]

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[38] Op. cit., pp. 12-13

[39] Op. cit., p. 21

[40] Op. cit., p. 164

It is pertinent at this time to examine the research for definitions of "enrichment." This term is not generally as well understood as "acceleration."

Cutts and Moseley explain enrichment in terms of its objectives as follows:

> Objectives of Enrichment:
> 1) Challenge the full use of abilities.
> 2) Broaden the base of knowledge.
> 3) Deepen understanding.
> 4) Increase the level of skills.
> 5) Develop a love of learning.
> 6) Inculcate desirable methods of learning, thinking, and sharing.
> 7) Encourage initiative.
> 8) Give play to creativity.[41]

Payne states that "There is agreement among authorities that enrichment should involve modifications in both content and teaching methods. It should entail content and activities that require a high order of logical thinking and creative imagination; It should deepen and strengthen understandings."[42]

De Haan and Havighurst define "enrichment" as follows:

> Simply stated, enrichment means more opportunities for the gifted child to go deeper and to range more widely than the average child in his intellectual, social, and artistic experience. The nature of the unusually capable student is such that effective enrichment of his education consists not in adding more of the same content and activity to the program but in providing experiences of greater variety or at a more advanced level so as to match his greater variety of gifts and higher level of ability. It is a matter of quality, not of quantity. Enrichment is based on the principle that for maximum learning to take place,

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[41] Op. cit., pp. 42-45

[42] Joseph N. Payne, "Self-Instructive Enrichment Topics for Bright Pupils in High School Algebra." The Mathematics Teacher, LI (February, 1958), p. 114.

> the educational environment must set learning tasks that are slightly more complex and advanced than those the individual has already known.[43]

The National Education Association Research Bulletin[44] lists a number of examples of types of enrichment, along with schools carrying out these types of programs. This is the same technique for which this publication was previously cited in its discussion of accelerated programs.

The first type of enriched program listed is that of Comprehensive Ability Grouping, in which outstanding students meet together in all of their classes. Pittsburgh; Rockford, Illinois; Hamilton, Ohio; and West Grove, Pennsylvania are mentioned as school systems using this type of program.

The second type of program is that in which Limited Plans of Ability Grouping are carried out. In this type of program, students are assigned to enriched classes in each subject matter individually, depending on the individual pupil's ability in that field. Antigo, Wisconsin and Burlington, Iowa are systems given as examples.

The third type of program is that of creating special honors classes on an ungraded basis. Rochester, New York; Baltimore; and New York City are given as examples.

The fourth type listed is that in particular use in New York City; namely that program in which are created special honor schools.

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[43] Robert F. De Haan and Robert J. Havighurst, Educating Gifted Children (Chicago: The University of Chicago Press, 1957), p. 97.

[44] Op. cit., pp. 174-177.

Elder discusses a program in operation in West Hempstead, New York, in which junior high students in grades seven and eight of special ability meet in seminars. "Students meet with their peers in all their regular classes and activities. They are, however, released from two of their regular classes to meet as a special group at semi-weekly seminar sessions."[45]

A United States Department of Health, Education, and Welfare Bulletin, Curriculum Adjustments for Gifted Children,[46] published in 1946, details a program of homogeneous grouping by individual classes, and also discusses an ungraded program involving outstanding students in grades 9, 10, 11 and 12. The schools are not named.

Choice of a Special Program

Strong arguments for both accelerated and enriched programs can be made. In the ultimate analysis the choice must be up to the individual school which operates a special program. According to Sumpton and Luecking, "There is no one program that can be rated as the one best for all junior high schools to adopt. Each school will need to develop its own approach in terms of the needs of the students and the capabilities of the faculty."[47]

Although the authors specifically refer to junior high schools, the same argument would hold true at any level. The

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[45] Op. cit., p. 503.

[46] United States Department of Health, Education, and Welfare, Curriculum Adjustments for Gifted Children (Washington, D. C.: U. S. Government Printing Office, 1946), pp. 21-22.

[47] Op. cit., p. 412.

important thing would appear to be that something be done. Moskowitz states simply that "There is an ever greater responsibility developing upon secondary schools to provide adequately for the gifted students."[48]

Evaluative Studies of Special Programs

Because most of the special programs for superior students are of recent origin, there has not been a great deal written on the evaluations of these programs. Some programs, however, have been established with a long range evaluative procedure built into the structure of the program. Passow[49] reports a number of these studies which encompass an evaluation. These programs are being studied by the Talented Youth Project, which was instigated by the Horace Mann - Lincoln Institute of School Experimentation of Teachers College, Columbia University. The first of these is a study of the differences in academic achievement plus social and personal relations between gifted and non-gifted elementary students in New York City where they are grouped by ability, and Norfolk County, Virginia, where they are not grouped.

The second study discussed is similar to the first and is being carried on in two elementary schools in Dade County, Florida. This study also involves a group of gifted students

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[48]David H. Moskowitz, "Educating Superior Students," High Points (In the Work of the High Schools of New York City), XXVIII (June, 1946), p. 5.

[49]A. Harry Passow, "The Talented Youth Project: A Report on Research Under Way," The Bulletin of the National Association of Secondary-School Principals, XLII (February, 1958), pp. 102-108.

who are grouped in an enriched program for one-half of each school day.

The third study is attempting to determine the difference in achievement of gifted high school students in English courses where special provisions are made for some and not for others. This study is being made in cooperation with the public schools in Evanston, Illinois.

Another study being evaluated by the Talented Youth Project is being carried on by the Board of Cooperative Educational Services of Lewis County, New York. In this project gifted students from six small high schools meet one afternoon a week for a special seminar.

In addition an evaluation of attitudes toward the academically talented by their peers is being examined by use of a questionnaire sent to 250 students in three different schools.

Passow lists a number of other evaluative projects being undertaken which are relative to studies of gifted students. However, most of them are concerned with underachievement of gifted students which is not pertinent to this study.

Braun and Steffensen[50] report on the evaluative procedures used in Urbana, Illinois, for an eighth grade accelerated program involving Algebra, English, and general science. The Cooperative Elementary Algebra Test and the Cooperative English Test were administered to the students respectively

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[50] R. H. Braun and James Steffensen, "Grouping, Acceleration, and Teacher Aides Experiments in Urbana Secondary Schools," The Bulletin of the National Association of Secondary-School Principals, XLIV (January, 1960), pp. 306-311.

accelerated into ninth grade algebra and ninth grade English. Matched pairing was used with accelerated eighth graders and ninth graders. In algebra the eighth graders achieved at a higher level than the ninth graders. The reverse was true for the English. In general science this evaluation could not be made.

In addition the students in the accelerated programs and their parents were asked to fill out a questionnaire relative to their attitudes toward the accelerated program. In general the responses to the questionnaire indicated that the programs were being enthusiastically accepted by the participants and their parents.

Smith made a study in four Michigan high schools in which the academic achievement of superior students enrolled in special programs, and the academic achievement of superior students in regular programs were compared. He reports the following findings:

> There was no indication that the academic achievement of academically talented students enrolled in enriched courses designed for academically talented students in these schools was significantly greater than that of similar students enrolled in regular college-preparatory courses in the same subjects.
>
> Academically talented students enrolled in accelerated courses in mathematics and world history (School B) attained significantly higher scores on the STEP tests than did similar groups of students enrolled in the regular college-preparatory courses in the same subjects.
>
> Grouping of students without changing instructional techniques or subject content in the grouped classes was not effective in increasing the academic achievement of these students when compared with the achievement of similar pupils in the regular college-preparatory classes in the same subjects.
>
> Instructional procedures and techniques in special programs for academically talented students,

> whether grouped and enriched or merely grouped, did not differ greatly in these schools from procedures and techniques followed in the regular college-preparatory classes in the same subjects.
>
> Accelerated courses in mathematics and world history were more effective in increasing the academic achievement of academically talented students than either enriched courses or courses which were merely grouped.
>
> From the results of this study, it cannot be concluded that the academically talented students enrolled in special programs for academically talented students in these schools was significantly greater than the academic achievement of academically talented students enrolled in the regular college-preparatory courses in these schools.[51]

Special Programs for Superior Students in Mathematics

The purpose of this study was to examine special programs in mathematics for superior students in Michigan junior high schools. Therefore it was of particular significance to examine research which has been done in this area in the light of the reported studies on special programs in general. Mathematics education, along with that of science, has received an unusual amount of attention in the last few years. Cairns makes an interesting comment upon the attention received:

> Many laymen might derive from the public press the impression that Soviet satellites suddenly roused us from complacent lethargy and galvanized us into frantic efforts to achieve a new scientific level. On the contrary, almost all of the current projects for improving mathematical education were well under way before the first sputnik and were not modified as a result of it. The more recently initiated efforts also show no signs of having been primarily motivated by Soviet achievements. But we still owe to the USSR

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[51] Frederick Robert Smith, "The Academic Achievement of Academically Talented Students" (Unpublished Ph.D. dissertation, University of Michigan, 1961), pp. 176-177.

> a certain gratitude for unwittingly launching, along with its first satellite, a powerful American clamor for improved scientific education.[52]

The importance of special mathematics programs for superior students was particularly noted previous to the launching of Sputnik. In 1951 Price stated that it was imperative to have special programs for the gifted because "in mathematics, as in other fields of science, it is only the exceptional and highly gifted individual who can be a creative scholar."[53]

Freese makes the following observations relative to special programs in mathematics for superior students.

> If the school and the community are ready for dividing the students into homogeneous groups, the problem resolves itself into implementing the program at all levels. One plan is to start algebra with a select group in the eighth grade and to complete an enriched high school course in the eleventh grade so that, in the last year of high school, the superior students may take a college course which will prepare them for advanced standing examinations. The same results may be obtained by completing four courses of enriched college preparatory mathematics in three years, so that the last year may be free for the course in college mathematics.[54]

Programs in Michigan Junior High Schools involving the introduction of algebra in the eighth grade are the focus of Chapter IV of this study. It is significant to note that many of the programs, or suggested programs, written about, involve this technique as the basis for special programs.

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[52]Stewart Scott Cairns, "Mathematical Education and the Scientific Revolution," The Mathematics Teacher, LIII (February, 1960), pp. 67-68.

[53]G. Bailey Price, "A Mathematics Program for the Able," The Mathematics Teacher, XLIV (October, 1951), p. 370.

[54]Frances Freese, "Gifted Students in Senior High School Mathematics, The Bulletin of the National Association of Secondary-School Principals, XLIII (May, 1959), p. 72.

Conant says, "I've been very interested in the extent to which algebra and foreign languages have been introduced at least by grade 8. Many schools on the East Coast offer algebra in grade 8 and we know of schools in the middle-West, and on the West Coast that do likewise."[55]

Finding and Educating the Academically Talented Student in the Secondary School, a pamphlet published by the National Education Association, states that the principal aim of mathematical acceleration is to provide an additional year of advanced mathematics at the senior level in high school. This can be done because "ninth grade mathematics can be moved to the eighth grade for students with mathematical talent."[56]

Keller maintains that schools are reintroducing algebra into the eighth grade; that at one time this was the traditional content of eighth grade mathematics. He writes, "not just the traditional algebra is being taught. Both content and teaching methods are being modified."[57]

A different approach to a special program is presented by Moore,[58] who suggests that small schools can best provide

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[55] James B. Conant, Some Problems of the Junior High School: A Progress Report on the Study of the Junior High School (An address delivered before the 44th annual convention of the National Association of Secondary-School Principals at Portland, Oregon reproduced from a tape recording produced by Station KBPS, Portland Public Schools, Portland, Oregon, February 27, 1960), p.7.

[56] Finding and Educating the Academically Talented Student in the Secondary School (Washington, D. C.: National Education Association, n.d.), p. 11.

