DOCUMENT RESUME

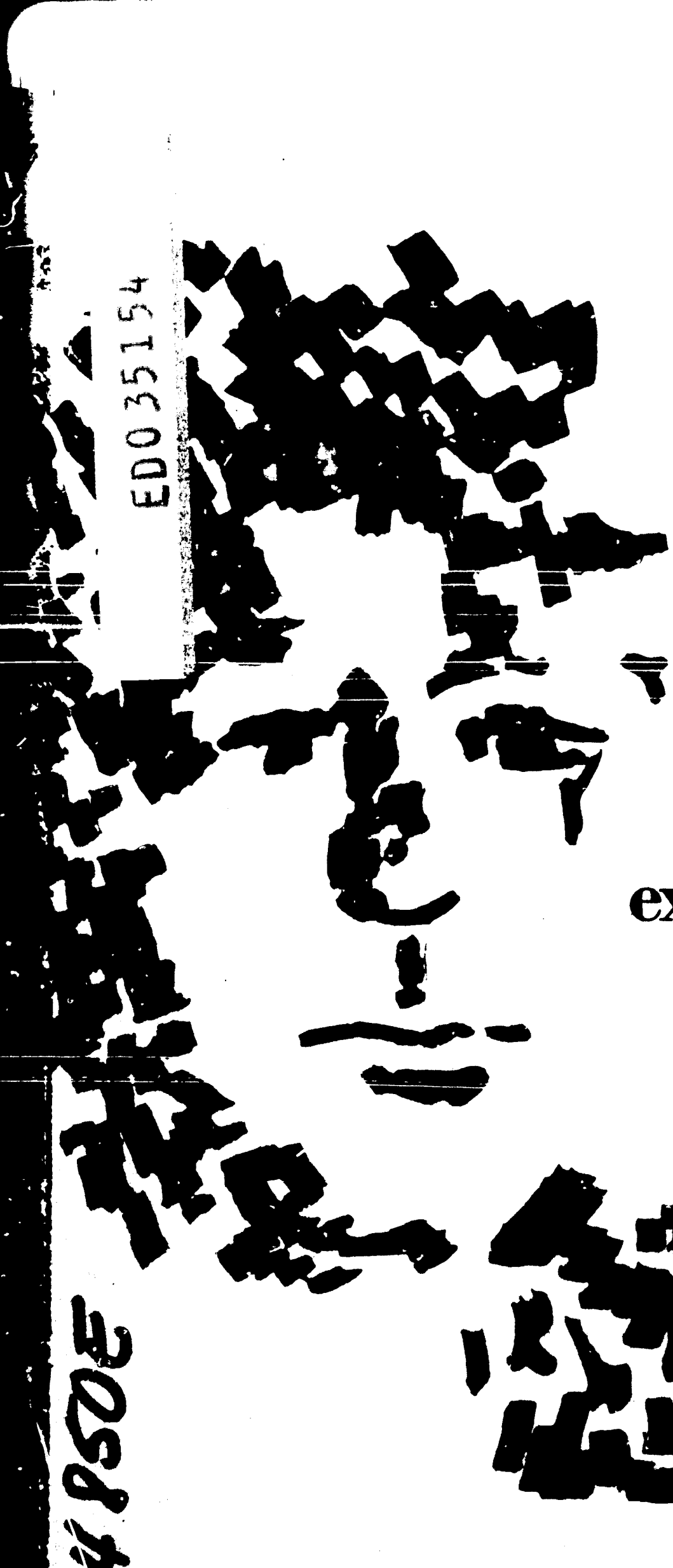
ED 035 154 EC 004 850

AUTHOR McBride, Edd, Ed.
TITLE A Guide for the Education of Exceptionally Talented Students.
INSTITUTION North Carolina State Dept. of Public Instruction, Raleigh.
PUB DATE Sep 69
NOTE 75p.

EDRS PRICE EDRS Price MF-$0.50 HC-$3.85
DESCRIPTORS Ability Grouping, *Administrator Guides, Arithmetic, Art, Class Size, Educational Objectives, English, *Exceptional Child Education, *Gifted, Identification, Language Arts, Learning Activities, Mathematics, Music Education, *Program Development, Program Evaluation, Program Planning, Sciences, Social Studies, *State Programs, Teacher Selection
IDENTIFIERS North Carolina

ABSTRACT

Rules and regulations governing education of the gifted in North Carolina precede an outline of screening and identification procedures. The question of ability grouping is explored through a review of eight research studies and articles. Questions and answers are used to present information on the gifted to parents, and the selection of teachers, class size, and program evaluation are considered. Objectives taken from Bloom's "Taxonomy of Educational Objectives" are presented with an explanation. The development of programs in the following areas includes activities and ideas: language arts, English, social studies (elementary and secondary), science (elementary and secondary), arithmetic, mathematics, music, and art. Available mimeographed materials are listed. (RJ)



IDENTIFICATION • INSTRUCTION • RESEARCH

a guide for the education of exceptionally talented students

STATE DEPARTMENT OF PUBLIC INSTRUCTION, RALEIGH, N.C.

A GUIDE FOR THE EDUCATION OF EXCEPTIONALLY TALENTED STUDENTS

Edited by Edd McBride
September, 1969

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"Nothing is so unequal as the equal treatment of unequals"

Ned Bryan

TABLE OF CONTENTS

FOREWORD.....iii

INTRODUCTION..... iv

RULES AND REGULATIONS..... 1

SCREENING AND IDENTIFICATION..... 4

ABILITY GROUPING..... 8

INFORMATION FOR PARENTS..... 15

SELECTION OF TEACHERS..... 21

CLASS SIZE..... 23

PROGRAM EVALUATION..... 25

MIMEOGRAPHED MATERIALS AVAILABLE ON REQUEST..... 30

PROGRAM DEVELOPMENT..... 32

An Explanation of the Taxonomy..... 40

Language Arts..... 46

English..... 49

Social Studies..... 52

Secondary..... 52

Elementary..... 54

Science..... 56

Secondary..... 57

Elementary..... 59

Arithmetic..... 61

Mathematics..... 64

Music..... 66

Art..... 68

FOREWORD

This publication is intended to serve one general purpose; namely, to assist those who are interested in the education of exceptionally talented students. Information of primary interest to administrators and supervisors is included, as well as information of primary interest to teachers. Only through the cooperation of all those groups can educational programs be designed which will improve those traits which are found in bright students, and in turn possibly produce a greater return to the requirements of our social structure.

Though each section of this publication is important in the overall program development, in the final analysis the instructional phase of this publication should be given much more study, consideration, and evaluation than others. The instructional phase will usually take much effort, intellignece, time, and study in order to dove-tail the suggested process with subject matter content. However, the staff of the Section for the Education of Exceptionally Talented Students is available to assist in this development.

INTRODUCTION

Motivation to improve educational provisions for bright students has resulted from considerable evidence demonstrating that there is a considerable waste of high intellectual potential. As far back as 1955 Paul F. Brondwein found that "half of the persons with an A.G.C.T. (mental ability test) score of 120 and higher do not enter college and only about a third of them graduate." Since that time inquiries by Wolfe, Cole, and several others have shown similar results.

In 1959, recognizing that this situation was evident in North Carolina, a joint resolution of the North Carolina General Assembly established the Commission to Study the Public School Education of Exceptionally Talented Children. In a final report, dated January, 1962, the following recommendation was cited by the Commission:

> "The Commission feels that every exceptionally talented pupil enrolled in North Carolina public schools--regardless of his grade placement or the place in which he lives--deserves an opportunity to develop his individual abilities to the fullest. The Commission recommends the adoption of a state-wide program for the bright and gifted children, adaptable to the varying needs of all public schools, large or small, rural or urban."

However, even before the publication of the Commission's final report, the North Carolina General Assembly in its 1961 session, passed legislation entitled "An Act to Provide for the Public School Education of Exceptionally Talented Children in North Carolina." (Article 38, Public School Laws of North Carolina.)

Following enactment of that legislation, five pilot centers were started in the state. Since that time the program has grown annually. During the 1967-68 school year 378 teachers worked full time with 14,924 exceptionally talented students. While the North Carolina program is the largest state-wide program in the nation for the exceptionally talented it is far too small. It is estimated that only about 15 percent of the eligible students in North

Carolina are now being served. We are constantly working to increase the annual growth rate of the program. We urgently request your support in this effort.

Gene Burnette

The Department of Public Instruction is grieved to announce the unexpected death of Dr. Eugene Burnette, Director of the Gifted and Talented Section on June 7, 1969, following a week of critical illness.

Those who worked with Dr. Burnette are aware of his deep interest in the education of young people; especially those young people needing special educational programs. His awareness that each pupil is an individual,distinct, and must be dealt with as such, won for him much respect and many friends.

RULES AND REGULATIONS GOVERNING THE PUBLIC SCHOOL EDUCATION OF EXCEPTIONALLY TALENTED CHILDREN (ARTICLE 38, CHAPTER 115)

(Adopted by the State Board of Education, July 3, 1969)

A. Administration

1. Rules, regulations, and policies governing the program shall be adopted by the State Board of Education upon recommendation of the State Superintendent.

2. The program provided in this Chapter (115 - 1965 Session Laws) shall be operated as a part of the Department of Public Instruction and shall be under the general supervision of the State Superintendent.

3. In the administration of this program the State Superintendent and the State Board of Education shall deal solely with county and city superintendents and their board of education.

4. Local programs shall be administered and supervised by county and city superintendents in accordance with policies adopted by their boards of education, not inconsistent with the policies of the State Board.

5. Local school administrative units may operate programs jointly in accordance with action taken by their boards of education and recorded in the minutes of the respective boards; provided, the school administrative unit under whose jurisdiction the program is located shall be the governing board in negotiating with the State Superintendent and the State Board.

6. The administrative and supervisory personnel provided in this Chapter shall be appointed by the State Superintendent subject to the approval of the State Board of Education.

7. The funds in this Chapter shall be expended in accordance with a budget recommended by the State Superintendent and approved by the State Board of Education.

B. Definitions and Criteria of Eligibility

1. The term "Exceptionally Talented Child" as defined by the General Assembly shall mean a pupil properly enrolled in the public school system of North Carolina who possesses the following qualifications:

   (a) An intelligence quotient (IQ) score of 120 or higher on a standardized group test of intelligence;

   (b) a majority of marks of A and B;

   (c) emotional adjustment that is average or better;

   (d) a standardized academic achievement test score of average or above; and

   (e) shall be recommended by the pupil's teacher or principal.

2. The responsibility for determining eligibility shall be vested in local boards of education and evidence of eligibility shall be subject to review by the administrative and supervisory personnel assigned to this program.

C. Allotment of Teachers and Allocation of Funds Available Under the Provisions of this Chapter and Through the Nine Months School Fund

1. Teachers available under the provisions of this Chapter and through the Nine Months School Fund shall be allotted to county and city boards of education in accordance with the following procedure:

   (a) Superintendents desiring personnel and/or funds for special programs for exceptionally talented children shall submit annually to the State Superintendent, on forms to be prepared and furnished by him, a proposal outlining factors such as these:

      (1) Number and age-range of children to be included in program;

      (2) certification as to eligibility of children;

      (3) curriculum to be offered;

(4) schedule of activities;

(5) qualifications of personnel;

(6) plans for supervision and evaluation of the program;

(7) plans for children in the succeeding year;

(8) local personnel and funds available for the implementation and support of the program.

(b) Proposals shall bear the approval of the board of education as certified by the signature of the chairman.

(c) Within funds available, and on the basis of the relative merit of the several proposals submitted, the State Superintendent shall recommend and the State Board of Education approve the allotment of personnel and/or funds.

