DOCUMENT RESUME

ED 035 575 SP 003 424

AUTHOR Hill, Mary Broderick
TITLE Enrichment Programs for Intellectually Gifted Pupils.
INSTITUTION California State Dept. of Education, Sacramento.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Cooperative Research Program.
PUB DATE [69]
NOTE 188p.

EDRS PRICE EDRS Price MF-$0.75 HC-$9.50
DESCRIPTORS Curriculum Development, *Curriculum Enrichment, *Elementary School Curriculum, Elementary School Science, *Enrichment Programs, Fine Arts, *Gifted, Inservice Teacher Education, Language Arts, Resource Materials
IDENTIFIERS California Project Talent

ABSTRACT

This report of the enrichment phase of California Project Talent is designed to provide guidelines for teachers in other schools. Part 1 contains five chapters on the planning phases of the enrichment program which was operated at the demonstration center of the Los Angeles Unified School District from 1963-1966. Included are rationale for enriched curriculum for the gifted; identification of factors to be considered in structuring or revising curriculums; outlines for criteria for objectives with specific cognitive, affective, and conative behaviors noted; description of learning activities and curriculum organization; and lists of resources in personnel and materials. The five chapters in part 2 report the continuing inservice teacher training program established at the demonstration center. Included are outlines of curriculum provisions to promote the development of creative expression, critical appreciation and scientific attitudes with formats for lesson plans and study units. Part 3, which deals with the implementation of the program in elementary schools, contains description of source materials for lesson plans and course outlines, the content of which parallels the teacher materials (presented in part 2) in language arts, fine arts, and science. Part 4 on program evaluation includes check lists for use in evaluating pupils' progress and for teacher self-appraisal. "Selected References" for each chapter cite books, articles, audiovisual aids, and other supplementary materials. (JS)

enrichment

Programs for Intellectually Gifted Pupils

Prepared by
Mary Broderick Hill
Education Research Consultant
CALIFORNIA PROJECT TALENT

This publication was funded under the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

Foreword

California public schools provide equal opportunity for every boy and girl of school age to become knowledgeable in the basic subjects and proficient in using the basic skills of learning. The programs are also of sufficient scope and depth to permit each girl and boy to acquire the special preparation needed for beginning employment in fields in which no more than high school graduation is required or for entering college. In conducting their educational programs, the schools of this state employ a variety of practices to meet the needs of those who are talented. California Project Talent has highlighted special provisions that have proved most beneficial to these students.

In this publication, which was developed by the project staff, attention is directed to program enrichment. The ideas regarding planning, developing, and conducting enrichment programs merit the attention of all educators, for they are ideas that have resulted from the work done in California Project Talent; that is, they are the products of experimentation. Their application has produced highly satisfactory results.

Max Rafferty

Superintendent of Public Instruction

Preface

California Project Talent was conducted under the direction of the California State Department of Education as a demonstration and field study of education programs that were designed to provide opportunity for talented pupils in grades one through eight to capitalize on their talents. The project was financed with funds secured through the Cooperative Research Branch of the Office of Education, U.S. Department of Health, Education, and Welfare.

The education programs demonstrated and studied were (1) enrichment; (2) acceleration; (3) counseling-instructional; and (4) special class. This publication contains the final report of the Enrichment Program, which was conducted cooperatively by the project staff and members of the professional staff of the Los Angeles Unified School District in 12 demonstration schools of that district.

Boys and girls can have the advantage of participating in enrichment programs and at the same time have the advantage of being with their own age groups. An enrichment program begun in elementary school can be extended into high school by making only minor adjustments in the regular school program. The adjustments result in the regular program having an added dimension -- one that permits the talented pupil to profit fully from using his ability to best advantage.

S. W. PATTERSON
Chief, Division of Special Schools and Services

JOSEPH P. RICE, JR.
Chief, Bureau for Educationally Handicapped and Mentally Exceptional Children

PAUL D. PLOWMAN
Consultant in Education of the Mentally Gifted

Contents

Part Two: The Teacher Training Program

Introduction

A comprehensive, operational statement of ideals and objectives should underlie any enrichment program developed for intellectually gifted pupils. Accordingly, the author has sought to adhere to that standard in preparing this volume for publication.

Part One presents five chapters on the planning phases of the enrichment program as it was conceived and executed at the demonstration center of the Los Angeles Unified School District from 1963 through 1966. Chapter I defines the concept of enrichment and discusses the philosophy upon which it is founded. Chapter II identifies those facets of programs for the gifted which need to be studied and considered in structuring or revising enriched curriculums. The major sections of that chapter pertain to environmental factors, sociopsychological implications of enrichment, the characteristics of gifted children, general principles of learning, levels of intellectual functioning, and the logic and sequence of course content presented in enrichment courses. Chapter III outlines suitable criteria upon which to base the program's objectives; it distinguishes intellectual levels of subject content and determines specific cognitive, affective, and conative or psychomotor behaviors to be achieved. In Chapter IV the author deals with the choice of pertinent learning activities and the organization of appropriate elements in offering an enriched curriculum. Chapter V lists the resources required for enriching educational programs in terms of personnel and materials.

Entitled "The Teacher Training Program," Part Two of this document also consists of five chapters. In Chapter VI the author reports on the teacher education program established for the faculty of the Los Angeles Enrichment Demonstration Center. This was an inservice type of program that operated for the duration of the enrichment project. The ensuing three chapters –VII, VIII, and IX – outline the curricular provisions developed at the Los Angeles center to promote the development of creative expression, critical appreciation, and scientific attitudes, respectively. To aid the instructor in implementing the curriculums described in those chapters, Chapter X contains formats for lesson plans and study units.

As indicated by its title, "Implementation of the Program," Part Three concerns the administration and promotion of enrichment in elementary schools. After discussing fundamental concepts, roles, and provisions in Chapter XI, the author describes source materials for lesson plans and course outlines in chapters XII, XIII, and XIV, the content of which parallels the teacher materials presented in chapters VII, VIII, and IX.

Part Four, "Program Evaluation," which consists solely of Chapter XV, presents both an overview and a summary of enrichment with special reference to the work of the demonstration center staff at Los Angeles directed by the author as educational consultant. Chapter XV concludes with checklists that should prove useful in evaluating the pupil's progress in creative writing, critical appreciation, and the scientific approach, together with a checklist for the teacher to utilize in evaluating his own effectiveness in enriching the learning experiences of his pupils.

The author has also appended conclusions or summaries to individual chapters. A list of "Selected References," citing books, articles, audio-visual aids, and other materials that can augment and strengthen enrichment programs, has been placed at the end of each chapter in the publication. Broad in scope and varied in subject matter, these lists offer an abundance of resource information on the various subject matter fields considered herein.

The Photographic Office of the Audio-Visual Section, Los Angeles Unified School District, provided the photographs contained in this monograph. All of them serve to illustrate enrichment in action at the demonstration center in Los Angeles.

This report of the enrichment phase of California Project Talent is published with the hope that it will provide effective guidelines and useful springboards for instructors in other schools as they carry out the vital work of fostering the educational progress of gifted children. A concomitant hope is that the report will also assist teachers in upgrading instruction for the school populace as a whole.

Part One
The Planning Phase

Chapter I

Foundations of the Enrichment Program

The term "enrichment" is often too loosely applied to a variety of programs within the curriculum. In order to delimit precisely and specifically the scope of the intended program, plans for enrichment should include a listing of those details to be incorporated in the program's operational definition.

SURVEY OF LITERATURE ON DEFINITIONS OF ENRICHMENT

A survey of the professional literature reaffirms the necessity for a specific operational definition of "enrichment" as a foundation upon which to base the program. As is shown by a perusal of the literature in the field, the term "enrichment" as originally used embodied broad connotations that varied widely among various school systems and that served traditionally to identify only vaguely a broad type of curricular program directed toward the superior student.

The advent of the Committee on Education of Intellectually Gifted Pupils under the aegis of the Los Angeles Unified School District marked one of the first attempts to define clearly and exactly the goals and to pinpoint the scope of a good enrichment program. That committee reported:

> Enrichment requires a learning environment conducive to exploration and originality. An enriched educational program for intellectually gifted pupils is based on the recognition of individual differences and is planned to meet individual needs and to challenge abilities. Enrichment emphasizes quality rather than quantity and adds depth and scope to learning experiences. It provides for development of the following abilities: reflective and critical thinking, problem solving, and creative thinking and expression. (13)[1]

Spencer Brown (3) says that enrichment means adding to the curriculum materials or experiences other than those offered to the average student. He lists three different types of so-called enrichment: (a) projects or reports prepared along the lines of the pupil's special interests, with emphasis on creative or investigative work, experiences in leadership and related reading; (b) study of the fine arts, handicrafts, or industrial arts; and (c) "busy work" or unnecessary drill. He maintains that the third type represents actual impoverishment for the superior child. He acknowledges the fact that true enrichment for the student invariably means additional work for his instructor because such a program demands that students be taught simultaneously on different instructional levels.

Ruth Martinson, the project coordinator of the California State Study of Gifted Programs (12), considers true enrichment as the kind of learning that enables the students (a) to perceive relationships between facts presented in course content and information gleaned from a broader fund of human knowledge; and (b) to make further discoveries based on those learning experiences. She views enrichment as encompassing those educational experiences that encourage a student to apply and to generalize his knowledge in a particular area.

Leon Lessinger (19) describes enrichment as a process of relating subject matter to those interdisciplinary concepts which have the potential of clarifying the subject matter, integrating general knowledge, and transferring training.

Many educational authorities have directed their attention to the learning characteristics of gifted students as a basis both for defining the word "enrichment" and for program planning. Robert DeHaan and Jack Kough (8) state that enrichment is the process of tailoring the curriculum to the needs, interests, and abilities of the gifted students and of adding more variety and complexity to their assignments. Paul Witty (29) declares that special abilities are nurtured in a classroom by capable, well-prepared, and enthusiastic teachers who stimulate the pupils' curiosity and who offer the pupils rich opportunities for developing their interests.

James Gallagher (16) defines "enrichment" as any activity that develops the intellectual skills and talents of the gifted child. Such a child has the ability to associate concepts, evaluate facts and arguments, create new ideas, reason through complex problems, and understand unusual situations. Gallagher asserts (15) that unless those extra activities serve to advance the special characteristics named, they do not merit the title of enrichment.

[1] Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

A publication of the Educational Policies Commission (11) states that life for the gifted appears to be enriched merely by the living of it. The Commission declares that from the same stimuli – whether formally arranged by the school or merely existing haphazardly in the environment – the gifted student acquires deeper insights, broader understandings, keener appreciations, and more memories. The Commission emphasizes, however, that although "learner-determined" enrichment almost inevitably results from practically any type of experience for mentally superior students, the gifted child derives considerably less value from unplanned, unstructured experiences than he does from the formal classroom situation aimed expressly at increasing his understandings. The Commission says that, as narrowly conceived, "enrichment" describes the deliberate differentiation of curriculum content and activities for the more intelligent pupils in a heterogeneous class. Such extra learning opportunities should permit each student to delve more deeply into the fields of his special interests, to give creative expression to his individual talents, and to explore a wide variety of both intellectual and nonintellectual activities. The Commission defines enrichment, in its broader sense, as a policy rather than a plan and notes that, as such, it may be executed in connection with acceleration, ability grouping, individualized assignments, elective courses, or any other such special techniques.

According to Maurice Freehill (14), too, it is perhaps improper to consider enrichment as a special plan, because all instruction of superior students is aimed at increasing curricular enrichment. Freehill describes enrichment "in depth" as being academic in content in contradistinction to that "in breadth," which involves wider variety and more opportunities for exploration. He points out that such programs permit gifted children to work at their own individual rates of speed and at their own levels of comprehension, using more difficult books and exploring more fields of learning than do other members of the class. He lists the most common approaches to enrichment as depth assignments and projects, free-choice activities, supervised correspondence courses, provision of extra materials, summer school, and participation in community activities.

SURVEY OF LITERATURE ON PHILOSOPHIES OF ENRICHMENT

The philosophy underlying a program necessarily determines the logic and rationale of the actions planned for its implementation. The purpose of the philosophy is to provide a statement of operational objectives to serve as a constant upon which to base the development of the program. Thus the philosophy of the enrichment program for gifted students dictates the choice of personnel, materials, and learning opportunities used in implementing that program.

Basic to any enrichment program are the following factors:

- Characteristics of the learner
- Needs of society
- Principles of learning
- Sociopsychological implications
- Levels of intellectual functioning
- The logic and sequence of subject matter fields

Chapter II deals with these six factors, all of which must be researched to obtain the data necessary to serve as a foundation for building an enrichment program.

In considering a philosophy of education designed to help realize the hopes and ambitions of parents for their children, Don Parker (21) has proposed what he terms a "Multi-level Philosophy." A multilevel school situation permits each child to start where he is and to move as fast and as far as his individual learning rate and capacity will allow. Parker stresses the wide variance in learning rate and ability among pupils within a single classroom.

Paul Woodring (30) remarks that while our philosophy must aim to promote the intellectual development of each student, broad differences in the intellectual ability of individual students must be recognized.

The fundamental concept expressed in the Rockefeller report is that although all men are equally worthy of the best efforts of educators, individuals differ widely in both their motivation and capacity; it follows, then, that they must also differ in their potential for achievement and in their actual attainments. Much of mankind's greatness stems from the individual's aspiration and abilities and ultimately from his freedom to excel. J. Ned Bryan (4) has furthered this idea in stating that freedom must include the freedom to develop fully one's own individual gifts.

The Educational Policies Commission (6) stresses the threefold thesis that all children have some gifts; that all of their gifts are required for a strong society; and that the ideal of democracy insists that all children be granted equal respect. The Commission's report asserts that the obligation to show equal respect and concern to the individual is not to be equated with the obligation to give each child identical treatment. The principle that extra provision should be made for students endowed with high intelligence simply because of that intelligence forms a part of the broader statement that all educational programs should be geared to the needs and abilities of the children whom they serve. Although many basic educational needs are common

to all persons, each student is a unique individual; therefore, within the limits of practicality, instructional methods should be individualized accordingly.

O. L. Davis (7) comments that providing equal opportunity for all does not mean offering everyone the same educational environment, experiences, or materials; rather, it means giving each student individualized attention in accordance with his ability to learn. Davis argues that educating for life in a democracy does not demand that the future physicist, musician, or salesman learn the same things at the same time; it does demand that each child be instructed according to his own inherent capabilities.

Further concern for the optimum development of the individual as a contribution to the vitality of the culture is voiced by Kenneth E. Anderson (24), who emphasizes the fact that the development of the full potential of talented persons is essential to the welfare and progress of society as a whole. Bereday and Lauwerys (1) assert that because everyone does some things better than others, no one is completely lacking in talent; they conclude from this statement that the finding and developing of talent is at the very root of all educational processes.

In its publication *The Central Purpose of American Education*, the Educational Policies Commission (5) affirms that respect for the individual, which lies at the core of the American value system, challenges teachers to enable each of their students to attain their full stature as adults by reaching the limits imposed by their native intelligence. The Commission defines the principal purpose of American education as developing the ability to think logically and accurately. On page 17 of the Commission's report is the statement that a person develops his thinking ability gradually and continually as he exercises it. Upon man's use of his rational powers rests his ability to achieve his personal goals and to fulfill his obligations to society at large.

According to the findings of the Educational Policies Commission, individual strength springs from a thinking, aware, and enlightened mind – a mind that possesses the capacity for aesthetic sensitivity and moral responsibility. The Commission's report affirms the importance of an education that is at once suffused with creativity and innovation and characterized by the process of logical thinking and the attitude of thoughtfulness.

In a federal report on the education of superior students, the Office of Education (9) has recognized the need to identify and to utilize the individual talents of all students. That report emphasizes the following four statements: (a) talents pertain to every avenue of human endeavor; (b) high intelligence is more likely to be generalized than specialized; (c) American society needs the positive development of all inherent capabilities with which its members are endowed; and (d) schools should discover and exploit all talents of their students.

J. Ned Bryan (26) urges that the gifted be identified and encouraged in the elementary school. He proposes the adoption of four general categories of talent as guides in designing educational programs: academic, creative, kinesthetic, and psychosocial. Bryan describes a gifted student as one who possesses a high degree of ability, actual or potential, in one or more of those categories.

Francis Keppel (18) also recognizes the national need for offering maximum opportunity to gifted students. Stressing the necessity for making a commitment to academic excellence, he defines the general goal of education as the optimum development of each individual's human resources within the context of his own capacity, motivation, and talents. Charles Bish (2) observes that if we cultivate the ideal of excellence while protecting the moral values of equality, we must be extremely sensitive to the principle rooted deep in the American conscience that each student is equally worthy of attention and concern and that each must be accorded equal opportunity in terms of his needs and abilities. This concept recognizes individual differences in intelligence and variations in motivation; hence it can accept wide disparities in intellectual performance.

The attainment of intellectual excellence is not a new objective, having been a human concern for centuries. As Plato wrote in Book VI of his *Laws* in the fourth century, B.C.:

> Whatever the creature, be it plant or animal, tame or wild, if its earliest growth makes a good start, that is the most important step toward the consummation of the excellence of which nature is capable.

Educators have long pondered the dimensions of excellence in education. Lawrence Thomas (27) comments that superiority applies not merely to a person or to his achievements; it also concerns the relationship between the two factors. He suggests that before judging the merits of a particular performance, we should first consider its elements: (a) the nature of the learning materials as related to the ability level of the student; and (b) the purpose, industry, and workmanship of the student. If the learner's purpose differs significantly from his teacher's, the learner's achievement may easily be evaluated inappropriately. A standard of excellence becomes valid and operative only insofar as the work materials are properly matched with the student's goals and abilities.

Ruth Martinson (20) reports that the philosophical attitude adopted toward a program for the gifted has a decided bearing upon the evaluation of the success of that program. When the Enrichment Demonstration Center was

opened, its leaders directed specific attention to the philosophy of the Los Angeles Unified School District under which it operated. That philosophy was explicitly defined as follows:

> The basic point of view. . . is that every pupil be expected to make the most of his potentialities; that every pupil be helped to attain as high a level of intellectual development as is possible; that there be deliberate plans made to identify individual differences; and that provisions be made for learning situations for pupils of varied abilities, interests, and talents. (10)

The flexible program of enrichment developed by the Los Angeles system (17) includes both group and individual work experiences.

Four different areas in which enrichment units may be integrated are listed by Virgil Ward as (a) the humanities, including language arts, literature, and foreign languages; (b) mathematics; (c) the natural sciences; and (d) the social sciences, including history, government, economics, and geography. (28)

David Sanders (25) observes that enrichment is highly dependent upon the skills and artistry of the individual teacher, as it differs subtly from the more routine instruction of the average child. He writes that the enrichment process requires a teacher who is at once psychologically secure and sensitive to the needs and interests of gifted students.

For teachers whose regular classes include a few superior students, Paul Plowman suggests the three following modes of enriching the program: (a) additional activities planned to meet individual interests and abilities; (b) use of advanced materials to generate ideas; and (c) special help, direct or indirect, to the gifted through resource persons of the community. (22)

CONCLUSIONS

From the foregoing discussion it would appear that most authorities specializing in the education of the gifted now agree in principle on the basic concepts involved in enrichment programs. However different these programs themselves may be, the various connotations of the term "enrichment," like the objectives underlying its implementation in the schools, have become generally standardized.

