

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE CHARACTERISTICS  
OF GIFTED STUDENTS.

by

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## THE PROBLEM

### Introduction

In recent years educators have witnessed an ever-growing amount of interest in the gifted student. Emphasis is now being given to the individual needs of each pupil. Many authorities have recognized the dangers inherent in the practice of providing schooling for the masses. Stalnaker stated it well when he said, "there is nothing undemocratic in providing a superior education for any student able to profit by such education. Mass education must not come to mean reducing the best to the level of the average."<sup>1</sup>

The many scientific breakthroughs which have occurred since the Soviet Union launched their Sputnik satellite in 1957 have caused many authorities to re-examine the system through which our future mathematicians and scientists must pass. They have recognized the tremendous stake our civilization has in the development of mathematical and scientific talent. Our highly complex society cannot function or survive without an adequate supply of these individuals.<sup>2</sup>

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<sup>1</sup>John M. Stalnaker, "Methods of Identification--the Complexity of the Problem," The Identification and Education of the Academically Talented Student in the American Secondary School, p. 22.

<sup>2</sup>John G. Kemeny, "The Mathematically Talented Student," The Bulletin of the National Association of Secondary School Principals, 47:32, April, 1963.

The introspection caused by the scientific revolution has prompted a number of studies on the gifted student. In these investigations, the authors have attempted to define the gifted individual, to describe his characteristics, and to outline the provisions which should be made for his education.

### Statement of the Problem

The purposes of this report were: (1) to attempt to discover some consensus of opinion among researchers as to the identifiable characteristics of the gifted mathematics student, and (2) to determine to what extent the secondary mathematics teachers of Kansas agreed with these findings.

### Importance of the Study

One of the first steps in providing for the gifted student is to identify those individuals who will be able to benefit from special programs. Identification has been defined as "the process which attempts to screen and select bright individuals in order to plan a program for them. The function of identification is to discover all gifted children who evince superior ability."<sup>3</sup> Identification usually involves the combination of two devices: teacher observation

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<sup>3</sup>Louis A. Fliegler and Joseph Leese, "Problems and Practices," Curriculum Planning for the Gifted, p. 18.



and standardized tests.

The problems involved in identifying those who excel in mathematics are essentially no different from those in any field. Gifted mathematics students exhibit the same characteristics as students in most other academic areas.<sup>4</sup>

Although teacher observation is widely used as a tool for identification, teachers often fail to select the highly superior students accurately. For example, one author found that only 15.7 per cent of the children nominated by teachers were qualified to be in the gifted group.<sup>5</sup> Such factors as neatness, obedience, and conformity have been overrated by many teachers.<sup>6</sup> It was this apparent breakdown in communications between the researchers and teachers which was of primary interest to this author.

#### Scope and Procedure

The research design. This study was essentially descriptive in nature, incorporating a survey of the literature and returns from a questionnaire sent to secondary mathematics teachers in Kansas.

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<sup>4</sup>E. R. Duncan, "The Identification and Education of the Gifted in Mathematics," Concepts of Excellence in Education, The Year Book of Education, p. 394.

<sup>5</sup>William H. Bristow, et. al., "Identifying Gifted Children," The Gifted Child, p. 16.

<sup>6</sup>Maurice F. Freehill, Gifted Children: Their Psychology and Education, p. 34.

Sources, collection, and analysis of data. The information for the first part of the problem was obtained by reviewing the literature. Material from the Kansas State University library, the Kansas City, Missouri, public library, and the interlibrary loan service was utilized. The author attempted to summarize and synthesize the findings of leading researchers in the field of education for the gifted.

The second aspect of the problem was to determine the extent to which practicing secondary mathematics teachers agreed with the research. The writer constructed a questionnaire which was designed to elicit the opinions of these instructors concerning the characteristics of gifted mathematics students. A listing of the mathematics teachers was obtained from the Kansas State Teachers Association, and questionnaires were sent to a 10 per cent random sample of the individuals on the list.

The returns from the questionnaire were analyzed by a percentage calculation of the responses to each question. The results were then summarized in tabular form.

Limits of the study. The review of the literature was limited to the sources outlined in the previous section. The size of the questionnaire sample was limited to 10 per cent of the mathematics teachers listed by the Kansas State Teachers Association. Questionnaires were sent to 140 individuals. The population for the sample included the secondary

mathematics teachers in the state of Kansas during the 1963-1964 academic year.

#### Definition of Terms

Secondary school. A secondary school was defined as any school having any combination of grades seven through twelve, inclusive.

Mathematics student. For the purposes of this study, a mathematics student was defined as a pupil enrolled in one or more courses in mathematics in a Kansas secondary school during the 1963-1964 academic year.

Mathematics teacher. A full- or part-time teacher of one or more mathematics courses in a Kansas secondary school in the 1963-1964 academic year, and listed by the Kansas State Teachers Association, was taken as the definition of a mathematics teacher.

## REVIEW OF THE LITERATURE

## History of Interest in the Gifted

Educational interest in persons with special intellectual ability dates back to early classical times. Plato, in planning his Republic, recommended that leadership responsibilities be given to the philosopher-kings endowed with the highest degree of intelligence. He emphasized the seeking out and training of the most able youth as future leaders.<sup>1</sup>

Up until 1850 the child prodigy was looked upon with a great deal of admiration. At that time, however, educational theorists began grouping the 'precocious' child with the abnormals and neurotics. They thought that these brilliant individuals were headed for stupidity or insanity in later life, and the myth was prevalent that the true geniuses of the day were dunces in childhood.<sup>2</sup>

The latter part of the nineteenth century saw the first attempts at providing special programs for the gifted in the schools. In 1870 the Saint Louis schools allowed some bright pupils to complete the first eight grades early. About

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<sup>1</sup>Henry Angelino, "Characteristics of Superior and Talented Youth," Working with Superior Students: Theories and Practices, p. 91.

<sup>2</sup>Lewis M. Terman and Melita H. Oden, The Gifted Child Grows Up (Vol. IV of Genetic Studies of Genius), pp. 1-2.

twenty years later, the Cambridge plan permitted gifted students to complete six years of schooling in four.<sup>3</sup> These early programs concentrated on acceleration rather than enrichment.

One of the first scientific investigations into the nature of giftedness appeared in 1869 when Sir Francis Galton concluded that heredity was the primary determinant of intellectual ability. It was not until the 1900's that authorities accepted the fact that environment plays a vital role in the development of intellectual capacities. The first two decades of the twentieth century witnessed several important research projects. The Binet intelligence test was developed during this period and became a significant research tool in the study of the gifted. Lewis M. Terman and Leta Stetter Hollingworth were pioneers in the systematic study of the characteristics of brilliant students.<sup>4</sup>

In the 1930's emphasis was placed on the common man. With this emphasis came the theory that all individuals should have essentially the same experiences, thus ruling out special provisions for the academically talented.<sup>5</sup>

The years following World War II found the pendulum

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<sup>3</sup>Robert F. DeHaan and Robert J. Havighurst, Educating Gifted Children, p. 10.

<sup>4</sup>Ibid., p. 11.

<sup>5</sup>John E. Anderson, "The Nature of Abilities," Talent and Education: Present Status and Future Directions, p. 9.



swinging back to theories favoring the education of the individual student according to his unique needs. Much impetus was given to the movement by the great scientific strides which took place in the late 1950's and early 1960's. With them came the realization that, to a great extent, our national welfare depended on an adequate reservoir of talented citizens.<sup>6</sup>

#### Attempts to Define Giftedness

Most treatises on the topic of giftedness attempted to define the term; however, this seemed to be a rather elusive concept. There was apparently no universally accepted definition of the gifted student.

The older position with respect to defining giftedness in students was assumed by Lewis M. Terman. He considered the gifted to be a rather restricted group, comprised of the top 1 per cent in general intellectual ability (corresponding to an I.Q. of 137 or above) as measured by the Stanford-Binet Intelligence Scale or similar instrument.<sup>7</sup> A similar concept was proposed by the Educational Policies Commission; this group suggested that those individuals with I.Q.'s of 137-plus be designated as highly gifted. Students having an I.Q.

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<sup>6</sup>Abraham J. Tannenbaum, "Recent Trends in the Education of the Gifted," The Educational Forum, 26:342, March, 1962.

<sup>7</sup>Virgil S. Ward, Educating the Gifted: An Axiomatic Approach, p. 10.



ranging from 120 to 136 were considered moderately gifted.<sup>8</sup>

A more recent stand attempted to define the gifted according to a definite percentage of the student population. However, these estimates ranged from the upper 1 per cent to the upper 20 per cent of all students. For example, Brown and Johnson defined the gifted students in mathematics and science as meaning "the pupils who are among the upper 20 per cent of the students in general intelligence and who seem to be apt in science and mathematics."<sup>9</sup> The cut-off point was purely arbitrary and was left up to the discretion of the writer.