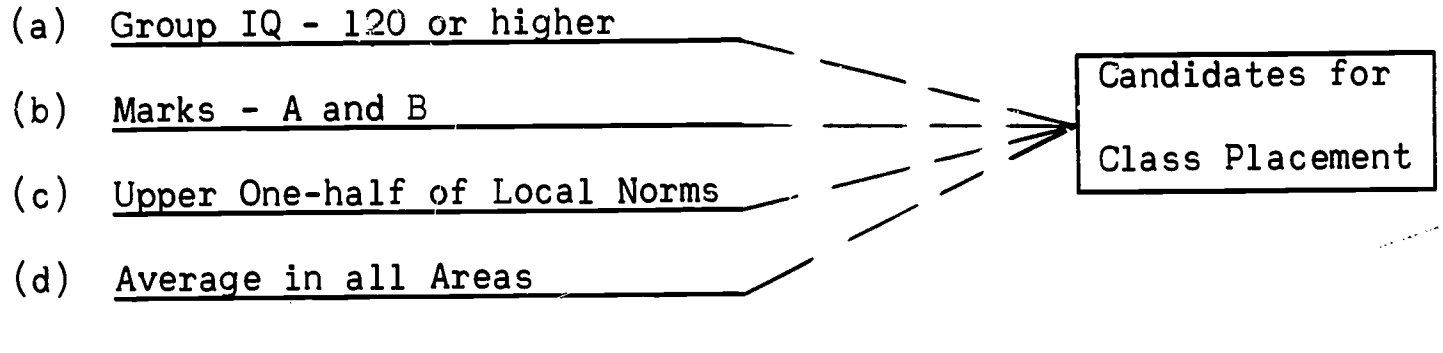
2. Allotments of personnel shall be for one year and their subsequent and continuing allotment shall be contingent upon availability of funds and the merit of the program.

SCREENING AND IDENTIFICATION

A Two-Step Procedure For Class Placement

I. SCREENING

Students who meet one or more of the following criteria are nominated for possible class placement:

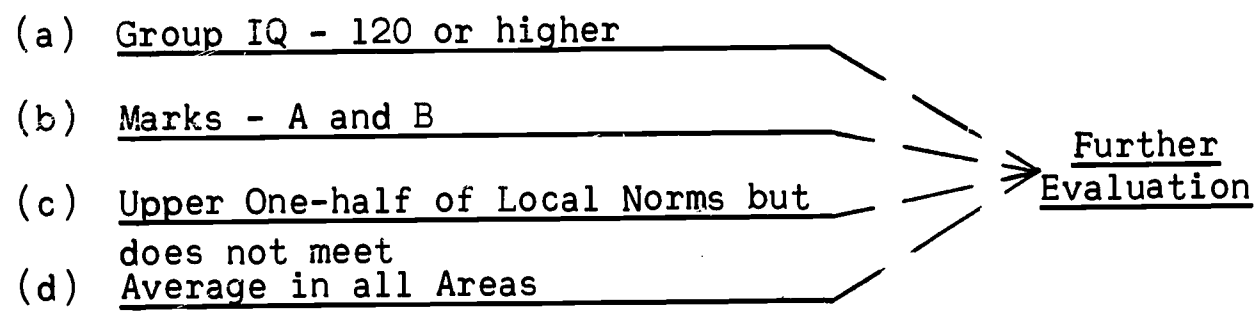


II. FINAL SELECTION

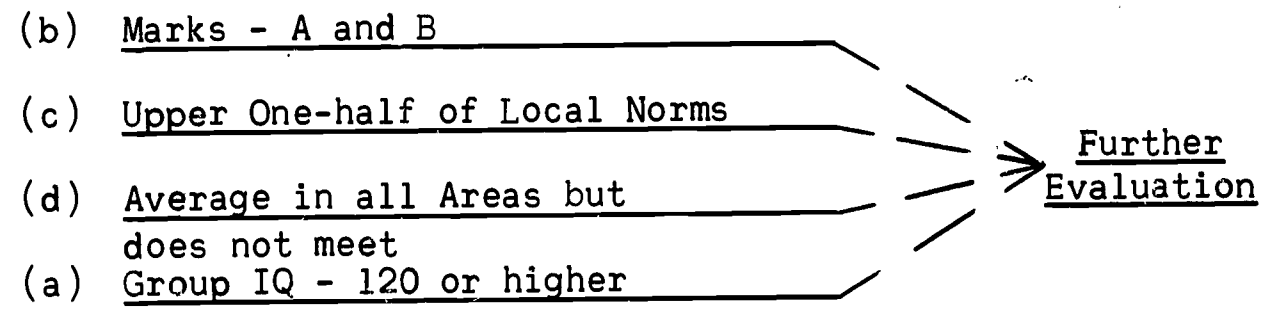
A. Each candidate can be placed in a class if a student meets all four criteria as listed above.

B. Further evaluation needed if a candidate fails to meet one of the four criteria.

(1) If the candidate meets:



(2) If the candidate meets:



II. B. Continued -

(3) If the candidate meets:

(a) Group IQ - 120 or higher
(c) Upper One-half of Local Norms
(d) Average in all Areas but does not meet
(b) Marks - A and B

→ Further Evaluation

(4) If the candidate meets:

(a) Group IQ - 120 or higher
(b) Marks - A and B
(d) Average in all Areas but does not meet
(c) Upper One-half of Local Norms

→ Further Evaluation

The purpose of adequate procedures for selecting and identifying Exceptionally Talented Students is twofold:

1. To include students who should be placed in an Exceptionally Talented Class on the basis of predetermined criteria.

2. To exclude students who should not be placed in an Exceptionally Talented Class on the basis of the same predetermined criteria.

SUGGESTED PROCEDURES FOR THE FINAL SELECTION OF STUDENTS FOR PLACEMENT IN EXCEPTIONALLY TALENTED CLASSES

Source: RULES AND REGULATIONS GOVERNING THE PUBLIC SCHOOL EDUCATION OF EXCEPTIONALLY TALENTED CHILDREN (CHAPTER 1077 - 1961 SESSION LAWS)

Students can be selected for class placement with a high degree of confidence if each prospective Exceptionally Talented Student meets qualifications (a) AND (c), which are:

(a) A group intelligence quotient of 120 or higher

(b) Academic achievement at least equal to the expected grade level as determined by the chronological age and standardized test scores

SUGGESTIONS FOR IDENTIFYING PRIMARY LEVEL STUDENTS FOR EXCEPTIONALLY TALENTED CLASSES

The results of intelligence tests administered in a group situation are less dependable for the primary age child than for other age groups. In order to overcome this difficulty and to be able to make selections with a rather high degree of confidence, one or more of the following alternative procedures can be utilized.

1. Individual intelligence tests--

   If possible, have an individual intelligence test administered to each prospective Exceptionally Talented Student, or

2. Group intelligence tests--

   a. Administer a group intelligence test individually to a prospective Exceptionally Talented Student, and

   b. After an appropriate interval of time has elapsed, readminister other forms of the group intelligence test previously given or administer another group intelligence test.

SUGGESTIONS FOR STUDENTS WHO HAVE BEEN PLACED IN AN EXCEPTIONALLY TALENTED CLASS BUT DO NOT MEET THE REQUIREMENTS OF A PARTICULAR TYPE INSTRUCTIONAL PROGRAM

At times, a student who meets the combined criteria of (a) a group intelligence quotient of 120 or higher, AND (c) academic achievement at least equal to the expected grade level as determined by the chronological age and standardized test scores, may not be able to profit from the instructional program for Exceptionally Talented Students or may prevent other students from doing so.

Where placement in an Exceptionally Talented Class is not satisfactory, criteria (b) and (d) need to be reapplied:

(b) A majority of marks of A and B, in related subject matter areas

(d) Shall be at least average in all areas of education when compared to other students of the same chronological age

If a student cannot meet criteria (b) and (d) further evaluations are needed and/or other class placement should be considered.

ABILITY GROUPING FOR INSTRUCTIONAL PURPOSES

The future of the bright student is undeniably related to the decisions and opportunities provided for him by educators. In the concern for improving educational provisions for the talented as well as for upgrading the quality of education for all students, questions about the relative advantages and disadvantages of ability grouping always seem to emerge.

Questions concerning grouping are not new. Ability grouping began on a wide scale in the 1920's. By 1930 it had reached its peak, and by the late 1930's it had mostly died out. An analysis of these early attempts showed that many had failed because no difference in the instructional program was provided for the different groups. It seems that many educators were merely grouping for the sake of grouping. Where different instructional programs were provided to more nearly meet the educational level of the groups, these initial attempts were almost always successful. For this reason many educators returned to the practice of ability grouping in the late 1950's and are continuing to do so. The same thing is found as was the case in the earlier attempts--grouping by ability has no advantage if no difference in instruction is provided for the groups.

This Section gives a review of eight research studies and articles concerning recent attempts at ability grouping. The purpose of the article is to provide understanding and not to provide a case "for" grouping, although all of the articles do favor the practice in some form. No studies showing the practice to be unfavorable are included because no well designed research studies could be found at this time that show the practice to be unfavorable when the grouping is done for the purpose of providing different courses of study for groups of different abilities. While it is not difficult to find negative opinions concerning the subject, the writer believes that the time has come to rely on facts rather than opinions.

1. Carter (1960)

The Encyclopedia of Educational Research includes the following comments:

1. "One of the obvious procedures for adjusting instruction to the gifted is provision of classes restricted to students of high ability and achievement."
2. "The old argument that special classes are undemocratic has been exploded."
3. "It is well known that recognized leaders like Hollingworth and Terman have consistently pointed out the advantages of special classes."
4. "The reports of participants in special classes, as analyzed by Barbe, Hollingworth, and many more have been very favorable."
5. "The undesirable effects of segregation and the desirable effects of mingling with all groups' are only postulated. They have not appeared in any fact-finding studies."
6. "The accumulated evidence is strongly in favor of ability grouping for instruction of bright students."

2. Gallagher (1960)

In an extensive study of the students in the Champaign and Urbana, Illinois public schools it was shown that adequate programs for gifted children were not provided in the regular classroom. An experimental program on an individual basis was conducted and found to be effective. The committee responsible for the study concluded, however, that such individualized programs conducted within the regular classrooms were not financially feasible; therefore, they recommended homogenous grouping for gifted students.

3. Gallagher (1960)

In the Portland, Oregon, program for the gifted, attempts were made to evaluate the effects of special classes in the fifth to eighth grades. Thirty pupils who were in a homeroom enrichment program and attended special classes were matched with thirty children in the regular program on IQ, sex, achievement, and socio-economic level of the school attended.

The study showed that the special class group took part in a greater number of school activities and had more hobbies and higher motivation for achievement than those students in the control group. The report concluded, - - - "elementary school pupils participating in the gifted child program have made and are continuing to make greater gains in intellectual achievement than comparable pupils not participating in the program. Second, the gifted child program apparently had no ill effects upon the general adjustment of the pupils participating."

4. Howell (1962)

This research study was conducted in Penfield, New York. The community, a suburb of Rochester, is essentially residential. Most of its citizens belong in the middle socio-economic group.

The purpose of the study was to find answers to several questions concerning the program being conducted for the talented and honor students in the local high school. In order to better evaluate the program a control group was chosen. Members of the control group were similar on the basis of tests and subjective analysis to those in the talented group. Neither the students in the control group, nor their teachers knew that they were being used for comparison.

From the analysis of the data obtained from their study, the author derived the following conclusions:

1. Grouping in the senior high school is a desirable practice, leading to better student achievement.
2. Students possessing high ability perform better when placed in a challenging homogenous situation.
3. Talented pupils can master the minimum essentials and have adequate time to pursue activities without jeopardizing their class ranking.
4. Grouping talented students gives them a more realistic view of their abilities.
5. It has not lead to conceitedness or snobbishness on the part of the pupils in the honor group.

6. Students in the honored group are not deprived of association with the typical average students.
7. We have observed very few cases of grouping causing tensions, because the stamina of most gifted students is above average. Most of them profit from this initial stimulation.
8. The social development of talented students is not neglected by their being grouped.

5. Baker, Hughes (1961)

In this study an experimental group and a control group were chosen from academically talented ninth grade students on the basis of intelligence and achievement test scores. The study was conducted after it had been found that the average class of thirty pupils in this school (Druid High School, Tuscaloosa, Alabama) contained a range of seven years in mental ability and academic achievement. "There was evidence to indicate that despite such techniques as ability grouping within the classes, differential assignments, and provisions for individual instruction, the presence of such a wide range of abilities posed too great a problem to be met effectively in many instances."