[57] Charles P. Keller, "A Dynamic Eighth Grade," The Bulletin of the National Association of Secondary-School Principals, XLIV (February, 1960), p. 142.

[58] Lillian Moore, "The Challenge of the Bright Pupil," The Mathematics Teacher, XXXIV (April, 1941), p. 156.

for their most capable mathematics students through mathematics clubs and contests, and through adequate subscriptions to mathematical magazines.

Klein[59] maintains that all secondary school mathematics classes should be enriched for all students.

In one sense of the word, there is a great deal of study going on at this time in the United States with this aim in mind. Mayor[60] gives a brief description of the purpose of most of these studies in the May, 1959, issue of The Bulletin of the National Association of Secondary-School Principals. It would appear that the only ones which relate directly to this study are the Commission on Mathematics of the College Entrance Examination Board, the University of Maryland Mathematics Project, and The School Mathematics Study Group.

The Commission on Mathematics makes the following statement suggesting acceleration of the better students:

> This much can be said: regardless of the form of school organization, in order to give students in grade 7 and 8 the type of mathematics study that will form a proper foundation for the Commission's program the following subject matter is regarded as essential. The Commission is convinced that it can be mastered by all college-capable students during grades 7 and 8. The better students can cover this work in one to one-and-a-half years and move on to the Commission's program during the eighth school year.[61]

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[59] Rose Klein, "Enrichment in Mathematics," High Points (In the Work of the High Schools of New York City), XXX (September, 1948), p. 67.

[60] John R. Mayor, "Efforts to Improve Programs and Teaching in Mathematics," The Bulletin of the National Association of Secondary-School Principals, XLIII (May, 1959), pp. 7-9.

[61] Program for College Mathematics: Report of the Commission on Mathematics (New York: College Entrance Examination Board, 1959), pp. 18-19.

The Commission goes into detail on the methodology of introducing the "foundation material" in the Appendices.[62]

Regarding the University of Maryland Mathematics Project, Keedy writes as follows:

> The primary goal of the project is to determine maturity levels at which certain mathematical concepts can be appropriately taught, and to prepare materials for a teaching sequence in grades seven and eight which is mathematically and psychologically sound, and appropriate to modern-day needs. Results of the study are being made available to curriculum planning groups across the country, and increasing cooperation with such groups and with other persons engaged in experimental work in mathematics curriculum is being developed.[63]

Progress Report Number 5[64] of the University of Maryland Mathematics Project speaks of the enthusiasm on the part of teachers and students involved in the use of the experimental materials, while Progress Report Number 6[65] reports on the introduction of algebra into the seventh and eighth grades, so that by the end of the eighth grade, students will have received the equivalent of a beginning year of algebra.

Begle[66] writes of the cooperation between the University of Maryland Mathematics Project and the School Mathematics

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[62] Appendices: Report of the Commission on Mathematics (New York: College Entrance Examination Board, 1959).

[63] M. L. Keedy, "The University of Maryland Mathematics Project," American Mathematical Monthly, LXVI (January, 1959), p. 58.

[64] Progress Report Number 5 (College Park, Maryland: The University of Maryland Mathematics Project, 1959) p. 1.

[65] Progress Report Number 6 (College Park, Maryland: The University of Maryland Mathematics Projects, n.d.), p. 1.

[66] E. G. Begle, "The School Mathematics Study Group," The Bulletin of the National Association of Secondary-School Principals, XLIII (May, 1959), p. 27.

Study Group, centered at Yale University, for the purpose of the latter using some Maryland materials in a variety of locations outside of those in the immediate vicinity of College Park, Maryland.

In citing references to individual schools which are operating special programs for superior students in mathematics, it becomes increasingly evident that the introduction of algebra into the eighth grade is fundamental to the majority of the programs which are currently commanding the attention of writers. Also the ultimate aim of these programs is generally to teach an additional year of mathematics at the twelfth grade level.

Programs of this nature in three diverse sections of the country - Seattle, Washington; Minneapolis, Minnesota; and Tulsa, Oklahoma - are reported on by Roudebush,[67] Yorgan,[68] and Payne,[69] respectively.

In Michigan the same trend appears. Payne writes of two programs in Ann Arbor which have variations at the beginning, but whose ultimate aim again is the addition of a special mathematics course in the twelfth grade.

Many schools are providing special classes for bright pupils in mathematics, mainly in the junior and

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[67]Elizabeth Roudebush, "The Seattle Project for Talented Students," The Bulletin of the National Association of Secondary-School Principals, XLIII (May, 1959), pp 78-81.

[68]Dorothy G. Yorgan, "Lincoln Junior High Administers an Accelerated Program for Superior Students," The Bulletin of the National Association of Secondary-School Principals, XLIV (March, 1960), pp. 65-70.

[69]Joseph N. Payne, "Teaching Mathematics to Bright Pupils," School of Education Bulletin (The University of Michigan), XXIX (April, 1958), p. 100.

> senior high schools. Most of the classes involve some acceleration though this is not necessarily true. This year at the University School of the University of Michigan 24 very able pupils from the eighth grade began the study of algebra the second semester. Pupils were counseled whether or not to enroll in this accelerated class on the basis of data from standardized tests (mental age, arithmetic achievement, algebra prognostic test), grades in mathematics, and results of observations by the mathematics teachers. The pupils will remain in the same group through the ninth grade and will complete the first course in algebra and plane geometry in this 1½ year period. In the tenth grade they may elect the regular second course in algebra, normally elected in the eleventh grade. They may choose the usual trigonometry and solid geometry in the eleventh grade. A special mathematics class will be provided for this experimental group in grade twelve. It will probably include topics from college algebra, analytical geometry, and an introduction to calculus. Details for the course in grade twelve have not been completed.
>
> In the Ann Arbor public schools, very bright pupils are grouped at the beginning of eighth grade and a special enriched and challenging program is provided for the bright pupils. They complete three semesters of algebra in the ninth grade, and the fourth semester of algebra and trigonometry in the eleventh grade. A special mathematics course is planned for grade twelve.[70]

Burchyett[71] and East[72] report on programs in operation in the Birmingham and Fitzgerald school systems, which follow the pattern of accelerating eighth graders through a full year of algebra, with the ultimate aim of adding a special course in the twelfth grade.

Summary

There is a considerable amount of confusion surrounding terms like "superior," "fast learning," and "gifted" when

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[70] Ibid., pp. 99-100.

[71] Jim Burchyett, "Birmingham Adopts Accelerated Mathematics Program," Action (Metropolitan Detroit Bureau of School Studies), XII (January, 1959), pp. 5-6.

[72] Carl M. East, "Accelerated Mathematics at Fitzgerald Public Schools," Action (Metropolitan Detroit Bureau of School Studies), XII (January, 1959), p. 8.

used to describe children. Some authorities set different cut-off levels for each classification while others use the terms interchangeably.

There are multiple factors to look for in identifying superior students, and there are many aids to help in identifying them. In the final analysis, however, the identification must be left up to the individual school.

There is an increasing interest in special programs for superior students and there appears to be little opposition to the setting up of such programs.

There are differences of opinion on the best type of program to establish. The fundamental disagreement is between those who advocate acceleration, and those who advocate enrichment. The individual school must again assume the responsibility of determining the type of program which will best fit its needs and capabilities.

Evaluative studies to determine the achievement of superior students in special programs are being made in conjunction with several accelerated and enriched groups. The Talented Youth Project is sponsoring a number of these evaluations. Other program evaluations have been made which indicate a high achievement level for students involved in accelerated programs at the junior and senior high school level.

There is a great deal of interest in special programs in mathematics for superior students. The most common type of program appears to be one in which algebra is introduced in the eighth grade with the ultimate aim of adding a special course in mathematics in the twelfth grade.

CHAPTER III

RESULTS OF A QUESTIONNAIRE ON SPECIAL MATHEMATICS PROGRAMS SENT TO MICHIGAN JUNIOR HIGH SCHOOLS

A questionnaire was sent to the principals of all public junior high schools in Michigan for the purpose of determining the extent to which special mathematics programs for superior students were being carried on in the state. The questionnaire was mailed in mid-November of 1959 to every public school which had the seventh and/or eighth grade as part of a secondary administrative unit.

The Nature of the Questionnaire

The questionnaire was divided into two parts. The first part appears in Appendix A. This part of the questionnaire sought to find out how many students were enrolled in the seventh and eighth grades of each school and to establish whether the schools had special programs.

The second part of the questionnaire, intended only for those schools in which the principal stated that a special program was in operation in grade seven or eight, is in Appendix B.

Accompanying the questionnaire was a letter to solicit the assistance of the principal and it is in Appendix C.

Enrollment in Special Programs in Mathematics

Of the 582 questionnaires mailed, 482, or 82.8 per cent were returned.

Eighty-five of the 482 schools returning the questionnaire reported that they had some form of special program for superior students in either the seventh grade, eighth grade, or both. Thus, 17.6 per cent of the schools surveyed indicated that they had established special programs for superior students as part of their mathematics curriculum.

The figures for enrollment in grades seven and eight were obtained from each one of the 482 schools returning the questionnaire. There were a few schools for which the information was not supplied on the original questionnaire, but follow-up post cards were sent which enabled the survey to have this information for all of the 482 schools which had returned the original questionnaire.

Four hundred seventy-seven of these schools indicated that they had seventh grades. Sixty-eight, or 14.3 per cent had special programs for superior students at this grade level. However, these 477 schools had 75,561 students in the seventh grade, and the 68 schools, sponsoring special programs, had 19,379 of these students. Thus 25.6 per cent of the seventh graders were in schools which had special programs, although only 14.3 per cent of the schools had these programs. Approximately one quarter of the students in the seventh grade, from the schools surveyed, had the opportunity to participate in such programs if they had the ability and desire.

Of the schools returning questionnaires, 478 indicated they had eighth grades. Eighty-three, or 17.4 per cent, had special programs for superior students in the eighth grade. These 478 schools had 67,782 pupils enrolled in the eighth grade. The eighty-three claiming special programs had 20,668 or 30.5 per cent of the students. This contrasts with 17.4 per cent of the schools which had such programs. Approximately three out of ten students in the eighth grade had the opportunity of participating in such programs, granted the ability and motivation. This shows that there are more special programs in the larger schools.

Table 1 shows the number of schools covered by the survey, catalogued by size of seventh grade, the number of schools in each size range which sponsored special mathematics programs for superior students in this grade, and the per cent of schools in each size range which sponsored special programs.

With the single exception of the one largest school surveyed, the per cent of schools with special programs in each size range above 200 was above average for the group. On the other hand, the per cent for all ranges below 200 were below average for the group.

There were 148 schools with seventh grade enrollments of 200 or more, comprising 31 per cent of the schools which answered the questionnaire. Forty-seven of the special seventh grade programs, or 69.1 per cent of them, were sponsored by these 148 schools. Thirty-one per cent of the schools with at least 200 students in grade seven had special programs.

TABLE 1

Number and Per cent of Michigan Junior High Schools with Special Mathematics Programs in the Seventh Grade, Classified According to Size of Seventh Grade.

Size of Seventh Grade	Number of Schools	Number of Schools with Special Seventh Grade Programs	Per cent of Schools with Special Seventh Grade Programs
850-899	1	0	0.0
800-849	1	1	100.0
750-799	0	-	-
700-749	0	-	-
650-699	2	2	100.0
600-649	3	2	66.7
550-599	3	1	33.3
500-549	9	3	33.3
450-499	6	3	50.0
400-449	11	3	27.3
350-399	20	4	20.0
300-349	21	6	28.6
250-299	34	16	47.1
200-249	37	6	16.2
150-199	36	5	13.9
100-149	78	10	12.8
50- 99	123	6	4.9
1- 49	92	0	0.0
Total	477	68	14.3

On the other hand, 329 schools, with seventh graders numbering less than 200, comprised 69 per cent of the schools covered by the survey. Among these 329 schools, there were only twenty-one special programs discovered. This figure constitutes only 30.9 per cent of the total number of seventh grade programs. Only 6.4 per cent of the schools, with enrollments of less than 200 for the seventh grade, had special mathematics programs for superior students at this grade level.