Some authors made a distinction between 'gifted' and 'talented' students, the former being more restricted in meaning. James B. Conant defined the top 2 or 3 per cent as being gifted, with the top 15 to 20 per cent designated as academically talented.<sup>10</sup>

Originally, the students included in the gifted category were restricted to those having intellectual ability. However, Paul Witty pioneered the proposal that "our definition of giftedness be expanded and that we consider a child whose performance in a potentially valuable line of human

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<sup>8</sup>Jack Kough, Practical Programs for the Gifted, p. 20.

<sup>9</sup>Kenneth E. Brown and Phillip G. Johnson, Education for the Talented in Mathematics and Science, p. 2.

<sup>10</sup>James B. Conant, "The Academically Talented Pupil," NEA Journal, 47:218, April, 1958.

activity is consistently remarkable."<sup>11</sup> Other authorities have suggested that we consider as being gifted only those students who are creative as well. This position was summarized in the publication Administration for the Academically Talented Student.<sup>12</sup>

The concept of 'giftedness' has evolved over the years. Whereas originally . . . the term referred only to intellectual abilities that could be measured by the standard I.Q. scale, it has more recently come to embrace any of the various ways in which individual students may be outstanding. Furthermore, it is recognized that creativity and originality are distinguishing characteristics of the truly gifted. Outstanding achievement along creative lines always goes hand in hand with high intellectual ability.

One author defined creativity as being "the process of sensing problems or gaps in information, forming ideas or hypothesis, testing and modifying these hypothesis, and communicating the results."<sup>13</sup>

#### Characteristics of Gifted Mathematics Students

Writings pertaining to gifted students have many lists and explanations of traits possessed by these individuals. However, Schifelbusch warned that we must keep in mind that a typical gifted child simply does not exist. Each student

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<sup>11</sup>Ward, op. cit.

<sup>12</sup>National Education Association and National Association of Secondary School Principals, Administration for the Academically Talented Student, p. 31.

<sup>13</sup>E. Paul Torrance, Creativity, p. 4.

displays a variety of characteristics and is a unique individual in his own right.<sup>14</sup> Most authors were of the opinion that there are certain attributes which are common to most bright students. In the Terman and Oden study, the majority of highly talented youngsters showed traits which deviated in the upward direction. That is, they tended to demonstrate behavior which was positively correlated with desirable characteristics.<sup>15</sup>

One of the most frequently mentioned traits was that of high intelligence. Intellectual ability was generally discussed in relation to one of the standardized I.Q. tests. One author stated that, no matter how talented a person is along a particular line, he is not really gifted unless he has a high I.Q.<sup>16</sup> The intelligence quotient that a person must possess before he can be considered gifted was subject to dispute. The figures generally ranged from 120 to 140.

One aspect closely related to intellectual ability is the power to communicate efficiently. Good communication skills were considered to be essential by most authorities. In order to excel in any intellectual endeavor, the student must be able to grasp ideas easily and to manipulate words

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<sup>14</sup>R. L. Schifelbusch, Our Gifted Children, p. 18.

<sup>15</sup>Terman and Oden, op. cit., p. 57.

<sup>16</sup>Henry Angelino, "Characteristics of Superior and Talented Youth," Working With Superior Students: Theories and Practices, p. 94.

and symbols effectively. In fact, Audrey Shectman went so far as to state that verbal fluency was the one most distinguishing factor between the gifted and non-gifted groups.<sup>17</sup>

Most gifted students were found to have highly-developed reading skills. They are able to read meaningfully and to draw inferences from what has been read. They show a high degree of competence in being able to organize material effectively, discover relationships between various parts of the material, and extract broad generalizations. They quickly grasp the underlying principles and apply them to new situations.<sup>18</sup>

Gifted students in all academic areas have been shown to have attention spans longer than those possessed by the norm. Their powers of concentration are greater, especially on topics which interest them, and they are able to complete assigned tasks more rapidly than the average student. In addition, they exhibit a marked degree of persistence and goal-directed behavior.<sup>19</sup> Bright students who have a good reason for working can strive for a long time until the goal is reached.

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<sup>17</sup>Audrey Shectman, "Follow-up Study of Gifted Girls," Talent and Education, p. 154.

<sup>18</sup>Charles E. Bish, "The Academically Talented," NEA Journal, 50:32, February, 1961.

<sup>19</sup>Norma E. Cutts and Nicholas Moseley, Teaching the Bright and Gifted, p. 21.



Many authors listed originality, inquisitiveness, and creativity as distinguishing qualities of the gifted. These pupils always seem to have new ideas and unique ways of arriving at solutions to problems. They seem never to be satisfied with things as they are; they ask many questions that show insight and understanding of the basic principles involved. They are extremely flexible and are not afraid of new ideas. Gifted pupils are also very inventive and like to create experiments, poems, plays, etc.<sup>20</sup>

Some investigators have objected to teachers using the perfect completion of routine assignments as an indication of high potential. Brown and Johnson maintained that "creativity of the student and conformity to inflexible regulations are hard to reconcile."<sup>21</sup>

Bright students generally were found to have wide and varied interests. They tend to be inveterate readers, especially in the areas of science, history, biography, poetry, and drama. They show a breadth of general knowledge that is often remarkable. Detailed and intensive understanding of subjects not connected with school work is often displayed.<sup>22</sup>

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<sup>20</sup>Robert F. DeHaan and Jack Kough, Identifying Students With Special Needs, pp. 35-36.

<sup>21</sup>Kenneth E. Brown and Phillip G. Johnson, Education for the Talented in Mathematics, p. 5.

<sup>22</sup>Virgil S. Ward, Educating the Gifted: An Axiomatic Approach, p. 26.

Many researchers were of the opinion that the intellectual traits exhibited by gifted mathematics students in particular did not differ greatly from those already mentioned. However, several writers listed characteristics which they thought were essential to a high degree of success in mathematics. Brown and Johnson<sup>23</sup> singled out quantitative reasoning ability as the most significant quality displayed by talented mathematics pupils; such traits as abstract reasoning ability and an outstanding talent for visualizing spatial relationships were also mentioned as being especially important. E. Paul Torrance stated that "the essential qualifications so far as mathematics is concerned are the possession of an unusually high degree of ability to work with ideas, that is, to manipulate and create in abstractions."<sup>24</sup> A position similar to this was held by E. R. Duncan; he contended that gifted mathematics students must have a high degree of 'mathematical power.' This was defined as a combination of good memory, insight, curiosity, persistence, and creativeness. Mathematical power is displayed when students are able to deduce broad generalizations and then add something of their own interpretation to the answer.<sup>25</sup>

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<sup>23</sup>Brown and Johnson, op. cit., p. 4.

<sup>24</sup>E. Paul Torrance, Creativity, p. 29

<sup>25</sup>E. R. Duncan, "The Identification and Education of the Gifted in Mathematics," Concepts of Excellence in Education, The Year Book of Education, 1961, p. 395.



The fact that some gifted children have created discipline problems in the classroom has lead some people to conclude that they are not well-adjusted socially. However, many authors concluded that academically talented students generally tend to be happier, more cheerful, and better adjusted than their peers. They seem to adjust easily to new situations and prefer to work out their own difficulties. <sup>26</sup>

Several authors felt that the gifted student shows superior character traits. He is more trustworthy under stressful conditions, less inclined to cheat, and he has a high degree of integrity. He is usually not boastful about what he knows and is less inclined than the average student to overstate his knowledge. <sup>27</sup>

Terman and Oden found in their study that gifted students were above average physically. They showed fewer physical defects and abnormalities and were generally in better health. They tended to be taller, heavier, and stronger than average. <sup>28</sup>

A child's early cultural environment was found to play

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<sup>26</sup>Harold D. Carter, "Gifted Children," Encyclopedia of Educational Research (3rd ed.), p. 586.

<sup>27</sup>Lewis M. Terman and Melita H. Oden, The Gifted Child Grows Up (Vol. IV of Genetic Studies of Genius), p. 56.

<sup>28</sup>Ibid., p. 20.

a vital role in the academic talent that he may develop. One study showed that there was a high correlation between a student's home surroundings and the emergence of giftedness.<sup>29</sup> Terman and Oden, as well as others, discovered that the social status of the parents of gifted children tended to be middle class or above and that they had obtained more schooling than the average parent of their generation. An investigation of the ethnic background of the families of bright students revealed that there was a great excess of Jewish blood, and that generally those of the Caucasian race had a disproportionate representation.<sup>30</sup>

DeHaan and Havighurst<sup>31</sup> reported that many children in families of low socioeconomic status failed to develop their abilities because of a lack of opportunity and stimulation in their early childhood. These authors stated that "all social groups which are culturally underprivileged tend to underproduce children of high-level achievement." In addition, they charged that special programs for the gifted increased the advantages of children who already have superior backgrounds and that college scholarships are often given to

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<sup>29</sup>William Bristow et. al., "Identifying Gifted Children," The Gifted Child, p. 11.