After one semester, teachers, students, and parents were asked to evaluate the program. All three groups rated the program as "totally favorable." Their testing program supported these ratings, showing that the students in the experimental group had achieved greater breadth and depth of knowledge than had the students in the control group.

6. Martinson (1961)

The following observation was made of a research study completed in the Sacramento public schools: "Evaluations made through the use of various tests and through judgments of parents, teachers, and pupils proved that pupils participating in the gifted program made striking gains in achievement with accompanying personal and social benefits."

7. Larson (1961)

Having surveyed professional literature on educating the gifted and the talented, Miss Larson reached the following conclusions:

1. "That ability grouping in some form or other has been accepted all over the country."
2. "That one of the chief purposes of this grouping has been to give some special attention to the gifted and the academically able, a group too long neglected."
3. "That noted programs for the gifted and the talented are now in operation throughout the country."
4. "That there is need for constant evaluation of these programs."

Miss Larson also offered the following suggestions for improving special programs:

1. Several valid criteria should be used for selecting students. Among the criteria should be intelligence tests scores, achievement tests scores, aptitude test scores, teacher recommendations, and report card grades.
2. The consent of both the student and his parents should be obtained before a student is enrolled in a special class.
3. Strive for both student and parent understanding of the program.
4. The program should be flexible. Students should be added or dropped at any time their performance shows that a change is needed.

8. Kough (1960)

In this study the author wished to identify the Nation's outstanding program for gifted children. Since no nationally recognized "yardstick" for measuring the effectiveness of programs was in existence, he resorted to the "expert nomination" technique.

Thirty well-known persons in the field of gifted child work were asked to

nominate persons they believed to be outstanding in gifted child education. Those individuals nominated by three or more of these experts were added to the original list. This procedure added sixteen for a total of forty-six "experts." Each of these "experts" were then asked to nominate the programs that they believed were unusually effective. A program was included on the unusually effective list if it received three or more nominations. The final list showed thirty-four such programs.

From a study of these thirty-four programs it was found that thirty-two were based on ability grouping. The remaining two relied mostly on enrichment in the regular classroom but in both cases ability grouping was used to some extent.

9. NORTH CAROLINA GOVERNOR'S SCHOOL (1968)

Through the experience of associating with four hundred other highly intelligent and talented youngsters that are their peers two things usually happen to youngsters who attend the GS: first they mutually stimulate each other, and discover that there are many other youngsters like themselves, so that after all, they are not freaks and social misfits; second, they are thoroughly humbled, perhaps for the first time in their young lives when they find out that there are other young roosters in the barnyard whose combs may be redder than their own!

CONCLUSION

In conclusion, one can readily see that ability grouping is not an end in itself. Regardless of how carefully students are screened and placed, positive results are not assured. Ability grouping does not constitute a program for talented students. It is merely an administrative procedure for adjusting instruction to talented students. When viewed in this light we can only agree with the Encyclopedia of Educational Research: "The accumulated evidence is strongly in favor of ability grouping for instruction of bright students."

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INFORMATION FOR PARENTS

In our constant efforts to improve the instructional programs for students, we sometimes fail to give parents complete information. However, parents do have the right to know what is being done for their children.

This article is an attempt to help correct this ommission. It consists of answers to questions that have been submitted to us from various places. We realize that the answers to only a few of many questions are included, and we request that parents and other interested individuals contact us at any time when they have questions or suggestions concerning the exceptionally talented program in North Carolina.

1. QUESTION: Other than test scores, what characteristics are exceptionally talented children likely to have that would indicate these abilities to parents?

   ANSWER: While research has shown that it is impossible to recognize all exceptionally talented children without the use of tests, it has also served to alleviate some gross misconceptions. For instance, in the past these children were often thought to be "eggheads" and frail weaklings. The best research available gives the following picture of the exceptionally talented student:

   a. The child probably learned to walk before the average child.
   b. He is generally above average for his age in heighth, weight, and physical endurance.
   c. He is generally above average in strength of grip, leg strength, and speed in running.
   d. He will be a little less likely to suffer a mental disorder (nervous breakdown) during his lifetime.
   e. He will generally be more independent than the average child.

f. He will usually get along better with his parents and friends than the average child.

g. He will show a better than average ability to evaluate facts and arguments.

h. He will be able to solve more complex problems, puzzles, and games than the average child.

i. He will learn to read easily and will read more and better books than the average child.

j. He is likely to make more collections and have more hobbies and acquire more knowledge of games and plays than the average child.

k. He will be less inclined to boast or overstate his knowledge; he will be more trustworthy when under temptation to cheat, and will score higher on tests of emotional stability.

2. QUESTION: In what areas are exceptionally talented children superior?

   ANSWER: Students identified as exceptionally talented are selected on their ability to do higher levels of thinking. They have the ability to cover more subject matter in school and to go deeper into their subject matter than the average students. They generally are no more talented in music or art than the average students. They likewise are no more likely to become successful at skilled occupations such as auto mechanics or brick-laying than the average student.

3. QUESTION: When are exceptionally talented children identified?

   ANSWER: Local school units decide the grade level at which exceptionally talented classes are started. More schools identify students and start classes at the fifth grade than at any other grade. It is possible, however, to effectively identify exceptionally talented children in the second grade, and this is done by some schools. Other schools wait until the student is in high school to begin exceptionally talented classes.

4. QUESTION: Do parents have any assurance that their child will remain talented as he continues to develop and mature?

   ANSWER: It was once thought that exceptionally talented children "burned out" early and often fell below the average students in ability early in life. It has now been proved that this is not the case. Many studies have shown that those who are superior in ability as children will in almost all cases remain superior throughout their lifetime. Dr. Lewis Terman has been carefully following a group that was identified as gifted in 1921. They have continued to improve their relative status since that time. This and other studies have shown that the "early ripe, early rot" theory is not correct.

5. QUESTION: Why do we need separate classes for the exceptionally talented?

   ANSWER: Our teachers have been trained to work mostly with the "average" or middle group. Those who are very high or very low in ability usually get shortchanged in a regular classroom. Even those teachers who have had training in working with students with low and high ability generally find little time for working with them after giving adequate instruction to the average students. When time is available, it usually goes toward helping the slower students. It is generally felt that the brighter students can "get it on their own." Research studies have shown that this is not the case. The school drop out rate is almost as high for the bright students as it is for the slower students. All students who are properly identified as exceptionally talented have the ability to complete a college education. However, only 60% of them go to college and only about 20% complete their college work. The exceptionally talented program in North Carolina is an attempt to correct this waste of talent.

6. QUESTION: What are the effects of acceleration on these students?

ANSWER: Early attempts at acceleration worked well for instructional purposes but caused some social problems. After a few years of acceleration the student found himself in classes with students three or four years older than himself. Some students could meet requirements for high school graduation when they were no older than fourteen or fifteen. They were then often denied admission to college at that age, and those who were admitted were generally "out of place" with the older college students.

Acceleration programs have mostly been abandoned. A more realistic approach is enrichment. Enrichment programs provide an opportunity for the student to go deeper into the material presented at his grade level instead of giving him the material that he would normally get at the next grade level. Exceptionally talented programs in North Carolina stress enrichment instead of acceleration.

7. QUESTION: What goes on in exceptionally talented classes that is different from a regular classroom?

ANSWER: In an attempt to answer this question, many prominent educators from all over the nation were asked to give their opinion of what should be different. Almost all agreed that the subject matter should be essentially the same. The difference should be in the way the material is presented. In the regular classroom much of the student's time is spent learning facts and opinions. Talented students can learn this information more rapidly than average students. In exceptionally talented classes the students learn this basic information rapidly and then move on to more complex operations, such as evaluating the facts and using them to form new ideas, without having to wait for the slower students to catch up.

8. QUESTION: How does the school know if the special class plan is a good technique for talented students?

ANSWER: In order to qualify for a state supported program for exceptionally talented students, a school must have a well-planned program of evaluation. In addition, to these local evaluations, the Department of Public Instruction carries on a very comprehensive program of evaluation on the state-wide program. These evaluations have shown positive effects since the program was started in 1961. They have also shown that the programs have been constantly improving each year.

9. QUESTION: Won't recognizing these students as the brightest in the school cause them to become snobbish?

ANSWER: This shall not be a problem. Studies have shown that students are more likely to feel superior if left in a regular classroom where they always know the answers to questions and always make the highest grades. Often students who have felt superior to their classmates have had a favorable change of attitude when placed in classes with students who were as intelligent as themselves.

10. QUESTION: I often hear that students are already being given too much work. Aren't these classes likely to overwork students and cause emotional problems?

ANSWER: This has not been a problem. Since these students can work faster, and since their stamina is greater, they usually have to work no harder in these classes than the average student does in the regular classroom. Students with average ability would find the work too difficult. That is why Article 38 of the Public School Laws prohibits them from being placed in these classes.

11. QUESTION: Will students in these classes miss the regular curriculum?

ANSWER: No. The subject areas covered are the same as the regular curriculum. In most cases the same textbooks are used. Since the material in the basic text can be learned more rapidly, students are given an opportunity to go into the material more deeply by using supplementary materials.

12. QUESTION: Can my child be removed from the class if we don't think that he is responding favorably in the class?

ANSWER: Yes. Participation in the class is voluntary.

13. QUESTION: Is the exceptionally talented program in North Carolina an experimental project?

ANSWER: No. The program is a regular permanent part of the Department of Public Instruction. It is based on a prior experimental project, but was made permanent by the state legislature in 1961.

14. QUESTION: Is the present program adequate in size to meet the needs of all exceptionally talented students in the state?

ANSWER: Not at the present time. The size of the program is determined by the amount of money appropriated for it by the Legislature. We are optimistic that the program will grow and improve as more aid becomes available.

SELECTION OF TEACHERS

Proper selection and placement of teachers is a problem common to all school administrators. In 1965 the National Commission on Teacher Education and Professional Standards reported that misassignment ranked fifth among the twelve most important factors limiting the quality of education.

Very little research has been done in the area of selecting teachers for gifted and talented classes. Perhaps the best available information in this area comes from a study completed by Dr. William E. Bishop of Indiana Central College. His findings closely support the suggestions of prominent authors and the conclusions drawn from surveys of teachers and students at the North Carolina Governor's School and in the North Carolina Exceptionally Talented Program.

Dr. Bishop's major findings are as follows:

1. Teachers who are judged effective by intellectually gifted, high achieving students do not differ with respect to teachers not so identified relative to such variables as sex, marital status, type of under-graduate institution attended, highest degree held, course work preparation and extent of association with professional organizations.
2. Teachers who are successful with mentally superior students are mentally superior themselves. They stand in the upper 3 percent (IQ 128 and above) relative to the general adult population and significantly higher than their teaching colleagues.
3. The effective teachers tend to pursue avocational interests which are "intellectual" in nature. They have a significantly greater interest than their teaching colleagues in literature, in the arts and the cultural life of their community.

4. The identified teachers are characterized by high achievement needs--they attempt to do their best and to succeed. This is reflected in past scholastic achievement as well as present teaching success.
5. Effective teachers have more favorable attitudes toward students than other teachers. They take a personal interest in their students and are sensitive to the students' motives and behaviors; they attempt to see things from the students' point of view and to understand how they feel.
6. Effective teachers tend to be more student-centered in their teaching approach. They encourage students to participate in class activities and they take student's opinions into consideration.
7. Teachers who are effective with gifted students are more stimulating and imaginative in the classroom than their teaching colleagues. They are well-grounded in and enthusiastic about their particular subject and about teaching. They define their success in terms of how well they motivate their students to want to study, to learn and to think independently. They are able to instill in their students interest in and appreciation for their subject.
8. Teachers identified as effective by gifted students support special educational provisions for gifted students. A significantly greater percent of them would prefer to teach a class of exceptionally bright students than would their fellow teachers.