Table 2 shows the number of schools covered by the survey, catalogued by size of eighth grade, the number of

schools in each size range which sponsored special mathematics programs for superior students in this grade, and the per cent of schools in each size range which sponsored special programs.

TABLE 2

Number and Per Cent of Michigan Junior High Schools with Special Mathematics Programs in the Eighth Grade, Classified According to Size of Eighth Grade.

Size of Eighth Grade	Number of Schools	Number of Schools with Special Eighth Grade Programs	Per Cent of Schools with Special Eighth Grade Programs
650-699	1	1	100.0
600-649	4	3	75.0
550-599	1	1	100.0
500-549	5	2	40.0
450-499	10	4	40.0
400-449	1	1	100.0
350-399	16	5	31.3
300-349	17	7	41.2
250-299	29	14	48.3
200-249	42	15	35.7
150-199	35	5	14.3
100-149	74	12	16.2
50- 99	139	11	7.9
1- 49	104	2	2.0
Total	478	83	17.4

Two hundred students in the eighth grade appeared to be a key point as it was with seventh graders. All size ranges above 200 had an above average per cent of schools with programs, and all ranges below 200 had a below average per cent.

There were 126 schools with eighth grade enrollments of 200 and above. This constituted 26.4 per cent of the schools covered by the survey. Fifty-three of the eighty-three special

programs in the eighth grade, or 63.9 per cent, were carried on in these schools. Therefore, 42.1 per cent of the schools with 200 or more students in the eighth grade had special programs for the superior mathematics students at this grade level.

Of the 352 schools with eighth grade enrollments of less than 200, only thirty had special programs for this grade. These 352 schools comprise 73.6 per cent of the schools included in the survey. Yet the 30 programs represent only 36.1 per cent of the total number of programs. Only 8.5 per cent of these schools had special programs in mathematics for superior eighth grade students.

It was noted that, for both seventh and eighth grades, the majority of the programs were sponsored by the larger schools.

The next matter, relative to the enrollment of students in special mathematics programs, revolves around the per cent of students in each school who were participants in such programs.

Of the sixty-eight schools which sponsored special programs in the seventh grade, fifty-eight gave the exact number of pupils enrolled in such programs. Table 3 indicates the number of schools in each size range which gave a specific answer to this question. It also gives the range in per cent of students enrolled in special programs in each school, classified by size, and the median per cent of students enrolled for each size range.

It was noted that, in general, the larger the school the smaller the per cent of students enrolled in the special mathematics programs for seventh graders.

TABLE 3

Lowest, Median, and Highest Per Cent of Seventh Graders in Special Mathematics Programs, Classified by Size of Seventh Grade

Number of Students in Seventh Grade	Number of Schools with (Seventh Grade) Special Programs	Lowest Per Cent of Students in Special Seventh Grade Program	Median Per Cent of Students in Special Seventh Grade Program	Highest Per Cent of Students in Special Seventh Grade Program
800 - 849	1	1.5	1.5	1.5
750 - 799	0	-	-	-
700 - 749	0	-	-	-
650 - 699	2	5.4	7.25	9.1
600 - 649	2	4.7	12.75	20.8
550 - 599	1	6.4	6.4	6.4
500 - 549	3	3.4	4.8	6.0
450 - 499	3	13.9	20.0	60.1
400 - 449	3	7.0	7.6	15.5
350 - 399	4	8.4	12.75	18.4
300 - 349	5	11.0	11.4	29.4
250 - 299	14	8.1	17.5	34.2
200 - 249	6	10.5	14.95	31.8
150 - 199	3	2.8	18.9	42.2
100 - 149	9	6.8	26.2	34.2
50 - 99	2	30.9	31.8	32.8
1 - 49	0	-	-	-
Total	58	1.5	15.6	60.1

This trend did not evidence itself so much in the eighth grade, although there was a slight tendency in this direction. It was most obvious among the smallest schools having programs. The schools below 150 enrollment in the eighth grade had a decidedly larger per cent of students participating in such programs than did the larger schools. This was also true regarding the seventh grade.

Table 4 gives the same type of information for the eighth grade that Table 3 gave for the seventh. Seventy three of the eighty-three schools sponsoring eighth grade programs supplied specific information on the number of students involved in special eighth grade programs.

Types of Special Programs

Special programs for superior seventh and eighth grade mathematics students took a number of different forms. Basically, however, they were three types, enriched, accelerated, and a combination of the two. However, there was variation within each category.

The first of these classifications was that of a program whose primary purpose was enrichment. Enrichment was generally taken to be the addition to a standard program of materials which would not normally be a part of the program. It might involve the addition of entirely different materials, or it might be a deeper probing into standard materials.

The second classification was a program whose primary purpose was acceleration of content. Acceleration was considered

TABLE 4

Lowest, Median, and Highest Per Cent of Eighth Graders in Special Mathematics Programs, Classified by Size of Eighth Grade

Number of Students in Eighth Grade	Number of Schools with Special Eighth Grade Programs	Lowest Per Cent of Students in Special Eighth Grade Programs	Median Per Cent of Students in Special Eighth Grade Programs	Highest Per Cent of Students in Special Eighth Grade Programs
650 - 699	1	9.2	9.2	9.2
600 - 649	3	2.2	5.6	11.2
550 - 599	1	16.4	16.4	16.4
500 - 549	2	6.0	6.5	7.0
450 - 499	4	3.4	6.75	18.3
400 - 449	1	22.5	22.5	22.5
350 - 399	4	10.5	16.9	65.4
300 - 349	7	8.3	9.8	23.3
250 - 299	12	8.4	12.25	27.7
200 - 249	14	8.6	15.0	34.1
150 - 199	4	3.6	9.1	15.6
100 - 149	10	9.5	25.5	61.7
50 - 99	8	10.9	33.85	54.7
1 - 49	2	8.7	23.65	38.6
Total	73	2.2	15.0	65.4

to be the introduction of studies which would normally be parts of one grade level's program at an earlier grade.

The third classification was a combination of enrichment and acceleration.

Programs in Grade Seven

Sixty-seven of the sixty-eight schools operating a special mathematics program for seventh graders indicated that their programs were basically enrichment, acceleration or a combination of the two. The other school did not answer the question asking for this information.

Table 5 shows the responses of these 67 schools with the schools classified by size.

There were nearly equal numbers of schools sponsoring the three types of programs with just a few more sponsoring accelerated programs. There was very little difference in types of programs as determined by the size of the size of the school.

Programs in Grade Eight

The size of school did not make much difference as far as the type of eighth grade program was concerned, but there was a decided preference for accelerated programs. Fifty per cent of the eighty-two schools which answered the part of the questionnaire relative to this matter indicated that their programs were purely accelerated.

Table 6 shows the responses of the eighty-two schools that answered this part of the questionnaire. Only one of the eighty-three schools sponsoring eighth grade programs did not reply relative to this matter.

TABLE 5

Types of Special Mathematics Programs for Seventh Graders, Classified by Size of Seventh Grade

Size of Seventh Grade	Number of Schools with Program	Schools with Enrichment Programs		Schools with Accelerated Programs		Schools with Combination Programs	
		Number	Per Cent	Number	Per Cent	Number	Per Cent
800-849	1	0	0.0	0	0.0	1	100.0
750-799	0	-	-	-	-	-	-
700-749	0	-	-	-	-	-	-
650-699	2	1	50.0	1	50.0	0	0.0
600-649	2	1	50.0	0	0.0	1	50.0
550-599	1	0	0.0	1	100.0	0	0.0
500-549	3	2	66.7	0	0.0	1	33.3
450-499	3	2	66.7	0	0.0	1	33.3
400-449	3	1	33.3	1	33.3	1	33.3
350-399	5	2	40.0	3	60.0	0	0.0
300-349	6	2	33.3	2	33.3	2	33.3
250-299	14	4	28.6	7	50.0	3	21.4
200-249	6	3	50.0	2	33.3	1	16.7
150-199	5	1	20.0	2	40.0	2	40.0
100-149	10	0	0.0	6	60.0	4	40.0
50- 99	6	1	16.7	1	16.7	4	66.7
1- 49	0	-	-	-	-	-	-
Total	67	20	29.8	26	38.8	21	31.4

TABLE 6

Types of Special Mathematics Programs for Eighth Graders, Classified by Size of Eighth Grade

Size of Eighth Grade	Number of Schools with Program	Schools with Enrichment Programs		Schools with Accelerated Programs		Schools with Combination Programs	
		Number	Per Cent	Number	Per Cent	Number	Per Cent
800-849	1	0	0.0	0	0.0	1	100.0
750-799	0	-	-	-	-	-	-
700-749	0	-	-	-	-	-	-
650-699	2	1	50.0	1	50.0	0	0.0
600-649	2	1	50.0	0	0.0	1	50.0
550-599	1	0	0.0	1	100.0	0	0.0
500-549	3	2	66.7	0	0.0	1	33.3
450-499	3	2	66.7	0	0.0	1	33.3
400-449	3	1	33.3	1	33.3	1	33.3
350-399	4	2	50.0	0	0.0	2	50.0
300-349	7	2	28.6	5	71.4	0	0.0
250-299	14	6	42.9	7	50.0	1	7.1
200-249	15	4	26.7	8	53.3	3	20.0
150-199	5	0	0.0	3	60.0	2	40.0
100-149	12	1	8.3	6	50.0	5	41.7
50- 99	11	3	27.3	5	45.5	3	27.3
1- 49	2	0	0.0	1	50.0	1	50.0
Total	82	22	26.8	41	50.0	19	23.2

Starting a Program in a School

The nature of various programs at different schools was determined by a number of methods. Of the eighty-five schools sponsoring programs the most commonly used method was that of a faculty study. Sixty-eight of the schools, or 80 per cent, used this method as one means of planning their particular program. The next most commonly used source was reference material, which was used by sixty, or 70.6 per cent, of the schools.

Thirty-nine of the eighty-five schools, or 45.9 per cent, brought in outside advisors to help in the determination of the specific type of program to be operated, while thirty-five, or 41.2 per cent, had representatives visit other schools which already had special programs in operation.

Three other methods were used by a sufficient number of schools to warrant some attention. A study of the needs of the community was made by twenty-one, or 24.7 per cent, of the schools, while fourteen, or 16.5 per cent, took student opinions into consideration. Twelve of the schools, or 14.1 per cent, used citizen groups to help establish the particular type of program in operation.

Relationship of Size of School to Type of Program

The type of program was generally related to the size of the school. The typical approach in the smaller schools was to have no special program in the seventh grade, and to put the superior students of the eighth grade directly into ninth grade algebra classes. This could be done no matter

how few students were involved. One school reported, for instance, that it had been done for two students. There was nothing added to the schedule of courses in these cases unless the students were to be moved ahead one year until they finish the normal twelfth grade program in the eleventh grade, and are then to be given a special course in their senior year. This course alone will then be the additional class. If the students were to be put in special classes all the way through from grade eight through twelve, it would mean five special classes the fifth year after instigation of the program. Some larger schools organized their programs on this basis also, particularly if they had only a very small per cent of their students involved.

Variations in Seventh and Eighth Grade Programs

Some schools, which put the students in special classes in the eighth grade, did not have special programs in the seventh. These schools almost universally were accelerating in the eighth grade rather than enriching.