<sup>30</sup>Terman and Oden, op. cit., pp. 14-15.

<sup>31</sup>Robert F. DeHaan and Robert J. Havighurst, Educating Gifted Children, pp. 30-31.

children of middle-class homes with above average incomes.

### Identification of the Gifted

One of the first, and most important, steps in setting up an effective program to meet the educational needs of gifted students is the proper selection of those individuals who can benefit from it. Identification procedures were found to be somewhat uniform in the extent that they usually involved some formal measures of general ability and classroom performance, plus an informal appraisal by the teacher. The emphasis placed upon the various methods depended largely on individual school policy.<sup>32</sup> It was generally agreed that good identification programs involved a combination of various procedures, rather than an exclusive reliance upon a single indicator of talent.

Formal identification procedures usually included the administration of one or more standardized tests. These tests can be divided into six categories: (1) general intelligence tests, both group and individual, (2) differential aptitude tests, (3) tests of special abilities, (4) achievement tests, (5) personality inventories, and (6) interest inventories.

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<sup>32</sup>Abraham J. Tannenbaum, "Recent Trends in the Education of the Gifted," Educational Forum, 26:333, March, 1962.

Perhaps the most frequently-mentioned standardized test for identifying the gifted was the general intelligence, or I.Q., test. Most group tests were constructed to measure differential aptitudes such as verbal comprehension, word fluency, numerical ability, spatial imagery, associative memory, perceptual speed, and reasoning ability. School administrators usually determined some cut-off point which was used to screen individuals being considered for special programs. Some of the more widely used group tests included the Science Research Association Tests of Primary Mental Abilities, the Differential Aptitude Test, the Guilford-Zimmerman Aptitude Survey, and the California Mental Maturity Test. Individually administered tests such as the Stanford-Binet Scale and the Wechsler Intelligence Scale were recommended for cases presenting special difficulties.<sup>33</sup>

The use of intelligence tests to discover academic talent has received some severe criticism. For example, Calvin W. Taylor felt that creative talent could not be measured by using I.Q. tests. He thought it "highly inconsistent to conceive of the mind as being represented by a single score or even by a handful of scores or dimensions that are present in our current intelligence tests. The

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<sup>33</sup>National Education Association and National Association of Secondary School Principals, Administration for the Academically Talented Student, p. 38.



brain which underlies the mind is far, far too complex."<sup>34</sup> Many authors, however, maintained that knowledgeable use of the tests can be a valuable tool for identification. Henry Chauncey, president of the Educational Testing Service, admitted that there was no particular evidence that standardized tests measured potential creativity, original thinking, or inventiveness, but he did contend that I.Q. tests can help identify a larger number of students from which our future leaders will likely emerge.<sup>35</sup>

Scholastic aptitude tests were also used to discover academic talent. Howard F. Fehr recommended the Mathematics Attainment Tests and the mathematics section of the Scholastic Aptitude Tests of the College Entrance Examination Board for use in predicting mathematical power.<sup>36</sup> An interesting study of the men listed in Who's Who and American Men of Science revealed that those scoring high on the Scholastic Aptitude Test had a much greater chance of appearing in these books than those who did not receive a high score.<sup>37</sup>

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<sup>34</sup>Calvin W. Taylor, "The Creative Individual: A New Portrait in Giftedness," Educational Leadership, 18:8, October, 1960.

<sup>35</sup>Henry Chancey, "Measurement and Prediction--Tests of Academic Ability," The Identification and Education of the Academically Talented Student, p. 30.

<sup>36</sup>Howard F. Fehr, "Mathematics for the Gifted," Bulletin of the NASSP, 38:105, May, 1954.

<sup>37</sup>Chauncey, op. cit., p. 34.

Many educators preferred the use of standardized achievement tests over school marks to predict giftedness. They maintained that these tests were superior because they did not reflect teacher opinion. High scores in reading comprehension, vocabulary, and arithmetic reasoning were considered especially important, with an achievement score of one and one-half to two years above average being significant. Such tests as the Metropolitan Achievement Test, the Iowa Tests of Educational Development, and the SRA Achievement series were most common.<sup>38</sup>

Of less significance in discovering academic talent than the previously mentioned standardized tests were the interest and personality inventories. The Kuder Preference Record and the Vineland Social Maturity Scale were recommended as being helpful in singling out students with the appropriate traits.<sup>39</sup>

In addition to standardized tests, observations by the classroom teachers were extensively used in discovering gifted students. Since teachers come in contact with each pupil, they are in a unique position to observe their actions and to identify those who possess traits indicative of giftedness. The observable characteristics discussed in the previous

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<sup>38</sup>National Education Association and National Association of Secondary School Principals, Administration for the Academically Talented Student, p. 39.

<sup>39</sup>Ibid, p. 40.



section have been used by many teachers to identify bright students. In fact, one author stated that "most of the students identified by teacher observation will be the same ones identified by tests and grades."<sup>40</sup> However, many authorities disagreed with this position. One research report estimated that teacher attempts to identify future leaders in science were correct in only fifteen cases in one hundred.<sup>41</sup>

Many gifted students present subtle problems in identification. Because of boredom they may exhibit a certain amount of undesirable behavior and may become discipline problems. Some students attempt to cover up their ability because they do not want to lose status with their peers. Others do not attain well because they believe that the teachers will give them extra work or because they think that teachers are pleased when apparent gains are made in the learning process.<sup>42</sup>

Some authors have suggested that a check list of characteristics be provided for each teacher. The instructor would be able to use the check list to systematically rate each individual. This would focus the teacher's attention

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<sup>40</sup>Henry Angelino, "Characteristics of Superior Youth," Working with Superior Students: Theories and Practices, p. 101.

<sup>41</sup>Brown and Johnson, op. cit.

<sup>42</sup>Robert F. DeHaan and Robert J. Havighurst, Educating Gifted Children, p. 54.

on the essentials of the identification process and would provide a type of insurance that he is not missing any clues to brightness.<sup>43</sup>

A number of writers felt that teachers tended to over-rate certain traits which were not really indicative of giftedness. Other factors, such as prejudice and ignorance, have tended to make the job more difficult. In writing of this problem, Howard Fehr<sup>44</sup> stated:

Classroom teachers have usually failed to identify students who subsequently become famous in mathematics or science chiefly because of three factors: (a) the personal equation of likes and dislikes and confusion of friendliness, obedience, conformity, and beauty for ability and talent; (b) lack of evaluative standards; that is, there was no way to make a valid estimate of memory, curiosity, and abstract thinking to judge these attributes as outstanding; and (c) ignoring chronological age factors; that is, in the case of two equally fine performances, that of the younger indicates the greater accomplishment.

The third major identification tool discussed by writers was past academic performance. Many authorities felt that school marks alone were not very valid predictors of giftedness. Jack Kough pointed out that some students are able to obtain good grades in school without being especially gifted; some bright pupils, on the other hand, may appear to be dull or maladjusted if they lack the desire to do good work and to

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<sup>43</sup>Norma E. Cutts and Nicholas Moseley, Teaching the Bright and Gifted, p. 17.

<sup>44</sup>Howard F. Fehr, Teaching High School Mathematics, p. 29.

address themselves to the tasks of school work.<sup>45</sup> However, some investigators felt that school records can be valuable when used in conjunction with other identification devices. One writer maintained that students who score high in both school marks and test scores have the greatest expectancy for academic success.<sup>46</sup>

Many problems arise when a school initiates a program for screening superior and talented students. These problems include discrepancies between the results of different standardized tests, discrepancies between test results and teachers judgments, and disagreement about the definition of talent. DeHaan and Havighurst made the following recommendation for minimizing these difficulties: "Two general approaches to identification are possible. The first of these is through the use of standardized tests, and the second is through the use of teacher observation. In general, it seems that the best results are obtained from a maximum use of both."<sup>47</sup>

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<sup>45</sup>Jack Kough, Practical Programs for the Gifted, p. 22.

<sup>46</sup>Henry Chauncey, "Measurement and Prediction--Tests of Academic Ability," The Identification and Education of the Academically Talented Student, p. 29.

<sup>47</sup>DeHaan and Havighurst, op. cit., p. 45.

# THE QUESTIONNAIRE STUDY

## Procedures Used

One of the purposes of this report was to determine the opinions of mathematics teachers on the secondary level concerning the characteristics of gifted mathematics students. The information for this section was obtained by the questionnaire method. Items for the questionnaire (see Appendix A) were constructed on the basis of the most frequently-mentioned traits in the literature.