Among the objectives stressed in most programs for the talented are: an increased ability to analyze and to solve problems; the development of more profound and worthwhile interests; the stimulation of originality, initiative, and self-direction; and an increased social conscience resulting from interaction with peer groups through cooperative activities. A view widely held among educators is that special classes offered for the gifted child will eventually improve instruction for all children, be they slow, average, or superior.

Superior students generally justify all educational efforts and funds expended in their behalf, because, to a greater degree than most, such students represent the hope of improvement in our civilization that may eventually result in a better life for their less well-endowed fellows as well as for themselves. "The butcher, the baker, the candlestick maker" and their occupational counterparts are all certainly essential to the smooth, day-to-day functioning of our society. For improvements in that society, however, we must look to the gifted – that fortunate group which has been, until recently, largely ignored in our efforts to raise the least able students to a level approaching mediocrity.

It is the superior children, comprising but a small minority of the student bodies throughout the land, who will provide most of our future authors, musicians, artists, statesmen, inventors, and leaders in other fields; it therefore behooves us to intensify our efforts to serve all gifted pupils more adequately – that they may better serve us in the future.

Selected References

1. Bereday, George Z. F., and Joseph A. Lauwerys. *Concepts of Excellence in Education. New York:* Harcourt, Brace & World, Inc., 1961.

2. Bish, Charles E. "The Academically Talented," NEA Journal, L (February, 1961), 33-34.

3. Brown, Spencer. "How Educate the Gifted Child? *Commentary Magazine,* XXI (June, 1956), 523-41.

4. Bryan, J. Ned. "Talent and Today's Schools," *The Superior Student,* VI (November-December, 1963). (The Newsletter of the Inter-University Committee on the Superior Student, University of Colorado.)

5. *The Central Purpose of American Education.* Educational Policies Commission. Washington, D.C.: National Education Association and the American Association of School Administrators, 1961.

6. *Contemporary Issues in Elementary Education.* Educational Policies Commission. Washington, D.C.: National Education Association and the American Association of School Administrators, 1960.

7. Davis, O. L., Jr. "Grouping for Instruction: Some Perspectives," *The Educational Forum,* XXIV (January, 1960), 209-16.

8. DeHaan, Robert F., and Jack Kough. *Helping Children with Special Needs.* Chicago: Science Research Associates, 1957.

9. "Educating Talented Children in Elementary Schools," in *Education Briefs,* No. 36. Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, November, 1958.

10. *Education of Intellectually Gifted Pupils in Los Angeles City Schools.* Committee on Education of Intellectually Gifted Pupils. Los Angeles: Los Angeles Unified School District, May, 1962.

11. *Education of the Gifted.* Educational Policies Commission. Washington, D.C.: National Education Association and American Association of School Administrators, 1950.

12. *Educational Programs for Gifted Pupils.* A Report to the California Legislature Prepared Pursuant to Section 2 of Chapter 2385, Statutes of 1957. Sacramento: California State Department of Education, 1961.

13. *Enrichment for the Intellectually Gifted.* Committee on Education of Intellectualy Gifted Pupils. Los Angeles: Los Angeles Unified School District, September, 1960.

14. Freehill, Maurice F. *Gifted Children: Their Psychology and Education.* New York: Macmillan Co., 1961.

15. Gallagher, James J. *The Gifted Child in the Elementary School.* Series: WHAT RESEARCH SAYS TO THE TEACHER, No. 17. Department of Classroom Teachers, American Educational Research Association of the National Education Association, 1959.

16. Gallagher, James J. *Teaching the Gifted Child.* Boston: Allyn & Bacon, Inc., 1964.

17. *Guidance of Gifted Pupils.* Guidance and Counseling Section, Division of Elementary Education. Los Angeles: Los Angeles Unified School District, May, 1961.

18. Keppel, Francis. "In Search of Excellence," *Health, Education, and Welfare Indicators* (April, 1964), xxxi-xxxviii. (Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, Division of Public Documents.)

19. Lessinger, Leon. "Enrichment for Gifted Pupils – Its Nature and Nurture," *Exceptional Children,* XXX (November, 1963), 119-20.

20. Martinson, Ruth. *Special Programs for Gifted Pupils.* Bulletin of the California State Department of Education, Vol. XXXI, No. 1, January, 1962. Sacramento: California State Department of Education, 1962.

21. Parker, Don H. *Schooling for Individual Excellence.* Camden, N.J.: Thomas Nelson & Sons, 1963.

22. Plowman, Paul D. *Guidelines for Establishing and Evaluating Programs for Mentally Gifted Minors.* Sacramento: California State Department of Education, 1962.

23. *The Pursuit of Excellence: Education and the Future of America.* Rockefeller Brothers Fund, Inc. New York: Doubleday and Company, Inc., 1958.

24. *Research on the Academically Talented Student.* Edited by Kenneth E. Anderson. Project on the Academically Talented Student. Washington, D.C.: National Education Association, 1961.

25. Sanders, David C. *Elementary Education and the Academically Talented Pupil.* Washington, D.C.: Conference on Elementary Education and the Academically Talented Pupil, 1959.

26. *Talent: A State's Resource, a State's Responsibility.* OE-20048, Bulletin No. 34. Edited by J. Ned Bryan. Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1963.

27. Thomas, Lawrence G. "Educational Dimensions in Excellence," *CTA Action,* II (April 17, 1964), 4.

28. Ward, Virgil S. "New Perspectives in the Education of the Gifted," *The Educational Forum,* XXIV (March, 1960), 329-35.

29. Witty, Paul. "Does the I.Q. Identify All Gifted Children?" *National Parent-Teacher,* LI (February, 1957), 17.

30. Woodring, Paul. *A Fourth of a Nation.* New York: McGraw-Hill Book Company, Inc., 1957.

Chapter II

Enrichment for the Gifted: A Frame of Reference

This chapter deals in sequence with the following topics, all of which are relevant to enriching the education of the gifted: (a) the nature of the environment; (b) sociopsychological implications of enrichment; (c) characteristics of gifted learners; (d) general principles of learning; (e) levels of intellectual functioning; and (f) the logic and sequence of subject matter.

THE NATURE OF THE ENVIRONMENT

Basic to an educational program for the gifted are a knowledge of the role of the school as a social agency, an understanding of the pupil's present environment, and an awareness of the society which he will be expected to serve. The various societal forces affecting talented children also affect their potential contributions to the world's welfare; such forces, therefore, must all be considered in designing curriculums for the superior child.

Functions of the School as a Social Institution

The principal purposes of the school are to help the pupil to shape realistically his personal goals in life, to give him the learning and the tools necessary to achieve those goals, and to transmit the cultural heritage from one generation to the next. To those primary objectives have been added certain supplementary obligations to help the child meet some of his basic needs. Subsidiary roles of the school are to assist its students in the following areas: health; companionship; economic and civic security; intellectual development; the instillation of moral, spiritual, and aesthetic values; and the pursuit of leisure-time activities.

Environmental Forces Affecting the School

As a social insitution, the school is expected to react to the various social, economic, and political pressures operating in its community. Especially in times of rapid drastic change like the present, these forces decisively affect the conditions under which American youth live and learn. Among the factors influencing the school are population growth, urbanization, automation, amount of manpower available, the attempts of disadvantaged groups to win rights and recognition, the fight for civil liberties, desegregation of classrooms through cross-town bussing, increased educational budgets and tuition costs, conflicting expectations from the schools, and the rapid explosion of knowledge in certain fields. (1)[1]

Recent manifestations of civilization have increased the pressures exerted on youth as well as on their elders. Strains operating upon our total society cannot fail to affect the child in his classroom; however, such strains may be somewhat alleviated by a closer interaction between the schools and the communities which they serve, thus narrowing the chasm between the varied world of reality outside the schoolhouse and the consistent learning routines within it. (2) Some types of stress are desirable; others are not. Causes of negative stress situations include the threat of almost instantaneous destruction by nuclear warfare, the dwindling of living space in the midst of population expansion, the acceleration of crime, the pollution of air and water, student unrest and revolt at the university level, and anxiety over school marks rather than a calm concern with learning.

Among the positive causes of pressure are the increasing amount of knowledge to be mastered, man's ventures into outer space, development of electronic instruments, progress in many scientific fields, and the multiplicity of inventions affecting everyday life. (2) Uncertainty and anxiety may result from the patterns emerging from our culture that require students to orient themselves to probabilities rather than to certainties – to accept change as the rule instead of the exception.

Tasks dictated to the school by social forces are enumerated by Richard I. Miller (3) as follows:

- Coping with the knowledge explosion
- Developing logical patterns of thought
- Teaching issues in relation to values
- Promoting a feeling of social responsibility

[1] Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

- Building an understanding of foreign languages and civilizations
- Focusing on the individual
- Maintaining integrity and courage

The Use of Societal Data in Planning for Enrichment

Like other educational developments, enrichment programs must reflect the needs of the society which they serve; hence the staff of the Enrichment Demonstration Center in Los Angeles studied the forces currently influencing our citizenry. Significant patterns in those forces were sought on which to focus enrichment. According to the study conducted by demonstration center personnel, the enrichment program should reflect two fundamental objectives of the school: developing the pupil's ability to think rationally and transmitting the cultural heritage. The curriculum, therefore, included material provided by various disciplines to promote those twin objectives. Changes in pupils' intellectual behavior were observed to indicate their levels of thought.

The demonstration center staff believed that enrichment should also promote the following supplementary functions of the school:

- Encouragement of healthful living
- Provision of human companionship
- Recognition of the importance of economic and civic security
- Intellectual development
- Acknowledgment of moral, spiritual, and aesthetic values
- Provision of worthwhile leisure-time activites

The prime objective of the ensuing enrichment program was to assist the 750 gifted children involved to realize their full potential so that they might utilize the riches of their heritage from the past, the better to contribute to the cultural legacy of the future.

SOCIOPSYCHOLOGICAL IMPLICATIONS OF ENRICHMENT

In their efforts to lead the gifted child to successful adulthood both as an individual and as a citizen in an evolving world, enrichment planners cannot afford to ignore the guidelines resulting from the research of psychologists and other social scientists.

Theories of Individual Development

Psychologists have determined that man has an inborn capacity for responsible self-direction and an inborn need to fulfill his capabilities. The behaviorist view of man as a reactive organism responding mechanically to the various stimuli of his environment has given way to the concept of man as an energy system whose behavior is determined jointly by his heredity and by his environment. The latter viewpoint explains man's ability to evaluate stimuli in terms of his needs, to assign value to events, to think creatively, and to initiate action.

Educational psychology is concerned with two types of learning processes – associative and cognitive. Associative learning, which plays a more significant role in early childhood, includes trial and error, conditioning, imitation, memorization, and identification. Cognitive learning, on the contrary, is concerned with creativity, imagination, and abstract reasoning; such learning becomes more important as the child becomes more actively involved in the learning process. Associative and cognitive learning are not mutually exclusive; they represent, rather, two extremes of a continuum having passive conditioning at one end and creative reasoning at the other. Learning does not consist merely in obtaining facts and information about the world; it also includes the acquisition of new insights and orientation patterns. (20)

To determine the factors most significant in nurturing the child's potential, researchers of the Association for Supervision and Curriculum Development examined findings of the behavioral disciplines of psychology, psychiatry, and sociology. They concluded that educators should devote more effort to (a) individual differences; (b) creative and divergent thinking; and (c) analyses of teaching processes and their effects on pupil achievement. (17)

J. S. Bruner and Leo Postman describe the learner as a discoverer or creator of his own world; the teacher's role is to provide him with opportunities to learn through thinking. The writers have found that the best way to evolve a personal framework is to use a spiral approach to major concepts through providing a wide diversity of experience. They stress the need for self-direction, active learning, and a rich classroom environment. (6)

Psychotherapists have also originated many ideas applicable to enrichment programs. Such authorities in the field as Carl R. Rogers (19), Erich Fromm (9), Earl C. Kelley (15), and Arthur W. Combs (18) agree that the

learner profits most from those experiences which he considers as self-enhancing, self-actualizing, or self-fulfilling. Their findings indicate that learning is affected by a positive view of self, by identification with others, by the pupil's goals and values, and by the process of attaining one's highest potential. Knowledge is assimilated and retained only as the learner can relate it to himself.

J. P. Guilford's laboratory experiments indicate that treatment should be differentiated for each child in the classroom in conformance with his own unique personality traits. Guilford defines "personality" as a pattern of traits that distinguishes one individual from another and that underlies his relatively consistent way of interacting with his environment. A "trait" is defined as any distinguishable and relatively enduring characteristic of a person; it may be general, such as his intelligence, or specific, such as a penchant for golf. Traits, which refer to either biological or psychological structure and functioning, are determined by the interaction between hereditary and environmental factors. The following broad areas of individual differences are used to categorize particular personality traits: (a) physical appearance; (b) temperament; (c) ability or actual competence in an area; (d) capacity or potential for development; (e) aptitude or propensity for achievement; (f) interest; (g) action patterns; (h) stress tolerance; (i) attitudes; and (j) character, or the moral and ethical dimensions of personality. To foster optimum development of the child, elementary school enrichment programs must provide for those differences by offering individualized work in various fields of endeavor. (13)

Ronald C. Doll has found that certain conditions in the schools militate against the development of a child's potential, alienate the learner from his teacher, and result in unrealistic self-images. In Doll's opinion, the pupil's self-image should be focused positively through interaction with empathetic instructors and peers and through the use of stimulating materials. (14)

In discussing the issue of free will versus determination, Jacob Getzels says that relative freedom depends on having multiple choices for behavior. The broadly educated man is freer than the narrowly trained man in that the former can choose from a greater number of possibilities for action. Emphasizing the importance of freedom of choice, Getzels writes that although emergent values tend to reward conformity and condemn individuality, the culture should encourage personal independence and autonomy in order to enable the gifted individual to be productive and innovative, to capitalize on his native endowments, to give expression to his exceptional talents, and to commit himself to his own standards. Thus, a change in our value system is required in order to motivate the superior pupil to work to his capacity and to sacrifice present pleasure for future achievement. (10)

Implications of Grouping

Optimum realization of individual potential within a group situation is treated by George F. Kneller, who says that the pupil ought not to be subjected to group processes in the misguided belief that group learning is somehow superior to individual effort. A subjective analysis of intragroup relations may strengthen the effectiveness of grouping, the most important objective of which is to aid in the individual struggle for self-fulfillment. The teacher must exercise vigilance to prevent the demands of group dynamics from repressing attempts at self-fulfillment. (16) Nevertheless, Marcella Bonsall feels that gifted children are aided in acquiring a sense of adequacy and self-confidence through just such associations with their intellectual peers. (5)

The theory of human behavior presented by Harry Giles concerns the individual's active striving for continuity between himself and his society. According to Giles, growth is the chief purpose and a sense of belonging the chief condition of human endeavor. A prime condition for growth is a feeling of belonging to a larger unit, and this is as true of the single cell and of the group itself as it is of the individual. The desire to "belong," which counts among the strongest motivators of humanity, poses the following dilemma: How can one follow one's own particular inclinations and concurrently maintain good relationships with other persons equally bent upon realizing their own potentials? (12)

The application of these sociopsychological ideas to enrichment dictates the necessity for teaching self-acceptance as a part of the curriculum. Varied experiences should be provided for children who should be given the time, space, and materials necessary to follow their particular bents. Children should occasionally work alone under the guidance of the teacher; at other times they should engage in group activities to communicate their learning and to react to the experiences of others. The teacher should therefore allot time blocks both for group instruction and for supervised study.

Jacob Getzels and Herbert Thelen observe that the school class is the image of a social system in motion or in dynamic disequilibrium. Continually faced with emergent complexities and conflicts, the classroom group deals with these realities by modifying their goals, expectations, and selective perceptions. Through such classroom experiences the children can become creative, autonomous participants in other social systems later in life. (11) Superior pupils tend to regard one another as resource persons and to cooperate in one another's projects more fully than do average ones. Able pupils should not be enslaved by group norms, which stifle their optimum growth. In order to enhance the child's freedom to verbalize frankly while

retaining the sense of anonymity essential to self-expression, the group should be kept as small as possible in consonance with its goals.

By his own behavior, the gifted child creates a school environment characterized by less discipline but more intellectual challenge than are found in the ordinary classroom. The teacher of the talented may thus increase her effectiveness by spending correspondingly less time on lectures and other directed lessons and more time as a guide and consultant than is usually the case. (7)

Behavior controls that are developed from reacting to the environment enable the child to participate usefully in the various groups to which he belongs. In a society of growing interdependency, in a world of increasing power for labor unions, corporations, governmental agencies, and social and fraternal organizations, children must learn to develop desirable individual-group relationships, to choose their leaders carefully, to recognize autocrats and demagogues, to protect individual rights in group settings, and to promote group progress. According to Edna Ambrose and Alice Miel (4), social learnings that contribute to the growth of democracy demand the following abilities:

- To feel with and for others
- To be personally ambitious without harming others
- To find steadfastness in human associations
- To learn values that are basic to action
- To cooperate with others in defining and solving problems
- To solve problems creatively and imaginatively
- To utilize intelligently the knowledge that has been gleaned from the past
- To be flexible enough to change procedures and to work alongside persons with differing sets of values
- To accept individual differences in others
- To be circumspect in thought, speech, and deed

In discussing factors that lead to a child's independence, Ned Flanders emphasizes the role of the teacher, upon whom every student is to some extent dependent. The teacher may create conditions eliciting, for the most part, dependent reactions from his class; conversely, he may encourage all but the most dependent pupils to respond independently. Although dependency does not normally encourage creativity, dependency on the teacher may facilitate such learning activities as drill and following directions. The most flexible social structures occur in the classroom through the use of both "group" and "non-group" techniques. The types of endeavor best achieved through group activity are setting goals, planning schoolwork, diagnosing difficulties, and learning social skills. The activities that best lend themselves to individual work are developing composition skills, obtaining and organizing specific information, and testing one's knowledge. (8) Application of Flanders' ideas to enrichment requires the teacher to balance his twin roles as director and consultant and to alternate among individual, small group, and whole class instruction.

Reviewing developments in social psychology that affect classroom instruction, William C. Trow and his collaborators describe the teacher first as a resource person who lectures and demonstrates in order to improve his pupils' thinking ability. Secondly, the teacher serves as a strategist who possesses a high regard for democratic values and considerable psychological insight into both group factors and individual personalities. In this role the teacher helps the group to evaluate their progress; he also activates democratic processes in the classroom. In his third role the teacher operates as a therapist who is both a clinician and a group worker. As such, he provides for group management and establishes rapport with each child to improve the latter's individual and social adjustment. (21)

Pupils may be grouped according to their objectives. Groupings may also be centered on special difficulties or abilities of their members, on generalized ability in one subject area, or on the solution of a particular problem; they may be founded upon peer friendships; or they may serve to divide and coordinate class-planned tasks. Other considerations to be observed in group formation follow:

- The classroom atmosphere should be sufficiently fluid to permit the natural formation of groups and their facile dissolution when their purposes have been served.
- Each child should move through a variety of groupings.
- In naming the groups, value judgments should be avoided to prevent the formation of a hierarchy.
- Group training should enable children to share ideas, serve as chairmen, learn self-management, and display cooperation.
- Groups should provide feelings of unity and continuity.

- As only one phase of classroom management, grouping should not be expected to solve all learning problems.
- The entire class should be used extensively as a valid group in itself.
- Some groups should be based on diversity rather than on homogeneity in interests or abilities.
- The teacher should allot time to work with each group and provide a variety of instructional materials.
- Groups should further the maximum individual growth of their members.
- As a subtle and complex process, grouping should be based on the teacher's judgment rather than on arbitrary mechanical or mathematical systems.