In summary, the best available evidence suggests that such practices as the assigning exceptionally talented teachers on the basis of seniority, and the rotation of teachers annually in order to "be fair to all faculty members" are invalid. Instead, it is suggested that an attempt should be made to select teachers who possess qualities which are common to the highest group, who have a special interest in working with the group, and who are willing to pursue in-service training.

CLASS SIZE

Because of the variety of programs offered for exceptionally talented students in North Carolina, it is impossible to give a firm recommendation for class size. Instead, educators should consider as many factors as possible that relate to their particular situation and base the size of their classes on those factors.

Certainly it is safe to suggest that exceptionally talented classes should never be larger than regular classes, and when possible, they should be smaller. At present the average size of exceptionally talented classes in North Carolina is twenty-three students.

Instruction for exceptionally talented students should be director toward the higher type intellectual operations (analysis, synthesis, evaluation). Instruction in these areas requires much individual and small group work. Small classes can be supervised much more adequately during this type of instruction.

Other factors to be considered include:

1. Grade level

   Younger students, even though they possess high intelligence and achievement scores, usually require much more individual attention than older children.

2. Subject area

   Some subject areas require considerably more effort from the teacher, both in class and out, than others.

3. Plant facilities and equipment

   Classes requiring considerable use of science laboratories, reading machines, computer terminals, language labs, etc. should be limited in size to the extent that each member of the class has adequate room and equipment.

4. Class organization

   Classes using the team-teaching approach and those in which teacher aids are employed can, of course, be larger than those which employ a single teacher.

5. Teacher competence

   Class size should be determined to some extent by the individual qualities of the teacher. In a recent study some teachers stated that they actually preferred large classes. Others stated that they could not adequately teach a class larger than twenty students.

6. Availability of eligible students

   Students with test scores and teacher ratings that indicate little chance of success should not be placed in a class in order to make the class larger. <u>There is no minimum class size</u>. Likewise, schools having more qualified students than would normally be placed in a class should be extremely selective. Quality should never be sacrificed for quantity.

THE EVALUATION OF EXCEPTIONALLY TALENTED CLASSES

The educator who embarks on an evaluation of the effectiveness of school learning experiences for exceptionally talented children should develop his plan of evaluation well in advance of the time that he plans to execute the details of the plan. Many of the weaknesses of current educational evaluations can be attributed to the fundamentally unsound viewpoint that the planning stage of a study is an initial stage that is quickly passed, to be followed by the more elaborate and prolonged stage of collecting data. The fact is that the major effort in the undertaking of evaluations should be devoted to the planning stage, which may include not only a careful formulation of the problem, but also a determination of the techniques by which the evaluation can be made.

It should be emphasized that we cannot demonstrate the effectiveness of a program for exceptionally talented children solely by obtaining the opinions of people connected with the programs, i.e., teachers, parents, and children, when these opinions have not been supported by objective data of some sort. It is well known that subjective evaluations or opinions have been shown in many experiments to be subject to conscious or unconscious bias. Many of the parents may be happy that the school system is providing a special program for their children and will give a favorable evaluation in order to see the program continue. Teachers who were not aware previously of the special characteristics or virtues of these youngsters because they had been subdued in a classroom of 35 or 40 children now pay more special attention to them and see these favorable characteristics which might have been present all along. They may misinterpret their own changed perceptions of the children to the advantage of the program. It has been clearly demonstrated that people will react favorably to any program which evidences a greater interest in the parents and their children.

There are several ways in which it is possible to evaluate the effectiveness of special provisions for exceptionally talented children, and most of these have already been described by Gallagher in Analyzing Research on the Education of Gifted Children.[1] Each plan is described below so that it will be possible to select the plan which appears to be most appropriate for a particular situation.

1. Matched Groups. The most commonly used plan is that of the matched groups with one group receiving the special treatment while the other, presumably equal, group is receiving the regular program. To be completely equal, these groups would have to be matched or shown to be equivalent on all of the variables that you believe might affect the outcome. This means that such factors as motivation and emotional stability will have to be matched as well as intelligence and achievement. A comparison between highly motivated groups of children in special class programs and an unmotivated group of exceptionally talented children in the regular program can be of little use in evaluating the effectiveness of the special program.

2. Own Control Group Plan. A variation of the matched groups approach is the use of the children in the special program as their own control group. This can be done by comparing their rate of academic or emotional or social growth during a time interval when they are not in a special program (control period) with their rate of growth in these various characteristics while in the special program (experimental period). This has the advantage of avoiding the assumption that child A is really equal to child B on all important characteristics since the same child would be used in both control and experimental situations. It does have the disadvantage of assuming that no factor related to maturation or

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[1]James J. Gallagher, Analysis of Research on the Education of Gifted Children. State of Illinois, Office of the Superintendent of Public Instruction, page 63-64, 1960.

growth will interfere with the results. If, for example, the child has become physically mature during either the control or experimental periods, then this might have an effect on his social acceptance that is not really associated with the special or regular program. If the program evaluator is sufficiently aware of these possible extraneous factors that might influence the results, this "own-control" approach has much to recommend it.

3. Random Selection. Probably the most defensible method is that of random selection of experimental and control samples. In this method a pool of potential candidates is made. In this pool are placed the children that are eligible for the special program on the desired characteristics. The size of the pool should be at least twice that which will attend the special program. Then the choice of the experimental group is made on the basis of a table of random numbers, the equivalent of picking names out of a hat. In this way you can be reasonably sure that the two groups are essentially equal on important characteristics prior to the beginning of the special training. Therefore, any differences which are obtained at the end of the program can be confidently stated as resulting from the special training situation.

STANDARDIZED TESTS

The proper use of group test results to evaluate the effectiveness of special provisions for exceptionally talented children is one of the primary methods of assessment. However, some precautions are needed; use group test results, only to determine the changes that are shown from large amounts of information, and when the important objective is to make decisions which are correct on the average. Conversely, group test results should not be used for individual diagnostic purposes as the results are much less satisfactory than individual tests.

Test Selection

Tests selected to evaluate progress of programs for exceptionally talented students should meet the following six requirements:

1. Objectives: Tests should be designed to seek evidence of the extent to which your students acquire the behavior being taught.

2. Validity: Tests should measure your stated objective. Validity is usually expressed as correlation coefficient. All other variables being equal, select the test with the highest coefficient.

3. Reliability: Tests should show consistency through a series of measurements. Consistency is usually expressed as reliability coefficient. If criteria of validity have been met, select the tests with the highest coefficient.

4. Ease of application: Tests should be simple. Simplicity of application applies to directions and scoring, which should require no observation of judgment by the tester.

5. Level: Tests should be selected at the proper level--especially if involving academic areas. An estimate of the student's achievement level must precede selection. In estimating levels, three points should be considered: the average, the lowest, and the highest possible scores that can be obtained.

6. Compilation of data: Tests should yield data that can be placed in a design that permits observation of the degree of changes that particular groups of students have made over a specific period of time.

For purposes of evaluation of exceptionally talented classes, watch these pitfalls:

1. Standardized group tests should be used with large amounts of information. When the important objective is to make decisions which are correct on the average, group tests are suitable. When a thorough understanding of the individual is sought, group tests are less satisfactory than individual tests.

2. Standardized group tests should not replace individual disgnostic tools. They can be used, however, to screen and identify pupils for later individual study.

3. Standardized group tests are not particularly sensitive to short-term changes in behavior.

The Section for the Education of Exceptionally Talented Children in the Department of Public Instruction will make its staff available for consultation concerning the evaluation of programs.

MIMEOGRAPHED MATERIALS AVAILABLE ON REQUEST

Much of the information in this publication consists of condensed and/or revised versons of the materials listed below. In most cases more information can be obtained by requesting specific items from this list.

GENERAL:

1. An Analysis of Research Studies and Articles on Ability Grouping for Talented Students
2. Annual Status Report
3. Characteristics of an Exceptionally Talented Child
4. Directory of Teaching Personnel - Program for Exceptionally Talented Children
5. Duties and Procedures of a State Supervisor in the Exceptionally Talented Program
6. New Opportunities for Talented and Gifted Youth
7. Rules and Regulations Governing the Public School Education of Exceptionally Talented Children (Article 38, Chapter 115)
8. Things We Have Learned

INSTRUCTION:

1. Don't Read This! (Factors related to program success)
2. Procedures for Introducing New Skills in Writing Situations to the Exceptionally Talented Students
3. Procedures for Teaching Exceptionally Talented Students About Language
4. Procedures for Teaching Exceptionally Talented Students About the Nature and History of Language
5. Procedures for Teaching Literature to Exceptionally Talented Students
6. Providing Speech Training for Exceptionally Talented Students
7. Recommended Class Size for Exceptionally Talented Classes in North Carolina
8. Some Points on the Evaluation of Learning for Exceptionally Talented Children
9. Tantalizing Reading (Questions about ability grouping)
10. "Taxonomy of Educational Objectives" (An Outline)
11. Yep, You Can Read This (Regular class activities used for exceptionally talented students)
12. Arithmetic - Elementary
13. Language Arts - Elementary
14. English - Secondary
15. Science - Elementary
16. Science - Secondary
17. Social Studies - Elementary
18. Social Studies - Secondary
19. Art - Elementary
20. Music - Elementary
21. Reading Materials for Exceptionally Talented Students

SCREENING AND IDENTIFICATION:

1. Information for Parents
2. Screening and Identification
3. The Selection and Use of Group Tests

PROGRAM DEVELOPMENT

In order to develop an instructional program for exceptionally talented students educational goals must be established which are directed to the abilities of the students and the demands of Society. Furthermore these educational goals must be specific enough to promote the development of an instructional program.

The Section for the Education of Exceptionally Talented Students recommends the objectives found in B. S. Bloom's Taxonomy of Educational Objectives as goals which are specific enough to base an instructional program for exceptionally talented students.[2] Though Jerome Bruner, J. P. Guilford, and J. J. Gallagher have established goals which are similar in content to these advocated by Bloom, it is the concensus of the staff that the educational goals outlined in this paper are more clearly defined and described than others. Therefore, these goals should be less difficult to use in the development of an instructional program for exceptionally talented students.

Groups interested in obtaining more information about the Taxonomy may contact the Section for the Education of Exceptionally Talented Children. Members of the Section are available to discuss the Taxonomy with those who wish additional information. Also, a series of films showing the Taxonomy in use with exceptionally talented students in the classroom has recently been purchases and is available for use by interested groups.

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[2]Benjamin S. Bloom, editor, Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain, New York, New York: David McKay Company, Inc., 1956, 207 pp.

CONDENSED VERSION OF THE
TAXONOMY OF EDUCATIONAL OBJECTIVES

Cognitive Domain

KNOWLEDGE

1.00 KNOWLEDGE

Knowledge, as defined here, involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting. For measurement purposes, the recall situation involves little more than bringing to mind the appropriate material. Although some alteration of the material may be required, this is a relatively minor part of the task. The knowledge objectives emphasize most the psychological processes of remembering. The process of relating is also involved in that a knowledge test situation requires the organization and reorganization of a problem such that it will furnish the appropriate signals and cues for the information and knowledge the individual possesses. To use an analogy, if one thinks of the mind as a file, the problem in a knowledge test situation is that of finding in the problem or task the appropriate signals, cues, and clues which will most effectively bring out whatever knowledge is filed or stored.

1.10 KNOWLEDGE OF SPECIFICS

The recall of specific and isolable bits of information. The emphasis is on symbols with concrete referents. This material which is at a very low level of abstraction, may be thought of as the elements from which more complex and abstract forms of knowledge are built.

1.11 KNOWLEDGE OF TERMINOLOGY

Knowledge of the referents for specifics symbols (verbal and non-verbal). This may include knowledge of the most generally accepted symbol referent, knowledge of the variety of symbols which may be used for a single referent, or knowledge of the referent most appropriate to a given use of a symbol.

* To define technical terms by giving their attributes, properties, or relations.

* Familiarity with a large number of words in their common range of meanings.