The questionnaire consisted of four parts. The first section contained four questions about the teachers' school, experience, and college training in mathematics. Part two was comprised of eight questions, each one having three possible choices. Each response consisted of phrases describing various observable traits of gifted students. Recipients of the questionnaire were asked to check the group of words which were most appropriate for describing individuals with a high degree of talent in mathematics. In part three, the teachers were requested to rate gifted mathematics students on ten additional characteristics. Five choices were offered, ranging from "poor" to "outstanding." Finally, section four was an open-ended question which allowed the respondents to describe any additional traits which they thought were especially significant.

The questionnaire was sent to a 10 per cent random



sampling of the secondary mathematics teachers in the state of Kansas during the 1963-1964 academic year. A listing of the population was obtained from the Kansas State Teachers Association; this list contained the names and addresses of 1,399 teachers. It was assumed that this list represented the entire population of secondary mathematics teachers in Kansas. Each name was assigned a number, and 140 teachers were selected by using a table of random numbers. Each questionnaire was accompanied by a cover letter explaining the purposes of the study (see Appendix B). A follow-up letter (see Appendix C) was later sent, along with another copy of the questionnaire and a stamped envelope, to the individuals who had not responded to the first mailing.

The completed questionnaires were sorted into four groups according to the teaching experience of the responding teachers. The following categories were established: zero to three years of experience, four to eight years, nine to seventeen years, and eighteen to thirty-eight years. The responses to each question were tallied, the percentages calculated, and the results presented in tabular form.

#### Analysis of Results

Out of the 140 questionnaires sent, 110 were returned. Of these, four were invalid because the teachers felt that they were not qualified to answer the questions. Three were received from junior college instructors; these were discarded

because the study was limited to teachers of grades seven through twelve. One hundred and three returns were used; this amounted to 73.6 per cent of the original sample.

An analysis of the first section of the questionnaire revealed that seventy-one of the respondents taught in senior high schools; thirty-one were junior high teachers. This was 68.9 per cent and 31.1 per cent of the usable returns, respectively. A tally of the responses to the question concerning the size of the schools yielded the following results:

<u>School size</u>	<u>Number of teachers</u>	<u>Per cent of total</u>
1001 plus	14	13.6
501-1000	28	27.2
251- 500	23	22.3
101- 250	20	19.4
0- 100	18	17.5

The data in the following table indicates the number of hours of college-level mathematics of the respondents:

<u>Number of hours</u>	<u>Number of teachers</u>	<u>Per cent of total</u>
0-10	2	1.9
11-20	21	20.4
21-30	23	22.3
31-50	39	37.9
51-88	18	17.5

The sample was also broken down into four groups according to the teaching experience of the participants. The



returns for each of the four categories were tabulated, and the percentage response to the questions calculated. In addition, the response of the entire sample was determined for each of the questions. The breakdown according to years of experience is revealed in the following table:

<u>Years of experience</u>	<u>Number</u>	<u>Per cent of total</u>
0-3	30	29.1
4-8	27	26.2
9-17	23	22.3
18-38	23	22.3

An examination of Table I reveals that almost 50 per cent of the teachers rated gifted mathematics students high in verbal ability. The same number, however, thought that these students were only average in this trait. Only five respondents checked the lowest category; all of these were teachers with three years of experience or less.

As is shown in Table II, seventy-five of the 103 were of the opinion that students who showed mathematical ability also had a great amount of perseverance. They felt that gifted students were able to stick with a project in spite of many difficulties. Teachers having the least amount of experience tended to rate students lower in this trait than did the others.

The opinions of Kansas secondary mathematics teachers concerning the originality and curiosity displayed by gifted students are shown in Table III. It can be seen that the

TABLE I  
 OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE VERBAL FLUENCY OF  
 GIFTED MATHEMATICS STUDENTS

Years of experience	N	Below average		Average		High	
		n <sub>1</sub>	% of N	n <sub>2</sub>	% of N	n <sub>3</sub>	% of N
0 - 3	30	5	16.7	15	50.0	10	33.3
4 - 8	27	0	0.0	13	48.1	14	51.9
9 -17	23	0	0.0	9	39.1	14	60.9
18 -38	23	0	0.0	12	52.2	11	47.8
Total	103	5	4.9	49	47.7	49	47.7

TABLE II  
 OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE PERSEVERENCE SHOWN BY  
 GIFTED MATHEMATICS STUDENTS

Years of experience	N	Below average		Average		High	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	1	3.3	12	40.0	17	56.7
4 - 8	27	1	3.7	3	11.1	23	85.2
9 -17	23	0	0.0	7	30.4	16	69.6
18 -38	23	1	4.3	3	13.0	19	82.6
Total	103	3	2.9	25	24.3	75	72.8

responses were divided about equally between the average and high rating. Only two individuals felt that gifted mathematics students showed little originality and curiosity. Similar results were obtained from each of the four groups.

Table IV indicates that the majority of the teachers sampled were of the opinion that gifted students normally get their work done on time and usually carry out the instructions given. Forty teachers, or 38.8 per cent of the respondents, rated these pupils very high on this characteristic; they felt that academically talented pupils always turned their assignments in on schedule and precisely according to the directions given. Only 5.8 per cent rated gifted students low on this trait.

The opinions of Kansas secondary mathematics teachers concerning the popularity of gifted students are summarized in Table V. This table shows that about two-thirds of the teachers felt that these students enjoyed an average amount of popularity. Twenty-eight teachers, or 27.2 per cent, thought these pupils to be highly popular, while 5.8 per cent were of the opinion that most gifted individuals tended to be below average in popularity. The teachers with three years of experience or less rated gifted mathematics students highest on this trait.

About 70 per cent of the teachers sampled felt that students with mathematical talent had no distinguishing socioeconomic background and that all classes were represented.

TABLE III

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE ORIGINALITY AND CURIOSITY  
 DISPLAYED BY GIFTED MATHEMATICS STUDENTS

Years of experience	N	Low		Average		High	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	0	0.0	16	53.3	14	46.7
4 - 8	27	0	0.0	13	48.1	14	51.9
9 -17	23	1	4.3	11	47.8	11	47.8
18 -38	23	1	4.3	10	43.5	12	52.2
Total	103	2	1.9	50	48.5	51	49.6



TABLE IV

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE ABILITY OF GIFTED MATHEMATICS  
 STUDENTS TO FOLLOW DIRECTIONS

Years of experience	N	Low		Average		High	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	4	13.3	12	40.0	14	46.7
4 - 8	27	0	0.0	17	63.0	10	37.0
9 -17	23	2	8.7	11	47.8	10	43.5
18 -38	23	0	0.0	17	73.9	6	26.1
Total	103	6	5.8	57	55.3	40	38.8

TABLE V

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE POPULARITY OF GIFTED  
MATHEMATICS STUDENTS

Years of experience	N	Below average popularity		Of average popularity		Highly popular	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	1	3.3	18	60.0	11	36.7
4 - 8	27	2	7.4	20	74.1	5	18.5
9 -17	23	3	13.0	14	60.9	6	26.1
18 -38	23	0	0.0	17	73.9	6	26.1
Total	103	6	5.8	69	67.0	28	27.2

An examination of Table VI reveals, however, that thirty individuals thought that most gifted students came from families with above-average social status.

Table VII shows that almost nine-tenths of those sampled rated gifted mathematics students as being average in size, strength, and physical maturity. Nine teachers felt that they tended to be taller and stronger than average, while two rated them as being below-average physically. The more teaching experience the respondents had, the more they tended to rate gifted students average in physical maturity.

The responses to the question concerning the percentage of the total student population which should be classified as gifted are reported in Table VIII. Most of the teachers favored the most restrictive classification, 0 to 4 per cent. However, thirty-seven selected the 5 to 10 per cent choice, while four marked the 11 to 25 per cent response.

The third section consisted of a list of ten traits with five choices each. The results are summarized in Tables IX to XVIII and Figures 1 to 3. Although five ratings were offered, only the top four appear in each table. None of the teachers chose the "poor" response for any characteristic, so this rating was eliminated.