Acceleration in the eighth grade meant, without exception, course work in algebra. Some eighth grade accelerated programs, which were in schools without seventh grade special programs, immediately started algebra. Others gave an accelerated eighth grade course the first part of the year and switched into algebra sometime around mid-year.

If there was a seventh grade program with an accelerated eighth, it, or the combination of both, would take one of three forms. First, the seventh could be enriched. Second, if it were accelerated, it could combine the normal seventh and

eighth grade programs into the seventh grade, and have begun algebra at the beginning of the eighth, or third, the seventh and eighth could be combined in one and one-half years, with algebra begun in the middle of the eighth grade. There were some variations in the time sequence in a few schools where algebra was started at the end of one quarter or one third of the eighth grade. There were two schools which began algebra near the end of the seventh grade.

The one remaining type of program was that in which enrichment took place in both the seventh and eighth grades. Some of the schools which started acceleration mid-year, after an enriched seventh and/or eighth grade program, were also enriching the normal program while speeding it up. These are the schools listed as "Combination of Both" in Tables 5 and 6.

There were no statistics on the number of programs in each of these areas. This is because the question which asked for such information required a sentence or two to answer, rather than a check-off. Some of the answers were somewhat vague and could not be specifically classified.

The most commonly described programs, however, could be identified as those in which students were accelerated into algebra for the entire eighth grade. These comprised roughly fifty per cent of the programs. About twenty-five per cent introduced algebra at mid-year in the eighth grade. Another twenty-five per cent enriched through the eighth grade. Only three schools had seventh grade programs without eighth

grade provisions being made. In all three cases the program was in its first year of operation and plans had been made for its continuance into the eighth grade the following year.

Methods of Selection of the Pupils for Special Programs

There were a number of ways pupils could be chosen as participants in the special mathematics programs. Obviously every school had to use some method of selection, and most used a combination of two or more.

Students Academic Achievement

The most commonly used method was based on students' past performance in school. Seventy-four, or 87.1 per cent, of the eighty-five schools which had programs used achievement in mathematics, as indicated by course marks, as a basis for selection. Sixty-three of these schools, or 74 per cent of the schools sponsoring programs, also used achievement in subject areas other than mathematics.

Specific standards were set for school achievement in thirty-nine, or 45.9 per cent, of the schools with programs. All but one of these required at least a B average. The one exception required a C average. Five schools set B+ as the necessary attainment level, two required an A- average, and three demanded a straight A record. Four schools did not specify their requirements and the remaining twenty-four insisted on a B average.

Teachers' Recommendations

Closely related to school achievement was teacher recommendation. Sixty-six of the schools, or 77.6 per cent,

took the mathematics teachers into consultation on the selection. Thirty-eight schools, or 41.2 per cent of those sponsoring programs, also used the opinions of teachers other than mathematics teachers as a criterion for selection. Opinions of recent elementary teachers for seventh graders and seventh grade teachers for eighth graders were used by almost all of these schools.

Testing Devices

Test results were used by the majority of schools for the selection of students to the special mathematics programs. These tests fell into three general catagories: intelligence tests, achievement tests, and aptitude tests.

The type of tests used by the greatest number of schools was intelligence tests. Sixty-seven of the eighty-five schools sponsoring programs, or 79.4 per cent, used some I. Q. test as part of the screening procedure. Thirty-six of the eighty-five schools, or 42.4 per cent, paid particular attention to the aspects of the intelligence tests which specifically related to ability in mathematics.

By far the most commonly used I. Q. test was the California Test of Mental Maturity. Thirty-three schools used either the long or short form of this test. Eight other tests were mentioned by at least one school, but no other test was used by more than six schools.

Thirty-six schools, or 42.4 per cent of the eighty-five sponsoring programs, had specific requirements of I. Q. for admission into these programs. Twenty-eight of these

thirty-six schools indicated what their requirements were. There was a considerable range in this area. One school required an I. Q. of 130, while another demanded only 105. In between these extremes, six required 110, one required 112, four demanded 115, one insisted upon 117, twelve required 120, and two demanded 125.

The next most commonly used testing device was standardized achievement tests. Forty-five schools, or 52.9 per cent, used achievement test scores in areas related to mathematics, and all but three of these used overall achievement in all areas examined by the test.

The California Achievement Tests were used by twenty schools, the Iowa Test of Basic Skills was utilized by fourteen, and the Standford Achievement Test was used by ten. Four other tests were used by at least one school, with no one being used by more than four. The number of tests used totaled more than forty-five because some schools used more than one test.

Thirty-five schools had specific standards set for achievement on these tests. Twenty-seven of them indicated the level of achievement necessary. Eleven of these demanded that the students achieve two grade levels above their own, three required achievement scores one and one-half grade levels above their own, eight insisted upon attainment scores of one grade level advanced and one required only one-half grade level advanced achievement. Four of the schools stated their requirements in percentile ranks.

Only twenty-six schools, or 30.6 per cent of the eighty-five sponsoring special programs, used aptitude tests in mathematics as a criterion for admission to the program. Fifteen used aptitude measurement in other areas.

Eight schools used the Iowa Algebra Aptitude Test and four used the Differential Aptitude Test. A total of ten other tests were used by one, two, or, in one case, three schools.

Only twelve schools had specific standards set for the scores attained on the tests, and only six of these stated what their standards were. Two of these required a score at the 90th percentile of the norm, one a score at the 65th percentile, one at the 60th, one at the 50th and one at the 40th.

Rigidity of Standards

Thirty schools indicated that particularly high scores in one area could compensate for substandard in another in the matter of selection. However, thirty-two indicated that this was not possible in their selection process. Twenty-three schools did not answer this question.

Other Selection Requirements

Forty-six of the eighty-five schools sponsoring programs, or 54.1 per cent, stated that their programs were voluntary. Thirty-one, or 36.5 per cent, required parental permission before students were able to become members of special programs.

Miscellaneous Information

Sixty-six of the eighty-five schools which sponsored programs indicated that the junior high school special

mathematics program was followed up in the senior high school grades or would be as soon as students completing the program entered high school. This figure represented 77.6 per cent of the schools with programs.

Eighty-one schools indicated the length of time during which their special program had been in operation. Thirty schools indicated that this was the first year of operation, twenty-eight stated that it was the second year for the program, and twelve claimed that they were currently sponsoring it for the third year. It was the fourth year of operation for nine schools. Only two schools stated that such programs had been in operation longer than four years. One of these was in its fifth year, and one was in its seventh.

Evaluation of the programs had not been undertaken to any great degree among the schools sponsoring special programs. This is true primarily because most of the programs had not been in operation long enough to have had an opportunity to be evaluated. A number of schools, however, indicated that such evaluations were contemplated for the future. Most of these would involve testing devices, teacher evaluations, and parent-teacher conferences.

Because of the shortness of time, most schools sponsoring programs had not had any opportunity to affect any major changes in the program.

Summary

This chapter reported the results of a questionnaire sent to all public junior high schools in Michigan relative

to special programs for superior students in mathematics. The questionnaire primarily sought the answers to questions pertaining to students involved in special programs, types of special programs, and methods of selection of the pupils. The answers to the questionnaire revealed the following:

1. Of the schools surveyed, 17.6 per cent indicated that they had special programs in mathematics for superior students in grades seven and/or eight; 14.3 per cent had programs in the seventh grade and 17.4 per cent had programs in the eighth grade.

2. Of the seventh grade students in the schools surveyed, 25.6 per cent were in schools with programs available to them; 30.5 per cent of the eighth grade students were in schools with programs available to them.

3. The larger schools had the majority of the special programs. The smaller schools, sponsoring programs, tended to enroll a larger per cent of their students in such programs.

4. In the seventh grade, programs of enrichment, acceleration, and combined enrichment and acceleration were nearly equally divided. However, in eighth grade programs, there was a decided preference for programs of acceleration.

5. Eighth grade programs of acceleration without exception accelerated the students into algebra with about fifty per cent accelerating for the full year and about twenty-five per cent accelerating for one-half year.

6. Almost all of the schools with special programs undertook a study before establishing a special program of

instruction. Faculty studies, the use of reference materials, and outside advisors were the most commonly used means of determining the type of program to be begun.

7. Pupil achievement, teacher recommendation, and testing devices were used extensively in selecting students for the special programs. I. Q. tests were given the major consideration among testing devices.

8. Most of the schools with special programs indicated that the programs would be followed up in senior high school, although few have yet had an opportunity to do so because the programs have been of recent origin.

9. Only two schools of eighty-one indicated that their programs had been in operation more than four years. Fifty-eight of the eighty-one stated that their program was in either its first or second year of operation.

CHAPTER IV

EVALUATION OF SELECTED ACCELERATED PROGRAMS

In Chapter III a survey of the special mathematics programs for superior students in mathematics throughout the junior high schools in Michigan was discussed. This survey, because of the large number of schools covered, necessarily was limited to what was being done, and in no sense attempted to evaluate the quality of the programs.

This chapter deals with a more extensive examination of the programs in eight junior high schools, and presents an evaluation of: (1) the perceptions of the programs by the principals, teachers, and students involved; and (2) the achievement of the students on standardized achievement tests near the completion of the program in the eighth grade.

Eighth grade programs accelerating students into algebra were examined exclusively in this part of the study. This was done for three reasons: (1) they were the single most common type of program; (2) it was important that this aspect of the research include schools which were all doing fundamentally the same thing for purposes of comparison; (3) algebra achievement was readily measurable by standardized tests.

Description of the Schools and Programs

The eight schools selected for the study are not purported to be a representative sample based on sociological, economic or other criteria. This study did not attempt to determine the type of school in which such programs could be carried on successfully, but rather to determine whether the programs could be carried on successfully at all.

The method used for selection was merely to screen the questionnaires from the schools, which accelerated their superior eighth grade students into algebra, and select schools with such programs on the basis of accessibility. There was an attempt made also to see that there was a spread among the schools on the basis of the per cent of their students who were in the program. No two schools were selected from the same school system. Five schools were picked which accelerated the students for a full year of algebra and three were chosen which accelerated students into algebra for the last half of the eighth grade.

The following descriptions of the schools were based on statements by the school authorities involved. This was for background purposes only and was not an attempt to establish a relationship between success of the program and type of school community.

As to geographic distribution, two of the schools each were in Wayne and Oakland Counties and one apiece in Jackson, Macomb, Monroe and St. Claire Counties.

School A was a combination junior-senior high school (Grades 7 - 12) in a small middle-class manufacturing and resort town. There was no special mathematics program in the seventh grade, but twenty-seven of 124, or 21.8 per cent of the students in the eighth grade, were accelerated in eighth grade mathematics so that they started algebra at the beginning of the second semester of the eighth grade. The students completed the first semester of what is normally ninth grade algebra by the end of the eighth grade. To be enrolled in the program, students were required to have at least a B+ average, including all of their subjects, an I. Q. of 117 on the California Test of Mental Maturity and to rate at the seventieth percentile on the Mathematics Differential Aptitude Test.

School B was a junior high school (Grades 7 - 9) in a middle-sized manufacturing city. The school serviced an area which was one of relative economic depression. There was an enriched program in the seventh grade and the first semester of the eighth grade, utilizing School Mathematics Study Group materials. Students in the special class began algebra the second semester of the eighth grade and completed the amount of material at the end of the eighth grade which is completed typically at the end of the first semester of the ninth grade. Twenty-nine of 242 eighth grade students, or 12.0 per cent, were enrolled in the special class. School achievement and I. Q. test scores on the Lorge-Thorndike Test were used to determine the class membership, but no specific standards were set. A rating at the eighty-fifth percentile

on the California Arithmetic test was required.