Sociopsychological Data – A Résumé

Because the major purpose of enrichment is to develop fully the individual talents of the gifted, all classroom activities, both group and nongroup, should further that end. Sociopsychological implications indicate that instructions should stress individual learning in all areas and should so balance group and nongroup methods as to provide maximum opportunities for all participants.

In providing an enrichment program, therefore, the educator needs to consider all of the following sociopsychological factors:

- The learner's capacity for responsible self-direction
- The effect upon the individual of his goals, values, self-image, and identification with others
- The learner's sensitivity to the feelings and reactions of others
- The learner's environment and heredity as they determine his behavior
- Provision of a varied environment to increase selectivity
- Differentiation in treatment for each child by his teacher
- The influence of group phenomena on the pace and type of learning
- Balance among individual, small group, and whole class instruction
- Balance between the teacher's role as director and as consultant
- Continuity and flexibility of grouping
- Group dynamics and cooperative determination of group goals and values

CHARACTERISTICS OF GIFTED LEARNERS

Before embarking on an enrichment program, educators should first identify those children who are gifted, learn as much as possible about the potentialities and other characteristics of each gifted child, and prepare cumulative records of information on each participant in the program.

Intelligence Levels of Gifted Children

Administrators of various school systems have applied different criteria in determining the intelligence level requisite for including a pupil in the ranks of the gifted. Generally speaking, intelligence quotients of children considered "gifted" range from 120 to 180 and above, as measured by individual intelligence tests. Spencer Brown reports that only about 3 percent of all Americans have IQs above 135; 1 percent above 140; and about one fourth of 1 percent, above 160. Only one or two persons in a million have IQs of 180 or more, as measured by the Stanford-Binet Intelligence Test, which is probably the best known of the many standardized tests for determining mental age as a basis for the IQ. (23)

The Educational Policies Commission suggests (a) that pupils having IQs of 137 and above be identified as highly gifted; and (b) that pupils having IQs of 120 to 137 be rated as moderately so. (26) For the enrichment program of California Project Talent, an IQ of 130 was arbitrarily set as the lowest limit of giftedness. (27)

Educators of the Los Angeles Unified School District have categorized as "gifted" those children whose IQ scores rank roughly in the top 2 percent of the total school population. Within that general classification are two subgroups: gifted pupils, whose IQs range from 130 to 160; and the highly gifted, whose IQs exceed 160. Children in the latter category, who number only one in each 10,000 of the population, obviously require highly individualized educational programs.

The American Association for Gifted Children defines an academically gifted student as one who consistently excels in one or more of socially useful endeavors. (29) Robert DeHaan and Robert Havighurst consider as gifted a child whose superiority in any field would enable him to

contribute significantly to cultural progress. They propose, therefore, that gifted children be selected from the top 10 percent of their age group in one or more of the following areas: general intellectual ability; talent in the creative arts of music, drama, creative writing, and graphic arts; and ability in science, mechanics, or social leadership. (24)

J. P. Guilford feels strongly that a single test score, such as that for mental age used in computing the IQ, cannot accurately measure all types of human intelligence, which comprises too many components to be summarized in one number on a scale. Guilford remarks that even Alfred Binet recognized intelligence as a multiplex of many different factors, although Binet himself encouraged the concept of IQ as a monolithic, undifferentiated ability by instituting and revising intelligence scales that produce but one score. Guilford also regards the IQ test as inadequate to determine such qualities as creativity, ingenuity, inventiveness, resourcefulness, and originality of thought. (75)

Historical Attitudes Toward the Gifted

Vestiges of ancient beliefs regarding the physical, mental, and emotional endowments of the intellectually gifted still abound in the stereotyped views of our culture regarding the superior student and still affect our attitudes toward giftedness. (32a)

Like the medieval Europeans, the ancient Greeks believed that genius was a divine gift, a touch of omniscience which enabled its possessors to penetrate into the depths of truth too profound for ordinary mortals to contemplate. Leadership of Plato's ideal state was to be entrusted only to philosopher-kings of the highest order of intelligence. The Bible itself extolled the saintly wisdom of prophets and adjured men to seek the proper interpretation of divine will from their learned elders. Coexisting with those views, however, was a contrasting theory which held that genius, being inherently aberrant, could soar into flights of creativity only on the wings of madness.

During the Renaissance, the Reformation, and the Industrial Revolution, renowned thinkers again supported the ancient credo to the effect that leadership should be limited to the mentally superior. In 1896 Sir Francis Galton published *Hereditary Genius,* the first quantitative analysis of mental ability. His conclusions credited heredity as being the prime determinant of intellectual prowess, which in Galton's opinion depended largely on sensory development. (32b) Other persons writing in the nineteenth century pointed to the instability inherent in genius; they held that nature somehow balances high mental powers with a type of affliction akin to degeneracy or insanity. That viewpoint was furthered in 1891 with the publication by Lombroso and Nisbet of their studies on famous historical figures, a disproportionately large number of whom were deranged. The names of Ralph Waldo Emerson, Friedrich Wilhelm Nietzsche, and Vaslav Nijinsky have popularly been cited as examples of genius gone awry. William James, after long denying any link between genius and emotional abnormality, later reversed his position to claim considerable soundness for the theory of the mad genius. (45, 46)

One might well ponder the possibility that the efforts of the school, like those of society at large, to force the gifted individual into the intellectual mold of the "average" might have contributed to his supposed instability. For it is undoubtedly true that educators of the past, in their efforts to equalize treatment for all, did try, albeit unconsciously and unintentionally, to encourage the talented child to work at a level well below his mental capacity – just as they tried to raise the below-average student to a level approximating mediocrity. Thus, learning could proceed comfortably at a lock-step pace without either inconveniencing the teacher or requiring undue effort on the part of the administrator. (32a)

Whether out of envy on the part of the general populace for their intellectual superiors or whether out of fear of the incomprehensible and the unknown, even modern man – at least before the space age – retained the concept that the gifted were rather "far out" intellectually; hence, the stereotype of the absent-minded professor or of the scientist so preoccupied that he didn't "know enough to come in out of the rain." As if to reinforce that viewpoint, the term "egghead" was widely and rudely applied to the intellectual in America. That derisive word evoked an unfortunate image of a man bald and shiny of pate, whose oversized, oval-shaped head broadened at the crown as though to accommodate an equally oversized brain. In the judgment of many of his contemporaries, the egghead was prone to laughable eccentricities, if not to near dementia. In the jargon of mid-twentieth century America, he was admonished to "take his head out of the clouds" and to "get his feet on the ground."

These misconceptions about the intellectually well-endowed were peculiar to the American culture and were especially common in small towns and rural areas, where "practicality" was the watchword and creative talent was a misprized commodity. Such views were hardly calculated to inspire the intellectual to exert himself to the fullest extent in behalf of a society that deprecated his ability and held him more in scorn than in admiration. Burdened with such a stereotype, of which he was well aware, the egghead, whether young or old, was often discouraged from realizing his true worth in the proper exercise of his talents.

This condition existed in school systems around the nation, in varying degrees, throughout the first half of the

twentieth century. Then in the 1950s a growing discontent in the populace, combined with an interest in putting man into space, began to apply brakes to the forces of anti-intellectualism. (32a) People began to realize that if satellites were to be manned and outer space conquered by humanity, those feats would be accomplished by the intellectual resources of our society, not by brawn alone or by any amount of ballyhoo. An increasing fear of the Russians and an awe for their accomplishments led to a determination on the part of Americans to match their scientific prowess, if not to surpass it. Beginning efforts were made to reach the talented. The program for Mentally Gifted Minors (MGM), instituted in California, heralded later endeavors on behalf of the gifted as exemplified by the programs of California Project Talent. Other projects and programs are being conducted in the nation. More are needed. Fortunately the citizenry and the schools have decided at last to recognize the potential of gifted students. Special programs geared to these youths' unique abilities and dedicated to the complete development of their talents are becoming increasingly helpful.

Negative Influences on Scholarship

Despite the recent positive developments, however, that have helped to improve the education of superior students, certain negativistic influences still hamper the progress of academic excellence in some California classrooms as in many other parts of the nation. Indicative of the spirit of anti-intellectualism that yet haunts our society and that induces many of our students to utilize only a modicum of their talents in scholarly pursuits is the shibboleth of the gentlemanly grade of "C" still coveted on many a college and high school campus. That ambition to achieve only average grades reflects a fear of superiority that has invaded even elementary school classes. When the "C" student invokes admiration among his peers, the "A" student is often held in contempt.

In order to avoid being ridiculed by their peers, students at all levels below that of university graduate programs have often sacrificed good grades to commonality, to the desire to "get along" with classmates of lesser ability. School counselors report that certain students actively retreat from excellence in all areas but athletics, where superiority is not a liability. The attitude of those students may reflect their elders' deprecation of brain in favor of brawn. It is certainly not to society's credit nor a matter of pride for our culture that the university professor has never achieved either the social status or the financial recognition of the professional athlete. Popular acclaim both inside and outside of the schoolhouse applauds and lionizes the athlete and sportsman at the expense of the outstanding student and the practitioner of the arts, the sciences, and the humanities; however, the recent advent of the sputniks has served to elevate the status of the scientist, at least. This disparagement of excellence in nearly all its forms but athletic reflects a mistaken sense of values and a faulty intellectual climate that perhaps characterize the United States to an extent greater than is exemplified by the other countries of the Western world. (32a)

As every teacher knows, children progress most rapidly in those areas wherein achievement is crowned with accolades. It is therefore not remarkable that the typical student prefers the captaincy of the football team to the presidency of the California Scholarship Federation (CSF) chapter in his school. The feminine contingent of the student body, too, tends to idolize the football hero and to denigrate the CSF seal-bearer. It would seem that such values and attitudes in our society do not augur well for the future of our civilization, which depends for its advancement on the development of our intellectuals more than it does on that of our athletes.

As J. P. Guilford has remarked, the zeal for mediocrity as evidenced by the wish for only average grades is hardly calculated to evoke the best effort from students either for themselves as individuals or for society at large. (32a) Small wonder, then, that the most promising students have often felt it necessary to conceal their light under the proverbial bushel. To restore scholarship to the honorable place that once it held, it is incumbent upon educators to eradicate the strange preoccupation with the mediocre and the ordinary that is the bane of scholarship. Far from discouraging our ablest students from raising their heads above the mob, the teacher has the vitally important duty of drawing forth the best efforts from all his pupils with the aim of helping those children to reach as high as they can – indeed, to stretch their reach by stretching their minds in intellectual effort.

Another condition that cannot help but affect the classroom at all levels is that of the riots and other upheavals which are currently upsetting college campuses at home as well as abroad. One can scarcely maintain the highest ideals of scholarship while participating in a riot or in a "sit-in" in the dean's office. Militating against scholastic excellence, too, is yet another recent phenomenon – the advent of the "hippy," complete with long hair, beads, boots, and flowers. The epitome of all that a schoolteacher attempts to discourage in his pupils, the average "flower child" is very little concerned with intellectual excellence or indeed with any form of superiority. It is not only the underprivileged or "The Man with the Hoe" of whom it might be said: ". . . what to him are Plato and the swing of Pleiades?"[2] If a child considers himself as a

[2]Edwin Markham, "The Man with the Hoe." In F. T. Palgrave, *The Golden Treasury* (Centennial edition). New York: The New American Library of World Literature, Inc. (Mentor Book), 1961, p. 471.

"dropout" from life, of what use is it to try to motivate him to stay in school? As pointed out in this chapter, the pupil in his classroom is not immune from the cankers that infect the world in the form of negative societal influences like conformity, cynicism, rebellion, and fear of mental excellence.

Still another reason for downgrading ability of a high order in the classrooms of America is the fallacy that anyone interested in so-called "highbrow" pursuits, whether in writing, music, or the other arts, is somehow lacking in masculinity. According to the stereotype created by popular fancy, a poet, musician, actor, or artist is suspect of being somewhat effeminate in nature; and a girl who excels in the humanities is often considered odd or peculiar. It would be interesting to know how many incipient Byrons, Frosts, Nijinskys, El Grecos, and Menuhins have been repressed in their creativity by the stereotype which conceives of the artist as unmasculine. And how many girls would have developed into a George Eliot without the stigma that attaches to "a female intellectual" and that forced Mary Ann Evans to adopt a masculine pseudonym?

In attempting to explain the forces opposed to scholarship that have so long dominated the American educational scene, J. P. Guilford has written that perhaps the root of the problem lies in an erroneous conception of democracy as a social ideal embracing the equality of mental abilities along with the equality of rights and opportunities. This odd notion, held also by some educators, has certainly inhibited the division of students into slow, average, and superior groups. Such division has fortunately been accomplished in most metropolitan areas in the face of complaints from certain quarters that the practice of "tracking" students is somehow "undemocratic." It can no longer be denied, however, that students learn best when they are neither forced to keep up with more intelligent pace-setters in the classroom nor yet retarded by slower learners, who require both a greater amount of repetition and a more detailed presentation of subject matter. At any rate, the leveling process as applied to the classroom has done our better students "a grave disservice," in the words of Guilford – a disservice that has damaged our entire social fabric. (32a)

Another reason adduced by Guilford for the dampening of interest in scholastic achievement is the formerly strong focus upon the personal adjustment of pupils at the expense of their intellectual growth. Subject matter has often been sacrificed to emphasize "life adjustment" courses in the mistaken belief that a child's intellectual development is of considerably less importance than his emotional health. That philosophy attempted to force all children into a common mold of mediocrity.

Fortunately, however, the latest educational trends have discouraged such leveling processes. Motivating the recent efforts of American educators to recognize and reward excellence on the part of gifted pupils has been the rise in Soviet power, for the threat posed by Communist forces has awakened these educators to the need for enabling better students in the United States to compete successfully with their counterparts in the U.S.S.R. It is also quite possible that the almost universal hunger of modern man for recognition of the dignity and worth of the individual is having a motivational impact on the youth in our schools.

American educators are becoming alerted also to the necessity for promoting creativity among the gifted. The traditions and the demands of mass education have perhaps retarded developments in that direction, for creativity is highly individualistic. However, it is encouraging to note that although much remains to be learned about the subject, such noted researchers as J. P. Guilford, who heads the Psychological Laboratory of the University of Southern California, are currently investigating the factors involved in creativity and may be expected to provide some answers on how best to promote its development in talented children. Now directing the Aptitudes Research Project for the Office of Naval Research, Guilford said as early as 1959:

> . . . We should be ready to experiment with novel methods. In these days of electronic marvels upon which we can draw . . . , we should expect to see some radical changes in educational procedures. If we are not ready to tolerate the idea of drastic changes, we are not ready for an age of creative education. (32a)

In the fourth century before Christ, Plato offered one solution to the problem of inspiring creativity in children when he wrote in *The Republic,* Book VII: "Let early education be a sort of amusement; you will then be better able to find out the natural bent."

Personal Attributes of Gifted Children

Popular opinion to the contrary, modern investigators have attested to the superiority of gifted children over their contemporaries in physical, social, moral, and emotional characteristics as well as in educational development. Binet's collaboration with Simon in publishing their intelligence test in 1905 paved the way for investigating IQs and identifying the special mental attributes of talented children. (42) From a study of 1,500 gifted pupils, ranging over a 25-year period, Terman and Oden found that intellectually superior children were also well above average in physical attractiveness, social adjustment, size, strength, general health, and educational attainment. (43) Terman affirms that the highly able differ from the average only in degree and not in kind and that their differences lie in general unitary intelligence, which may be measured on a continuum. As already indicated, J. P. Guilford disagrees with the latter conclusion. (75)

The outstanding intellectual abilities of gifted children as enumerated by James Gallagher are the following: the association of basic concepts; the critical evaluation of facts and arguments; the creation of new ideas; and the ability to analyze complex problems through an understanding of other situations, other times, and other persons. (28)

Because he is better balanced emotionally, by and large, than the child of average or low ability, the gifted child is able to respond more appropriately to social situations, according to Ruth Strang. She notes, too, that highly intelligent children are usually endowed with more versatility, creativity, logic, empathy, and curiosity and are possessed of a broader range of interests than are their contemporaries. Strang concurs with Terman's findings that the gifted tend also to be above average in strength of physique and in mental and physical health. (41) In brief, to an extent far greater than most, gifted children exemplify the ancient Roman dictum of *Mens sana in corpore sano* – "a sound mind in a sound body."

If personality be considered as the dynamic interrelation of all the predispositions, desires, habits, and values of the individual, then the desirable characteristics attributed to gifted children would logically tend to contribute to the formation of a superior personality. That such is indeed the case was demonstrated by a study of Gertrude Hildreth on 50 gifted children; this group received almost five times as many favorable notations from observers of their personality traits as did the control group. (34)

Learning Characteristics of Gifted Children

Research studies have very often indicated the rapidity with which the gifted learn, as well as their ability to master complex, profound material. Both of these faculties obviously ought to be considered in planning enrichment curriculums. Virgil Ward summarizes other learning characteristics of superior children as follows: (a) accurate perception of social and natural situations, with insight into part-whole relationships; (b) independent learning of fact and principle; (c) superior powers of retention and recall; (d) sensitivity to inferences; (e) spontaneous elevation of immediate observations to higher abstraction planes; (f) association of ideas; (g) discriminatory power; (h) analysis and organization of factors; and (i) critical thinking about self, other persons, and situations. (44) L. M. Terman and M. Oden estimate that about half of the children having IQs of 135 or more have mastered the school curriculum to a point two full grades beyond the one in which they are currently enrolled. (43) Helen Heyl agrees with Terman that learning characteristics of the gifted differ from those of the average only in degree. Both types of pupils learn best from having direct, concrete experiences and from relating desirable or undesirable consequences to their acts; both profit from exercising their abilities and must be motivated in order to learn. (33)

Individual Differences Among the Gifted

Individual differences are as widespread among the gifted as they are in the general population. The IQs of children considered superior range from 120 to more than 200, and that variation in intellectual endowment is reflected in other differences. According to Ruth Strang, gifted children whose IQs approximate 135 usually achieve a better emotional adjustment than do those with IQs of about 165; the latter group normally excels scholastically, however. Besides differing in IQ, these pupils also manifest wide ranges in family background, cultural influences, rates of development, values and goals, and home and school experiences. Some gifted children have well-integrated personalities, which make their behavior predictable; others do not. Thus the gifted as a group are less homogeneous than are children with only average or lower IQs. (41)

Talent and Creativity

Children may be considered as gifted in several areas other than scholastic achievement or general intelligence. Paul Witty urges that the definition of giftedness be broadened to include achievement in one or more lines of valuable human activity. As Witty observes, children gifted in art, music, writing, or social leadership are recognized more readily by their performance than by their IQs. (45)

Talent is a complex product comprised of innate ability plus training, according to Norman Meier, who specifies six components of artistic ability: manual skill, drive, general intelligence, keen perception, creative imagination, and aesthetic judgment. (37) Sidney Pressey thinks that talent is culturally determined. The concentrations of giftedness at certain periods and places, such as painting during the Italian Renaissance or music in eighteenth century Germany, was encouraged by a high degree of popular interest and acclaim in their respective environments. Pressey therefore stresses the importance of developing artistic potentials of the gifted through enrichment. (38)

A high correlation between the components of creativity and the characteristics of the gifted was found by J.P. Guilford, who developed objective measurements for identifying talented persons. According to Guilford, creative thinking involves the following processes: identification, preparation, incubation, illumination, elaboration, and verification. (32a)

Elizabeth Drews believes that creativity consists primarily of great self-confidence, combined with a desire to

understand, discover, and achieve. (25) Abraham Maslow distinguishes between "special-talent" and "self-actualizing" creativeness (36); he agrees with Carl Rogers that the urge to create is an inborn tendency of mankind. (39)

Importance of Early Identification

That the school's identification of children's capacities should begin early and continue systematically throughout their educational careers is the thesis of the Guidance and Counseling Section of the Los Angeles Unified School District. Members of that section maintain that the following advantages accrue from early identification of the gifted: the school may begin early to guide both the child and his parents; the school may provide enrichment calculated to realize the young pupil's innate capacities; by interpreting the child's ability level to him, the school may help him to establish appropriate goals; and acceleration may start early in his educational career. (31)

Techniques for Identification of the Gifted

The variety of approaches used by the schools to discover their gifted students should include observation by parents, teachers, medical advisers, and other professional persons; intelligence and achievement tests; individual study by the school counselor and psychologist; and dated examples of classroom and extracurricular endeavor that indicate the talent of their originators. The intellectually gifted display the following attributes at an earlier age than do other children: (a) walking independently and talking with a large vocabulary; (b) resourcefulness in problem solving; (c) alertness, curiosity, and an eagerness to learn; (d) ability to retain information; (e) desire to read; (f) protracted concentration; (g) an interest in time measurements by clocks and calendars; and (h) above-average physical size and strength.