Table IX shows that the majority of the teachers sampled rated gifted students as possessing an above average ability to appraise their own progress. Twelve teachers

TABLE VI

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE SOCIAL STATUS OF GIFTED  
MATHEMATICS STUDENTS

Years of experience	N	Below avg. status		No distinct status		Above avg. status	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	1	3.3	22	73.3	7	23.3
4 - 8	27	0	0.0	17	63.0	10	37.0
9 -17	23	0	0.0	17	73.9	6	26.1
18 -38	23	0	0.0	16	69.6	7	30.4
Total	103	1	1.0	72	69.9	30	29.1

TABLE VII  
 OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE PHYSICAL MATURITY OF  
 GIFTED MATHEMATICS STUDENTS

Years of experience	N	Below average		Average		Above average	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	2	6.7	24	80.0	4	13.3
4 - 8	27	0	0.0	24	89.0	3	11.1
9 -17	23	0	0.0	22	95.7	1	4.3
18 -38	23	0	0.0	22	95.7	1	4.3
Total	103	2	1.9	92	89.3	9	8.7



TABLE VIII

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE PERCENTAGE OF THE TOTAL  
 STUDENT POPULATION TO BE  
 CLASSED AS GIFTED

Years of experience	N	0 - 4		5 - 10		11 - 25	
		$n_1$	% of N	$n_2$	% of N	$n_3$	% of N
0 - 3	30	17	56.7	12	40.0	1	3.3
4 - 8	27	15	55.6	10	37.0	2	7.4
9 -17	23	15	65.2	8	34.8	0	0.0
18 -38	23	15	65.2	7	30.4	1	4.3
Total	103	62	60.2	37	35.9	4	3.9

chose the highest rating, while sixty-eight selected the second-highest. About 22 per cent of the sample felt that gifted students were only average or below in their ability to appraise themselves. Teachers with the most experience tended to rate the students higher on this characteristic than did any other group.

Gifted students were also rated above average in their leadership ability, by the majority of the respondents, as can be seen in Table X. Fifteen teachers felt that they exhibited outstanding leadership characteristics, while twenty-six felt that they were only average on this point. The individuals with the least amount of experience rated gifted students highest in leadership ability.

The attention span of mathematically talented pupils was rated as outstanding by 38.8 per cent of the teachers. Table XI also shows that about one-half were of the opinion that bright students possessed an attention span that was above average in length. Only thirteen teachers rated them as being average or below.

Table XII shows that over 85 per cent of the persons sampled rated gifted students as outstanding or above average on their ability to work efficiently. The teachers with seventeen years of experience or more rated them highest on this trait, with 56.5 per cent of the group choosing the best rating.

A trait closely related to efficiency of work habits

TABLE IX

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE GIFTED MATHEMATICS STUDENT'S  
 ABILITY OF SELF-APPRAISAL

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	2	6.7	20	66.7	8	26.7	0	0.0
4 - 8	27	1	3.7	21	77.8	4	17.4	1	3.7
9 -17	23	3	13.0	14	60.9	6	26.1	0	0.0
18 -38	23	6	26.1	13	56.5	4	17.4	0	0.0
Total	103	12	11.6	68	66.0	22	21.4	1	1.0

TABLE X  
 OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE LEADERSHIP ABILITY  
 OF GIFTED MATHEMATICS STUDENTS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	4	13.3	20	66.7	6	20.0	0	0.0
4 - 8	27	2	7.4	16	59.3	8	29.6	1	3.7
9 -17	23	3	13.0	13	56.5	6	26.1	1	4.3
18 -38	23	6	26.1	11	47.8	6	26.1	0	0.0
Total	103	15	14.6	60	58.3	26	25.2	2	1.9

TABLE XI

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE LENGTH OF ATTENTION SPAN  
 POSSESSED BY GIFTED MATHEMATICS STUDENTS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	9	30.0	14	46.7	4	13.3	3	10.0
4 - 8	27	15	55.6	10	37.0	2	7.4	0	0.0
9 -17	23	8	34.8	12	52.2	2	8.7	1	4.3
18 -38	23	8	34.8	14	60.9	1	4.3	0	0.0
Total	103	40	38.8	50	48.5	9	8.7	4	3.9



TABLE XII  
 OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE EFFICIENCY OF WORK HABITS  
 OF GIFTED MATHEMATICS STUDENTS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	8	26.7	12	40.0	8	26.7	2	6.7
4 - 8	27	14	51.9	10	37.0	3	11.0	0	0.0
9 -17	23	8	34.8	15	65.2	0	0.0	0	0.0
18 -38	23	13	56.5	9	39.1	1	4.3	0	0.0
Total	103	43	41.7	46	44.7	12	11.6	2	1.9

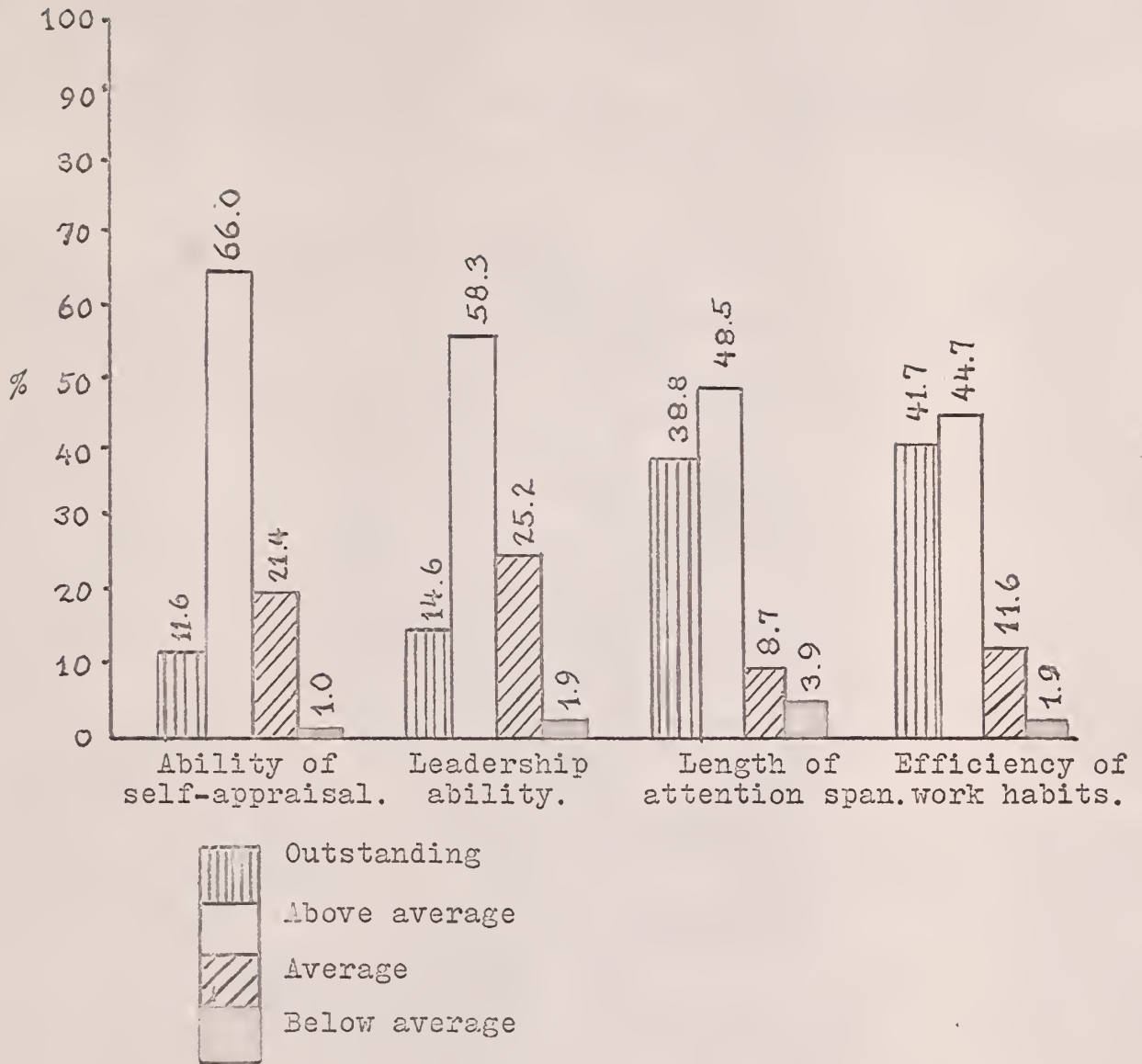


FIGURE I

RATINGS OF GIFTED MATHEMATICS  
STUDENTS ON CERTAIN TRAITS

is that of speed in completing assigned tasks. Table XIII indicates that 42 per cent of the teachers rated gifted students as outstanding, with about 48 per cent rating them as above average. Less than 10 per cent felt that these students were only average or below in their ability to complete tasks speedily.

Table XIV shows the opinions of Kansas mathematics teachers concerning the ability of gifted mathematics students to generalize. All 103 respondents rated them average or above on this trait, with 33.9 per cent marking the highest ranking and 44.7 per cent the second-highest. Teachers with four to eight years of experience were highest in their ratings, with 55.6 per cent choosing the outstanding response.

The ratings of gifted students in their ability to do abstract reasoning are summarized in Table XV. Only twelve teachers considered academically talented students in mathematics to be only average in this quality, and none marked the below average rating. The remaining ninety-one respondents were about evenly divided between the top two rankings.