School C was a junior high school (Grades 7 - 9) in a large suburban manufacturing city. The school was located in an upper - middle class area of the city. Students were accelerated throughout the seventh and eighth grade, starting algebra at the beginning of the second semester, completing the normal first semester sequence by the end of the eighth grade. A complication arose in this school as another junior high was to open the next fall, which necessitated a reduction of the algebra content in the program for the special class, because the new school would not have such a program, and many of the students would be attending the other school in the ninth grade. Thirty of 297 eighth grade students, or 10.1 per cent, participated in the special program. An average of B or better and an I. Q. of 120 on the Otis Beta Test were required for participation in this class. The Iowa Algebra Aptitude test was also used in selecting the students, but no minimum score was required.

School D was a junior high school (Grades 7 - 9) in an upper middle class suburban area. Thirty students out of 200, or 15.0 per cent, were enrolled in an eighth grade class which was accelerated into algebra for the entire year. These students had been accelerated through seventh and eighth grade mathematics in the seventh grade. Students were required to have a B average and an I. Q. of 110 or better on the California Mental Maturity Test. A rating at the sixty-fifth percentile on the Iowa Algebra Test, and a B grade rating on

the total California Achievement Test were necessary to be a part of the program.

School E was a junior-senior high school (Grades 7 - 12) in a lower middle class industrial - suburban area. Thirty-six students out of 255, or 14.1 per cent, were enrolled in an eighth grade class which was accelerated into algebra for the entire year. These students had been accelerated through seventh and eighth grade mathematics in the seventh grade. Students were required to have a B average, an I. Q. of 120 or better on the California Mental Maturity Test, a rating at the fortieth percentile on the Iowa Algebra Test and be above two years in attainment on the reading, language, and mathematics tests of the California Achievement Battery to be members of the program.

School F was a junior-senior high school (Grades 7 - 12) in a middle class rural - suburban area. Eleven eighth graders out of 116, or 9.5 per cent, were enrolled in regular ninth grade algebra classes. There was no special seventh grade program, and the accelerated eighth grade students simply skipped the usual eighth grade mathematics class. A rating at the sixtieth percentile on the Iowa Algebra Aptitude Test was required for admittance into the program.

School G was a junior high school (Grades 7 - 9) in an upper class suburban area. This particular school was located in the most exclusive neighborhood in the community. Thirty-one eighth graders out of 199, or 15.6 per cent, were in a special class devoted entirely to algebra. These

students had participated in a seventh grade accelerated course, which covered all of the normal seventh and eighth grade material in one year. Requirements for entrance into the program were a B average, a "high" I. Q., although no specific requirements were set, and a minimum of one year advanced production on three achievement tests: The Otis, California, and Science Research Associates Tests.

School H was a junior high school (Grades 7 - 9) in an upper middle class suburban area. Ninety eighth graders out of 492, or 18.3 per cent, were enrolled in one of two special classes which covered all the regular ninth grade algebra content. There were no special classes in the seventh grade. The eighth graders in the special class skipped all of the usual eighth grade mathematics material. Requirements for admission were a B average and an I. Q. of 110 on the Science Research Associates Basic Skill Test.

It should be noted that in all schools using aptitude tests as a basis for selection, the score requirements were based on ninth grade norms, and in those utilizing achievement tests, the norms used were those of the grade level in which the students were enrolled at the time of examination.

The Opinionnaire

The opinionnaire, which was submitted personally by the author of this study to the principals, teachers and students involved in the special programs in each of the eight schools surveyed, was in actuality two opinionnaires which are listed in Appendices D and E. Although the questions

asked, and answers to choose from, were fundamentally the same, the opinionnaire given to the principals and teachers was written in the third person, while that given to the students was written in the second person. The opinionnaires were checked and the results compiled by the author.

Each of the opinionnaires contained nine questions with five possible check-off answers for each question, ranging in sequential order from the responses indicating the highest degree of satisfaction with the special program to the responses indicating the least degree of satisfaction.

The questions for the principals and teachers, and the questions for the students were as follows:

Questions for Principals and Teachers

1. What are the eighth graders' usual reactions to being participants in special mathematics programs for superior students?
2. How does participation in the special mathematics program affect the work of eighth graders in their other courses?
3. How challenging do you believe the material in the special mathematics classes is for the eighth graders as compared to the material they have had in regular classes in the past?
4. How has the interest in mathematics of eighth graders been affected by participation in the special classes?
5. How is the competition among eighth graders in the special program as compared to the competition in regular classes?
6. What is the usual reaction of the parents of the eighth graders in the special mathematics program?
7. How do most of the eighth graders not in the program feel toward those in the special mathematics program?
8. How much interest would eighth graders in the special mathematics program have in taking part in special programs in other subject areas if available to them?
9. How well prepared do you believe the eighth graders in the special program will be for advanced mathematics courses?

Questions for Students

1. What is your reaction to being a participant in a special mathematics program?
2. How does being a member of a special program in mathematics affect your work in your other classes?
3. How challenging do you believe the material in your special mathematics classes is compared to the material you have had?
4. How has your interest in mathematics been affected by participation in the special program?
5. How is competition from other students in your special mathematics program as compared to the competition in your other mathematics classes in the past?
6. What is the reaction of your parents to your being in a special mathematics program?
7. How do the eighth graders, not in the special mathematics program, feel toward you for being in the program?
8. How much interest would you have in taking part in a special program in another subject area in addition to mathematics if available to you?
9. How well prepared do you believe you will be for advanced mathematics courses?

The check-off answers for each of the questions were labeled a, b, c, d, and e with (a) indicating the highest degree of satisfaction and (e) indicating the least. For the purpose of statistical treatment of the results, these were transposed to 4, 3, 2, 1, and 0 respectively with (4) indicating the highest and (0) the lowest degree of satisfaction.

Responses to the Opinionnaire in the Individual Schools

Table 7 presents the responses of the principal and teacher of the special class in School A to the opinionnaire, transposed as indicated above.

All 27 of the students in the special class were present on the day that the author of this report visited School A. All of them filled out an opinionnaire. Table 8 indicates the responses of these students to the opinionnaire.

TABLE 7

Responses of the Principal and Teacher to the Opinionnaire in School A

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	4	3	3	3	4	-	3	3	4
Teacher's Responses	3	2	4	3	4	4	3	3	4

TABLE 8

Responses of the Students to the Opinionnaire in School A

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	9	1	15	4	10	18	0	5	14
Number of Students Checking (3)	14	2	10	14	9	8	11	18	9
Number of Students Checking (2)	4	23	1	8	7	1	12	4	0
Number of Students Checking (1)	0	0	1	0	1	0	4	0	2
Number of Students Checking (0)	0	1	0	1	0	0	0	0	1
Mean	3.19	2.07	3.44	2.74	3.04	3.63	2.26	3.04	3.27

Table 9 shows the responses of the principal and teacher of the special class in School B to the opinionnaire.

TABLE 9

Responses of the Principal and Teacher to the Opinionnaire in School B

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	3	2	3	3	3	3	2	3	4
Teacher's Responses	3	2	4	3	3	3	2	3	4

All 29 of the students in the special class were present on the day School B was visited. All of them filled out an opinionnaire. Table 10 indicates the responses of these students.

TABLE 10

Responses of the Students to the Opinionnaire in School B

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	16	0	18	6	12	19	7	15	22
Number of Students Checking (3)	9	11	10	16	10	8	8	9	4
Number of Students Checking (2)	1	13	1	5	7	2	14	4	2
Number of Students Checking (1)	2	4	0	2	0	0	0	0	1
Number of Students Checking (0)	1	1	0	0	0	0	0	1	0
Mean	3.28	2.17	3.59	2.90	3.17	3.59	2.76	3.28	3.62

Table 11 indicates the responses of the principal and teacher of the special class in School C to the opinionnaire.

TABLE 11

Responses of the Principal and Teacher to the Opinionnaire in School C

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	3	2	4	3	2	3	3	3	2
Teacher's Responses	4	4	4	3	4	4	2	4	4

All 30 of the students in the special class were present on the day School C was visited. All 30 filled out an opinionnaire. Table 12 shows the responses of these students.

Table 13 gives the responses of the principal and teacher of the special class in School D to the opinionnaire.

Twenty-nine of the thirty students enrolled in the special class were present on the day School D was visited. Table 14 indicates the responses of these students to the opinionnaire.

Table 15 indicates the responses of the principal and teacher of the special class in School E to the opinionnaire.

Twenty-nine of the thirty-six students enrolled in the special class in School E were present on the day School E was visited. Table 16 gives the responses of these students to the opinionnaire.

Table 17 shows the responses of the principal and teacher of the accelerated students in algebra in School F to the opinionnaire.

TABLE 12

Responses of the Students to the Opinionnaire in School C

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	9	1	20	7	6	21	3	9	22
Number of Students Checking (3)	14	3	8	19	14	9	11	11	8
Number of Students Checking (2)	7	22	2	4	5	0	16	8	0
Number of Students Checking (1)	0	4	0	0	3	0	0	1	0
Number of Students Checking (0)	0	0	0	0	2	0	0	1	0
Mean	3.07	2.03	3.60	3.10	2.63	3.70	2.57	2.87	3.73

TABLE 13

Responses of the Principal and Teacher to the Opinionnaire in School D

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	3	2	4	3	3	4	3	3	3
Teacher's Responses	3	2	4	3	3	3	3	3	4

TABLE 14

Responses of the Students to the Opinionnaire in School D

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	13	2	16	16	14	20	4	15	10
Number of Students Checking (3)	15	7	12	8	11	9	14	12	15
Number of Students Checking (2)	0	18	1	4	4	0	10	1	2
Number of Students Checking (1)	0	2	0	1	0	0	1	0	2
Number of Students Checking (0)	1	0	0	0	0	0	0	1	0
Mean	3.34	2.31	3.52	3.34	3.34	3.69	2.72	3.38	3.14

TABLE 15

Responses of the Principal and Teacher to the Opinionnaire in School E

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	4	4	4	4	4	-	-	4	4
Teacher's Responses	4	3	4	3	4	4	3	4	3

TABLE 16

Responses of the Students to the Opinionnaire in School E

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	15	4	11	12	14	22	0	29	23
Number of Students Checking (3)	12	5	14	7	10	6	6	0	5
Number of Students Checking (2)	1	20	4	9	5	0	22	0	0
Number of Students Checking (1)	0	0	0	1	0	0	1	0	1
Number of Students Checking (0)	1	0	0	0	0	1	0	0	0
Mean	3.38	2.44	3.24	3.03	3.31	3.66	3.17	4.00	3.72

TABLE 17

Responses of the Principal and Teacher to the Opinionnaire in School F

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	4	2	4	3	3	3	3	3	2
Teacher's Responses	4	3	4	3	3	4	3	3	4

Nine of the eleven eighth graders taking algebra in School F were present on the day the school was visited. Table 18 indicates the responses of these students to the opinionnaire.

TABLE 18

Responses of the Students to the Opinionnaire in School F

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	7	0	3	5	1	8	0	4	6
Number of Students Checking (3)	2	1	2	3	2	1	5	5	2
Number of Students Checking (2)	0	8	4	1	6	0	3	0	1
Number of Students Checking (1)	0	0	0	0	0	0	1	0	0
Number of Students Checking (0)	0	0	0	0	0	0	0	0	0
Mean	3.78	2.11	2.23	3.44	2.44	3.89	2.11	3.44	3.56

Table 19 shows the responses to the opinionnaire of the principal and teacher of the special program in School G.

TABLE 19

Responses of the Principal and Teacher to the Opinionnaire in School G

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	3	3	4	4	3	3	3	3	4
Teacher's Responses	4	3	4	3	4	4	-	3	4

Twenty-eight of the thirty-one students enrolled in the special eighth grade algebra class were present on the day that School G was visited. Table 20 gives the responses of these students to the opinionnaire.