Children who score high on group intelligence tests should be tested individually by psychologists, who can thus observe facets of the personality dynamics of the student and his reaction to problem solving. Mental ability should be tested at intervals throughout the school years, although test scores may not be directly compatible owing to varying degrees of validity and reliability. While intelligence tests have many limitations and do not measure all facets of ability, they do aid in the discovery of those students who possess a large vocabulary, a high degree of insight, a capacity for abstract thinking, and an aptitude for inductive reasoning.

Paul Witty reports that authorities disagree as to whether children inherit or acquire certain talents and aptitudes. He describes the difficulties inherent in determining the child's degree of artistry or creativity at all stages of growth. The search for such talent is impeded by the following factors: the correlation between talent and general intelligence is not high; artistic children may lack opportunities to develop their ability; as most young children enjoy exploring the creative arts, in the initial stages the average child may perform as well as the gifted; shy, withdrawn children need guidance and a feeling of security before they can perform freely; such talents are best assessed by observing actual performance; and tests do not measure such factors as critical thinking, motivation, determination, and sustention of interest. Witty is also concerned about the discovery and development of talents for leadership, because if such ability is not channeled into worthwhile, constructive activities, it may easily be diverted toward destructive goals. (46)

Cumulative Records

All pertinent information on each student should be recorded in a single cumulative file presenting the following data: standardized test scores; teachers' grades; attendance records; health history; family data; recreational and avocational activities; information on the pupil's attitudes, interests, and behavior patterns; notes on teacher conferences; anecdotal information; and teachers' observations.

In their efforts to develop the potentials of their pupils, teachers need to understand the causes underlying student behavior. Proper implementation of an enrichment program entails a knowledge of the individual motivations, emotions, personal relationships, and environmental factors of the participants. This information is best presented in a cumulative record, which aids in planning a curriculum to include variations in learning opportunities for different children at their several levels of development. (30) The teacher's recorded observation of pupils may indicate tangible evidence of giftedness. In commenting on the preparation of teachers' notes for the pupil profile, Dorothy Barclay emphasizes the significance of colorful language in presenting a realistic picture of the child. (22)

The case study has a fourfold purpose: individualizing children's curriculum experiences, integrating guidance efforts with curriculum, providing materials for teacher education, and extending research in child development. California Project Talent has developed a case study form to facilitate the study of gifted students. That form provides for the following types of information: confidential background data; records of contacts with pupils and parents; health records; test scores; estimates of intellectual functioning; factors affecting physical, social, and emotional development; teacher recommendations and ratings; questionnaires from parents; pupil ratings; dated samples of children's writings; and anecdotal records. (35)

A case study should be initiated as early as possible in the pupil's school career to present a comprehensive, cumulative record of his particular educational needs and achievements. (40)

Whether an intensive and extensive case study be devised or a more informal cumulative record be kept, information on each child should be forwarded from the originating school to the next educational level as the child progresses from the primary grades through college. Gathered from the school, the home, and the pupil himself, information on his giftedness should expedite continuity of his guidance in attaining educational goals consistent with his special aptitudes.

For apportionment purposes under Education Code Section 6426, the State Board of Education has placed responsibility for identifying mentally gifted minors on the administrative head of the individual school district or a district employee designated by the chief administrator. Section 199.11, Title 5, the California Administrative Code, which became effective on December 21, 1967, also provides for a committee to aid in identifying mentally gifted minors. That section of the code reads in part:

> . . . The identification shall be based upon a study made by a committee of all available evidence as to a pupil's general intellectual and scholastic capacity. The committee shall consist of the school principal, a classroom teacher familiar with the school work of the pupil, a qualified school psychologist, and any other person or persons designated by the district employee responsible for making the identification.

To summarize, gifted children are generally superior to their classmates of similar age with respect to mental, physical, social, emotional, and personal characteristics. The wide range in their personal traits disproves the assumption that they comprise a homogeneous group. To a greater degree than other pupils, they possess insights, energy, and emotional stability. Although most gifted pupils may be identified through their IQ scores, those whose abilities lie in art, music, writing, and leadership may be better identified by their individual performance. Creativity and originality are difficult to determine, inasmuch as tests to identify such talent have not been refined and IQ scores do not correlate highly with creativity. Identification procedures should be initiated early in the grade school.

Like educators engaged in other programs for the gifted, personnel of the demonstration center of the Los Angeles Unified School District planned their enrichment activities to equip the pupil to work with abstract concepts, generalize and summarize well, learn independently, concentrate for extended periods, interrelate learnings from various fields, evaluate critically, reason logically, and evolve new ideas.

GENERAL PRINCIPLES OF LEARNING

In implementing programs for the gifted, teachers must apply their knowledge of educational principles to classroom procedures if the goals of enrichment are to be attained. Because basic learning principles are applicable to helping the gifted attain their highest potential, a knowledge of those principles is considered significant for educators who are concerned with the intellectually endowed child. This section, therefore, briefly presents the learning principles that influenced planning for the California Project Talent Demonstration Center in Los Angeles.

Learning Defined

Chiefly a conscious process as shown in Figure 1, learning may be termed a modification in pupil behavior caused by interaction with his environment. The process of learning involves changes in behavior patterns of knowing, understanding, thinking, feeling, valuing, and performing. The student should always be aware that he is learning.

Developmental Learning

Gertrude Hildreth defines developmental learning as an integral phase of child development that occurs concomitantly with the whole growth process and that is characterized by organization, spontaneity, self-initiation, and goal searching. Such learning depends upon maturation within the human organism as well as upon the outside stimuli presented. Society expects each individual to master certain tasks appropriate to his level of maturity at each stage of his development. Underlying those specific tasks are general ones common to all developmental stages that focus upon the achievement of healthy attitudes and accurate assumptions about one's self and one's environment; the development of essential competencies to include physical, intellectual, emotional, and social skills; and the awareness of problems likely to be encountered and methods of resolving them successfully. (51)

Each new learned performance depends upon the acquisition of different patterns of response. For example, the development of skills requires practice; attitudes involve value formulation; understandings suggest some type of rational experience. Because a student begins to learn only when he discovers the inadequacy of his current modes of response to satisfy a conscious need, proper motivation is of the utmost importance. Only when a person cannot meet a felt need with a reflexive, automatic, or habitual response pattern does he begin to reason in attempting to solve his problem. When a situation causes a person to respond emotionally, he acquires such feelings as love, hate,

sympathy, resentment, pity, or admiration. Learning continues throughout life as various needs arise and are fulfilled.

As the learner attempts to maintain himself and achieve his goals, his responses become purposive; they may require the gathering of data or the application of facts, feelings, and sentiments. Such responses, common to all humanity, are referred to as thinking, feeling, and striving, or more technically as the cognitive, affective, and conative dimensions of human behavior. (51)

See Figure 1 for a diagram of the various stages involved in true learning, which results in a permanent change in behavior patterns, as opposed to temporary learning, which is concerned only with the acquisition of easily forgotten facts.

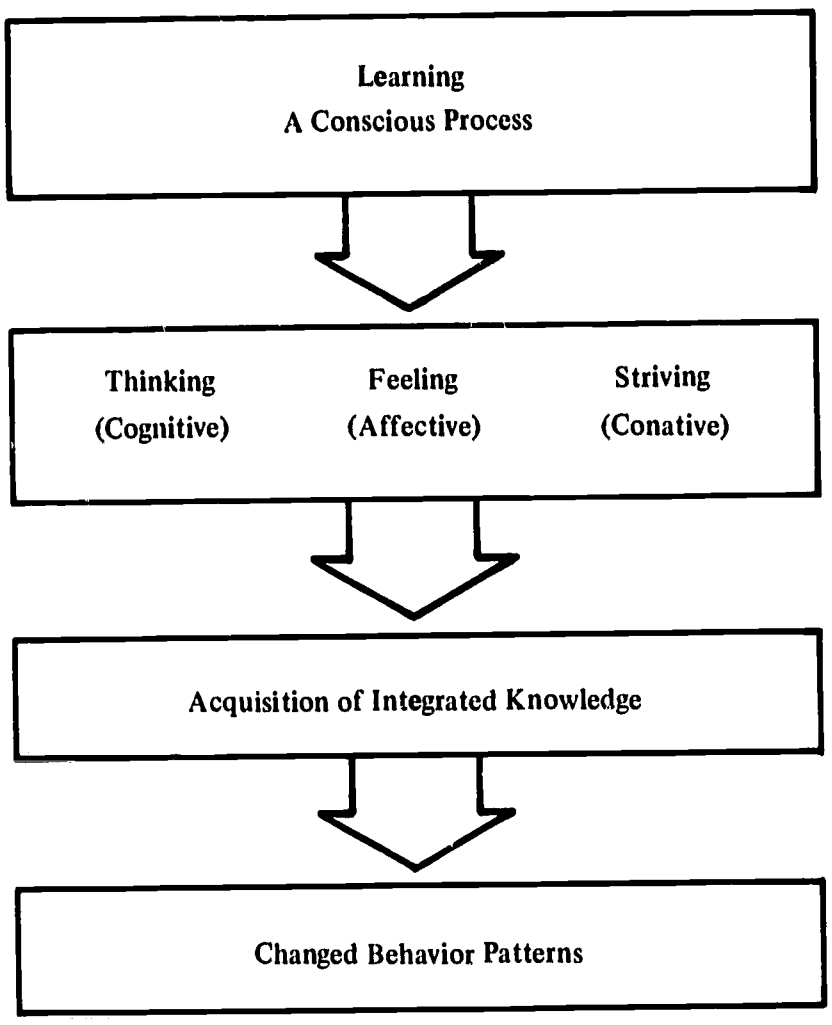


Figure 1. Stages in Permanent Learning

Recognition of Varied Potentials

Vital to the enrichment process is the recognition of and provision for the varied capabilities of the gifted. As previously noted, IQs of such children, varying as they do from 120 to above 180, represent a much wider range than is exhibited on intelligence levels of more average pupils. It is therefore necessary to determine as accurately as possible both the limitations and potentialities of each pupil and to plan his educational experiences accordingly.

Physiological differences among children also affect their learning ability. Inasmuch as increasing knowledge rests in large measure upon sense perception, any defect or loss of sight, hearing, taste, smell, or touch that is unobserved and uncorrected may impoverish the learning process both in quality and in quantity. Because learning depends largely upon the relative perfection of the senses and the general health of the learner, it is incumbent upon teachers to consider the physical attributes of their students in presenting their lessons. Physiological maturity affects the learning processes because, as the organic structures basic to certain skills mature, learning is facilitated; for example, many typing teachers feel that their subject can best be taught after a student reaches the age of fifteen, when his hand-eye coordination has improved to a point beyond that of the younger adolescent. Psychological maturity also influences learning by enhancing certain traits of the student, such as his ability to concentrate on a particular assignment, to tolerate frustration, and to regard with objectivity the introduction of new ideas.

Differences in intelligence levels are significant in determining pupils' learning rates, their interests, and the complexity of the subject matter that they are prepared to absorb. Generally speaking, the higher a person's IQ, the more capably and quickly he can master his assignments. Brighter children tend to solve problems involving concept attainment with rather insightful leaps to solutions, while duller children usually learn more gradually. (56) Significant individual differences in learning, as expressed by perceptual, emotional, cognitive, social, and simple motor behavior, have been reported by J. Kagan and his colleagues (58) and by G. S. Klein. (53) These authorities attribute the variations that they observed to the children's correspondingly different degrees of impulsiveness, attentiveness, and ability to focus on the environment. Effective learning implies integrated progress by the student in achieving his various potentials for intellectual, social, emotional, and physical development.

The Principles of Motivation

An adequate degree of motivation impels, directs, and sustains those activities that result in learning. The student is motivated to absorb information related directly to his own specific needs, interests, and goals. Association with persons who value intellectual competence usually increases motivation for learning. Interest and effort are mutually related as motivating forces; interest that is engendered as the learner identifies with the subject then motivates further effort. Intrinsic motivation arises when the subject matter is in itself meaningful to the learner; in such

instances learning is its own reward. Somewhat less desirable from a learning standpoint is extrinsic motivation, external to the subject and imposed from without; it is related to some form of reward or punishment, such as grades. A common form of motivation lies in making the pupil aware of his progress, which feat the teacher may accomplish by using achievement-measuring devices and other yardsticks in grading pupils' efforts. Only when successes and failures become obvious are students encouraged to understand and correct their errors.

To involve his pupils in the learning situation, the successful teacher relates learning tasks to their individual purposes and experiences. Although competition may prove stimulating, it should be based upon the pupil's own grade record rather than upon rivalry with others; indeed, the argument has been raised that interpupil comparisons may actually impede learning. Kurt Lewin reports that the pleasure attendant upon a pupil's surpassing his own achievement rate adds zest to his learning experiences. (55) In discussing success and recognition relationships, Gordon Allport says that not only does human learning proceed faster when extrinsically motivated by the incentives of praise and other recognition, but also the individual's capacity for learning seems actually to expand. Knowledge of progress, praise, understanding, and other such factors all tend to reinforce prior learning and to motivate further effort. (47)

Effects of Self-structure on Learning Processes

Generally speaking, the child's self-structure determines whether he perceives the learning situation as being unimportant or significant and whether he regards education as posing a threat or a challenge. Arthur Combs writes that a student engages readily in those learning tasks in which he feels competent and which satisfy his needs and purposes; conversely, he shuns those tasks that make him feel inadequate. (48) Whatever devices produce a feeling of adequacy promote learning. (57)

A major determinant of man's perception is his self-concept. In order to promote the level of learning, teachers must study the child's perception of himself, of his immediate environment, and of the world. A student's level of aspiration should be realistic: if that level be too high, it will lead to failure and self-deprecation; if too low, it will lead to wasted opportunities and loss of personal resources.

By establishing attainable goals, the student develops an active mental set and obtains confidence in his abilities to achieve his objectives. To a greater degree than most, gifted pupils possess those personal resources that promote a good mental set; for example, specialized talents, the ability to concentrate, proper study habits, good health, a high level of energy, and the ability to perceive and to organize relationships.

General Types of Learning

As has been previously indicated, learning falls into two categories – associative and cognitive. Associations may be either logical or arbitrary. Memorization, a form of association usually limited to verbal symbols, involves both logical and arbitrary types of learning. Although significant meaning improves memorization, it is not essential thereto. Cognitive learning involves the acquisition of insights, which may be described as the perception of new relationships based on one's knowledge, memories of past experiences, and reasoning powers.

The concept of generalization, though it grew from that of associative thinking, applies also to cognitive learning. Past experiences largely influence patterns of perceptual learning, which is concerned with discriminating objects, time, space, and motion. Inductive reasoning involves the perception of the logical relationships of significant parts of a concept so that certain likenesses upon which to base generalizations are discerned.

Learned modes of thinking, feeling, and acting tend to become habitual; thus the student forms habits which are persistent, uniform, and automatic. A skill is a capability for any type of expert performance requiring continual practice to maintain it. Learning may also be manifested in the form of coordinated movements resulting from certain stimuli, which may be tactile, visual, or kinesthetic. Learning processes normally promote the selection of certain acts to the exclusion or inhibition of others. B. F. Skinner recommends the use of programmed materials in presenting basic elements of course material, inasmuch as that technique requires the rapid repetition of simple responses. (59)

The Transfer Principle

Whether in motor or in verbal learning, "transfer" springs from noting a similarity in contents, techniques, principles, or a combination thereof. Perhaps the most common form of learning transfer is generalization, which is an always deliberate process of observing relationships between learning patterns. To foster appropriate learning transfers, educators should encourage students to look for general principles, study their range of application, seek their relatedness, and organize them into a coherent, consistent frame of reference.

Task Elements of Import to Learning

Factors important to the relative difficulty of performing a task and achieving other types of learning are the following: clarity, primacy, recency, contiguity, vividness or intensity, size, complexity, and familiarity. The clarity of a problem partly determines the amount of effort required to solve it. Primacy influences learning because of the novelty inherent in first experiences. Recent experiences are more vivid than prior ones. Contiguity associates the stimulus with its required response. When motivational or other conditions are intense, learning tends to be firmly fixed, although too much emotion may interfere with the acquisition of complex skills. The smaller the amount of the material to be absorbed, the easier it is learned. If the learner is generally familiar with the subject matter, the complexity of a task or problem may be offset correspondingly.

Principles of Effect and Belonging

According to the principle of effect, the student tends to retain those responses that satisfy his needs and to reject unsuccessful responses. Situations eliciting positive reactions generally produce a continuance of those reactions.

The "belonging" principle was formulated on the basis of verbal learning by Edward L. Thorndike, who pointed out the significance of repetition when the instructor is presenting conjointly various related facts. Thus the principle of belonging resembles that of effect, which depends upon the relevance of stimuli to needs. "Belonging" depends primarily upon attitudes developed from past experience; for example, one expects a second name to follow the first. The principles of both effect and belonging emphasize the inadequacies of sheer contiguity and repetition. (60)

The Principle of Relativity

Gestalt psychologists support the thesis of the principle of relativity that learning in context facilitates psychological assimilation of information, whereas learning isolated facts is much more difficult. The more related the learner's experiences, the more readily are they retained and incorporated into his behavior patterns. The studies of both George Katona (52) and J. P. Guilford (50) indicate the rapidity with which a series of items may be memorized if that series be organized around some general principle, in contrast to the difficulty inherent in trying to learn unrelated facts. The "whole" method of teaching is especially profitable to superior pupils, who are capable of grasping the total pattern. While agreeing on the superiority of the whole-part method of instruction, Wolfgang Köhler (54) and Arthur Gates (49) warn that the method's success depends upon the logical organization of the learning content and the pupil's awareness of the relatedness existing in that content.

The Principle of Frequency

The principle of exercise or frequency dictates that the student must respond repeatedly to the stimuli presented in order to increase his proficiency; hence the desirability of a certain amount of drill in memorizing such material as multiplication tables or foreign language vocabularies. Retention of the information can be improved with repeated practice, the amount of which depends upon the nature of the task, the degree of overlearning desired, and the intelligence and the memory of the learner. To a large degree, mastery also rests on the data's meaningfulness to the student and on his motivation; if these factors are lacking, repetition is to no avail.