Table XVI indicates that almost 90 per cent of the teachers thought that bright math pupils possessed an outstanding or above average ability to reason quantitatively. There were no respondents who marked the below average or poor rating. The teachers with four to eight years of experience were highest in their rankings on this trait.

The results of the question concerning the ability of

TABLE XIII

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE SPEED WITH WHICH GIFTED  
MATHEMATICS STUDENTS COMPLETE  
ASSIGNED TASKS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	15	50.0	9	30.0	5	16.7	1	3.3
4 - 8	27	13	48.1	13	48.1	1	3.7	0	0.0
9 -17	23	7	30.4	14	60.9	2	8.7	0	0.0
18 -38	23	9	39.1	13	56.5	1	4.3	0	0.0
Total	103	44	42.7	49	47.7	9	8.7	1	1.0

TABLE XIV

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE ABILITY OF GIFTED MATHEMATICS  
 STUDENTS TO GENERALIZE

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	7	23.3	18	60.0	5	16.7	0	0.0
4 - 8	27	15	55.6	10	37.0	2	7.4	0	0.0
9 -17	23	8	34.8	12	52.2	3	13.0	0	0.0
18 -38	23	5	21.7	16	69.6	2	8.7	0	0.0
Total	103	35	33.9	56	54.4	12	11.6	0	0.0



TABLE XV

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE ABILITY OF GIFTED MATHEMATICS  
STUDENTS TO DO ABSTRACT REASONING

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	11	36.7	12	40.0	7	23.3	0	0.0
4 - 8	27	16	59.3	11	40.8	0	0.0	0	0.0
9 -17	23	11	47.8	8	34.8	4	17.4	0	0.0
18 -38	23	12	52.2	10	43.5	1	4.3	0	0.0
Total	103	50	48.5	41	39.8	12	11.6	0	0.0

TABLE XVI

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE ABILITY OF GIFTED MATHEMATICS  
 STUDENTS TO REASON QUANTITATIVELY

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	8	26.7	17	56.7	5	16.7	0	0.0
4 - 8	27	17	63.0	8	29.6	2	7.4	0	0.0
9 -17	23	12	52.2	8	34.8	3	13.0	0	0.0
18 -38	23	8	34.8	14	60.9	1	4.3	0	0.0
Total	103	45	43.7	47	45.6	11	10.7	0	0.0

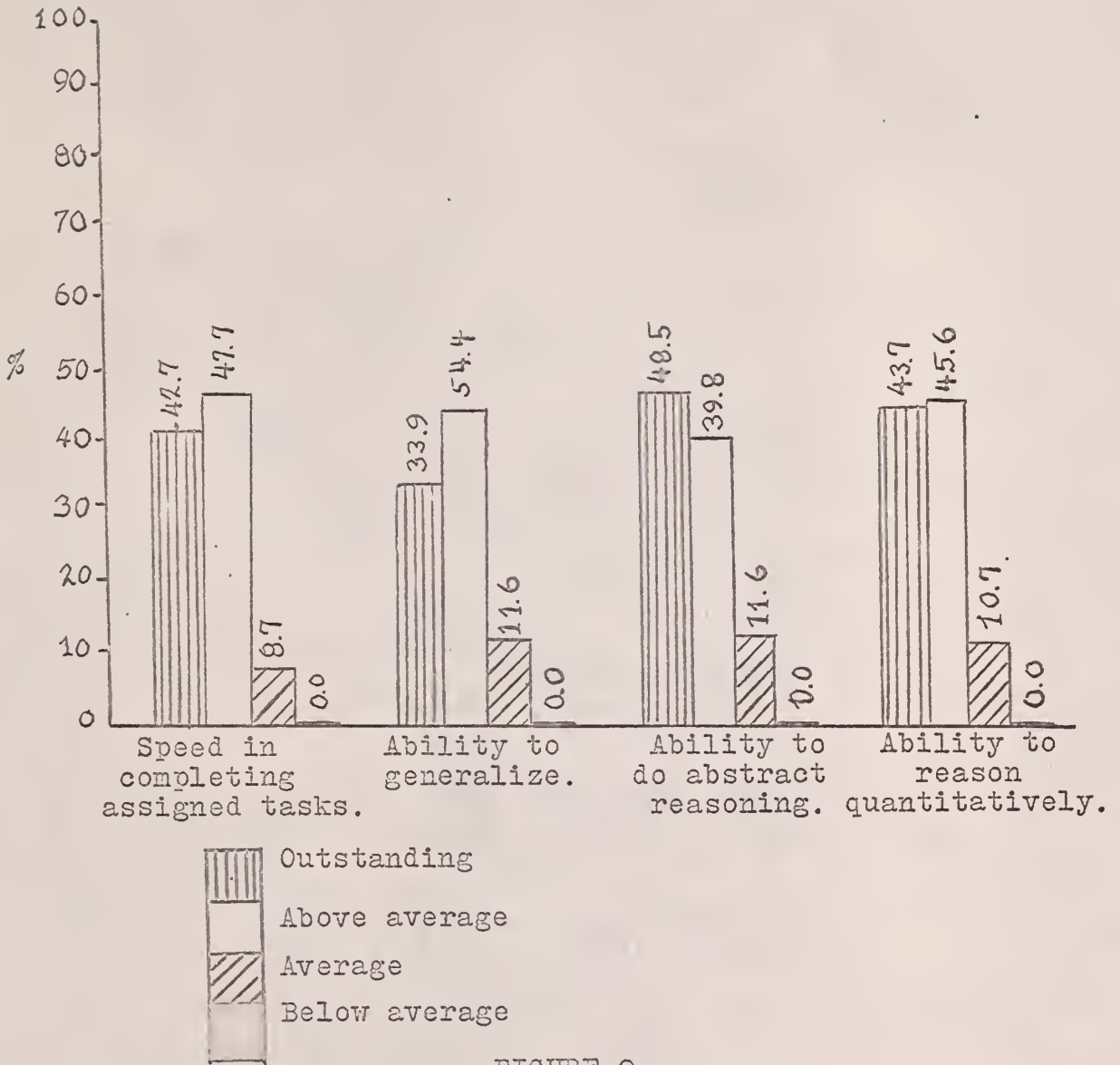


FIGURE 2

RATINGS OF GIFTED MATHEMATICS STUDENTS ON CERTAIN TRAITS

students with mathematical talent to visualize spatial relationships are shown in Table XVII. Over 50 per cent of the teachers marked the above average rating, and about 35 per cent chose the outstanding rating. Only two respondents felt that gifted pupils were below average on this trait.

Table XVIII shows the opinions of the teachers concerning the resourcefulness exhibited by gifted mathematics students. Fifty-four of the 103 rated these pupils as outstanding. Only 6.8 per cent felt that bright students were average or below in their ability to solve problems resourcefully.

The last section of the questionnaire allowed the teachers to list additional characteristics which they thought were especially significant. Twenty-four individuals, or 22.3 per cent of the respondents, made some comment in this section.

The most frequent comment was that most students who were outstanding in mathematics were also outstanding in other academic areas. They felt that gifted students were the better all-around pupils in the school.

Several teachers emphasized the fact that gifted mathematics students were quick to detect relationships and make broad generalizations. One individual stated that "all have the ability to 'see through' my lectures and arrive at the conclusion before I finish my explanations." Another teacher said: "They are eager to get at the reason for certain methods and manipulations."

Two of the respondents felt that academically talented

TABLE XVII

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE ABILITY OF GIFTED MATHEMATICS  
 STUDENTS TO VISUALIZE SPATIAL RELATIONSHIPS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	7	23.3	15	50.0	7	23.3	1	3.3
4 - 8	27	13	48.1	12	44.5	2	7.4	0	0.0
9 -17	23	8	34.8	12	52.2	2	8.7	1	4.3
18 -38	23	8	34.8	15	65.2	0	0.0	0	0.0
Total	103	36	34.9	54	52.4	11	10.7	2	1.9



TABLE XVIII

OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
 CONCERNING THE RESOURCEFULNESS OF GIFTED  
 MATHEMATICS STUDENTS IN SOLVING PROBLEMS

Years of experience	N	Out- standing		Above average		Average		Below average	
		n <sub>1</sub>	% N	n <sub>2</sub>	% N	n <sub>3</sub>	% N	n <sub>4</sub>	% N
0 - 3	30	15	50.0	11	36.7	2	6.7	2	6.7
4 - 8	27	17	63.0	9	33.3	1	3.7	0	0.0
9 -17	23	9	39.1	12	52.2	2	8.7	0	0.0
18 -38	23	13	56.5	10	43.5	0	0.0	0	0.0
Total	103	54	52.4	42	40.8	5	4.9	2	1.9