1.12 KNOWLEDGE OF SPECIFIC FACTS

Knowledge of dates, events, persons, places, etc. This may include very precise and specific information such as the specific date or exact magnitude of a phenomenon. It may also include approximate or relative information such as an approximate time period or the general order of magnitude of a phenomenon.

* The recall of major facts about particular cultures.

* The possession of a minimum knowledge about the organisms studied in the laboratory.

1.20 KNOWLEDGE OF WAYS AND MEANS OF DEALING WITH SPECIFICS

Knowledge of the ways of organizing, studying, judging, and criticizing. This includes the methods of inquiry, the chronological sequences, and the standards of judgment within a field as well as the patterns of organization through which the areas of the fields themselves are determined and internally organized. This knowledge is at an intermediate level of abstraction between specific knowledge on the one hand and knowledge of universals on the other. It does not so much demand the activity of the student in using the materials as it does a more passive awareness of their nature.

1.21 KNOWLEDGE OF CONVENTIONS

Knowledge of characteristic ways of treating and presenting ideas and phenomena. For purposes of communication and consistency, workers in a field employ usages, styles, practices, and forms which best suit their purposes and/or which appear to suit best the phenomena with which they deal. It should be recognized that although these forms and conventions are likely to be set up on arbitrary, accidental, authoritative bases, they are retained because of the general agreement or concurrence of individuals concerned with the subject, phenomena, or problem.

* Familiarity with the forms and conventions of the major types of work, e.g., verse, plays, scientific paper, etc.

* To make pupils conscious of correct form and usage in speech and writing.

1.22 KNOWLEDGE OF TRENDS AND SEQUENCES

Knowledge of the processes, directions, and movements of phenomena with respect to time.

* Understanding of the continuity and development of American culture as exemplified in American life.

* Knowledge of the basic trends underlying the development of public assistance programs.

1.23 KNOWLEDGE OF CLASSIFICATIONS AND CATEGORIES

Knowledge of the classes, sets, divisions, and arrangements which are regarded as fundamental for a given subject field, purpose, argument, or problem.

* To recognize the area encompassed by various kinds of problems or materials.

* Becoming familiar with a range of types of literature.

1.24 KNOWLEDGE OF CRITERIA

Knowledge of the criteria by which facts, principles, opinions, and conduct are tested or judged.

* Familiarity with criteria for judgment appropriate to the type of work and the purpose for which it is read.

* Knowledge of criteria for the evaluation of recreational activities.

1.25 KNOWLEDGE OF METHODOLOGY

Knowledge of the methods of inquiry, techniques, and procedures employed in a particular subject field as well as those employed in investigating particular problems and phenomena. The emphasis here is on the individual's knowledge of the method rather than his ability to use the method.

* Knowledge of scientific methods for evaluating health concepts.

* The student shall know the methods of attack relevant to the kinds of problems of concern to the social sciences.

1.30 KNOWLEDGE OF THE UNIVERSALS AND ABSTRACTIONS IN A FIELD

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field or which are quite generally used in studying phenomena or solving problems. These are at the highest levels of abstraction and complexity.

1.31 KNOWLEDGE OF PRINCIPLES AND GENERALIZATIONS

Knowledge of particular abstractions which summarize observations of phenomena. These are the abstractions which are of value in explaining, describing, predicting, or in determining the most appropriate and relevant action or direction to be taken.

* Knowledge of the important principles by which our experience with biological phenomena is summarized.

* The recall of major generalizations about particular cultures.

1.32 KNOWLEDGE OF THEORIES AND STRUCTURES

Knowledge of the body of principles and generalizations together with their interrelations which present a clear, rounded and systematic view of a complex phenomenon, problem, or field. These are the most abstract formulations, and they can be used to show the interrelation and organization of a great range of specifics.

* The recall of major theories about particular cultures.

* Knowledge of a relatively complete formulation of the theory of evolution.

INTELLECTUAL ABILITIES AND SKILLS

Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. The materials and problems may be of such a nature that little or no specialized and technical information is required. Such information as is required can be assumed to be part of the individual's general fund of knowledge. Other problems may require specialized and technical information at a rather high level such that specific knowledge and skill in dealing with the problem and the materials are required. The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose. The materials may be given or remembered.

2.00 COMPREHENSION

This represents the lowest level of understanding. It refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.

2.10 TRANSLATION

Comprehension as evidenced by the care and accuracy with which the communication is paraphrased or rendered from one language or form of communication to another. Translation is judged on the basis of faithfulness and accuracy, that is, on the extent to which the material in the original communication is preserved although the form of the communication has been altered.

* The ability to understand non-literal statements (metaphor, symbolism, irony, exaggeration).

* Skill in translating mathematical verbal material into symbolic statements and vice versa.

2.20 INTERPRETATION

The explanation or summarization of a communication. Whereas translation involves an objective part-for-part rendering of a communication, interpretation involves a reordering, rearrangement, or a new view of the material.

* The ability to grasp the thought of the work as a whole at any desired level of generality.

* The ability to interpret various types of social data.

2.30 EXTRAPOLATION

The extension of trends or tendencies beyond the given data to determine implications, consequences, corollaries, effects, etc., which are in accordance with the conditions described in the original communication.

* The ability to deal with the conclusions of a work in terms of the immediate inference made from the explicit statements.

* Skill in predicting continuation of trends.

3.00 APPLICATION

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules of procedures, or generalized methods. The abstractions may also be technical principles, ideas, and theories which must be remembered and applied.

* Application to the phenomena discussed in one paper of the scientific terms or concepts used in other papers.

* The ability to predict the probable effect of a change in a factor on a biological situation previously at equilibrium.

4.00 ANALYSIS

The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. Such analyses are intended to clarify the communication, to indicate how the communication is organized, and the way in which it manages to convey its effects, as well as its basis and arrangement.

4.10 ANALYSIS OF ELEMENTS

Identification of the elements included in a communication.

* The ability to recognize unstated assumptions.

* Skill in distinguishing facts from hypotheses.

4.20 ANALYSES OF RELATIONSHIPS

The connections and interactions between elements and parts of a communication.

* Ability to check the consistency of hypotheses with given information and assumptions.

* Skill in comprehending the interrelationships among the ideas in a passage.

4.30 ANALYSIS OF ORGANIZATIONAL PRINCIPLES

The organization, systematic arrangement, and structure which hold the communication together. This includes the "explicit" as well as "implicit" structure. It includes the bases, necessary arrangement, and the mechanics which make the communication a unit.

* The ability to recognize form and pattern in literary or artistic works as a means of understanding their meaning.

* Ability to recognize the general techniques used in persuasive materials, such as advertising, propaganda, etc.

5.00 SYNTHESIS

The putting together of elements and parts so as to form a whole. This involves the process of working with pieces, parts, elements, etc., and arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

5.10 PRODUCTION OF A UNIQUE COMMUNICATION

The development of a communication in which the writer or speaker attempts to convey ideas, feelings, and/or experiences to others.

* Skill in writing, using an excellent organization of ideas and statements.

* Ability to tell a personal experience effectively.

5.20 PRODUCTION OF A PLAN, OR PROPOSED SET OF OPERATIONS

The development of a plan of work or the proposal of a plan of operations. The plan should satisfy requirements of the task which may be given to the student or which he may develop for himself.

* Ability to propose ways of testing hypotheses.

* Ability to plan a unit of instruction for a particular teaching situation.

5.30 DERIVATION OF A SET OF ABSTRACT RELATIONS

The development of a set of abstract relations either to classify or explain particular data or phenomena, or the deduction of propositions and relations from a set of basic propositions or symbolic representations.

* Ability to formulate appropriate hypotheses based upon an analysis of factors involved, and to modify such hypotheses in the light of new factors and considerations.

* Ability to make mathematical discoveries and generalizations.

6.00 EVALUATION

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard of appraisal. The criteria may be those determined by the student or those which are given to him.

6.10 JUDGMENTS IN TERMS OF INTERNAL EVIDENCE

Evaluation of the accuracy of a communication from such evidence as logical accuracy, consistency, and other internal criteria.

* Judging by internal standards, the ability to assess general probability of accuracy in reporting facts from the care given to exactness of statement, documentation, proof, etc.

* The ability to indicate logical fallacies in arguments.

6.20 JUDGMENTS IN TERMS OF EXTERNAL CRITERIA

Evaluation of material with reference to selected or remembered criteria.

* The comparison of major theories, generalizations, and facts about particular cultures.

* Judging by external standards, the ability to compare a work with the highest known standards in its field--especially with other works of recognized excellence.

Benjamin S. Bloom, editor, Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain, New York, New York: David McKay Company, Inc., 1956, pp. 201-207. Condensed version reprinted here with permission of author and publisher.

A BRIEF EXPLANATION OF THE TAXONOMY

I. KNOWLEDGE

In the Taxonomy Knowledge refers to the ability to recognize or recall information. It should not be confused with a philosophical definition. Teaching this phase of the taxonomy merely involves "pouring in" information.

This phase of instruction is usually accomplished in a formal setting. It can be accomplished with very large groups.

A. Activities usually done by student:

1. Responds to classroom situation - is attentive
2. Absorbs information - looks, listens, reads
3. Remembers
4. Practices effective procedures - drills, recites
5. Covers information in books
6. Recognizes information that has been covered

B. Evidence of student's success:

1. Completes class and homework assignments
2. Completes programmed learning sequences
3. Scores satisfactorily on objective tests

C. Activities usually done by teachers:

1. Directs student activities
2. Gives information - lectures, drills
3. Shows information - audio-visuals, demonstrations
4. Enlarges information
5. Makes and administers objective tests
6. Makes homework assignments

II. COMPREHENSION

Comprehension represents the lowest level of understanding. The student should be able to make some use of the knowledge that he has gained but he may not necessarily be able to relate it to other material or see its fullest implications.

This instruction is usually accomplished in a formal setting with a group no larger than a typical class.

A. Activities usually done by student:

1. Explains information rather than merely quotes it
2. Makes simple demonstrations
3. Translates information into his own words
4. Extends information to new situations
5. Interprets information from technical terms to familiar terms

B. Evidence of student's success:

1. Has the ability to intelligently discuss information
2. Can write simple essays
3. Scores satisfactorily on objective tests

C. Activities usually done by teachers:

1. Demonstrates material
2. Listens to students
3. Asks questions
4. Compares and contrasts students' answers
5. Examines students' ideas
6. Makes and administers objective tests and low level essay tests
7. Makes carefully selected homework assignments

III. APPLICATION

Application refers to the ability to use abstractions in particular and concrete situations. An example of this phase could be the using of an abstract mathematical formula to solve a specific math problem. In this phase instruction is usually rather informal. It is readily adaptable to laboratories, shops, the field, the stage, or to small groups within the classroom.

A. Activities usually done by students:

1. Solves novel problems
2. Constructs projects, models, apparatus, etc.
3. Demonstrates use of knowledge

B. Evidence of students' success:

1. Masters problem solving tests
2. Constructs equipment, models, graphs, etc.
3. Demonstrates ability to use equipment

C. Activities usually done by teachers:

1. Shows students ways to facilitate their work
2. Observes students' activities
3. Criticizes students' activities
4. Helps design students' projects
5. Organizes field trips and contests

IV. ANALYSIS

Analysis refers to the breaking down of a communication into its basic parts. This allows the relationship between ideas to be seen more clearly and allows basic arrangements to be studied. This phase of instruction is best conducted in an informal and irregular manner. Small group and independent study techniques are especially useful here. Homework assignments directed toward analysis have been especially valuable.

A. Activities usually done by students:

1. Discusses information in depth
2. Uncovers interrelationships among ideas
3. Discovers deeper meanings and insinuations that were not apparent at first
4. Sees similarities and differences between styles

B. Evidence of students' success:

1. Makes effective outlines
2. Writes effective precis
3. Completes effective experimental write-ups

C. Activities usually done by teachers:

1. Probes, guides, and observes students
2. Acts as a resource person
3. Plans for and conducts discussions, seminars, and group critiques

V. SYNTHESIS

Synthesis is the putting together of elements or parts so as to form a whole. It is the arranging and combining of pieces to form a pattern or structure that was not clearly evident before. This phase of the Taxonomy is especially adaptable to independent study. It can be accomplished in almost any setting including the home. The library is especially useful. Much reflection is generally required--these results often come slowly. Patience is necessary.