The Principle of Distributed Exercise

Adequate use or distributed exercise of a newly acquired response pattern is essential to its permanent retention. This principle, which applies chiefly to learning skills that require practice, depends for its effectiveness on the proper spacing of practice periods and on obtaining the appropriate degree of concentration. The optimum length of the lessons varies with the age, interest, strength, freshness, and stability of the pupils, as well as with the character of the practice involved. By being alert for indications of boredom or fatigue, the teacher may terminate a lesson when it ceases to be fruitful.

The principle of distributed exercise poses two problems: the optimal length for particular practice periods and the most economic interval between practices of a given length. Jost's law reads to the effect that, given associations of equal strength but different length, further practice strengthens the older more than the newer; this law means that additional practice would be more advantageous in strengthening the fixation of a learner's week-old association than of his day-old one. The most appropriate distribution of effort varies with the learning situation at hand.

The Principle of Self-involvement

Another general educational principle is that pupils learn only from their own responses and not from those of others. One learns to think by thinking. In performing his assignments, the pupil should engage in self-activity and maintain an active attitude.

The Plateau Principle

A plateau, or period of no apparent progress, sometimes occurs in the learning curve. Factors that might contribute to a plateau include failure to use the most efficient methods, fatigue, loss of interest, or discouragement. Plateaus typically occur in those types of learning that involve considerable insight or the formation of large response patterns. Plateaus may succeed and precede a period of rapid progress in the skill or learning portrayed in the curve.

The Environmental Principle

The learning process is rendered more difficult by such factors as social disapproval, unfavorable conditions for study, lack of essential tools or resources, time restrictions, and distractions caused by other demands of life, such as the necessity to earn money. A proper environment for learning should include: (a) adequately defined roles to inform the pupils what is expected of them; (b) proper methodology to encourage desired behavior; (c) realistic goals appropriate to the pupils' respective age groups, needs, and abilities; and (d) instruction designed to present information, stimulate thought, guide experiences, and identify relationships. To develop his full potential, the child requires an environment that both stimulates and rewards his assimilation of learning.

Faulty techniques and characteristics of the instructor that may compound learning difficulties include the following: the failure to utilize existing motivation or to increase it; the failure to understand the learner's attitude, viewpoint, ideals, and native capacities; the failure to grasp clearly the teaching objectives of lesson plans – such failure possibly leading to unproductive assignments or "busy work"; ignorance of the learning principles involved; lack of scholarship, which might entail inadequate leadership and possibly also factual errors. Pupil interest in learning may be incited by adjusting materials to his abilities, choosing attractive content, and using a variety of audio-visual aids. A vital facet of the classroom environment is the instructor himself, whose optimism, encouragement, and assistance tend to increase both the effectiveness and permanence of learning.

The Principle of Permanency

A final, significant principle is that learning may be considered permanent although the following two qualifications should be borne in mind: (a) a distinction must be made between genuine learning as opposed to the acquisition of only temporary mental content; and (b) most tests deal with temporary information, which is remembered only briefly, instead of with real changes, which are difficult of measurement. The order of forgetting, which seems fairly well-established, decreases in the following order: (a) nonsense or meaningless material; (b) meaningful data; and (c) motor learning, which persists in the memory the longest. Two types of inhibition – retroactive and associative – interfere with previously learned concepts. Retroactive inhibition refers to the tendency of new learning to block the old and prevent its recall. The more firmly the original learning responses were entrenched, the less the retroaction. Similar to retroactive inhibition is associative inhibition, in which certain concepts formed earlier interfere with ones developed later. Although learning itself can be improved, the power of retention cannot. True learning, which implies real growth change in the pupil, is always permanent. Refer to Figure 1, page 21, for a graphic presentation of the several steps to such learning and its concomitant behavioral changes.

A Résumé of Learning Principles

The following general learning principles influenced the planning of both subject matter content and teaching procedures used in the enrichment program at the Los Angeles Demonstration Center:

- Learning is chiefly a conscious process; the learner should be aware that he has learned.
- The changes caused by true learning become functioning aspects of a developing personality.
- Learning responses involve basic human activity that includes thinking, feeling, and striving – or more technically, the cognitive, affective, and conative dimensions of human behavior.
- Recognition of and provision for the individual capacities of learners are crucial to the learning process because effective learning implies integrated progress toward fulfillment of those capacities.
- Adequate motivation impels, sustains, and directs learning.
- The learner's self-structure affects his learning ability. Personal resources that encourage an active mental set are the ability to recognize and to organize relationships, good study habits, good health, a high energy level, specialized talents, and the time and concentration necessary for mastering a particular task.
- The two types of learning are associative and cognitive, both of which are necessary to shape the course of human growth.

- Transfer of learning is occasioned by similarity of contents, of techniques, of principles, or by a combination thereof.

- Meaningful learning enables the pupil to integrate the various fields of his knowledge. Related learning experiences are retained longer and are incorporated into the learner's behavior more firmly than are unrelated ones.

- The following factors affect the quality of learning: clarity, primacy, recency, contiguity, intensity, size, complexity, and familiarity of the learning task. Several of these conditions may coexist in a particular learning situation.

- According to the principle of effect, a student tends to retain the responses that satisfy his needs and to reject those that do not.

- The more frequently a certain response is repeated in a learning situation, the greater the likelihood that the same response will be evoked by the same situation in the future.

- Adequate use or distributed exercise of a newly acquired pattern of response is essential to make that learning permanent. Learning is more effective when practice periods are properly spaced – neither overly concentrated nor too infrequent.

- Self-activity promotes the learning process.

- The learning curve may contain a plateau, or period of no observable progress.

- Learning is facilitated in an educational environment conducive to the pupil's maximum effectiveness – an environment that stimulates and rewards learning.

LEVELS OF INTELLECTUAL FUNCTIONING

To develop fully the many capacities of the gifted, the teacher should be able accurately to predict the changes in pupil behavior that will result from enrichment experiences. An awareness of the range and the hierarchy of intellectual functions enhances the teacher's skill in measuring the intellectual dimensions of his pupils and in specifying the exact intellectual behaviors to be evoked by his teaching. By directing his classroom presentations toward particular modes of intellectual functioning, the teacher can more confidently estimate the fruits of his endeavors and can alter his methodology, course content, and educational materials in accordance with his varying objectives.

A study on the levels of intellectual functioning of gifted pupils enrolled in the Los Angeles enrichment program facilitated the work of the staff of the demonstration center there in choosing that content and in providing those experiences that would best promote the thinking abilities and other skills of their students. This study was based on the three cognitive patterns delineated in the following works: *The Structure of Intellect Model* by J. P. Guilford and P. R. Merrifield (75); *The Process of Education* by Jerome Bruner (63); and *Taxonomy of Educational Objectives*, edited by Benjamin S. Bloom (76). There follows a discussion of the three basic patterns of cognition and their significance in developing an enrichment program

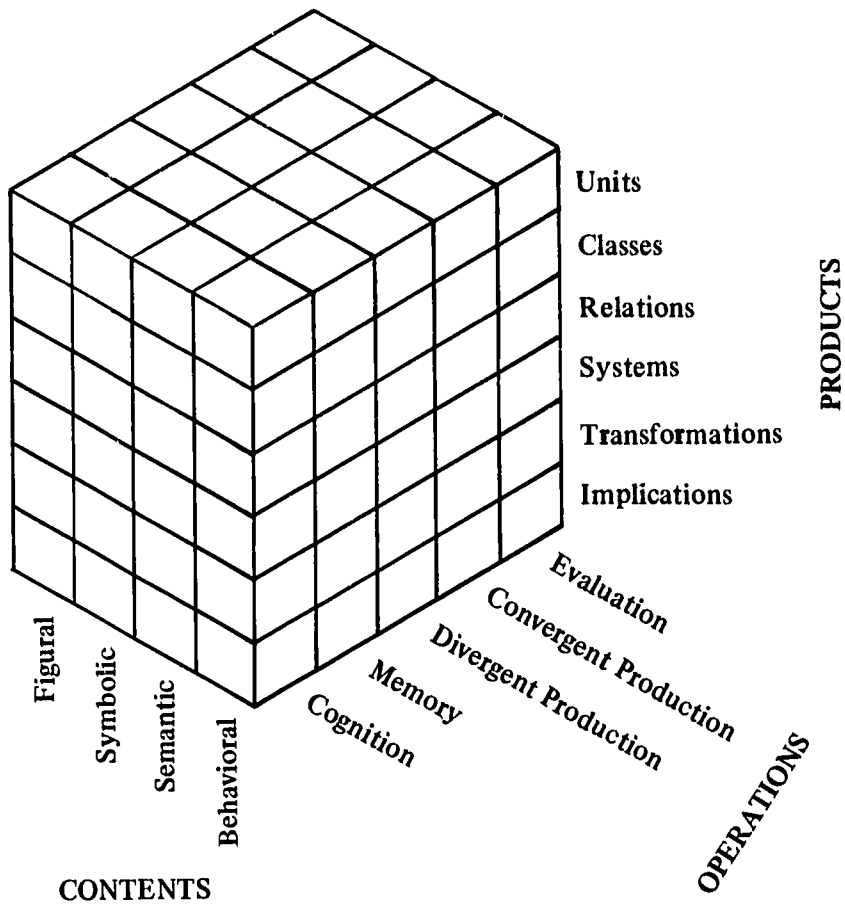


Figure 2. Theoretical Model for the Complete "Structure of Intellect," Department of Psychology, University of Southern California

Classification of the Intellectual Factors

Figure 2 depicts the three-dimensional model evolved by J. P. Guilford to present in a single system a theory on the organization of the various components of the intellect. (32) Called "Structure of Intellect," this morphological model visually represents the classification of the various intellectual factors into one of three major headings entitled operations, contents, and products. Each dimension of the model demonstrates the several modes of

variation involved in those primary intellectual categories. (67, 71, 72, 73, 74) Guilford developed his theory on the components of human intelligence through applying factor analysis to the intercorrelations of many test scores. Although intellectual factors consist of unique abilities, they may be classified according to certain resemblances occurring among them. (75) Guilford found five fundamental factors of operations, four factors of contents, and six factors of products; these he grouped around three dimensions of his model, as shown in Figure 2.

By "operations" Guilford means basic intellectual activities or functions. He defines cognition as "discovery, rediscovery, or recognition of information." The cognitive abilities are basic, providing information without which intellectual performance is impossible. Cognition includes the ability to perform the following: perceive problems and possess a sensitivity to them; know facts and concepts; understand ideas and information; and acquire knowledge. The cognitive factors of intellect include most of the components scored by IQ tests, which normally measure but little ability for divergent thinking or transformation. But learning without retention is useless. Memory, or the retention of that which has been cognized, requires the ability to recall facts, detect meaning and reapply facts, and remember and assimilate any given information.

Two types of productive thinking generate new information from old: divergent and convergent thought. Creativity is largely based on divergent thinking operations, which involve the production of original responses; elaboration on ideas by adding details; foresight; supposition; speculation on alternative approaches; and the fluent and flexible generation of ideas. Convergent thinking, on the other hand, leads to obtaining a single correct answer or best solution, determining logical inevitability, formulating ideas, redefining thoughts by regrouping familiar ideas, and assuming correct attitudes. Transmission of the cultural heritage, based as it is on providing conventional answers to problems, requires thinking of the convergent type. By evaluation is meant those thought processes that lead to decisions regarding the correctness, aptness, adequacy, or excellence of the conclusions derived from information recalled or produced by other intellectual operations. (66, 68) The self-criticism essential to the creative thinker requires evaluative abilities of a high order.

A second method of classifying or grouping intellectual factors is according to the respective content or materials involved (69), as indicated in Figure 2. Figural material, which includes things heard, felt, or seen, has various properties of size, shape, color, texture, and location. Letters, digits, and other such conventional signs comprise symbolic content, whereas semantic content is presented in the form of verbal ideas or meanings. Essentially nonverbal in nature, behavioral content is concerned with human interactions involving empathy or awareness of the attitudes, needs, desires, moods, intentions, perceptions, and thoughts of other persons and of ourselves.

The ability to cognize figural units may be tested by requesting the student to recognize figures or pictures of objects, parts of which have been blotted out, as in the Street Gestalt completion test. The ability to cognize symbolic units is measured by having the student replace the vowels in words as in the "Disemvoweled Words" test or to rearrange jumbled letters to form a word as in the "Scrambled Words" test. A straight vocabulary examination best rates the factor of verbal comprehension, which represents the ability to cognize semantic units. This ability to acquire verbal concepts usually dominates the IQ test for verbal intelligence and correlates highly with academic grades. In measuring a student's ability to cognize classes of figures, symbols, and meanings, the tester presents a series of four figures, letter groups, or names of objects, respectively, and requests the pupil to indicate which particular unit in each series is not a member of the class. Factors in the other types of intellectual operations besides cognition may also be categorized as being figural, symbolic, or semantic.

When one of the five kinds of operations is applied to a certain type of content, the resulting product must emerge as one of six general classifications (70), as shown in Figure 2. Units consist of relatively circumscribed items of information, which may be grouped together in sets of data according to their common properties to provide certain conceptions or classes. Relations are recognized connections among units of information containing common variables or points of contact. Systems are composed of structured or organized aggregates of data. Guilford termed transformations as various changes in known information or in its use. Implications are comprised of extrapolations of information in the form of predictions, consequences, or expectancies.

In the opinion of such an authority as Maurice Freehill (65), Guilford's work in defining intellectual components, selecting test forms related to each component, and organizing the components into a theoretical structure descriptive of levels should lead to improved educational practices.

Guilford points out that each intellectual factor in his model provides a particular educational goal. Each such goal, as defined by a certain combination of content, operation, and product, requires a certain kind of practice. For example, classroom lessons devoted to increasing knowledge and understanding develop the learner's cognitive ability; lessons requiring recall improve his memory; lessons challenging the pupil to synthesize develop his

convergent thinking ability; lessons stimulating the formation of original responses and speculations promote divergent thinking; and lessons demanding judgments based on a sense of values require evaluative types of thought. (77)

The model of the "Structure of Intellect" challenges educators so to organize their curriculum and so to differentiate their methodology as to develop each intellectual factor, at least to some extent, in each of their students.

Significance of Bruner's Observations on the Stages of Learning

To comprehend the structure of a subject is to understand it in relation to other subjects, according to Jerome Bruner (63); therefore understanding structure forms the core of the transfer of learning. Bruner regards transfer as the first objective of any educational activity, because he feels that any learning should be useful in the future through its specific applicability to similar tasks. Through the transfer of principles and attitudes, too, all subject matter should be applicable to material yet to be learned.

Bruner indicates that the act of learning seems to involve three almost simultaneous processes: acquisition, transformation, and evaluation of subject content. In acquiring new information, the pupil may learn facts that contradict or replace material previously derived from persons, books, films, records, or personal observation. During this stage the learner may accurately and systematically refine facts, truths, and principles earlier acquired and may accumulate details in depth and breadth. During this stage, too, the pupil comprehends the relation of facts to other learnings.

The second stage of learning – transformation – comprises the methods with which the pupils deal with information in order to transcend it. Such methods may include interpreting, translating, composing, interpolating, extrapolating, remembering, transferring, changing, organizing, manipulating, applying, and analyzing.

Evaluation or critical thinking involves the formation of value judgments by assessing, selecting, deciding, comparing, contrasting, and appraising. Bruner theorizes that the proper assimilation of any subject is usually accompanied by a series of episodes, each of which utilizes all three processes of acquiring, transforming, and evaluating knowledge.

Intuition may be equated with the intellectual technique of reaching plausible but tentative conclusions without first analyzing the validity of the formulations from which those conclusions were derived. Intuitive thought thus involves hunches, guesses, hypotheses, and leaps to conclusions. When thinking intuitively, the learner arrives at an answer with little or no awareness of the thought processes in which he is engaged. Usually, therefore, intuition occurs only when the learner is familiar with the general area and structure of the subject content concerned. The development of intellectual self-confidence in the pupil encourages him to think intuitively.

Bruner states that the best single stimulus to learning is the interest inherent in the subject matter. Such interest is engendered as pupils expand their knowledge of course content, clarify it, and give it personal significance. Although direct experiences may develop interest, vicarious experiences, provided through use of such devices as models, automation, and dramatization, are also valuable. (62)

A learner's intellectual power is enhanced by organizing isolated information gained from a series of episodes into a systematic framework of knowledge, according to Bruner. (61) Intellectual growth also depends upon two other forms of competence, representation and integration. Representation involves the ability to record the many recurring regularities in the environment; and integration represents the ability to transcend momentary events by linking the past and present with the future. Bruner comments that intellectual growth is irregular, moving in spurts with the adoption of different ways of responding, looking, and translating into language the various aspects of the environment. (63)

Bloom's Classification of Educational Aims

In editing his *Taxonomy of Educational Objectives – Handbook I: Cognitive Domain,* Benjamin S. Bloom uses the term "cognition" in a much broader sense than Guilford to include the processes of creating, remembering, thinking, and problem solving. As treated by Bloom, the "cognitive domain" deals with the development of intellectual abilities arranged in a hierarchy, with each classification of skills demanding a mastery of those in the level below. (76)

The particular significance of Bloom's *Taxonomy* to the enrichment program evolved in Los Angeles lay in its adaptability to the objectives of intellectual functioning in the scientific area. In planning the levels of learning opportunities in their unit on scientific discovery, methodology, and investigation, staff members of the demonstration center utilized the six major classes of the *Taxonomy:* knowledge, comprehension, application, analysis, synthesis, and evaluation. (For a discussion of these classes, the reader is referred to the condensed version of the *Taxonomy of Educational Objectives* included as an appendix to *Handbook I.*) The *Taxonomy* outlines the progression of thought

processes and clarifies the definitions of intellectual functions, thus aiding the teacher in selecting specific learning experiences for his pupils.

William Connell suggests specific uses for the levels of intellectual functioning in constructing a school syllabus or test from the definitions, descriptions, and illustrations contained in the *Taxonomy*. He says that instruction and examination procedures have heretofore emphasized the first three levels of educational objectives – knowledge, comprehension, and application – at the expense of the latter three levels, and that educators have yet to exploit properly the methods of analysis, synthesis, and evaluation. These latter intellectual abilities distinguish a truly educated man from one who is merely knowledgeable, according to Connell, who says that the possession of these three skills represents the beginning of wisdom. (64)

Knowledge of the classifications of educational objectives aids in preparing long-range curriculum plans as well as in formulating objectives for specific lessons. Decision makers at the Los Angeles center considered the levels of intellectual functions in curriculum building, specifying different levels of thinking in daily lessons, observing classroom activities, and evaluating pupil attainment.

THE LOGIC AND SEQUENCE OF SUBJECT MATTER

A consideration of the logic and sequence of subject matter is vital to assist educators in choosing objectives, organizing learning experiences, selecting materials, and planning course content for both the gifted in enrichment classes and their instructors in teacher education programs.