Table 21 indicates the responses to the opinionnaire of the principal and teachers of the special classes in School H. School H was the one school covered in this survey which had more than one special class. The two classes were taught by two different teachers. Therefore, Table 21 is different than the tables indicating principal and teacher responses in the other schools.

Seventy-seven of the ninety eighth grade students enrolled in the special mathematics classes in School H were present on the day the school was visited. Table 22 indicates the responses of these students to the opinionnaire.

Means of the Responses to the Opinionnaire in All of the Schools

The mean scores on the transposed rating scale for principals, teachers, and students in all of the schools for each of the questions appear in Table 23.

TABLE 20

Responses of the Students to the Opinionnaire in School G

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	21	1	23	14	14	23	4	17	26
Number of Students Checking (3)	7	7	4	10	8	5	13	7	2
Number of Students Checking (2)	0	17	1	3	5	0	10	4	0
Number of Students Checking (1)	0	3	0	1	1	0	0	0	0
Number of Students Checking (0)	0	0	0	0	0	0	1	0	0
Mean	3.75	2.21	3.79	3.32	2.71	3.82	2.68	3.46	3.93

TABLE 21

Responses of the Principal and Teachers to the Opinionnaire in School H

Question Number	1	2	3	4	5	6	7	8	9
Principal's Responses	4	3	4	4	4	4	4	3	4
1st Teacher's Responses	4	2	4	4	4	4	2	4	4
2nd Teacher's Responses	3	3	4	4	2	3	4	3	4

TABLE 22

Responses of the Students to the Opinionnaire in School H

Question Number	1	2	3	4	5	6	7	8	9
Number of Students Checking (4)	50	8	60	37	48	56	8	34	58
Number of Students Checking (3)	24	16	14	27	22	17	42	33	16
Number of Students Checking (2)	3	45	3	12	7	3	26	10	0
Number of Students Checking (1)	0	8	0	1	0	0	0	0	1
Number of Students Checking (0)	0	0	0	0	0	0	0	0	1
Mean	3.61	2.31	3.74	3.30	3.53	3.70	2.77	3.31	3.70

TABLE 23

Mean Responses of the Principals, Teachers, and Students in all the Schools to each of the Questions in the Opinionnaire

Question Number	Principals' Responses		Teachers' Responses		Students' Responses	
	Number Answering Question	Mean Response	Number Answering Question	Mean Response	Number Answering Question	Mean Response
1	8	3.50	9	3.56	258	3.43
2	8	2.63	9	2.67	258	2.24
3	8	3.75	9	4.00	258	3.57
4	8	3.38	9	3.22	258	3.16
5	8	3.25	9	3.44	258	3.22
6	6	3.33	9	3.67	257	3.69
7	7	3.00	8	2.75	257	2.60
8	8	3.13	9	3.33	258	3.33
9	8	3.38	9	3.89	256	3.61

An alternate tabulation for Question Number 8 should be given. This question and check-off answer a) read as follows for principals and teachers:

8. How much interest would eighth graders in the special mathematics program have in taking part in special programs in other subject areas if available to them?

_____ a) Most of them would enthusiastically welcome the opportunity or are already in such programs.

In the student opinionnaire, Question 8 and check-off answer a) read:

8. How much interest would you have in taking part in a special program in another subject area in addition to mathematics if available to you?

_____ a) I would be very enthused about taking part in such a program, or I am already in such a program.

In School E, all of the students enrolled in the special eighth grade mathematics program were also enrolled in a special program in science. None of the students in any of the other schools were enrolled in special classes in other subject areas.

Obviously all the students, in addition to the principal and teacher, in School E checked off answer "a." Since the students, principals and teachers in all the other schools were able to answer the question on the basis of opinion as to what the reaction would be if such a class were offered, a strong argument could be given for eliminating School E from the study for this one question.

Table 23, Question 8 (alternate tabulation) eliminating School E would read as follows:

TABLE 23, (alternate tabulation, Question 8)

Question Number	Principals' Responses		Teachers' Responses		Students' Responses	
	Number Answering Question	Mean Response	Number Answering Question	Mean Response	Number Answering Question	Mean Response
8	7	3.00	8	3.25	229	3.25

Test of Hypothesis (A)

Hypothesis (A), as previously stated in Chapter I, was as follows:

The variance of the means of the principals', teachers', and students' perceptions as determined on a 5 point rating scale will not generally reach the .05 level of significance when they are compared group to group.

The significance of the variance of means can be tested by use of the F - test as explained in Garrett's Statistics in Psychology and Education.[73]

The first comparison to be made was that between the mean perceptions of the principals and the mean perceptions of the teachers.

Table 24 shows the variance ratio between the mean perception of the principals and the mean perception of the teachers on each of the nine questions on the opinionnaire. It also shows the value necessary for the F ratio to reach the .05 level of significance for each of the questions. Both of these sets of figures were determined by using the F - test.

The variance ratio between the mean perception of the principals and the mean perception of the teachers was not proved to be significant at the .05 level of significance for any of the questions on the opinionnaire.

The next comparison to be made was that between the mean perceptions of the principals and the mean perceptions of the students.

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[73]Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1953), pp. 281-284, 429-432.

TABLE 24

Variance Ratio Between the Mean Perceptions of the Principals and Teachers on the Opinionnaire

Question Number	Variance Ratio	Number for the .05 Level
1	.04	243.91
2	.02	243.91
3	2.60	4.54
4	1.74	4.54
5	.38	243.91
6	1.81	4.67
7	.55	243.91
8	.73	243.91
8[a]	2.09	4.67
9	2.49	4.54

[a]Alternate tabulation

Table 25 shows the variance ratio between the mean perception of the principals and the mean perception of the students on each of the nine questions on the opinionnaire. It also shows the value necessary for the F ratio to reach the .05 level of significance for each of the questions. Both of these sets of figures were determined by using the F test.

TABLE 25

Variance Ratio Between the Mean Perceptions of the Principals and Students on the Opinionnaire

Question Number	Variance Ratio	Number for the .05 Level
1	.07	254.32
2	2.25	3.87
3	.72	254.32
4	.52	254.32
5	0	-
6	2.45	3.87
7	2.15	3.87
8	1.46	3.87
8[a]	.76	254.32
9	.80	254.32

[a]Alternate tabulation

The variance ratio between the mean perception of the principals and the mean perception of the students was not proved to be significant at the .05 level of significance for any of the questions on the opinionnaire.

The next comparison to be made was that between the mean perceptions of the teachers and the mean perceptions of the students.

Table 26 shows the variance ratio between the mean perception of the teachers and the mean perception of the students on each of the nine questions on the opinionnaire.

It also shows the value necessary for the F ratio to reach the .05 level of significance for each of the questions. Both sets of figures were determined by using the F test.

TABLE 26

Variance Ratio Between the Mean Perceptions of the Teachers and Students on the Opinionnaire

Question Number	Variance Ratio	Number for the .05 Level
1	.26	254.32
2	3.10	3.87
3	4.58	3.87
4	.05	254.32
5	.58	254.32
6	0	-
7	.37	254.32
8	0	-
8[a]	0	-
9	1.39	3.87

[a]Alternate tabulation

The only variance ratio which is significant at the .05 level of significance is that between the mean perception of the teachers and the mean perception of the students on Question Number 3. This question dealt with the perceptions of how challenging the material in the special mathematics courses appeared to be in comparison to the subject matter

taken previously. The teachers' perceptions indicated that they felt the material was more challenging than the students believed it to be. On Question Number 2 relative to the affect of the special programs on other courses, the teachers' more favorable perceptions came near the .05 level of significance.

The variance of the means did not reach the .05 level of significance when the perceptions of the principals, teachers, and students were compared group to group with the single exception of the teachers' and students' perceptions of how challenging the material in the special classes appeared to be.

Test of Hypothesis (B)

Hypothesis (B), as stated in Chapter I, read:

The variance of the means between the principals', teachers', and students' perceptions, as determined on a 5 point rating scale, in the schools which accelerate students into algebra at the end of one semester of the eighth grade, and the respective principals', teachers', and students' perceptions, as determined on a 5 point rating scale, in the schools which accelerate students into algebra for the entire eighth grade will not generally reach the .05 level of significance.

The F test can be used to test Hypothesis (B) as it was used to test Hypothesis (A).

The first comparison to be made was that between the perceptions of the principals in the schools accelerating for one-half year, and the perceptions of the principals in

the schools accelerating for the entire year. Schools A, B and C were the schools accelerating for one-half year, while D, E, F, G and H were the schools accelerating for the entire year.

Table 27 shows the mean perceptions of the principals in the schools accelerating students into algebra for one-half year, the mean perceptions of the principals in the schools accelerating students into algebra for a full year, the variance ratio between the means on each of the nine questions, and the value necessary for the F ratio to reach the .05 level of significance for each of the questions.

The variance ratio between the mean perception of the principals in the schools accelerating eighth graders for one-half year, and the mean perception of the principals in the schools accelerating them for a full year were not proved to be significant at the .05 level of significance for any of the questions on the opinionnaire.

Table 28 shows the mean perceptions of the teachers of the classes accelerating students into algebra for one-half year, the mean perceptions of the teachers of the classes accelerating students into algebra for a full year, the variance ratio between the means on each of the nine questions, and the value necessary for the F ratio to reach the .05 level of significance for each of the questions.

The variance ratio between the mean perception of the teachers of the classes accelerating eighth graders for one-half year, and the mean perception of the teachers of the

TABLE 27

Mean Perceptions of the Principals in Schools Accelerating Students into Algebra for One-half and One Full Year in Grade Eight, and the Variance Ratio Between the Means on the Opinionnaire

Question Number	Schools Accelerating for One-half Year		Schools Accelerating for the Full Year		Variance Ratio Between the Means	Number for the .05 Level of Significance
	Number of Principals' Perceptions	Mean Perception	Number of Principals' Perceptions	Mean Perception		
1	3	3.33	5	3.60	.42	233.97
2	3	2.33	5	2.80	.72	233.97
3	3	3.33	5	4.00	4.82	5.99
4	3	3.00	5	3.60	3.35	5.99
5	3	3.00	5	3.40	.57	233.97
6	2	3.00	4	3.50	1.32	7.71
7	3	2.67	4	3.25	2.07	6.61
8	3	3.00	5	3.20	.54	233.97
8[a]	3	3.00	4	3.00	0	-
9	3	3.33	5	3.40	0	-

[a]Alternate tabulation

TABLE 28

Mean Perceptions of the Teachers of Classes Accelerating Students into Algebra for One-half and One Full Year in Grade Eight, and the Variance Ratio Between the Means on the Opinionnaire

Question Number	Classes Accelerating for One-half year		Classes Accelerating for the Full year		Variance Ratio Between the Means	Number for the .05 Level of Significance
	Number of Teachers' Perceptions	Mean Perception	Number of Teachers' Perceptions	Mean Perception		
1	3	3.33	6	3.67	.76	233.97
2	3	2.67	6	2.50	.08	233.97
3	3	4.00	6	4.00	0	-
4	3	3.00	6	3.33	1.32	5.59
5	3	3.67	6	3.33	.39	233.97
6	3	3.67	6	3.67	0	-
7	3	2.33	5	3.20	4.60	5.99
8	3	3.33	6	3.33	0	-
8[a]	3	3.33	5	3.20	.12	233.97
9	3	4.00	6	3.83	.08	233.97

[a]Alternate tabulation

classes accelerating eighth graders for a full year were not proved to be significant at the .05 level of significance for any of the questions on the opinionnaire.

Table 29 shows the mean perceptions of the eighth graders being accelerated into algebra for one-half year, the mean perceptions of the eighth graders being accelerated into algebra for a full year, the variance ratio between the means on each of the nine questions, and the value necessary for the F ratio to reach the .05 level of significance for each of the questions.