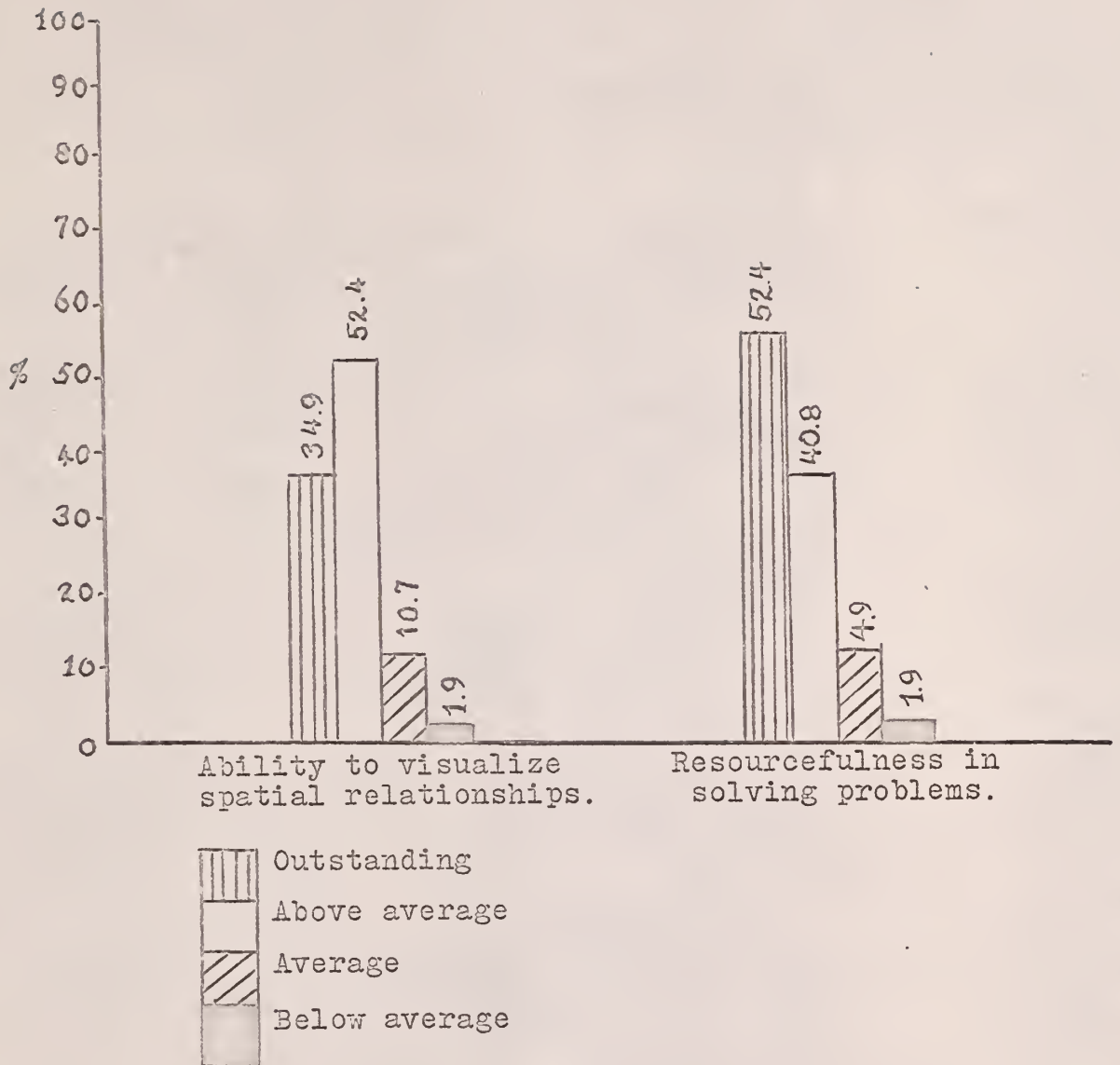


FIGURE 3

RATINGS OF GIFTED MATHEMATICS  
STUDENTS ON CERTAIN TRAITS

pupils were good listeners and were able to pick out details easily. One of these teachers related that they delighted in listening very carefully and detecting any mistakes. Additional traits noted by the respondents included a passion for learning, a willingness to do independent study, and the possession of an excellent set of values.

Several teachers pointed out some negativistic traits. One individual made this comment: "Gifted students are experts at asking questions which lead to very interesting discussions, although I sometimes feel that they are interested only in 'killing time' and not so much in the discussion." Another teacher felt that bright students too often become one-sided, and he thought that if no special place were provided for them they tended to become "big-headed."

## SUMMARY AND CONCLUSIONS

The purposes of this report were: (1) to conduct a review of the literature concerning the characteristics of gifted mathematics students, and (2) to determine to what extent the secondary mathematics teachers of Kansas agreed with the conclusions reached by the authorities in the field.

This writer found that many authors agreed on a number of points concerning the traits of bright students. Generally, they tended to rate gifted pupils above average on most of the characteristics investigated.

The most frequently mentioned quality was that of high intelligence. Most authorities included general intellectual ability in their definitions of giftedness, and some indicated that a person can not be considered gifted unless he possesses high intelligence. Intelligence was usually discussed with reference to standardized I.Q. tests, but writers disagreed as to the cut-off point which should be used.

The following traits were generally those which were considered to be characteristic of gifted students:

1. Most were rated high in verbal skills; they were able to read well and to communicate effectively.
2. They were able to draw broad generalizations from the information presented to them.
3. Bright pupils were generally found to be very inquisitive and highly curious individuals.

4. They showed a great deal of perseverance and were able to stick with a project until it was completed.
5. Intellectually talented individuals tended to come from families of above-average socioeconomic backgrounds.
6. They tended to be stronger and taller than the average student of the same chronological age.

Authors writing especially about gifted mathematics students agreed with the above points, but stressed such qualities as abstract reasoning power and the ability to generalize. Additional characteristics which were emphasized included the ability to visualize spatial relationships, resourcefulness in solving problems, and the possession of a long attention span.

Writers generally felt that the most effective programs for identifying gifted students consisted of a variety of methods, including standardized tests, teacher observations, and cumulative records. It appeared to this author that authorities favored the use of standardized tests over any other method. Many investigators were of the opinion that the observations of teachers were not very reliable in identifying the academically talented. They thought that teachers were often biased in their judgments and that such factors as friendliness and conformity to rules were overrated.



The second aspect of the study was to obtain the opinions of secondary mathematics teachers concerning the traits of students showing a high degree of talent in mathematics. The data was obtained by sending a questionnaire to a 10 per cent random sample of the secondary mathematics teachers of Kansas during the 1963-1964 academic year. One hundred and forty questionnaires were sent, and 103 usable returns were received.

The teachers were requested to rate gifted mathematics students on eight characteristics by marking the most appropriate of three answers. The following results were obtained:

1. Verbal fluency: Over one-half rated gifted students as being average or below in their ability to communicate effectively.
2. Perseverence: About 73 per cent chose the highest ranking provided.
3. Curiosity and originality: About 50 per cent felt that gifted mathematics pupils were "highly inquisitive."
4. Ability to follow directions: Approximately 39 per cent responded that gifted students followed directions exactly, with the remainder choosing answers indicating a lesser degree of perfection.
5. Popularity: Two-thirds of the teachers were of the opinion that gifted mathematics students were average in popularity.

6. Socioeconomic background: Seventy per cent of the respondents felt that all classes were represented and that bright students had no distinguishing socioeconomic background.
7. Physique: About nine-tenths of the teachers replied that academically talented individuals were of average size and strength.
8. Per cent included in the gifted category: Three-fifths of those replying thought that from 0 to 4 per cent of the total student population should be considered gifted. Most of the remainder chose the 5 to 10 per cent category.

Recipients of the questionnaire were also asked to rank gifted students on the following ten traits: leadership ability, attention span, efficiency of work habits, ability of self-appraisal, speed in completing assigned tasks, ability to generalize, ability to reason quantitatively, abstract reasoning power, ability to visualize spatial relationships, and resourcefulness in solving problems. Five choices were offered: outstanding, above average, average, below average, and poor.

The majority of teachers rated talented mathematics students as being above average or outstanding on each of the above ten characteristics. Three-fourths of the respondents chose the two highest rankings for leadership ability, and 80

per cent chose these ratings on the question concerning the ability of self-appraisal. On the remaining eight traits, Kansas mathematics teachers marked the top two ratings 85 to 93 per cent of the time.

Authorities generally felt that it was important for gifted mathematics students to possess the following traits to a high degree: ability to reason quantitatively, ability to do abstract reasoning, ability to visualize spatial relationships, and ability to generalize. Although most of the teachers sampled rated bright students high on these characteristics, about one-tenth ranked them as being average or below average.

Kansas secondary mathematics teachers tended to rate gifted students rather low on several traits, including verbal fluency and curiosity. These two qualities were emphasized by many authors as being essential for giftedness. In addition, most respondents indicated that bright students were of average size and strength, while research has indicated that most possess above-average physiques.