Importance of Structuring Course Content

In discussing curricular needs, George Denemark encourages educators to focus upon identifying the fundamental ideas, concepts, and principles afforded by the different subject matter areas. (79) He agrees with Harold Shane (81) and Ralph Tyler (84) on the significance of curriculum planning based on the interrelationships between the various fields of knowledge. In a foreword on children's literature, Shane says that this field requires a specialized, encyclopedic knowledge, because literature is interrelated to the many areas of sciences, social sciences, mathematics, and language arts. (81) John Goodlad advocates that instead of concentrating upon definite curricular content, teachers should identify the generalizations, principles, and theories around which to organize specific content. (80) Philip Phenix writes that the good instructor deliberately highlights certain basic concepts distinctive to the discipline under consideration. (82)

One reason for the current trend to examine closely the content and structure of subject matter fields is that the recent fantastic growth in many areas of knowledge renders impossible the task of assimilating all pertinent information; hence teachers must confine course content to identifying basic principles. Another reason for this trend is the recent sharpening of concern with creativity and productive thinking, which development has stimulated teachers so to present their lessons as to promote advanced thought processes in their classes. Teachers cannot encourage increased creativity in the classroom without themselves increasing their concern for the structure of the subject matter content. (83)

Besides the immediate satisfaction to the learner, the first object of any study is to accelerate future learning. Lesson activities should be planned in such a manner that they are specifically applicable to similar tasks to be presented later in direct extension of habits and associations; those activities should also provide for indirect or nonspecific transfer of training, which usually does not involve a skill but rather a generality that may serve as a basis for recognizing subsequent solutions to problems. The mastery of basic principles deepens the student's knowledge of how best to approach subsequent learning assignments.

According to Jerome Bruner, the following four advantages adhere to the teaching of a subject's fundamental structure:

- A subject is more comprehensible when fundamentals are understood.
- Details are more easily remembered when they are placed into a structural pattern.
- An understanding of information presented as an example of a generality provides a model for understanding similar instances in the future.
- The continual reexamination of material taught to determine its fundamental character enables the student to narrow the gap in progressive stages of learning.

Bruner concludes that courses of study should be based on the underlying principles that give structure to a subject. (78)

Selection of Subject Matter for Enrichment

Contracts negotiated with the Cooperative Research Branch of the Office of Education, U.S. Department of Health, Education and Welfare, provided for enrichment opportunities for gifted pupils of the Los Angeles school

system in the areas of creative expression, critical appreciation, and scientific investigation. Chapter IV of this publication describes the particular subject matter selected for the program. In organizing appropriate courses of study, educators of the demonstration center considered the fund of organized knowledge in their respective fields as well as the other factors discussed in this chapter. Subject area specialists assisted in selecting learning experiences, which were based on levels of difficulty, as well as on spatial, chronological, and psychological factors. Curriculum planners emphasized the structure, form, and sequence of subject matter.

SUMMARY

This chapter considers the significant sources of data which serve as a foundation for building any curricular program and which proved especially helpful to authorities concerned with enrichment for the gifted. A consideration of the nature of society is significant in formulating enrichment programs in that educational objectives should reflect both the needs of the gifted individual and the society in which he lives. A knowledge of the functions of the school as a social agency and of the universal needs of the citizenry who established the school is essential to fulfilling those needs. The fields of sociology and psychology contribute information necessary to planning for both individual and group instruction.

The gifted learners themselves afford a valuable source of data, because educators must consider their pupils' wide variances in individual characteristics if those pupils' capacities are to be fully realized. Another *sine qua non* to enrichment planners is a knowledge of the general educational principles underlying the intelligent guidance of all classroom work. Levels of intellectual functioning are also significant for enrichment, because courses offered to the gifted must challenge all intellectual dimensions. Finally, curriculum planners are enabled to structure their courses logically by a thorough knowledge of the particular subject matter involved. Thus the task of educators in planning enrichment on a rational basis is facilitated by consulting all appropriate data sources.

Selected References

The Nature of the Environment

1. *The Changing American School.* Sixty-fifth Yearbook of the National Society for the Study of Education, Part II. Edited by John I. Goodlad. Chicago: University of Chicago Press, 1966.
2. Drummond, Harold D. "Growing Up in America," *Educational Leadership,* XXI (April, 1964), 419-22, 455.
3. Miller, Richard I. "Education in a Changing Society," in *Project on the Instructional Program of the Public Schools.* Washington, D.C.: National Education Association [1964].

Sociopsychological Implications of Enrichment

4. Ambrose, Edna, and Alice Miel. *Children's Social Learning; Implications of Research and Expert Study.* Washington, D.C.: Association for Supervision and Curriculum Development, 1958.
5. Ronsall, Marcella Ryser. "The Significance of the Gifted Child in the Elementary School," in *The Gifted Child in the Elementary School.* Twenty-sixth Yearbook of the California Elementary School Administrators Association. Edited by E. Polhemus. Oakland, Calif.: California Elementary School Administrators Association, F. B. Zimmerman, and Tompkins School, 1954.
6. Bruner, J. S., and Leo Postman. "Symbolic Value as an Organizing Factor in Perception," *Journal of Social Psychology,* XXVII (1948), 203-8.
7. *A Conference on Research on the Education of Gifted Children.* Compiled by James J. Gallagher. Urbana, Ill.: University of Illinois, 1963.
8. Flanders, Ned. "Teacher and Classroom Influences and Individual Learning," in *Nurturing Individual Potential.* Curriculum Research Institute, 1961-62. Washington, D.C.: Association for Supervision and Curriculum Development [1964].
9. Fromm, Erich. *The Sane Society.* New York: Holt, Rinehart & Winston, Inc., 1955.
10. Getzels, Jacob. "Social Values and Individual Motives: The Dilemma of the Gifted," in *Psychology and Education of the Gifted.* Edited by Walter B. Barbe. New York: Appleton-Century-Crofts, 1965.
11. Getzels, Jacob, and Herbert Thelen. "The Classroom Group as a Unique Social System," in *The Dynamics of Instructional Groups: Sociopsychological Aspects of Teaching and Learning.* Fifty-ninth Yearbook, Part II. Edited by Nelson B. Henry. Chicago: National Society for the Study of Education, 1960.

12. Giles, H. Harry. *Human Dynamics and Human Relations Education.* New York: New York University Press, 1954.

13. Guilford, J. P. *A Revised Structure of Intellect: Studies of Aptitudes of High-Level Personnel.* Reports from the Psychological Laboratory, No. 19. Los Angeles: University of Southern California, 1957.

14. *Individualizing Instruction.* Yearbook, 1964. Edited by Ronald C. Doll. Washington, D.C.: Association for Supervision and Curriculum Development and National Education Association, 1964.

15. Kelley, Earl C., and Marie I. Rasey. *Education and the Nature of Man.* New York: Harper & Brothers, 1952.

16. Kneller, George F. *Existentialism and Education.* New York: Philosophical Library, Inc., 1958.

17. *Nurturing Individual Potential.* Edited by A. Harry Passow. Washington, D.C.: Association for Supervision and Curriculum Development, 1964.

18. *Perceiving, Behaving, Becoming: A New Focus for Education.* Yearbook, 1962. Edited by Arthur W. Combs. Washington, D.C.: Association for Supervision and Curriculum Development and the National Education Association, 1962.

19. Rogers, Carl R. *On Becoming a Person: A Therapist's View of of Psychotherapy.* Boston: Houghton Mifflin Co., 1961.

20. *Toward a General Theory of Action.* Edited by Talcott Parsons and Edward A. Shils. Cambridge, Mass.: Harvard University Press, 1951.

21. Trow, William C., and Others. "Psychology of Group Behavior: The Class as a Group," *Journal of Educational Psychology,* XLI (1950), 322-38.

Characteristics of Gifted Learners

22. Barclay, Dorothy. "Child-Watching for Child Understanding," *The New York Times Magazine* (March 22, 1959), 56.

23. Brown, Spencer. "How Educate the Gifted Child?" *Commentary Magazine,* XXI (June, 1956), 532-41.

24. DeHaan, Robert F., and Robert J. Havighurst. *Educating Gifted Children.* Chicago: University of Chicago Press, 1961.

25. Drews, Elizabeth. "Are Intelligence and Talent the Same?" *NEA Journal,* L (January, 1961), 40-41.

26. *Education of the Gifted.* Educational Policies Commission. Washington, D.C.: National Education Association and the American Association of School Administrators, 1950.

27. *Education of Intellectually Gifted Pupils in Los Angeles City Schools.* Committee on Education of Intellectually Gifted Pupils. Los Angeles: Los Angeles Unified School District, May, 1962.

28. Gallagher, James J. *The Gifted Child in the Elementary School.* Department of Classroom Teachers, American Educational Research Association, NEA. Washington, D.C.: National Education Association, 1959.

29. *The Gifted Child.* American Association for Gifted Children. Edited by Paul Witty. Boston: D. C. Heath & Co., 1951.

30. *Guidance in the Curriculum.* Yearbook, 1955. Prepared by C. M. Low. Washington, D.C.: Association for Supervision and Curriculum Development and National Education Association, 1955.

31. *Guidance of Gifted Pupils.* Division of Elementary Education, Guidance and Counseling Section. Los Angeles: Los Angeles Unified School District, May, 1961.

32. Guilford, J. P. "Creativity," *American Psychologist,* V (September, 1950), 444-54.

32a. Guilford, J. P. "Creativity: Its Measurement and Development." Address presented in Sacramento to educators of Sacramento County, January 20, 1959. Sacramento: Office of the Sacramento County Superintendent of Schools.

32b. Guilford, J. P. *Personality.* New York: McGraw-Hill Book Company, 1959.

33. Heyl, Helen. "Learning Characteristics and Problems of Gifted Children," in *Educating the Academically Able: A Book of Readings.* Edited by Lester D. Crow and Alice Crow. New York: David McKay Co., Inc., 1963.

34. Hildreth, Gertrude. "Characteristics of Young Gifted Children," *Pedagogical Seminary and Journal of Genetic Psychology*, LIII (December, 1938), 287-311.

35. *Identification Case Study*. California Project Talent. Sacramento: California State Department of Education, 1964.

36. Maslow, Abraham. *Motivation and Personality*. New York: Harper & Row Pubs., 1954.

37. Meier, Norman. *Art in Human Affairs: An Introduction to the Psychology of Art*. New York: McGraw-Hill Book Company, 1942.

38. Pressey, Sidney. "Concerning the Nature and Nurture of Genius," *The Scientific Monthly*, LXXXI (September, 1955), 123-29.

39. Rogers, Carl R. See entry number 19.

40. *The School Psychologist and the Education of Gifted Children*. Gifted Child Committee of the California Association of School Psychologists and Psychometrists. Sacramento: California State Department of Education, 1962.

41. Strang, Ruth M. *Helping Your Gifted Child*. New York: E. P. Dutton & Co., Inc., 1960.

42. Terman, L. M., and M. Oden. *The Gifted Child Grows Up: Twenty-five Years' Follow-up of a Superior Group*. Palo Alto, Calif.: Stanford University Press, 1947.

43. Terman, L. M., and M. Oden. "The Stanford Studies of the Gifted," in *The Gifted Child*. Edited by Paul A. Witty. Boston: D. C. Heath & Co., 1951.

44. Ward, Virgil. *Educating the Gifted: An Axiomatic Approach*. Columbus, Ohio: Charles E. Merrill Books, Inc., 1961.

45. Witty, Paul. *Helping the Gifted Child*. Chicago: Science Research Associates, 1952.

46. Witty, Paul. "Who Are the Gifted?" in *Education for the Gifted*. Fifty-seventh Yearbook of the National Society for the Study of Education, Part II. Edited by N. B. Henry. Chicago: University of Chicago Press, 1958.

General Principles of Learning

47. Allport, Gordon W. "The Ego in Contemporary Psychology," *Psychological Review*, L (September, 1943), 451-78.

48. Combs, Arthur. "Intelligence from a Perceptual Point of View," *The Journal of Abnormal and Social Psychology*, XLVII (1952), 662-73.

49. Gates, Arthur I., and Others. *Educational Psychology*. New York: Macmillan Co., 1942.

50. Guilford, J. P. "The Role of Form in Learning," *Journal of Experimental Psychology*, X (1927), 415-23.

51. Hildreth, Gertrude. *Child Growth Through Education: Effective Teaching in the Modern School*. New York: Ronald Press Company, 1948.

52. Katona, George. *Organizing and Memorizing; Studies in the Psychology of Learning and Teaching*. New York: Columbia University Press, 1940.

53. Klein, G. S. "The Personal World Through Perception," in *Perception: An Approach to Personality*, by R. R. Blake and Others. New York: Ronald Press Company, 1951.

54. Köhler, Wolfgang. "Gestalt Psychology Today," *American Psychologist*, XIV (1959), 727-34.

55. Lewin, Kurt. "Field Theory and Learning," in *The Psychology of Learning*. Forty-first Yearbook of the National Society for the Study of Education, Part II. Chicago: University of Chicago Press, 1942.

56. Osler, Sonia F., and Myrna W. Fivel. "Concept Attainment: I, The Role of Age and Intelligence in Concept Attainment by Induction," *Journal of Experimental Psychology*, LXIII (1961), 1-8.

57. *Perceiving, Behaving, Becoming: A New Focus for Education*. See entry number 18.

58. "The Psychological Significance of Styles of Conceptualization," in *Basic Cognitive Processes in Children*. Monograph of the Society for Research in Child Development. Edited by Jerome Kagan and Others. Lafayette, Ind.: Child Development Publications, 1963.

59. Skinner, B. F."The Science of Learning and the Art of Teaching," *Harvard Educational Review,* XXIV (1954), 86-97.

60. Thorndike, E. L. *Fundamentals of Learning.* New York: Teachers College Press, Columbia University, 1932.

Levels of Intellectual Functioning

61. Bruner, Jerome S. "The Act of Discovery," *Harvard Educational Review,* XXXI (Winter, 1961), 21-32.

62. Bruner, Jerome S. "The Course of Cognitive Growth," *American Psychologist,* XIX (January, 1964), 1-15.

63. Bruner, Jerome S. *The Process of Education.* Cambridge, Mass.: Harvard University Press, 1960. Also, paperback – New York: Vintage Books, 1963.

64. Connell, William. "Excellence in General Education," *School Review,* LXVII (Winter, 1959), 375-86.

65. Freehill, Maurice F. *Gifted Children: Their Psychology and Education.* New York: Macmillan Co., 1961.

66. Guilford, J. P. "Basic Conceptual Problems in the Psychology of Thinking," *Annals of the New York Academy of Sciences,* XCI (December, 1960), 6-21.

67. Guilford, J. P. "Creative Abilities in the Arts," *Psychological Review,* LXIV (1957), 110-18.

68. Guilford, J. P. "Factorial Angles to Psychology," *Psychological Review,* LXVIII (1961), 1-20.

69. Guilford, J. P. *"Human Abilities in Education," California Journal for Instructional Improvement,* I (December, 1958), 3-7.

70. Guilford, J. P. "The Relation of Intellectual Factors to Creative Thinking in Science," in *Research Conference on the Identification of Creative Scientific Talent.* Principal investigator, Calvin W. Taylor. Salt Lake City: University of Utah, 1956.

71. Guilford, J. P. "Some Recent Findings on Thinking Abilities and Their Implications," *Bulletin of the National Association of Secondary-School Principals,* XXXVII (November, 1953), 1-13.

72. Guilford, J. P. "The Structure of Intellect," *Psychological Bulletin,* LIII (1956), 267-93.

73. Guilford, J. P. "Three Faces of Intellect," *American Psychologist,* XIV (August, 1959), 469-79.

74. Guilford, J. P. "Traits of Creativity," in *Creativity and Its Cultivation.* Edited by H. H. Anderson. New York: Harper & Brothers, 1959.

75. Guilford, J. P., and P. R. Merrifield. *The Structure of Intellect Model: Its Uses and Implications.* Reports from the Psychological Laboratory, No. 24. Los Angeles: University of Southern California, 1960. The material in this work is amplified and extended in J. P. Guilford's *The Nature of Human Intelligence.* New York: McGraw-Hill Book Company, 1967.

76. *Taxonomy of Educational Objectives: The Classification of Educational Goals – Handbook I: Cognitive Domain.* Edited by Benjamin S. Bloom. New York: David McKay Co., Inc., 1956.

77. *Teaching Gifted Students: A Book of Readings.* Edited by James J. Gallagher. Boston: Allyn & Bacon, Inc., 1965.

The Logic and Sequence of Subject Matter

78. Bruner, Jerome S. See entry number 63.

79. Denemark, George. "The Curriculum Challenge of Our Times," *NEA Journal,* L (December, 1961), 12-14.

80. Goodlad, John I. "Changing Curriculum of America's Schools," *Saturday Review,* XLVI (November 16,1963), 65-67.

81. Huck, Charlotte S., and Doris A. Young. *Children's Literature in the Elementary School.* New York: Holt, Rinehart & Winston, Inc., 1961. (Foreword by Harold Shane.)

82. Phenix, Philip H. *Realms of Meaning: A Philosophy of the Curriculum for General Education.* New York: McGraw-Hill Book Company, 1964.

83. *Teaching Gifted Students: A Book of Readings.* See entry number 77.

84. Tyler, Ralph. "The Interrelationship of Knowledge," *The National Elementary Principal,* XLIII (February, 1964), 13-21.

Chapter III
Objectives of Enrichment

The ultimate aim of all education is to endow the student with the knowledge, attitudes, and skills requisite to enable him to achieve personal satisfaction and to function in the various areas of his life to the fullest extent of his ability. That broad framework presents a spectrum of possibilities from which to select more specific objectives; it also complicates the problem of the enrichment specialist in choosing appropriate goals.

GUIDELINES FOR IDENTIFYING OBJECTIVES

In formulating enrichment aims, educators should be guided by studies of the characteristics of the learners involved and the trends in contemporary society, both of which factors indicate possible directions and emphases for the statement of objectives. Goals are more readily defined when planners are properly informed of the interests and concerns of the gifted. In identifying appropriate objectives, personnel who use such data sources as the student and his environment should make painstaking analyses and careful interpretations, according to Ralph W. Tyler. He says that such information helps to formulate objectives only when planners extract present societal conditions for comparison with the more favorable conditions projected for the future. (15)[1]

Also germane to establishing objectives are the following factors: the varied nature of the school population, the availability of learning opportunities outside the school, societal pressures affecting the school, and the socio-economic differences manifest within and among the communities concerned. (6)

Ruth Cunningham and others mention the importance of group dynamics in choosing educational aims. Because instruction normally occurs in a group setting, which strongly affects learning, educators should study the characteristics of classroom groups for information on which to base their specific instructional goals. (4)

In summarizing a report on outcomes in elementary education, Nolan C. Kearney discusses the role of subject matter specialists in determining objectives. Besides serving as resource persons, specialists also contribute information from their respective fields. (10)

E. Paul Torrance urges that teaching goals be revised to include fuller emphasis on thinking processes and their effect on creativity. He lists the following types of thinking as essential to creativity: critical, constructive, independent, logical, liberal, and analytical thought. (14) As early as 1924, Henry S. Pritchett also stressed the value of thinking ability when he wrote that teachers involved in liberal education were unduly devoted to imparting knowledge at the expense of training the mind. Considering the school primarily as an intellectual agency, Pritchett said that its teachings best serve society when they inculcate the ability to reason logically. (12)

To assist educators in delineating their instructional purposes, Ralph Tyler poses three questions: (a) How may such objectives be identified? (b) How can a teacher make appropriate choices from among the many possible objectives? and (c) Who is responsible for formulating objectives? (2)

In formulating the aims of its program, the staff of the Enrichment Demonstration Center of Los Angeles concerned itself first with determining the sources from which to elect objectives; second, with choosing those objectives; and third, with validating the objectives in terms of their applicability in fulfilling the fundamental needs of its gifted pupils. Influencing the staff's decisions at each stage of the planning were the twin considerations of feasibility and desirability of enrichment goals for every age level represented in the school population.