The variance ratio between the mean perception of the students who are accelerated into algebra for one-half year and the mean perception of the students who are accelerated into algebra for a full year were proved to be significant at the .05 level of significance on five of the nine questions. This was a decidedly different result than was discovered for any of the other comparisons.

The five questions on which there was a significant difference at the .05 level were the questions relating to the general reaction at being a participant in the program, the affect of participation in the program on work in other classes, the affect of participation in the program on interest in mathematics, the level of competition in the program compared to the level of competition in other courses, and interest in participation in special programs in other subject areas. On Questions Number 4, 5 and 8 relating to interest in mathematics, the level of competition, and interest in other special

TABLE 29

Mean Perceptions of the Students in Eighth Grade Classes Accelerating Them into Algebra for One-half Year and One Full Year, and the Variance Ratio Between the Means on the Opinionnaire

Question Number	Classes Accelerating for One-half Year		Classes Accelerating for the Full Year		Variance Ratio Between the Means	Number for the .05 Level of Significance
	Number of Students' Perceptions	Mean Perception	Number of Students' Perceptions	Mean Perception		
1	86	3.17	172	3.56	4.67*	3.87
2	86	2.09	172	2.31	5.10*	3.87
3	86	3.55	172	3.58	.18	254.32
4	86	2.92	172	3.27	10.92*	3.87
5	86	2.94	172	3.36	14.36*	3.87
6	86	3.64	171	3.71	2.77	3.87
7	86	2.53	171	2.63	.90	254.32
8	86	3.06	172	3.47	16.56*	3.87
8[a]	86	3.06	143	3.36	15.84*	3.89
9	85	3.55	171	3.64	.76	254.32

[a]Alternate tabulation

*Significant difference

classes, the variance ratio between the means actually reached the .01 level of significance.

It should be noted also that on all nine questions the mean perception of the students being accelerated for the full year was higher, or more favorable to participation in the program, than were the mean perceptions of the students being accelerated for one-half year. This same relationship was evident in the mean difference between the perceptions of the principals, although the variance ratio was not determined to be significant at the .05 level for any of the questions, the mean perception of the principals of the schools with programs accelerating for the full year was higher on each of the nine questions, unless the alternate answer were to be used on Question Number 8. In this case, the means were identical.

This relationship did not exist in regard to the comparison of means between the two groups of teachers. In this case the more favorable mean perceptions are almost equally divided between the two groups and several had exactly the same mean.

It should be pointed out at this point that School C, which, as previously noted, reduced its algebra content near the end of the course, had not done so at the time the opinionnaire was submitted to the students; nor had the students been informed that this was going to be done. The mean perception of the students in this school are not solely responsible for the lower mean perceptions of the students in the schools accelerating for one-half year.

Hypothesis (B) has not been proved as far as the students' perceptions are concerned.

Test of Hypothesis (C)

Hypothesis (C), as stated in Chapter I, read:

The perceptions of the effectiveness of the special mathematics programs for superior students in the selected schools will generally be above the 2 point level on a 5 point rating scale on which the number 4 indicates the most favorable perception and zero indicates the least favorable perception. This will be true of the perceptions of the principals, teachers, and students involved.

A review of Table 28 shows that the mean perception was above the 2 point level on each question for each group: principals, teachers, and students. Hypothesis (C) was demonstrated to be valid.

The Testing Analysis

The teachers of the special classes all agreed, with their principals' permission, to administer a standardized algebra achievement test to the eighth graders in the special classes during the last two weeks of the Spring semester.

Algebra Achievement Tests

The Seattle Algebra Test was administered to the students in the schools whose programs accelerated them for one-half year of algebra in the eighth grade. The Cooperative Algebra Test was administered in the schools which accelerated students for the full year.

The Seattle Algebra Test is a test designed to measure algebra achievement at the end of the first half year. The test was standardized by administration to 8,285 students in sixty-two schools in twenty-seven states throughout the United States. Form AM of the test was used in the three schools, examined in this study, which accelerated eighth graders into algebra for the last one-half of the grade.

The Cooperative Algebra Test is an end-of-the-first-year-of-algebra test measuring elementary algebra achievement through quadratics. The test was standardized by administration to 15,000 ninth grade algebra students in 130 schools in public secondary schools of the East, Middle West and West. Form T of the test was used in the five schools, examined in this study, which accelerated eighth graders into algebra for the full year.

One-half Year Acceleration

Table 30 shows the number of students in the three schools accelerating eighth graders into one-half year of algebra who took the Seattle Algebra Test. It also shows the highest, median, and lowest standard score and percentile rank for each school, and the mean standard score with its corresponding percentile rank.

One Full Year Acceleration

Table 31 shows the number of students in the five schools accelerating eighth graders into a full year of beginning algebra who took the Cooperative Algebra Test. It also shows the highest, median, and the lowest scaled score

TABLE 30

Highest, Median, Mean, and Lowest Standard Scores and Percentile Ranks by Schools on One-half Year Algebra Standardized Test

School	Number of Students Taking the Test	Highest Standard Score	P.R.	Median Standard Score	P.R.	Mean Standard Score	P.R.	Lowest Standard Score	P.R.
School A	26	150	99+	122	81	124	84	108	48
School B	27	139	97	122	81	122	81	99	25
School C	29	130	91	114	64	116	67	94	16

TABLE 31

Highest, Median, Mean, and Lowest Scaled Scores and Percentile Ranks by Schools on One Full Year Algebra Standardized Test

School	Number of Students Taking the Test	Highest Scaled Score	P.R.	Median Scaled Score	P.R.	Mean Scaled Score	P.R.	Lowest Scaled Score	P.R.
School D	29	78	99+	71	97	71	97	61	80
School E	32	76	99+	62	83	63	86	40	09
School F	10	74	99	64	88	64	88	52	46
School G	31	78	99+	71	97	71	97	53	50
School H	79	80	99+	68	94	67	93	42	13

and percentile rank for each school, and the mean scaled score with its corresponding percentile rank.

Test of Hypothesis (D)

Hypothesis (D) as stated in Chapter I read:

The mean standard score on the Seattle Algebra Test and the mean scaled score on the Cooperative Algebra Test for eighth graders in the selected schools, accelerated into one-half year of algebra and a full year of algebra respectively, will correspond to at least the seventy-fifth percentile rank on national norms in each school.

Tables 30 and 31 demonstrated that the seventy-fifth percentile rank was achieved as the mean score for two of the three schools accelerating into one-half year of algebra, and for all of the schools accelerating into algebra for the entire year.

It should be noted that School C, the only school in which the mean score did not correspond to a percentile rank of at least seventy-five, was the school in which the program was abandoned before the completion of the course. Because of this irregularity, it would appear that the hypothesis was substantiated.

It also should be pointed out that the lowest percentile rank for the mean score in the schools accelerating for the full year was higher than the highest percentile rank for the mean score in the schools accelerating for one-half year.

Summary

This chapter reported the results of an analysis made of the special eighth grade mathematics programs in eight junior high schools in Michigan. Three of the schools' eighth grade programs accelerated the students into algebra for one-half year. The other five programs accelerated the students into a full year of algebra in the eighth grade.

In each of the schools an opinionnaire consisting of nine questions was submitted to the principals, teachers of the special classes, and students participating in the special programs. Each question had five possible check-off answers ranging in sequential order from the responses indicating the highest degree of satisfaction to the responses indicating the least degree of satisfaction. The results show the following:

1. The mean variance between the principals', teachers' and students' perceptions did not reach the .05 level of significance, as determined by the F test, except the mean variance between the teachers' and students' perceptions on one question in which the teachers indicated that they believed the material in the special classes was more challenging than the students perceived it to be.

2. The mean variance between the principals' perceptions in the schools accelerating eighth graders into one-half year of algebra and the principals perceptions in the schools accelerating eighth graders into a full year of algebra did not reach the .05 level of significance, as determined by the F test, although the perceptions of principals in schools

with full-year algebra programs were more favorable on each question.

3. The same result was found for the mean variance between the perceptions of the teachers of the classes accelerating students into algebra for one-half year and the teachers of classes accelerating students into algebra for a full year.

4. There was, however, a significant difference at the .05 level of significance on five of the nine questions when the mean perceptions of the students were compared. In each case the perceptions of the students who were accelerated into algebra for a full year were significantly more favorable to the program than were the perceptions of the students who were accelerated into algebra for one-half year. These five questions dealt with: the general reaction at being in a special program, the special program's affect on other course work, the special program's effect on interest in mathematics, the level of competition in the special program, and student interest in participation in other special programs. On the latter three of these, the variance ratio reached the .01 level of significance. The students participating in full year programs had more favorable perceptions on all nine questions of the opinionnaire than did the students participating in one-half year programs.

5. The mean perceptions of the principals, teachers, and students were all above the 2 point level for each question on a 5 point rating scale on which the number 4 indicated the

most favorable perception and zero indicated the least favorable perception.

6. The Seattle Algebra Test was given at the end of the course to the students participating in special programs accelerating them into one-half year of algebra. The Cooperative Algebra Test was given at the end of the course to the students participating in special programs accelerating them into algebra for a full year. The percentile rankings for the mean standard scores in each of the three schools administering the Seattle Algebra Test were 84, 81, and 67. The percentile rankings for the mean scaled scores in each of the five schools administering the Cooperative Algebra Test were 97, 97, 93, 88, and 86.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Questionnaires relative to special programs in mathematics for superior students were answered by the principals of 482 public junior high schools in Michigan. Eighty-five of these schools had special programs. Eight programs involving eighth graders accelerated into algebra were examined in detail by the use of an opinionnaire submitted to the principals, teachers, and students involved in these programs. Standardized algebra achievement tests were given to the students in the special programs in these eight schools. Based on the results of the questionnaires, opinionnaires and standardized achievement tests, the following conclusions have been reached.

1. There was a great deal of interest on the part of junior high school administrators in special programs in mathematics for superior students. This was evident from an 82.8 per cent return on the questionnaire.

2. Eighty-one junior high schools were experimenting in the area of special mathematics programs. Seventy-nine of these programs in operation had been organized within the last four years.

3. Sixty-nine per cent of the special seventh grade programs were in operation in junior high schools with at least 200 students in grade seven. Sixty-four per cent of the special eighth grade programs were in operation in junior high schools with at least 200 students in grade eight.

4. There were more programs at the eighth grade level than there were at the seventh grade level. All schools having seventh grade programs also had, or planned to have, eighth grade programs.

5. Most schools with special programs had made a conscientious effort in planning the programs and planned to evaluate the programs once they were in operation.

6. At the seventh grade level, there was considerable diversity in the type of program offered, with nearly equal numbers sponsoring enriched, accelerated, and combination programs.

7. At the eighth grade level, seventy-three per cent of the programs involved acceleration, which universally meant starting algebra earlier than usual.

8. The responses of principals, teachers, and students answering the opinionnaire indicated a favorable reaction to the programs.

9. There appeared to be little significant difference between the reactions of the three groups - principals, teachers, and students - to the special programs.

10. Among the students, and to a lesser degree among the principals, there was a more favorable reaction among those involved in accelerating students into algebra for a

full year than there was among those involved in accelerating students into algebra for the last half of the year. This was not the case with the teachers. On five questions the variance ratio between the means of the two groups of students reached the .05 level of significance, and on three questions it reached the .01 level of significance. In all cases the mean perceptions of the students in full year programs were the most favorable.

11. The success of the students, as measured by standardized achievement tests, indicated that superior eighth graders could successfully take algebra in the eighth grade.

12. A reasonable degree of success at the eighth grade level apparently could be achieved regardless of the socio-economic background of the students.