A. Activities usually done by students:

1. Produces unique communications
2. Formulates new hypotheses based on analyzed information
3. Makes discoveries and generalizations
4. Shows relationships between ideas and philosophies
5. Propose new ways of doing things

B. Evidence of students' success:

1. Activities above are effectively completed
2. Writes quality essays and term papers
3. Makes blue prints or sets of plans for projects

C. Activities usually done by teachers:

1. Extends students knowledge
2. Analyzes and evaluates students work
3. Prepares reading lists--including critical questions
4. Brings in consultants
5. Plans seminars
6. Allows for independent study

VI. EVALUATION

Evaluation involves making judgments about the value of materials, methods, or ideas for a given purpose. This represents the highest level of intellectual functioning. This process is difficult for even the brightest students. Results should not be expected to come quickly. Students should not feel rushed. This phase must be taught in a very informal manner and is handled best in small groups.

A. Activities usually done by students:

1. Makes firm commitments
2. Judges quality based on sound criteria
3. Effectively supports or disputes ideas, theories, etc.

B. Evidence of students' success:

1. Oral and written critiques are logical
2. Speeches and essays are based on sound information
3. Projects are completed successfully
4. Performance is effective (atheletic, artistic, musical, etc.)

C. Activities usually done by teachers:

1. Accepts students ideas
2. Plans competitive essay assignments
3. Plans tournaments (speech, debates, etc.)
4. Helps establish criteria for evaluations

LANGUAGE ARTS - Elementary

Activities designed for exceptionally talented students in the language arts should be aimed at the development of those skills in reading and oral and written expression which will aid them most in their other learning. For example, exceptionally talented students can begin very early to develop basic research skills, learn to use the library, locate information, and use reference material. They should develop skills in taking notes from material read and know how to credit sources in reports. They can become discriminating readers, determining whether material is fact or opinion, accurate or inaccurate, by comparing sources and checking on the background of the author.

Exceptionally talented students can use many different reading materials, such as supplemental books on a higher grade level, newspapers, news magazines, editorials, supplemental science books, and current magazines. They should be encouraged to read a wide variety of material and explore new interests, as well as to read in connection with hobbies and special interests.

Offering the students a wide choice of good books (classics and the best of today's children's literature) is the best way to develop their appreciation of literature. Using new and interesting ways to report on books, dramatizing stories, and playing games with book titles will arouse interest in more independent reading.

Writing is an important area of learning for the exceptionally talented. They should be encouraged to express their thoughts and ideas on paper. Writing stories, poetry, factual information, and letters are all worthwhile. Publishing class newspapers, poetry booklets, storybooks with original stories are possibilities for encouraging creative writing. If facilities permit, exceptionally talented students can begin early to learn to use typewriters.

Oral and written reports of all types give the students an opportunity to share their learnings and to express their ideas. Finding different ways to present reports is a constant challenge to the students' originality.

Activities and Ideas

1. Write dramatizations and stories of historical events.

2. Read widely to select material suitable for plays, tableaus, monologues, puppet shows; and do research necessary for staging the production.

3. Participate in all phases of theater production (directing, stage lighting, stagecraft, acting).

4. Plan a play for a particular age group and present it.

5. Plan an interview with an adult or pupils from an upper grade with specific questions in mind; organize the information received for later presentation to the class.

6. Write scripts for radio programs; produce and participate in radio and television programs.

7. Portray a character role in a monologue.

8. Tell a story through a sequence of pictures, pantomime, dance, tableaus, dramatizations, choral speech.

9. Make brief reports to the class based on more difficult reading material than that used by other students.

10. In presenting the materials, use handcrafts such as puppetry, dioramas, stage settings, costumed dolls, shadow screen, or feltboard cut-outs.

11. Select and prepare a story for sharing orally with another grade group or with the class.

12. Write unfinished stories to be completed by others.

13. Give commentaries for silent movies, filmstrips, or slide showings.

14. Take a character from a story such as Robin Hood or Cinderella and rewrite the story in a 20th-century setting.

15. Explain with clarity a technical subject, such as a factory operation or some astronomical phenomenon.

16. Plan and give explicit directions for planning a game, for making an object, for organizing activities, or for carrying out science experiments.

17. Practice public speaking by giving two-minute impromptu speeches. Keep a file of possible topics.

18. Participate in and lead discussions on such topics as TV program evaluations, book criticisms, group behavior, field trips, current events.

19. Participate in debates or panel discussions on challenging subjects.

20. Recognize words or biased terms which indicate prejudice.

21. Become acquainted with the techniques of propaganda. Analyze advertisements and commercials, noting which techniques were used.

22. Make a display showing examples of various progaganda techniques.

23. Learn to distinguish between statements of fact and opinion. By giving supporting evidence, prove that an article is based on one or the other.

24. Become familiar with elementary logic. Find examples of invalid arguments in reading materials.

25. Analyze the ways in which newspapers interest people in a problem and stir them to action.

26. Bring in an article in which the author has tried to influence you to his point of view. Analyze the method he used to influence your thinking.

27. Express in writing your feelings about music, paintings, and other art creations.

28. Look at some objects (tree, landscape, etc.) until you see something not seen before. Then put your impression on paper.

29. Develop collections of colloquialisms or "regional" expressions.

30. Collect folklore such as rope-jumping rhymes, counting-out rhymes, legends, folk songs.

31. Make constructive evaluations of TV or school programs which the group has enjoyed.

32. Analyze two talks on the same subject; try to determine why one was more interesting than the other.

33. If the class is to read a story with a definite geographical locale or other specialized subject, become a "specialist" on the subject before the class reads the story.

34. Study the history of books and libraries through the ages and learn how information has been recorded and transmitted through various civilizations. Make a time line to show the history of written communication.

35. Develop skill in predicting or guessing the meaning of new, unknown words. Check dictionary.

36. Establish criteria for judging a book. Choose the best books of the year or the "Book of the Year." Defend choices.

37. Make tape recordings of your oral presentations to help in self-evaluation and improvement.

Hazel L. Gibbony, Enrichment--Classroom Challenge, Columbus, Ohio: Ohio State University, 1966.

ENGLISH - Secondary

An exceptionally talented program in English should include extensive reading, present many opportunities for practice in expository writing and effective speaking, and encourage many types of thinking and writing. An appreciation of the world's literature through reading can be developed where a variety of books is on hand for student use. Seminars or small groups organized for the purpose of discussing good books are very helpful in providing for students who are reading beyond that which is required in the regular English class. Discrimination in reading can be encouraged by learning to verify factual material read, checking sources of information, reviewing qualifications of authors, comparing reviews of books with the books themselves, reading in current periodicals, comparing periodicals, and reading several articles on one topic.

Valuable experience in speaking can be obtained through participation in dramatics, school assemblies, speaking contests, school clubs, and radio programs, and by assuming leadership roles in extracurricular activities. Practice in presenting information in written form may be gained by work on a class or school newspaper, and by relating English with other subject areas. Research in any area on topics of individual or group interest is appropriate for an English paper.

Various types of writing are often of interest to talented students and can be encouraged by the formation of groups of students interested in writing poetry, short stories, or essays. A school literary magazine is an outlet for writing and many students are motivated by the writing contests sponsored by various magazines or newspapers.

Activities and Ideas:

1. Use the dictionary, glossary, and thesaurus to improve the range and exactness of effective vocabulary.

2. Make objective checklists, charts, and outlines as guides for gathering information.

3. Locate and use numerous authoritative sources to verify facts and give weight to opinions.

4. Study the theme "Fall from Innocence" in such works as Lord of the Flies, Paradise Lost, Oedipus Rex, and Young Goodman Brown. Compare and contrast ideas about the nature of good and evil.

5. Through reading biographies, become an authority on some famous person.

6. Use review sources such as Saturday Review or literary supplements of New York Times and New York Herald Tribune, including reviews of current stage, cinema, and television presentations.

7. Read regularly such periodicals as the New York Times, Harper's, Saturday Review, and the Atlantic.

8. Read literature of foreign countries as well as English literature. Examples are: Buddenbrooks (Germany); The House by the Medlar Tree (Italy); Hania (Poland); Fathers and Sons (Russia); The Wanderer (France).

9. Debate controversial viewpoints in philosophical essays.

10. Trace the accuracy of newspaper reports on a single incident over a period of days.

11. Compare newspapers in treatment of one topic.

12. By studying the headlines, the news articles, the syndicated column, the editorial, the pictures, the cartoons, all from the same paper and on the same topic, evaluate methods for influencing public opinion. Judge the consistency of the paper.

13. Write an essay satirizing the TV habit, the comics, or some modern fad.

14. Compare American and foreign magazines.

15. Create stories or pictures to interpret musical selections or poems.

16. Make a study of editorials in newspapers and magazines, identifying the ways in which the author tried to influence your opinion.

17. Judge reliability of newspaper or news magazines articles by corroborating information or finding information which was omitted in the report.

18. Write an editorial designed to change the opinion of those who differ with your ideas.

19. Write a newspaper feature story that will appeal to the emotions of the reader.

20. Compile a "Who's Who" of characters from fiction--English literature, American literature, world literature.

21. Compile a dictionary of school language after the fashion of Samuel Johnson's Dictionary of the English Language, trying to maintain some of Johnson's wit.

22. By selective reading of essays, novels, short stories, drama, etc., make studies of such topics as human progress, freedom and responsibility, the nature of tragedy.

23. By reading literature of other countries, find the universality of human traits.

24. Study such topics as "war," "death," "religion," "love" as treated in poetry. Make an anthology of poetry on one of these topics. Write an original poem to include with this, or add more illustrations.

25. Consider abstract questions. For example, an inquiry into the soul and mind of the human being might be prompted by reading Plato.

26. Develop and use techniques for debates, panel discussions. and parliamentary procedures.

27. Write defining paragraphs on such topics as "What is an essay?" or "What is poetry?"

28. Experiment with relating a brief incident revealing a human trait such as shyness, kindness, modesty, cruelty, etc.

29. Write a political speech for a local, state, or national office.

30. Develop a list of standards for judging various types of movies and TV programs.

31. Compare American films with foreign films.

32. Compare Addison and Steele with Walter Lippman or some other modern columnist.

33. Make a study of Nobel and Pulitzer Prize winners.

34. Listen to debates, discussions, newscasts, and lectures in order to form opinions, to hold discussions, to draw conclusions.

35. Listen to speakers in order to pick out main points of their talks and to arrange them in sequence.

Hazel L. Gibbony, Enrichment--Classroom Challenge, Columbus, Ohio: Ohio State University, 1966.

SOCIAL STUDIES

Independent reading and research will make up a large part of any exceptionally talented program in the social studies. Student groups can accept responsibility for planning and pursuing a large part of their study. In planning projects with exceptionally talented students, an adult approach based upon conferences, seminars, problem-solving methods, and teacher-pupil planning should be used. Student projects may be voluntary, alternative assignments or in some way integrated with the regular class work, but should always give the student freedom of choice to explore and to discover what is especially intriguing.

Exceptionally talented students can deal with topics far beyond the grasp of many of the other students and their studies should therefore be planned with emphasis on concepts, theories, ideas, relationships, and generalizations. They should become familiar with the methods of research used by social scientists--gathering information, interpreting data, and organizing material for written or oral presentation. Such a program should include wide reading from a variety of sources in order to become familiar with the literature of the social sciences. Often coverage must be sacrificed to depth. However, a balanced program would always include study of non-American and non-Western areas.

Students may report the results of their study in various types of class presentations, debates, discussions, forums, oral or written reports, or in research papers.

Activities and Ideas (Secondary):

1. Translate one form of expression into another: a paragraph into a table of figures, a class talk, or a graph.

2. Discuss the need to modify the North Carolina Constitution--or the dangers involved in such a modification.

3. Choose the five greatest ideas, the five greatest men, the five greatest events, the five greatest tragedies, the five greatest books, or the five greatest examples of human error in the history of man. Report to the class and defend choices.