The basic purpose of the Enrichment Demonstration Center was to develop completely each pupil's potential. Sources of data used to select particular goals from the plethora of possible ones included the fund of organized knowledge, the principles of learning, and the levels of intellectual functioning.

To match their aims with the needs of their students, educators of the Los Angeles center considered both the maturity levels of the gifted children involved and the major psychological precepts relating to growth sequence

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

and learning readiness. The resulting objectives portrayed both the behavioral changes desired and the course content chosen to elicit those changes in order to guide teachers in planning and to aid in evaluating.

SELECTION OF OBJECTIVES

Meeting in 1960, the President's Commission on National Goals identified 15 major problems to be solved in the following decade. Central to all those problems was the single objective of the optimal development of the individual. The introduction to the Commission's report began: "The paramount goal of the United States was set long ago. It is to guard the rights of the individual, to ensure his development, and to enlarge his opportunity." (3) In discussing that report, Francis S. Chase also advocates objectives committed to the maximum development of each pupil. Educational objectives should include provisions for imparting a large body of organized knowledge in each of the major disciplines, together with motivation for the continuance of learning. In Chase's opinion, teachers should provide sufficient differentiation in approaches to learning to correspond to individual differences in ability, values, and motivations. Learning should be paced by allotting time for individual learning through reading, through the use of self-teaching devices, and through participation in self-directed activities in laboratories or workshops. Chase also believes that the teacher should inculcate the talented student with the social obligation to contribute to the welfare of mankind. (3)

Basic to determining educational goals are the following value assumptions: (a) respect for the worth of the individual; (b) equality of opportunity; (c) acceptance of variability; (d) faith in man's ability to reason logically; (e) shared responsibility for the common good; and (f) respect for spiritual values and ethical standards. (13)

Francis Horn enumerates four long-range instructional aims: (a) teaching the child to accept change as normal and inevitable and easing his adaptation to change without fear or frustration; (b) inculcating in the child a sense of independence on which to build a firm educational foundation together with an enthusiasm for further learning; (c) implanting in the child a respect for the intellectual life and an appreciation of the role of knowledge in illuminating and enriching his life; and (d) instilling in the child enduring values. Perhaps to a greater extent than any other does the educational profession offer its practitioners the opportunity to contribute significantly to the individual and to society, according to Horn. He adds that those teachers who best visualize the significance of their long-range objectives derive the most satisfaction from their work. (9)

In analyzing the developmental tasks mastered at progressive stages of maturity, Robert Havighurst illustrates how the child's motivations and maturation combine with the demands of society to set tasks that may properly be termed educational objectives. Based both on the learner's growth patterns and on environmental factors, developmental tasks arise at a specific period in life. When successfully completed, they lead to personal happiness and to future success with similar tasks; conversely, failure to accomplish developmental tasks at the proper time leads to individual unhappiness, social disapproval, and difficulty with later tasks. An example of such a task is learning to talk. When speech habits are not successfully initiated at the usual age of between one and two years, the child has difficulty in learning to speak later in life; indeed, he may never properly master the art of speech. (7)

Havighurst's concept of developmental tasks helps to establish objectives because such tasks, set by society and accomplished largely through the school, aid the pupil in achieving some of his personal goals. The concept also stresses the proper timing of educational efforts to correspond to the child's maturational level. According to Havighurst, the teachable moment for a particular topic has come when the physical organism is prepared to master it, when social pressures require its introduction, and when the child is properly motivated. (8)

Although the prime objectives for educating gifted pupils roughly correspond to those for other children, certain specific goals pertain largely to the gifted. A report of a conference held in 1961 on the Project on the Academically Talented Student recognized the following six objectives as being peculiarly appropriate to teachers of gifted children: (a) encouraging independent study; (b) providing efficient learning techniques; (c) orienting pupils in methods of research and problem solving; (d) developing special talents; (e) encouraging creativity and concern for humanity; and (f) developing communication skills. (5)

Listed as pupil objectives of enrichment were: (a) developing intellectual curiosity by searching for new relationships rather than by acquiring mere factual knowledge; (b) performing research properly; (c) applying a wide range of facts and principles in solving life's problems; (d) gaining skill in objective self-evaluation; (e) developing critical thinking, a feeling for truth, and open-mindedness by suspending judgment; (f) realizing the responsibilities as well as the power of knowledge; (g) developing leadership by gaining poise, respect for others, and skill in group dynamics; (h) encouraging creativity; (i) sensing the implications of change; (j) perfecting skills in communication; and (k) developing an awareness of the realities of the present, the heritage from the past, and a vision of the future from which to synthesize an overview of the continuing stream of man's ideas and aspirations. (1)

In formulating objectives, enrichment planners should consider the needs both of society and of the individual. Involving pupils in determining possible enrichment aims may provide teachers with insights into their pupils' value systems; joint planning of instructional purposes may also improve pupil motivation and assist teachers in lesson planning.

A statement of long-range objectives should precede that of immediate objectives related specifically to subject matter. All objectives should reflect the changes sought in terms of cognitive, affective, and conative behavior.

VALIDITY OF OBJECTIVES

In analyzing educational objectives for the gifted in California's elementary schools, Donald J. Kincaid evaluated the goals of enrichment. Kincaid based his study on questionnaires submitted to 635 elementary school districts in California, of which 39 districts conducted special programs for the gifted. He queried six groups of persons: elementary school principals, teachers, and supervisors; the guidance directors of Los Angeles County; parents of gifted children; and gifted high school students. His statewide sampling indicated that the administrators, teachers, and counselors surveyed generally agreed with the parents and students on the following points: (a) the goals for the gifted do not differ materially from those of average pupils; (b) gifted children customarily attain most educational objectives at an age earlier than average; and (c) gifted children attain most objectives to a greater extent than average. (11)

From a total of 119 specific educational objectives classified in 12 broad areas, Kincaid's study adjudged five areas as being particularly significant for gifted children: citizenship, basic skills, understanding of environment, effective thinking, and international understanding. Three other areas productive of objectives deemed especially significant for the gifted were found to be appreciation of art and music, character development and human relations, and vocational competence. Kincaid's study indicated that no appreciable difference between objectives of the gifted and those of average children exists in the areas of leisure-time activities, health and safety measures, family living, and consumer effectiveness. Of the five school staff groups of raters, the guidance directors considered more of the 119 specific objectives as having greater import for gifted children than for average ones. But exceeding even the directors in singling out more objectives as pertaining primarily to enrichment programs were the gifted students themselves. As a group, the supervisors listed fewer objectives as having prime significance for the gifted than did the others interviewed. (11)

Kincaid concluded that the objectives rated as of greatest import to the gifted are generally most difficult to attain, involving as they do the ability to reason both inductively and deductively. He therefore recommended: (a) instructional materials for enrichment should promote rational thought; (b) objectives for all educational programs should be stated specifically in behavioral terms to facilitate planning; and (c) evaluative procedures should be planned concurrently with the objectives and the instructional practices proposed for their implementation. (11)

EVALUATION OF OBJECTIVES

The two major purposes of a statement of objectives are (a) to aid in selecting and organizing learning opportunities; and (b) to appraise the effectiveness of instruction. Long-range objectives should be scrutinized to determine their validity; short-term objectives should be checked for levels of content and behavior required to fulfill the demands of the resulting curriculum. Applicable both to general and to specific objectives are these criteria: validity, appropriateness, feasibility, precision, consistency, and comprehensiveness. To be valid, objectives should accurately reflect the intentions of the controlling agency. The appropriateness of the goals is determined in relation to the age group and intellectual capacities of the pupils. Also significant are philosophical values as to what the pupil should learn about the nature of man, of knowledge, and of truth. Planners should aim for consistency in the statements of the various goals. The proper choice of objectives provides a framework on which to base appropriate learning opportunities, teaching procedures and materials, and the evaluation of pupil progress through the various levels of intellectual functioning.

Selected References

1. *Administration: Procedures and School Practices for the Academically Talented Talented Student in the Secondary School.* Project on the Academically Talented Student and National Association of Secondary-School Principals. Washington, D.C.: National Education Association, 1960.

2. *Basic Principles of Curriculum and Instruction.* (Syllabus for Education 360). Prepared by Ralph W. Tyler. Chicago: University of Chicago Press, 1950.

3. Chase, Francis S. "Excellence and Equality: Can Both Claims Be Honored in Education?" *Educational Horizons,* XLII (Spring, 1964).

4. Cunningham, Ruth, and Others. *Understanding Group Behavior of Boys and Girls.* New York: Teachers College Press, Columbia University, 1952.

5. *Guidance for the Academically Talented Student.* Report of a conference sponsored jointly by the American Personnel and Guidance Association and the National Education Association Project on the Academically Talented Student. Edited by Elizabeth M. Drews. Washington, D.C.: National Education Association and American Personnel and Guidance Association, 1961.

6. *Guidance in the Curriculum,* Yearbook 1955. Prepared by C. M. Low. Washington, D.C.: Association for Supervision and Curriculum Development and National Education Association, 1955.

7. Havighurst, Robert J. *Developmental Tasks and Education.* New York: David McKay Co., Inc., 1962.

8. Havighurst, Robert J. *Human Development and Education.* New York: David McKay Co., Inc., 1953.

9. Horn, Francis H. "The Ends for Which We Educate," *The Educational Forum,* XXVIII (January, 1964), 133-43.

10. Kearney, Nolan C. *Elementary School Objectives.* Report of the Mid-Century Committee on Outcomes in Elementary Education. New York: Russell Sage Foundation, 1953.

11. Kincaid, Donald J. *Objectives of Education for Gifted Children in California Elementary Schools.* No. 2 of a series approved by the Committee on Research Studies. Los Angeles: Los Angeles Unified School District, April, 1956.

12. Pritchett, Henry Smith. *Nineteenth Annual Report.* New York: The Carnegie Foundation for the Advancement of Teaching, 1924.

13. *Role of Supervisor and Curriculum Director in a Climate of Change.* Edited by Robert R. Leeper. Washington, D.C.: Association for Supervision and Curriculum Development, 1965.

14. Torrance, E. Paul. *Education and the Creative Potential.* Minneapolis: University of Minnesotà Press, 1963.

15. Tyler, Ralph W. "Translating Youth Needs into Teaching Goals," in *Adapting the Secondary School Program to the Needs of Youth.* Fifty-second Yearbook of the National Society for the Study of Education, Part I. Edited by Nelson B. Henry. Chicago: University of Chicago Press, 1953.

Chapter IV

The Provision of an Enriched Curriculum

This chapter discusses the three-pronged curriculum offered to academically gifted children at the California Project Talent Demonstration Center, which operated in the Los Angeles Unified School District from 1963 through 1966. Also considered are the values reflected by the selection and organization of learning opportunities offered in the enriched curriculum.

The staff of the demonstration center devised courses of study appropriate to produce the specific, permanent changes desired in the learners' behavior patterns as determined by the demands of society and the interests of the 750 pupils themselves. Certain courses were provided for all the children; others were offered only to children at a particular developmental level; still other learning opportunities served to meet only the needs of individual pupils.

The term "learning opportunity" is used in preference to the more usual "learning experience" in recognition of the fact that each individual internalizes learning activities differently according to his previous experience and his physiological, social, emotional, and intellectual characteristics. The teacher provides the opportunities that are converted into experiences by the pupils. A learning experience thus results from the reaction of a student to an environmental situation; that reaction is affected by his mental set, which is derived from his knowledge, feelings, memories, attitudes, drives, and capabilities. The mental set in turn profoundly influences the particular student's acceptance of the values and objectives of the school program. To expend his best efforts, a gifted pupil must be convinced of the significance to himself and of the applicability to his own life of the values underlying curriculum selections; i.e., he must be properly motivated.

VALUES UNDERLYING CURRICULAR PLANNING

The values acquired through developmental tasks are the concern of Robert Havighurst, who says that the period of middle childhood from the ages of about six to twelve years is characterized by three outward thrusts. The child is pushed from the home to association with his peers; to games and work requiring neuromuscular skills; and to the world of concepts, logic, symbolism, and communication. By the end of middle childhood, the pupil has developed his own particular style and operating level in all three areas. The educator should so select and organize learning opportunities as to contribute to the formation of the child's value concepts in accordance with the value system underlying the school program. If the school staff values personal independence, for example, pupils will be taught to study independently, to share in planning the school program, and to evaluate the result of their planning. In such a situation, teachers should set limits for the growing independence of their charges and support them when they make mistakes. (12)[1]

Warranting a place in the curriculum are those learning opportunities that have a utilitarian, cultural, or disciplinary value, or any combination thereof. A subject area may be chosen for its utilitarian value in furthering the individual purposes of the pupil, in forming habits and skills, or in awakening the learner's interest. A subject area of cultural value may be chosen because it helps to acquaint the child with exalted ideas expressed through the arts, to implant ethical ideals, or to inspire him to realize moral ideals. A subject area of disciplinary value may be chosen because it develops the qualities of precision, tolerance, purpose, appreciation, or self-expression. If the appropriate use of leisure time be valued by our society, the school curriculum should provide opportunities for the pupil to engage in leisure activities. Ernest Havemann says that the only way to evaluate a leisure-time activity is in terms of the pleasure it provides for its participants. (11)

According to most authorities, the schools should aim to develop an educated man at once compassionate, rational, and probing – a man suspicious of oversimplification, respectful of the past, tolerant of ambiguity, and dedicated to the pursuit of truth and wisdom. (8)

SELECTION OF CURRICULAR CONTENT

A review of the professional literature aids in enriching the curriculum in depth as well as in breadth.

---

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

Four factors common to all subject fields to be considered in curriculum building are: (a) language processes related to communication, clarification of understandings, personal and social roles, and organization of operations; (b) thought processes concerned with validating data, generalizing, inferring, and predicting consequences; (c) social processes that progressively clarify self-concepts and promote effective interpersonal relationships; and (d) the abilities required to use educational resources such as persons, library materials, and audio-visual aids. (14)

The development of rational thought is the central purpose of American education, according to the Educational Policies Commission. That Commission's report states that the abilities essential to perceiving patterns among abstract data are also essential to analyzing, deducting, or inferring. Such abilities may be developed through mathematics as well as through aesthetic, humanistic, and practical fields involving perception of form and design. Experiences in music, literature, and the other arts may contribute more extensively to abstract thinking than do the subject fields normally assumed to promote logical thought. All the higher mental processes require more than a mere awareness of facts; they also demand originality and creativity in speculating, hypothesizing, and conceptualizing. (5) The importance of critical thinking is also stressed in a statement of the New Jersey Secondary School Teachers Association. (6)

Specialists in all fields should be educated in broad principles that may be used in many ways, because the uncertainty of future developments in the physical and social sciences requires the ability to think and to express oneself. Edward Carlin considers that a general education should also provide pupils with motivation for continued learning. (3) Francis Horn is concerned with planning curriculums to inspire both intellectual curiosity and a heuristic desire for continued learning. (15)

Two modes of knowledge, analogical and digital, are described by Lawrence K. Frank. Analogy is the type of knowledge that involves the discovery of similarities, that uses figures of speech, and that relies upon symbols, images, pictures, models, and diagrams. Illustrative of the analogical approach are music, art, and poetry, which combine form and feeling in perceptional patterns infused with emotion. The digital mode, on the contrary, is a sequential process utilized in learning language, logic, and arithmetic. Digital thinking is used in gradually formulating a logical conclusion and in analyzing the components of an entity. The curriculum should include both analogical and digital operations, which are complementary. Artists and scientists begin with an analogue expressed as an idea or a concept that is manipulated digitally to produce a refined version, which is again treated digitally to produce the finished analogue in the form of a composition, poem, equation, or diagram. (9)

Philip Phenix believes that, in order to economize learning effort, the curriculum of the various disciplines should be organized around the representative ideas characterizing the structure of each subject. Representative ideas of academic subjects constitute the elements of their essential content; hence a thorough understanding of these ideas is equivalent to a knowledge of the entire subject. (17)

Jerome Bruner also advocates building curriculums from the most basic understanding afforded by the structure of a particular subject. He writes: "... at the heart of the educational process is the continual broadening and deepening of knowledge in terms of basic and general ideas." (2) Bruner adduces four advantages to the teaching of structure: (a) an understanding of fundamentals aids comprehension; (b) human memory requires ordered details for recall; (c) an understanding of a subject's fundamentals aids in the transfer of knowledge; and (d) reexamination by secondary school students of materials previously learned narrows the gap between advanced and elementary knowledge. (2) The concept of structure is useful, too, in providing for economy in learning, stimulating thought, and pointing up relationships in knowledge. (1)

The concepts identified with a particular discipline also serve as a foundation upon which to erect a course of study, according to J. Frances Huey. Requiring the ability to recognize a common factor or set of factors in a group of complex experiences, concept formation is an abstraction process that represents a type of perception. Concept formation and language development are mutually interdependent because every word except a proper noun represents a concept. Concept learning begins with a word itself and proceeds inductively to its definitions. The framework proposed by Huey assigns the following functions to teachers of enrichment: (a) arrange for abundant sensory experiences to promote discrimination learnings and manifold associations; (b) provide experimental and manipulative opportunities for pupil-selected activities; (c) encourage pupils to symbolize their experiences through play, art, language, and other such activities; (d) extend recent experiences through the use of books, pictures, and audio-visual materials; and (e) pace learning opportunities to help the child form clear images and reinforce new concepts without overstimulating him. (16)

In scheduling learning opportunities, the teacher should consider the intelligence of his pupils and their level of intellectual functioning. Thomas Gladwin predicts that further attention to the relationship of teaching to intellectual development will lead to more effective curriculum planning. (10)

Teachers who are involved in curricular planning should thoughtfully consider responses to the following questions posed by Ralph Tyler (20):

- Is the particular learning opportunity based upon bodies of organized knowledge?
- Does the learning consist of complex, difficult components, requiring the organization of experience and the distribution of practice over protracted time periods?
- Must the learning of essential concepts be brought specifically to the student's attention?
- Can the experience be provided in extracurricular activities?
- Does the learning require structured experience?
- Does the learning demand the interpretation of experience?

Tyler believes that the curriculum should be evaluated in terms of the answers to these queries.

ORGANIZATION OF LEARNING OPPORTUNITIES

After choosing learning opportunities for enrichment, the educator should structure them sequentially. The Project on the Instructional Program of the Public Schools, NEA, has stressed the need to establish priorities and to maintain balance in the curriculum, which may be organized in different ways. Some principles of organization are levels of difficulty in content; chronological sequences of historical events; spatial subdivisions of geography; and various psychological areas of interest. Besides those organizational principles, the curriculum may be planned to focus on one of the following factors: (a) the subject matter, such as an academic discipline; (b) the integration of broad fields, such as natural or social sciences and art; (c) the core curriculum, revolving around basic social issues; (d) persistent life situations; and (e) the child-centered curriculum. (7)

Virgil Ward urges educators to construct units of study appropriate to the various learning levels of the gifted. Three basic elements of curriculum construction – sequence, scope, organizing elements and centers – govern the organization of units of study. Sequence provides depth; scope provides breadth; and organizing elements and centers provide chronological sequence. The hierarchy of difficulty of subject matter should dictate the organization of content levels. Intellectual behavior, which should be organized sequentially on varying levels, may serve to indicate the validity of educational objectives. (22)

Hilda Taba discusses the sequence of learning in terms of the order of its complexity, the abstractness of ideas, and the increasing rigor of the intellectual processes required. The usual pattern of curricular content is to concentrate first on facts and to postpone the explorations that lead to abstractions. This sequence has resulted in an overemphasis in grade school classes on factual as opposed to ideational, theoretical, or abstract knowledge. In deploration of that tendency, Taba remarks that present data on the structure of thinking would indicate that the capacity for abstract thinking develops at an age considerably earlier than has previously been supposed. Modern educators have largely abandoned the practice of teaching a succession of factual details in the various subject areas in favor of presenting a continuity of information leading toward the formation of ideas and the use of cognitive processes on increasingly difficult intellectual levels. (19)

Fundamental to curriculum planning are organizing elements and organizing centers. An organizing element is a facet of the subject matter that provides continuity or relationship. An organizing center, which might be a generalization, concept, principle, or mode of inquiry, provides for a range of learning opportunities. In order to reach all levels of ability in the classroom, a teacher might plan three different organizing centers, each of which relates to the others by the topic or organizing element.