The returns were tabulated in four groups according to the teaching experience of the respondents. The results indicated that there apparently was no relationship between the number of years in the profession and the ratings given to gifted students. On some traits the least experienced teachers rated the pupils highest, while on others the teachers with the most years of service gave the highest rankings.

The author recognizes that the problem of semantics enters into this type of study. Words have many different meanings; a performance that is considered to be outstanding by one teacher may be rated as average by another. However, it appears to this writer that some discrepancies do exist between the opinions of researchers and teachers. This difficulty must be resolved if teachers are to do an effective job of identifying gifted students. This writer feels that the best way to do this is to improve the communication between educational researchers and teachers.

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APPENDIX A

QUESTIONNAIRE



## QUESTIONNAIRE

Part I: Questions one through four apply to you and your school. Fill in the blank or check the appropriate response at the right of the question.

1. On what level do you teach?
 

Junior college	( )
Senior high	( )
Junior high	( )
  
2. In what size school do you teach?
 

1,001 or more	( )
501 - 1000	( )
251 - 500	( )
101 - 250	( )
  
3. How many years of teaching experience have you had? \_\_\_\_\_
  
4. Approximately how many hours of college-level mathematics have you had? \_\_\_\_\_

Part II: The questions in this section pertain to the traits of gifted mathematics students. Place a check mark in the box above the phrase or group of words which, in your opinion, is the most appropriate for describing these students. Please mark only one answer per question.

5. How proficient are gifted mathematics students in expressing their ideas?

<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>
Below average verbal ability, sometimes can't express ideas, below average vocabulary.	Of average verbal ability, express themselves fairly well, average vocabulary.	Very high verbal ability, fluent, express themselves very well, large vocabulary.

6. How much perseverance do these students show?

<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="checkbox"/>
Able to stick with a project until it is completed, keep trying in spite of many failures.	Sometimes unable to complete projects, give up when large problems develop.	Often don't finish projects, give up in face of difficulties.

7. How much originality and curiosity would you say they have?

<input type="text"/>	<input type="text"/>	<input type="text"/>
Extremely inquisitive, look beyond the facts, have ideas of their own, imaginative.	Sometimes raise questions, sometimes have new ideas, of average originality.	Hardly ever question the facts, seldom original, don't often contribute ideas.

8. How well do talented mathematics students follow directions?

<input type="text"/>	<input type="text"/>	<input type="text"/>
Often fail to carry out instructions, work is often late or left undone.	Usually carry out instructions, normally get work done on time.	Always carry out instructions precisely, work is never late.

9. How would you describe their social relationships?

<input type="text"/>	<input type="text"/>	<input type="text"/>
Tend to be the popular class members, have many friends, extroverted.	Of average popularity, average number of friends.	Tend to remain apart from the rest, few friends, introverted.

10. From what socioeconomic background would you say most of these pupils come?

<input type="text"/>	<input type="text"/>	<input type="text"/>
Tend to come from upper or upper-middle class, above average income.	All classes represented, no disguising socioeconomic background.	Tend to be from lower middle or lower class homes, below average incomes.

11. Which phrase best describes the physical characteristics of gifted mathematics students?

<input type="text"/>	<input type="text"/>	<input type="text"/>
Tend to be smaller than average, not as well developed, below average physical maturity.	Of average size, strength, and physical maturity.	Larger and taller than average, more mature physically, stronger than average.

12. What percentage of the total student population would you classify as being gifted in mathematics?

0 - 4 per cent

5 - 10 per cent

11 - 25 per cent

Part III: In this section, please rate gifted students on the characteristics listed. Place a check mark under the heading which most closely describes talented mathematics pupils.

	Out- standing	Above average	Average	Below average	Poor
13. Ability of self-appraisal					
14. Leadership ability					
15. Length of attention span					
16. Efficiency of work habits					
17. Speed in completing assigned tasks					
18. Ability to generalize.					
19. Ability to do abstract thinking					
20. Ability to reason quantitatively					
21. Ability to visualize spatial relationships					
22. Resourcefulness in solving problems					

Part IV: Please feel free to describe any characteristics in addition to those covered which you have found helpful in identifying gifted mathematics students.

APPENDIX B

COVER LETTER

Richard D. Avery  
616 East 36th  
Kansas City, Missouri

March 16, 1964

Dear Fellow Math Teacher:

With today's fast-expanding technical world, it has become essential that educators be able to recognize the characteristics of tomorrow's mathematicians and scientists. Consequently, I am conducting a study of the traits of gifted mathematics students as partial fulfillment of the requirements for the degree of Master of Science in Education at Kansas State University.

You have been selected by a random sampling of the mathematics teachers in Kansas secondary schools. As a member of this group, you are in a unique position to observe the characteristics of superior students and to make a valuable contribution to this study. Would you take a few minutes out of your busy schedule and complete the enclosed questionnaire?

In any investigation it is imperative that the researcher be able to identify the source of his information. Hence, each questionnaire has been assigned a number and will be referred to in this manner throughout the study. Your name will be held in strictest confidence.

In order that your opinions be counted in this study, it is important that you complete and return the questionnaire by April 5, 1964. After you have finished filling it out, just seal it in the enclosed self-addressed, stamped envelope and return it to me.

Thank you for your consideration and assistance in this matter.

Sincerely yours,

Richard D. Avery

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APPENDIX C

FOLLOW-UP LETTER

Richard D. Avery  
616 East 36th  
Kansas City, Missouri

March 27, 1964

Dear Fellow Math Teacher:

As you may recall, I recently sent you a questionnaire concerning the characteristics of gifted mathematics students. This survey is being conducted as part of a study I am doing for the Master of Science in Education degree at Kansas State University.

Over 50 per cent of your colleagues have responded to the questionnaire. However, the April 5th deadline is drawing near, and it is important that your opinion be counted in this study.

In case you have misplaced the original copy of the questionnaire, I am enclosing another. It will take only a few minutes to complete it and return it in the self-addressed, stamped envelope.

You may be assured that your response will remain completely anonymous. Neither you or your school will be identified in any way.

Your efforts in this matter are sincerely appreciated.

Yours truly,

Richard D. Avery

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OPINIONS OF KANSAS SECONDARY MATHEMATICS TEACHERS  
CONCERNING THE CHARACTERISTICS  
OF GIFTED STUDENTS

by

RICHARD DEAN AVERY

B. S., Kansas State University, 1962

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

School of Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1964

The purposes of this report were: (1) to conduct a review of the literature concerning the characteristics of gifted mathematics students, and (2) to determine the extent to which Kansas secondary mathematics teachers agreed with findings of the researchers.

It was found that authorities agreed on a number of the traits of academically talented pupils. Such qualities as high I. Q., excellent communication skills, ability to generalize, curiosity, and a high degree of perseverance were generally emphasized by writers as being necessary for giftedness. Authors especially interested in bright mathematics students stressed the ability of pupils to generalize, reason abstractly, solve problems resourcefully, visualize spatial relationships, and reason quantitatively.

Most writers recommended a combination of standardized tests and teacher observation as being the best method for identifying bright pupils. However, many researchers felt that teachers were often unable to correctly select the gifted pupils in their classes.

The opinions of Kansas mathematics teachers were obtained by sending a questionnaire to a 10 per cent random sample of the mathematics teachers listed by the Kansas State Teachers Association in 1963-1964. The recipients were asked to rate gifted mathematics students on eighteen traits. Out of 140 questionnaires sent, 103 usable returns were received.

Participants in the study generally rated gifted mathematics students as being above average on most of the characteristics mentioned. Three-fifths of the teachers felt that from 0 to 4 per cent of the student population could be considered talented in mathematics. These gifted pupils were described as being average in popularity and physical maturity. Most respondents felt that gifted students had no distinguishing socioeconomic background. The majority of the teachers were of the opinion that these students showed a great amount of perseverance, but only about one-half rated them high on verbal fluency and originality.

Gifted mathematics students were rated as above average or outstanding on the following eight traits 85 to 93 per cent of the time: efficiency of work habits, speed in completing assigned tasks, length of attention span, ability to generalize, ability to reason quantitatively, abstract reasoning power, ability to visualize spatial relationships, and resourcefulness in solving problems. The leadership ability of bright pupils was highly rated by 73 per cent of the teachers, while their ability of self-appraisal was so rated by 78 per cent.

The greatest discrepancy between the opinions of writers and teachers appeared to be in the areas of verbal fluency and originality. While these two traits were considered to be essential by most of the authorities, only about one-half of the teachers marked the highest ranking.



On all of the traits, however, 7 per cent or more of the respondents rated talented mathematics students as being only average or below. The author concluded that if teachers are to do an effecient job of identifying gifted mathematics pupils the results of research must be more effectively communicated to them.