4. Organize a symposium of three or more students on the Taft-Hartley Law or some other legislation--one for outright repeal, one for retention, and one for modification.

5. Carry out an opinion survey. Construct a questionnaire and distribute it to students. Compile and interpret results.

6. Produce dramatizations of such events as: The Negro in America--(Act I) landing at Williamsburg in 1619, (Act II) Dred Scott Decision, (Act III) Supreme Court Decision of 1954; labor-management mediation proceeding; congressional proceeding; congressional hearing on any topic; etc.

7. Make maps showing trade routes, population distribution, natural resources, industrial development, climate, railroads, topography, farm products, air routes between major airports, and outstanding features of any area.

8. Make a current events map.

9. Make special maps of : containment of Communism; new countries around the world; membership in the UN, NATO, SEATO, OAS, Warsaw Pact.

10. Debate the wisdom of government ownership of public utilities.

11. Take any issue of a local newspaper and rewrite specified sections--front page, editorial, letters to the editor--as they would probably be written in a country under some form of dictatorship.

12. Prepare lists of criteria by which to judge reliability of information and to detect progaganda.

13. Make an analysis of propaganda in pamphlet material from NAM and labor unions, advertisements, materials from civic groups, from embassies, etc.

14. Compare two newspapers for accuracy and objectivity.

15. Study the history of campaign issues.

16. Report on the life of a famous man by studying one specific aspect. For example, how did Benjamin Franklin express the Protestant ethic in his life? How is this expressed by the "organization man" of today?

17. Buy imaginary stocks in some company listed on the New York Stock Exchange. Follow the daily fluctuations in this investment and compute gains or losses over a period of time. Explain reasons for observed fluctuations.

18. Prepare a position paper on the ethics of modern medical practices (heart transplants, etc). Present it to the class and defend your position.

19. Conduct research and report to class on such topics as: the effect of climate on people's lives, the "Great Man" theory of history, war and natural resources, population movements of the past and present, the nature of common law, rise and fall of the Nazis in Germany, music of the Middle Ages, relationship of politics and economics.

20. Study topics of a mature nature such as: organization and functions of administrative agencies; the civil rights cases of the Supreme Court; various interpretations of the causes of the Civil War; various interpretations of the causes of the War of 1812; theories of well-known economists, sociologists, anthropologists, historians, etc.; various philosophies of history, etc.

21. Carry on individual research on the historical background and on current material related to such topics as nationalism, imperialism, civil rights, the judicial system, etc.

22. Make a study of the concept of civil disobedience and conscience by reading Thoreau's "Civil Disobedience," Gandhi's works, Martin Luther King's Stride Toward Freedom, The Bible (Matt. 5:38-39), Tolstoi's What Is Religion, and The Kingdom of God.

23. Develop an understanding of the problems others face by putting ourselves in their place, obtaining insights into prejudice on the basis of race, culture, and nationality. Use role-playing, or presenting another's point of view, in a paper, talk, or report.

24. Make a study showing how the economics of other nations affect the economy of the United States.

25. Show through charts the significance of various exports of different countries, for example, the significance of Australian wool to the world market.

Activities and Ideas (Elementary):

1. Read several books about one man or historical event; note any discrepancies in facts; check accuracy.

2. Study the history of our alphabet and other alphabets and systems of writing.

3. Trace some contemporary American holiday customs to the nations of their origin.

4. Collect data on a particular problem from many sources and critically analyze the data.

5. There are many ways in which other peoples of the world learn about us, such as through movies, radio and TV, magazines, and books. Select a few examples that give them a true picture and some that give them a false impression of our daily life.

6. Read about a particular area; check facts with present status of the area, noting changes caused by recent political and social events.

7. Compose biographical riddles about American heroes and heroines, real and fictional, such as Johnny Appleseed, Paul Bunyan, Daniel Boone, Betsy Ross.

8. Find pictures of famous people from your state. Write a short legend for each illustration and combine all into a "Hall of Fame."

9. Give flannel board talks about clothing. Add bits of fur, plants, cloth, to depict animal skins, grass skirts, togas, sarongs, and other garments.

10. Select one basic food and list all the workers involved in producing, processing, and distributing it.

11. Clip pictures of new clothing manufactured for firemen, stratosphere pilots, arctic explorers, deep-sea divers, and astronauts. Write short articles to accompany the pictures. Post on the bulletin board.

12. Do reference on American Flags. Discover their origins, purposes, designs, colors, and meanings.

13. Read stories in old-time books, like the McGuffey Reader series.

14. Contrast and compare family life in country and city homes today and a hundred years ago.

15. Work out a check list for qualities of citizenship. Evaluate one's self once a month.

16. Write summaries, paragraphs, or explanations of a new idea, as might be found in a news report. Do this almost daily until the essay comes naturally.

17. Begin a collection from each of the fifty states. Use a United States map to star states represented in the collection. Invite friends to help with the collection by loaning possessions.

18. Collect and examine building materials. Trace them to their sources and find out how they are processed for use.

19. Find picutres of famous canals, like the Panama, Suez, and Erie. Locate them on maps. Find out about plans for a new canal dividing North and South America. What are the advantages and disadvantages of the various proposed locations?

20. Produce neighborhood maps for use by new pupils. Show locations of school, new pupil's homes, and important establishments. Use arrows to indicate safe routes to each of these. Include information about proper safety behavior.

21. Use various art media to produce objects representative of some foreign nation. Display with explanatory labels.

22. Draw up a Declaration of Human Rights. Compare with UN Universal Declaration of Human Rights.

23. Study cartoons for political implications that reflect beliefs of the paper. Draw a cartoon for the class newspaper.

24. Prepare an issue of a "contemporary" newspaper for any interesting historical period. Advertisements, editorials, and pictures must be in keeping with the period.

25. Design different methods of communication or transportation which might be used in the future.

SCIENCE

Secondary

The science program can be extended into the principal areas of reading, experimenting, and reporting. Reading should include selections from original literature of science as well as contemporary scientific thinking and discovery. Exceptionally talented students should have the opportunity to work with many different types of laboratory equipment and apparatus and to become acquainted with the various techniques of laboratory work. Students should plan experimentation, observe, and record data. Laboratory work requiring students to design their own experiments and procedures and to draw original conclusions is far more worthwhile than merely following the directions of a manual. The science program should include the opportunity to explore fields not presented to textbooks and to succeed or fail in research projects.

Research and experimentation ultimately result in reporting. Exceptionally talented students should learn to present clear explanations of their plan of experimentation and the conclusions they draw at the end. They should become equally skilled in oral and written reporting. Seminars and small groups of students undertaking research offer more opportunities for oral presentations and discussion than is possible in the regular classroom. Science clubs may offer experiences of this type by featuring programs of student demonstrations, reports, panels, and group discussions.

Elementary

The students' experiences with science should be research-oriented from the beginning. They learn to question, doubt, and find out. This approach challenges the children's ability to think critically, promotes curiosity, and encourages originality. It permits them to pursue topics of group or individual interest.

More advanced experiments and projects may be carried on by interested children, but they will require time, materials, and guidance. A wide variety of books, reference materials, textbooks of different levels, projection equipment, and laboratory supplies must be available.

A small museum or laboratory may be set up in a corner of the classroom where students can keep science materials and carry on work. A file of simple experiments may be kept handy for pupil reference. These are but a few of the many possibilities for stimulating independent work.

Activities and Ideas (Secondary):

1. Study some of the recent researches in biochemistry that fall in line with the concept of evolution.

2. Study Darwin's theory of the origin of the species in the light of how it was received by society, what influences it had on people's thinking and on the work of other scientists.

3. Trace man's development of new weapons and how this affected methods of warfare.

4. Study a scientific theory by tracing the development of representative classical theories in the history of science.

5. Subscribe to a scientific journal such as: Science Digest, Scientific American, Journal of the American Chemical Society, Natural History Magazine, Science World, Tomorrow's Scientists, Science, or Science Newsletter.

6. Serve as laboratory assistants.

7. Use the biology, chemistry, and physics laboratories, under the direction of the teacher or selected students, for performance of individual experiments.

8. Engage in self-directed study. Do advanced experimental work in the regular laboratory period. Use supplemental texts, references, individual or group conferences with teacher.

9. Read not only the findings of Mendel, Morgan, and Muller, but also those of Beadle, Tatun, Lederberg, and Zinder, who in recent years have opened up the field of chemical genetics.

10. In chemistry, study John Dalton's diagrams of elements and their weights as given in his A New System of Chemical Philosophy. After examining his data for the weights of elements in CO and CO_2, devise a theory to explain the facts.

11. Construct a crystal radio set and develop understanding of electronics.

12. Obtain a radio amateur's license.

13. Make constructions such as ripple tank, various types of wave generators and stroboscopes, and utilize these devices in determinations and discovery of frequency, wavelength, and amplitude relationships.

14. Construct pieces of apparatus that are not available in the school laboratory.

15. Consider the impact of these modern developments upon our general view of the nature of the universe and the solar system.

16. Do projects or special studies in such areas as: microbiology, field biology, advanced general chemistry (utilizing techniques of qualitative and quantitative analysis), atomic physics, electronics and electricity, geophysics, history of science (or case histories), astronomy, geochemistry.

17. Learn the expert use and operation of laboratory equipment of all types (analytical balance, microscope, electric oven, autoclave, etc.).

18. Assist the science teacher in his field of special interest.

19. Give demonstrations or lessons to younger students.

20. Investigate the implications of nuclear energy for world peace, for the moral responsibilities of world leadership, and for the improvement of the standard of living of the world's peoples.

21. Demonstrate and explain how blood clots.

22. Study the use of science in crime detection.

23. Experiment with plant grafting.

24. Design and carry out experiments to determine quantitatively such values as heats of neutralizations.

25. Set up and give demonstrations for the class.

26. Learn about modern methods of studying the universe and solar system, such as the use of radio telescopes as well as optical telescopes, the use of tools for analyzing light waves and radiations from space, and the use of rockets.

27. Experiment for the improvement of equipment.

28. Design new laboratory equipment.

29. Learn laboratory techniques (histological, bacteriological, techniques of analytical chemistry).

30. Study modern theories concerning basic causes of weather--influence on weather of Arctic ice caps, ocean currents, modern research on weather.

Activities and Ideas (Elementary):

1. Write about "what would happen if--pills could be substituted for food?--everyone suddenly became deaf?--we had only three fingers on each hand?--the oceans dried up?--all the air became radioactive?" (Think of other "Science If's.")

2. Study the lives and contributions of early scientists, such as Galileo, Pasteur, Lister, Koch, etc. Repeat some of their early experiments.

3. Study the production of sound from a phonograph.

4. Experiment to test the effectiveness of preservatives (heavy sugar solution, salts, drying, spices, vinegar) in inhibiting bacterial growth.

5. Study the communication system of various animals. Report to class.

6. Select a controversial science issue such as the danger of nuclear tests and prepare arguments on both sides of the controversy.

7. Correspond with a scientist (technician, engineer) for information about his work.

8. Report on television programs concerned with science; analyze scientific principles, methods, and procedures shown.

9. Make a terrarium representative of a desert, forest, or swamp scene.

10. Make a soilless garden using a sponge, gravel, moss basket, and sawdust.

11. Experiment with the pressure of water. Punch holes in a container at different levels and note from which water squirts the farthest.

12. Experiment with the density of water. Using an egg and glasses of fresh and salt water, see which will float the egg. Explain why.

13. Assemble a small electric motor with the help of a resource person.

14. Make and explain electromagnet.

15. Make up inventions. Present diagrams and written directions.

16. Write science fiction stories describing changes which might take place.

17. Make a chart showing modern man-made materials and the former "natural" materials which they have largely replaced. Explain how some of the man-made materials are made.

18. Soak large seeds to soften them; then cut them open and study with a magnifying glass. Learn scientific terminology for the outside and internal structure of the seed.