13. It appeared that greater success could be achieved in programs where the students were accelerated into algebra for the entire eighth grade rather than for one-half year.

The following recommendations for further study are made in view of the findings of this study.

1. It is recommended that a study be made to determine the extent to which special programs for superior students in other subject areas are being carried on in the junior high schools of Michigan.

2. It is recommended that a study be made to determine the relationship between I. Q. and success in special programs in mathematics at the junior high school level for the purpose of determining how many students should be included in such programs.

3. It is recommended that a study be made of the relationship between the socio-economic background of the students and the degree of success possible in special mathematics programs for superior students.

4. It is recommended that a study be made to determine whether students taking algebra in the eighth grade are deficient in mathematics subject matter usually taught in the eighth grade. This study could be divided into an examination of the students in programs which have attempted to cover this material before beginning the study of algebra and the programs which have made no such provision.

5. It is recommended that a study be made of the success of pupils in senior high school mathematics who have begun algebra in the eighth grade.

6. It is recommended that a study be made to determine whether superior students would be successful if they were enrolled in an accelerated program beginning the study of algebra in the seventh grade.

7. It is recommended that a study be made to determine the extent to which special programs in mathematics for superior junior high school students are being carried on in other parts of the United States.

8. It is recommended that a study be made of the achievement of junior high school students enrolled in enriched mathematics programs.

9. It is recommended that a study be made to determine the significant difference between the perceptions of

principals, teachers, and students involved in enriched junior high school mathematics programs and the perceptions of principals, teachers, and students involved in accelerated junior high school mathematics programs.

APPENDIX A

QUESTIONNAIRE SENT TO ALL MICHIGAN JUNIOR HIGH SCHOOLS - PART I

Name of School

1. How many students do you have in:

   (a) grade 7?_____

   (b) grade 8?_____

2. Do you have a special program in mathematics for superior students in:

   (a) grade 7?_____

   (b) grade 8?_____

If the answer to parts (a) and (b) of question 2 are both 'no' detach this sheet and mail it to:

Russell Baker, Principal
Ida High School
Ida, Michigan

If the answer to either part (a) or (b) of question 2 is 'yes' please complete the remainder of the questionnaire.

APPENDIX B

QUESTIONNAIRE SENT TO ALL MICHIGAN JUNIOR HIGH SCHOOLS - PART II

3. How many students are involved in these special programs in

   (a) grade 7?_____

   (b) grade 8?_____

4. Are the students in special programs being taught in classes separate from the rest of the students at their grade level?

   _____

5. Is the mathematics content for students in special classes different from the content for other pupils in:

   (a) grade 7?_____

   (b) grade 8?_____

6. Do you consider your special mathematics program to be basically one of:

   (a) enrichment_____in grade 7?_____in grade 8?_____

   or

   (b) acceleration_____in grade 7?_____in grade 8?_____

7. Why do you make this particular distinction?

   _____

   _____

   _____

8. In making the determination of the particular program being used did you utilize

   (a) references on the subject?_____

   (b) outside advisors?_____

   (c) citizen groups?_____

(d) a study of the needs of the community?_____

(e) a faculty study?_____

(f) student opinions?_____

(g) visits to other schools with special programs?_____

(h) other sources?_____What?_____

_____

9. In selecting pupils for the special programs do you consider:

(a) School Achievement

in Math_____

in general_____

(b) I. Q. Tests

Total I. Q._____

Specific aspects of intelligence related to mathematics_____

What tests are used?_____

(c) Aptitude Tests

Overall aptitude_____

Aptitude for mathematics_____

What tests are used?_____

(d) Achievement Tests

Overall achievement scores?_____

Achievement scores in areas related to mathematics_____

What tests are used?_____

(e) Teachers opinion

Mathematics teachers?_____

Other teachers?_____Which ones?_____

10. In selecting pupils for the special programs do you have specific standards set for

    (a) school achievement_____If yes, what grade average___

    (b) I. Q._____If yes, what I. Q._____

    (c) aptitude scores_____If yes, what score?_____

    (d) achievement scores_____If yes, what score?_____

11. Can particularly high scores in one area compensate for substandard scores in another?_____

12. Is the program voluntary?_____

13. Is parental permission required?_____

14. Is the program followed up in the high school grades?_____

15. How long has your program been in operation?_____

16. Have follow up studies been made to determine the effectiveness of your program?_____

    (a) What criteria are used to determine effectiveness?_____

    _____

    _____

    (b) What devices are used to determine whether the program is fulfilling the standards set for it?_____

    _____

17. Have any modifications been made in the program since its inception?_____If so, what changes have been made?

    _____

    _____

18. Would you like a copy of the report when completed?_____

Please mail by December 7 to: Russell Baker
Ida High School
Ida, Michigan

_____
Name and title of person filling out report

APPENDIX C

LETTER ACCOMPANYING QUESTIONNAIRE SENT TO ALL MICHIGAN JUNIOR HIGH SCHOOLS

Dear _____:

For the past two years the Ida Junior-Senior High School has been operating a special program in mathematics for superior students in junior high school. There are, of course, many other schools operating similar programs throughout Michigan.

The enclosed questionnaire is one of nearly six hundred which is being sent to every public school in the state which operates a seventh and/or eighth grade as a secondary program.

It is hoped that this survey will make a contribution to the general field of knowledge dealing with special programs for superior students in Michigan. There is a minimum of material on such programs in junior high school. Your cooperation in filling in the questionnaire will be greatly appreciated. Please return it by December 7. Thank you.

Sincerely,

Russell R. Baker, Principal
Ida High School
Ida, Michigan

APPENDIX D

OPINIONNAIRE FOR PRINCIPALS AND TEACHERS IN EIGHT SELECTED SCHOOLS

1. What are the eighth graders' usual reactions to being participants in special mathematics programs for superior students?

_____ a) Extremely pleased about being participants.
_____ b) Pleased about being participants.
_____ c) Indifferent about being participants.
_____ d) Reluctant about being participants.
_____ e) Ungracious about being participants.

2. How does participation in the special mathematics program affect the work of eighth graders in their other courses?

_____ a) It stimulates them to do much better work through all their courses.
_____ b) It has a positive carry over effect on their work.
_____ c) It does not appear to have any effect on their other courses.
_____ d) The time spent on the special program makes it hard for students to do quite the job they would normally do in their other courses.
_____ e) The special program is so time consuming that the students must necessarily neglect their other courses.

3. How challenging do you believe the material in the special mathematics classes is for the eighth graders as compared to the material they have had in regular classes in the past?

_____ a) It is much more challenging.
_____ b) It is somewhat more challenging.
_____ c) It is equally as challenging.
_____ d) It is not as challenging.
_____ e) It is much less challenging.

4. How has the interest in mathematics of eighth graders been affected by participation in the special classes?

_____ a) It has greatly intensified their interest.
_____ b) It has somewhat increased their interest.

_____ c) It has not made notable change in their interest.
_____ d) It has made them lose some of their interest.
_____ e) It has made them completely lose their interest.

5. How is the competition among eighth graders in the special program as compared to the competition in regular classes?

_____ a) Competition is much stronger.
_____ b) Competition is somewhat stronger.
_____ c) Competition is about the same.
_____ d) Competition is somewhat less.
_____ e) Competition is much less.

6. What is the usual reaction of the parents of the eighth graders in the special mathematics program?

_____ a) Extremely pleased about their children being in the program.
_____ b) Pleased about their children being in the program.
_____ c) Indifferent about their children being in the program.
_____ d) Reluctant about their children being in the program.
_____ e) Displeased about their children being in the program.

7. How do most of the eighth graders not in the program feel toward those in the special mathematics program?

_____ a) The rest of the students admire those in the program.
_____ b) The rest of the students think that it is nice for those in the program.
_____ c) The rest of the students are disinterested in the fact that some students are in the program.
_____ d) The rest of the students resent those that are in the program.
_____ e) The rest of the students strongly resent those that are in the program.

8. How much interest would eighth graders in the special mathematics program have in taking part in special programs in other subject areas if available to them?

_____ a) Most of them would enthusiastically welcome the opportunity or are already in such programs.
_____ b) Most of them would be willing to take part in such programs.
_____ c) Most of them would waiver in their decision as to whether to join another such program or not.
_____ d) Most of them would be reluctant to join another such program.

_____ e) Most of them would not join such a program if given a chance to refuse.

9. How well prepared do you believe the eighth graders in the special program will be for advanced mathematics courses?

_____ a) Much better prepared than they would be if they were not in the special program.
_____ b) Somewhat better prepared than they would be if they were not in the special program.
_____ c) As well prepared as they would be if they were not in the special program.
_____ d) Not as well prepared as they would be if they were not in the special program.
_____ e) Much less well prepared than they would be if they were not in the special program.

APPENDIX E

OPINIONNAIRE FOR STUDENTS IN EIGHT SELECTED SCHOOLS

1. What is your reaction to being a participant in a special mathematics program?

_____ a) I am extremely pleased about being a participant.
_____ b) I am pleased about being a participant.
_____ c) I am indifferent about being a participant.
_____ d) I am unhappy about being a participant.
_____ e) I would like to quit the program.

2. How does being a member of a special program in mathematics affect your work in your other classes?

_____ a) It has greatly helped me improve the level of work in my other classes.
_____ b) It has a positive carry over effect on my work in my other classes.
_____ c) It does not appear to have any effect on my other classes.
_____ d) The time spent on the special program makes it hard for me to do justice to my other classes.
_____ e) The special program is so time consuming that my other work must necessarily be neglected.

3. How challenging do you believe the material in your special mathematics class is compared to the material you have had in regular classes in the past?

_____ a) It is much more challenging.
_____ b) It is somewhat more challenging.
_____ c) It is equally as challenging.
_____ d) It is not as challenging.
_____ e) It is much less challenging.

4. How has your interest in mathematics been affected by participation in the special program?

_____ a) It has been greatly increased.
_____ b) It has been somewhat increased.
_____ c) It has not been changed.
_____ d) It has made me lose some interest.
_____ e) It has made me completely lose interest.

5. How is competition from other students in your special mathematics program as compared to the competition in your other mathematics classes in the past?

_____ a) Competition is much stronger.
_____ b) Competition is somewhat stronger.
_____ c) Competition is about the same.
_____ d) Competition is somewhat less.
_____ e) Competition is much less.

6. What is the reaction of your parents to your being in a special mathematics program?

_____ a) They are extremely pleased about my being in the program.
_____ b) They are pleased about my being in the program.
_____ c) They are indifferent about my being in the program.
_____ d) They are unhappy about my being in the program.
_____ e) They would like me to quit the program.

7. How do the eighth graders, not in the special mathematics program, feel toward you for being in the program?

_____ a) The rest of the students admire me for being in the program.
_____ b) The rest of the students think that it is nice for me to be in the program.
_____ c) The rest of the students are not interested in the fact that I am in the program.
_____ d) The rest of the students resent me for being in the program.
_____ e) The rest of the students strongly resent me for being in the program.

8. How much interest would you have in taking part in a special program in another subject area in addition to mathematics if available to you?

_____ a) I would be very enthused about taking part in such a program, or I am already in such a program.
_____ b) I would be willing to take part in such a program.
_____ c) I don't know if I would want to join such a program.
_____ d) I would be reluctant to join such a program.
_____ e) I would not join such a program if given a chance to refuse.

9. How well prepared do you believe you will be for advanced mathematics courses?

_____ a) Much better prepared than I would be if I were not in the special program.
_____ b) Somewhat better prepared than I would be if I were not in the special program.

_____ c) As well prepared as I would be if I were not in the special program.

_____ d) Not as well prepared as I would be if I were not in the special program.

_____ e) Much less well prepared than I would be if I were not in the special program.

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