19. Attempt a scientific interpretation of some natural or physical phenomenon.

20. Plan experiments to test statements found in science books.

21. Draw the stages through which a butterfly passes. In telling about them use proper terms: embryo, larva, pupa, adult.

22. Plan an experiment to ascertain the speed of sound. Determine the relationship of temperature to speed of sound.

23. Explore the effects of mutations, cross-pollination, hand pollination, hybrids, grafting, and de-budding.

24. Learn the names, characteristics, and implications of different kinds of clouds. Predict weather from cloud formation seen.

25. Design and draw automobiles, planes, houses, furniture, etc., which may be used in the future. Explain possible changes from those in use today.

26. Make a study of our present attempts to communicate with any intelligent being which may exist elsewhere in the universe.

27. Explain why ocean water is salty. Report on the desalination efforts being made.

Hazel L. Gibbony, Enrichment--Classroom Challenge, Columbus, Ohio: Ohio State University, 1966.

ARITHMETIC - Elementary

A variety of materials and activities may be used for the arithmetic program. Such materials and activities should add to the understanding of mathematical principles and lead to a higher level of comprehension. Activities might include the use of materials in supplementary texts, the preparation of exhibits and models, the preparation of reports on individually selected topics, or participation in arithmetic clubs and contests. Devising different methods of solving problems and finding short-cuts or new ways of checking answers are challenging.

Exceptionally talented students may learn by creating and solving mathematical puzzles, games, novel problems, magic squares, and other types of recreational arithmetic. However, these should always be regarded as recreational and not as a substitute for a supplementary program for able students in arithmetic. The classroom might include a shelf with books related to arithmetic for individual reading, a corner or table with challenging games, puzzles, and various self-instructional devices.

Exceptionally talented students should be encouraged to become increasingly less dependent on pencil and paper in the solution of problems and to use different methods of mental arithmetic. The discovery of mathematical relationships and a higher understanding of mathematical principles are leading purposes of enrichment in arithmetic.

Activities and Ideas:

1. Keep class records of attendance, milk bills, and stamp sales. Chart progress in Junior Red Cross work or other organization activities.

2. Keep statistical records of significance; e.g., number of children staying at school for lunch for whom table arrangements and play activities must be planned; weekly and monthly absences by cause, in order to determine why pupils are absent and how to prevent illness.

3. Study a problem such as the cost of building a house--involving kinds of materials, fixtures, construction, installation, and labor costs.

4. Study the history of numbers.

5. Study other number systems, dyadic, duodecimal, etc.

6. Explore the history of measurement. Prepare a talk during which examples of measurement devices are shown.

7. Lead a small group in the study of a selected topic like "Calendars--Old and New." Plan with them some unique way to share their findings; e.g., cartoon-type drawings of people and their early calendars, or a modern-day alamanac.

8. Solve problems mentally by breaking numbers up into tens, hundreds, thousands, and the like.

9. Use accepted short-cut methods to solve problems mentally; e.g., to multiply by 25, multiply by 100, add two zeros, and divide by 4.

10. Estimate answers with mixed numbers by computing with the whole numbers involved and determining about how much more the real answer will be.

11. Solve problems without paper and pencil.

12. Identify and state the arithmetical principle governing the solution to a problem.

13. Play number games. (Example: Write any number you like, multiply by 2, add 18, and then divide by 2, now subtract the number with which you began; the answer will always be 9.)

14. Answer "number quizzes" and make up some. (Example: "Take the answer to 3 times 4, double it, add 1, subtract 3, take one-half of the number. What is the answer?")

15. Bring a new number game of one's own and play it with groups of classmates.

16. Study the relationship of musical notes and fractions.

17. Estimate distances in the neighborhood.

18. Estimate the size of certain play areas. Check estimation by accurate measurement.

19. Construct helpful homemade arithmetic aids, such as counting devices, matching games, number charts, graphs, posters, magic squares, and individual sets of flash cards which can be used in the classroom or with younger pupils.

20. Make charts or graphs showing the increase in postal rates through the years and the increase in the quantity of mail handled, the increase in the number of postal officials needed, the cost of maintaining this service, and the proposed changes which are under consideration by the government.

21. Estimate answers to all problems and compare computed answer with the estimated one.

22. Read instruments of various kinds which measure miles, degrees, angles, or other abstractions. Note the more refined division of the clinical thermometer as contrasted with the regular thermometer.

23. Construct bird houses, kites, etc., using accurate measurements.

24. Graph daily temperatures over a long period of time and note the general downward or upward trend as the seasons advance.

25. Investigate and report on the cost of sending books and other packages according to various classes of mail.

26. Make up an arithmetic story problem and illustrate it in a series of pictures.

27. Keep a record of family buying at special sales versus regular purchases and calculate savings made by taking advantage of special sales.

28. Learn to use the slide rule.

29. Use programmed materials designed for superior students in arithmetic.

30. Make original problems of any type.

31. Give more than one solution to problems and examples.

32. Reduce foreign money to our values.

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MATHEMATICS - Secondary

Mathematics should be directed at reaching a deeper understanding of the basic concepts of mathematics. Exceptionally talented students should recognize mathematics as a logical discipline worthwhile in itself, as an instrument of physical and biological science, and as a tool of growing importance in the social sciences. An exceptionally talented program in mathematics should include consideration of recent developments in the theories and applications of mathematics as well as a study of the historical development of mathematics.

A shelf in the school library that includes some of the classics of mathematical literature, some books on recreations and puzzles, college texts in advanced mathematics, and some works on the history of mathematics can be a source of enrichment to talented students.

These students should be encouraged to work independently on topics of interest which are not included in the regular mathematics program. Library research and preparation of papers and projects on topics ranging from non-Euclidean geometry to the mechanics of computers can be successfully carried out by interested students. Contests and fairs often act as motivation for research and preparation of projects.

Exceptionally talented students should experience the satisfaction of thinking through problems, of analyzing problems and developing a logical formula for solution, rather than spending their time on repeated drill in procedures.

Activities and Ideas:

1. Conduct seminars for small groups who want to study topics and areas in mathematics beyond the scope of the curriculum.

2. Study the history of mathematics.

3. Make a study of the lives of great mathematicians.

4. Become acquainted with the ideas of the men whose names are commonly met in mathematics: Pythagoras, Euclid, Archimedes, Ptolemy, Newton.

5. Make a study of mathematics in the theories of astronomy of Copernicus, Galileo, and Kepler.

6. In the history of mathematics, study Thales' conception of proof. Make a study of such topics as: the determination of the value of Pi by Archimedes, the measurement of the circumference of the earth by Eratosthenes, the invention of calculus by Newton, the musical scale as established by Pythagoras, the invention of binary numbers by Leibniz.

7. Read parts of the work of Descartes, Pascal, and Liebniz.

8. Study the philosophy of mathematics--such topics as continuity, infinity, the concept of limit, etc.

9. Study the law of probabilities in various types of gambling.

10. Learn to use the slide rule effectively.

11. Work at the famous problems of geometry; squaring the circle, duplicating the cube, or trisecting an angle.

12. Deal independently with such topics as: Boolean Algebra, electrical networks, Rolle's theorem, the theorem of the mean, Newton's method of approximating inactional roots of an equation, approximation of the definite integral by the trapezoidal methods and by Simpson's Rule.

13. Consider recent developments in quantitative procedures.

14. Study the non-Euclidean geometry of Riemann and Loborheivski.

15. Use laboratory to experiment in measurement to establish the facts of theorems. Confirm afterward by formal proof.

Hazel L. Gibbony, Enrichment--Classroom Challenge, Columbus, Ohio: Ohio State University, 1966.

MUSIC

The elementary music program should provide experiences which will lead to a real interest in and enjoyment of music. The purposes of a music program for the exceptionally talented are not fundamentally different from those for other students. However, the exceptionally talented, even though not possessing a superior aptitude for music performance, will evidence more mature intellectual and emotional responses to music. They will probably make more rapid progress in learning to read music, will be able to interpret symbols sooner, and will be able to recognize tonal patterns at an early age. The development of these abilities is essential to their understanding of the music they hear.

The exceptionally talented students should be given an opportunity to enjoy broad experiences in listening to music--both recordings and concerts. They should become familiar with outstanding composers and their works. They are likely to be interested in reading about composers, performing artists, and musical events. They should become familiar with the organization of the orchestra and examine the construction of instruments. They may be interested in studying various facts of music history or learning about the scientific and mathematical basis of music.

Students who show an aptitude for music should be given every opportunity to develop their skill. Conferences should be held with parents to arrange outside training in music. Given the opportunity, all children can develop a love of music and an understanding of its importance in life.

Activities and Ideas:

1. Make a listening center in the classroom for a free-time activity. Borrow records from school and local libraries.

2. Attend concerts. Prepare for them by learning about the composers and listening to the music.

3. Identify musical themes when listening.

4. Interpret mood, story, and musical forms of recorded music.

5. Recognize instruments of orchestra by sight and sound.

6. Compare the instruments of one family: the strings, woodwinds, brasses, and percussion.

7. Compare different interpretations of the same music.

8. Read biographies of famous composers. Listen to recordings of their works.

9. Determine fractional equivalents of whole, half, quarter, eighth notes, etc. Compose measures using these fractional equivalents in varying time and rhythm combinations.

10. Compose lyrics and music of songs for special occasions.

11. Set poems to music.

12. Make a list of songs and recordings to enrich other areas of instruction; e.g., songs of a particular era, favorites of a famous person, animal life as interpreted in music, sea chanteys.

13. Add square dance directions to folk songs.

14. Do research on folk songs; find stories behind them.

15. Create songs or melodies to express different moods: happiness, sorrow, thankfulness, victory, mystery, etc.

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ART

The needs of exceptionally talented students or children talented in art can be met by providing time and space for a wide range of experience, an atmosphere which fosters originality and experimentation, many challenging materials, and by using more advanced processes and techniques than are planned for the regular curriculum.

While direct experience may be the best way to develop an awareness of artistic values and beauty, exceptionally talented students will also profit from studying or browsing through art books and periodicals, from viewing slides and reproductions, and from visiting exhibits and collections available in the community. Materials available from the Museum of Modern Art, the Metropolitan Museum in New York, the Chicago Art Institute, and the National Gallery in Washington, D. C., are very helpful.

Opportunities for out-of-school classes which may exist in the community should be explored. Many museums and universities offer Saturday or summer classes for children interested in art. Visits to the studios of practicing artists or to the art departments of nearby colleges may be very profitable. Conferences with parents can be used to suggest ways in which the child's experiences outside school may be extended.

All available means should be used to increase the exceptionally talented students' awareness of their natural environment, their impressions and feelings, and their ability to react to these in a personal, imaginative way. They should experience the pleasure of creative expression and learn to value the place of art in life.

Activities and Ideas:

1. Plan murals and friezes to accompany unit work. Example: hunting through the ages, soldiers through the ages, great explorers, flight from Icarus to astronauts.

2. Report on art exhibits. Study art through the ages. Begin with the prehistoric art of the cavemen, brush paintings of the ancient Chinese.

3. Study lives of famous artists.

4. Study a particular style, such as that of the impressionists. Make a painting in that style.

5. Choose a poem as inspiration for art work.

6. Make cartoons of an imaginary character.

7. Arrange a display of creative paintings inspired by particularly beautiful passages from a favorite book.

8. Analyze pictures having vivid expressions of human emotions, such as joy and happiness, rage, and fear.

9. Become familiar with paintings and artists.

10. Find unusual materials to use in collages and mosaics. Examples: nuts, chenille, seeds, styrofoam, leaves, bottle caps, eggshells, broken shells, pebbles, construction paper, tissue paper, corrugated paper, cellophane, metallic paper, crepe paper, tile, wood, metal foil, broken glass, sand, chalk, shavings, feathers, sponges, wallpaper scraps, cotton, macaroni, yarn, straws, sandpaper, felt, balsa wood, dyed rice, paper doilies.

11. Try abstract sculpture, making unusual and spontaneous use of materials.

12. Observe form and color in nature: soil, rocks, leaves, fossils, insects, rainbows.

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