In an NEA report completed in 1962, John Goodlad suggests that the organizing center may be so narrow as to encompass only elements within a single discipline or so broad as to cut across various subject fields. (18) Virgil Herrick defines the organizing center as any object, idea, person, question, or instructional material employed to focus the thinking and relate it to the action of an individual or of a group. He says that organizing centers, which can be better described by their function than by their nature, consist of those curricular elements that demand the thought, generalization, and activity of both pupil and teacher. For example, a picture may serve as an organizing center of instruction when the pupils focus their thoughts on it and relate their learning behavior to it. In order to meet individual needs, an organizing center should include more than one child, provide for several levels of contribution, permit movement in different directions, and promote the exploration of numerous relationships. (13)

Learning opportunities should be organized to engender knowledge of three types: cognitive, affective, and conative, or psychomotor. The educational process consists of channeling the energy drives of pupils into units of work that promote growth in all three intellectual domains.

The interrelationships among various forms of knowledge should be exploited in the classroom because pupils have different kinds of knowledge as a result of their individually different experiences, purposes, and methods of obtaining information. The various areas of knowledge

are related in that they all contribute to the child's cognitive, affective, and conative abilities. Ralph Tyler recommends that teachers enlist the aid of scientists and scholars of the various disciplines in developing instructional procedures and materials. He further recommends that teachers study the learning processes the better to present the interrelationships among the branches of knowledge. (21)

Marjorie Carpenter also urges that pupils be exposed to large areas of interrelated knowledge. She claims that understanding the implications of interrelated facts poses a challenge to the intellect that demands the insight derived from several academic disciplines. A student who solves a problem in one subject through the use of viewpoints acquired from another tends thereby to examine all facets of the matter and to suspend judgment until he has learned all the facts involved. Leonard Bernstein cites the example of Ludwig van Beethoven, who composed each of his nine symphonies around an original musical theme, upon which he then embroidered by weaving strains of melody and harmony with all the resources of the orchestra. In like vein, Carpenter challenges teachers to recall the principles of the creative artist in magnifying the essence of subject content until it too acquires three-dimensional depth and significant development. (4) Giving depth to enrichment, the study of interrelated subjects is especially valuable to gifted children, who are capable both of grasping the significant implications of the relationships presented and of discovering new ones.

CURRICULUM OF THE ENRICHMENT CENTER

The California Project Talent contract with the Office of Education, U.S. Department of Health, Education, and Welfare, specified that the Enrichment Demonstration Center, Los Angeles Unified School District, would offer enrichment in three different areas. Creative expression was to be developed through the language arts; critical appreciation, through the fine arts; and scientific discovery, methodology, and investigation, through mathematics and the social and natural sciences. Within those broad guidelines, the demonstration center staff determined the specific subject matter to be enriched on the basis of the program's objectives and the principles of curriculum organization as previously outlined.

PROMOTION OF CREATIVE EXPRESSION

Although the California Project Talent contract dictated the general field of language arts as the principal mode for promoting creative expression, creativity also was frequently expressed in classes devoted to art, the sciences, and mathematics. The center's language arts program provided opportunities for its pupils to study various literary forms as a basis for preparing their own literary works; to develop their imagination through expressing themselves creatively both in oral and written work; and to develop leisure-time activities in the language arts field.

The nine objectives of the language arts curriculum in developing creative expression follow:

- *Cognitive Goals*

  To appreciate literary forms and elements of style in reading and to use them in writing

  To read with speed and comprehension and to speak and write grammatically

  To improve perceptual skills through observing, listening, interpreting, experimenting, and evaluating

  To learn new concepts and to perceive new relationships through reading, discussing, and creating

- *Affective Goals*

  To promote aesthetic appreciation and discrimination through listening, reading, interpreting, and evaluating

  To develop literary taste and critical ability with which to evaluate the writing of others

  To release emotion through creative expression, both oral and written

- *Conative Goals*

  To acquire the self-discipline required for creativity through involvement in the creative process and production of creative writing

  To develop manual skills, such as typing and handwriting, that are needed in creative writing

In achieving those three types of goals, pupils at the enrichment center were encouraged to express themselves creatively by first studying literature and composition. The course outline contained provisions for developing skills in vocabulary building, studying, and reading. Reading skills were improved through emphasis on evaluation, inference, interpretation, denotation, connotation, and diction. Forms of literature considered were the short story, essay, novel, drama, poetry, fantasy, mythology, animal and adventure stories, historical fiction, folk tales, legends, fables, and biography.

In studying a particular literary form, the classes demonstrated imaginative ideas through painting as well as writing, after being given background information and examples of the form involved. In presenting fantasy as a type of children's literature, for example, the instructor utilized a collection of library books, art prints, and other forms of realia related to fantasy as a prelude to releasing the children's creative capacity in their own original stories. The class also prepared a chart summarizing the criteria for fantasy and discussed such questions as "How do authors or painters create fantasy?" Art and music were integrated in oral presentations of prose and poetry. The students improved their command of the language by studying grammar, usage, style, spelling, diction, and figures of speech in connection with their writing.

PROMOTION OF CRITICAL APPRECIATION

In improving critical appreciation of the fine arts, the demonstration center staff provided opportunities for the gifted children to appreciate artistic accomplishments, to understand the cultural contributions of the arts, and to enrich their leisure-time activities through their knowledge of the arts and artists. While the contract with the Office of Education for California Project Talent stipulated the arts as the prime means for developing appreciation, the faculty observed an increase in critical abilities as a subsidiary outcome of courses devoted to other subjects as well.

Cognitive goals of the program were to sharpen the perceptions of the pupils and to teach them the elements and structures of art forms and their historical development. Affective goals included improving the pupils' aesthetic judgment, discrimination, and appreciation of the creativity required for artistic achievement. Conative goals, which were sought through experimenting with various media and styles, were to teach pupils artistic techniques, to provide them with a degree of proficiency in using tools of the several art forms, and to inform them of the principal characteristics of art produced in different historical periods.

In implementing those goals, the enrichment center staff prepared curriculums for art and music courses. The music curriculum covered the following subjects: the functions of orchestras; the elements of music; musical structure and texture; the fundamental forms of music; and the history of music.

Included in the pictorial art curriculum were the following: periods in art history; types of themes, like the pastoral, which are treated in different art forms; the artistic elements of color, line, form, chiaroscuro, and texture; and the artistic principles, including dominance and subordination, proportion, balance, oppostion, transition, rhythm, and repetition.

PROMOTION OF THE SCIENTIFIC APPROACH

Enrichment in scientific discovery, methodology, and investigation was provided at the Los Angeles center through courses in social sciences, in natural sciences, and in mathematics.

The science and mathematics offerings were designed to encourage pupils to pursue their interests in depth, to develop intellectual curiosity, to make accurate observations and to report them accurately, to employ scientific methods in solving problems, to make quantitative analyses, and to understand the world in which they live and the persons with whom they live.

Cognitive goals of the science program were to equip the pupils (a) to utilize the scientific approach in identifying problems, analyzing hypotheses, experimenting, proposing and verifying solutions, validating data, summarizing, generalizing, and evaluating; (b) to apply the scientific approach in solving problems; and (c) to employ properly such means of problem solving as logic, semantics, and group techniques.

Affective goals were provided for the pupils to attain increasing awareness and appreciation of the contributions and methodologies of mathematicians, natural scientists, and social scientists, together with a knowledge of common difficulties in problem solving by learning to avoid faulty assumptions, reasoning, and attitudes; rigid mental sets; defensive orientation; and oversimplification.

Conative goals were to endow the pupils with the organizational skills requisite to preparing reports; the laboratory skills requisite to perform experiments; and the techniques of historical, descriptive, and experimental research.

The science course outline encompassed the following subjects:

- *Astronomy:* the universe, the solar system, man-made satellites, and space travel
- *Geography:* identification of geographical elements and the unit areas formed by them; areal differentiation of the earth's surface
- *Mathematics:* structure of number, synthesis, analysis, comparison, fractions, and approximate numbers; geometric structure – lines, segments, angles, figures, numerical properties of figures; descriptive statistics – frequency distributions, graphic representations, percentiles, measures of central tendency, and variability

- *Mathematical and astronomical geography:* planetary relationships of the Earth to the solar system; figure, magnitude, and motions of the Earth; the celestial sphere and the equator; the ecliptic plane; the terrestrial and celestial poles; the horizon, zenith, and nadir

- *Research methods:* methods of historical, descriptive, and experimental research

- *Logic:* inductive and deductive reasoning, sentences and statements, tautologies, testing and validity of statements, quantifiers, and sources of error

SUMMARY

Curriculum specialists recommended that the following factors be considered in establishing course content for enrichment: mental, lingual, and social processes; potential for inspiring future investigation and learning; structure of subject fields; and representative ideas from the various disciplines.

The curriculum may be organized around one of five factors: subject matter, broad fields, core, persistent life situations, or the child himself. Four elements of curriculum construction govern the organization of enrichment units: sequence, scope, organizing elements, and organizing centers. Enrichment units should include content levels organized from the hierarchy of difficulty of subject matter. These units should specify particular levels of intellectual behavior and should be organized sequentially. To develop each child's maximum potential, the course content should provide opportunities to interrelate information provided from the different disciplines.

Selected References

1. Bruner, Jerome S. "Needed: A Theory of Instruction," *Educational Leadership,* XX (May, 1963), 523-27.

2. Bruner, Jerome S. *The Process of Education.* Cambridge, Mass.: Harvard University Press, 1962.

3. Carlin, Edward A. "General Education for the Future," *College and University Bulletin,* XVII (January, 1965), 2. (Association for Higher Education, National Education Association, Washington, D.C.)

4. Carpenter, Marjorie. "Depth: Third Dimension in Learning – Potentialities in General Education,". *College and University Bulletin,* XV (April 15, 1963). (Association for Higher Education, National Education Association, Washington, D. C.)

5. *The Central Purpose of American Education.* Educational Policies Commission. Washington, D.C.: National Education Association, 1961.

6. *Critical Thinking.* Plainfield, N.J.: New Jersey Secondary School Teachers Association, 1963.

7. *Deciding What to Teach* [writer: Dorothy M. Fraser]. Project on the Instructional Program of the Public Schools -- Center for the Study of Instruction. Washington, D.C.: National Education Association, 1963. Also in paperback. Filmstrip is available.

8. *The Educated Man: Studies in the History of Educational Thought.* Edited by Paul Nash and Others. New York: John Wiley & Sons, Inc., 1965.

9. Frank, Lawrence K. "Four Ways to Look at Potentialities," in *New Insights and the Curriculum.* Yearbook, 1963. Edited by A. Frazier. Washington, D.C.: Association for Supervision and Curriculum Development, National Education Association, 1963.

10. Gladwin, Thomas. "The Need: Better Ways of Teaching Children to Think," in *Freeing Capacity to Learn.* Edited by A. Frazier. Washington, D.C.: Association for Supervision and Curriculum Development, National Education Association, 1960.

11. Havemann, Ernest. "Leisure, the Great New Challenge," *Life,* LVI (February 14 and 21, 1964), 76-80 and 84-86.

12. Havighurst, Robert J. *Developmental Tasks and Education.* New York: David McKay Co., Inc., 1952.

13. Herrick, Virgil E. "Curriculum Decisions and Provision for Individual Differences," *The Elementary School Journal,* LXII (March, 1962), 313-20.

14. Herrick, Virgil E. "Sources of Curriculum Development," in *What Are the Sources of the Curriculum? – A Symposium.* Washington, D.C.: Association for Supervision and Curriculum Development, National Education Association, 1962.

15. Horn, Francis H. "The Ends for Which We Educate," *The Educational Forum,* XXVIII (January, 1964), 133-43.

16. Huey, J. Frances. "Learning Potential of the Young Child," *Educational Leadership,* XXIII (November, 1965), 117-20.

17. Phenix, Philip H. *Realms of Meaning: A Philosophy of the Curriculum for General Education.* New York: McGraw-Hill Book Company, 1964.

18. "The Scholars Look at the Schools," in *Project on the Instructional Program of the Public Schools: A Report of the Disciplines Seminar Convened at the NEA Center, June 15-17, 1961.* A working paper prepared for the Project on the Instructional Program of the Public Schools. Washington, D.C.: National Education Association, 1962.

19. Taba, Hilda. *Curriculum Development: Theory and Practice.* New York: Harcourt, Brace & World, Inc., 1962.

20. Tyler, Ralph W. "Emphasize Tasks Appropriate for the School," *Phi Delta Kappan,* XL (November, 1958), 72-74.

21. Tyler, Ralph W. "The Interrelationship of Knowledge," *The National Elementary Principal,* XLIII (February, 1964), 13-21.

22. Ward, Virgil. *Educating the Gifted: An Axiomatic Approach.* Columbus, Ohio: Charles E. Merrill Books, Inc., 1961.

Chapter V

Enrichment Resources in Personnel and Materials

To implement enrichment in the classroom, teachers at the Los Angeles center enlisted the aid of persons having special competencies and utilized a variety of educational materials. While some teachers possessed the competencies requisite for presenting an enriched curriculum, other teachers were aided by resource persons.

THE ROLES OF RESOURCE PERSONNEL

In developing the enrichment program for the gifted in Los Angeles, the consultant of the demonstration center there utilized the services of specialists in four fields: subject matter, guidance, methodology, and instructional media.

The Subject Matter Specialist

Teachers at the Los Angeles center received assistance from specialists of the different disciplines in the following areas: (a) subject matter; (b) recent trends in the field; (c) levels of difficulty in subject content; (d) learning materials; and (e) speculation regarding future developments.

The Guidance Specialist

The threefold contribution of guidance specialists to the Los Angeles enrichment program included: (a) measuring intelligence levels of pupils to determine their eligibility for enrichment; (b) providing information on individual pupils' aptitudes; and (c) individual counseling with gifted children and with their parents.

The Specialist in Methodology

Skilled in organizing course content and in choosing instructional materials, educational methodologists assisted the enrichment center staff in pacing lessons, directing independent study, introducing new learning materials, guiding group discussions, and organizing time schedules to allow for individual study and pupil-teacher conferences.

The Specialist in Educational Media

The role of the media specialist was to plan for the use of many available teaching tools, which included recording and playing machines, radios, television sets, projectors, films and filmstrips, laboratory equipment, models, textbooks, manuals, reference and library books, information storage and retrieval systems, and teaching machines. (6)[1] Media specialists also contributed to the enrichment program by advising on the choice of books, pictures, slides, kits, exhibits, records, motion pictures, and transcriptions. Objectives of such materials were fivefold: to create interest, to clarify content, to speed learning, to supply concrete examples, and to increase retention.

The Education Research Consultant to the Program

From its inception in 1963 until its termination in 1966, the Enrichment Demonstration Center in the Los Angeles Unified School District was directed by the author, Mary P. Broderick. As the education research consultant assigned to the enrichment center of California Project Talent, Miss Broderick selected the curricular content and resources and wrote curricular materials for the program. This consultant also planned and conducted the teacher-education program described in Chapter VI. That program included the following six types of activities: observation lessons; individual teacher conferences; group conferences with teachers, administrators, and other educators; regular inservice meetings; periodic all-day workshops to meet special interests; and discussions of filmed observation lessons.

The author maintained that a consultant to an enrichment program should recognize individual differences among teachers in order to individualize programs and to

---

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

focus on persons rather than on competencies. To release the creative potentials of teachers, the consultant should be flexible while retaining the perspective necessary to direct the entire enrichment program.

The Basic Role of the Teacher

The cornerstone of the enrichment center was the classroom teacher, upon whose efforts the success of the program depended. John Brademas observes that high-quality teaching is also the foundation of the educational system of the country as a whole. (2) Although no single personality configuration characterizes good teachers, the California Teachers Association has listed the following personality traits as essential to a teacher: enthusiasm, interest in students and their activities, cheerfulness and optimism, poise, willingness to admit errors, fairness and impartiality, patience, understanding, and sympathy. (9) According to Joyce Cary, the *sine qua non* of good teaching is a forcefulness combined of confidence, enthusiasm, strong feelings, and clear ideas. (3)

Teachers of the gifted should rank among the best in the profession, in the opinion of Virgil Ward, who says that all such teachers need to acquire those insights that are essential for a philosophical perspective of human issues. Their personality traits should be adaptable to the many demands placed upon the teacher by children of marked talent, initiative, interest, and intelligence. (10) Creative children deserve to be taught by equally able instructors.

Ability in performing the following functions may serve as criteria for evaluating teachers: explaining, informing, illustrating; initiating, directing, administering; unifying groups; giving security; clarifying attitudes, beliefs, problems; diagnosing learning problems; making curriculum materials; evaluating, recording, and reporting; organizing a classroom; and participating in school, civic, and professional activities. (8)

The unique educational needs of gifted children place additional responsibilities on their teachers. To a greater extent than average ones, enriched curriculums demand that teachers foster the integration of knowledge, regardless of special interests; develop the pupils' broad cultural background; recognize indications of intelligence and their implications for teaching; understand the special methodology of enrichment, including problem-centered teaching and pupil-teacher planning to the exclusion of more traditional patterns; recognize the unique qualities of giftedness and understand the child who possesses them; realize the guidance needs posed by the gifted; provide varied learning activities to achieve higher levels of experience and to transmit a love of learning; gain skill in knowing when to guide, to direct, or to "get out of the way"; help pupils to attain that degree of achievement commensurate with their abilities; provide freedom for exploring and expressing ideas; and develop intrinsic (as opposed to extrinsic) motivation. (1)

In reviewing research on teaching practices, Arthur Combs notes that no common denominator identifies good teachers except their high degree of individuality and originality. The very failure of research to indicate a commonality in characteristics would demonstrate that a teacher is primarily a unique personality who uses his own talents and his classroom environment to aid both his pupils and himself to achieve satisfaction. (5)

While collaboration is essential to modern society, large, impressive, and impersonal institutions are no more creative or purposeful than the persons operating them. The individual behind the corporate facade should not lose his identity in corporate enterprises, however impressive they may be. A free society can best ensure its own invigoration through its educational system, its public and private institutional practices, and its attitude toward the creative person. (7) It is therefore incumbent upon administrators to foster individual differences among teachers and to encourage them to be creative and resourceful in guiding their pupils.

The experience of the staff members at the Enrichment Demonstration Center indicated that teachers of the gifted should possess four qualities: a desire to teach, enjoyment in working with children, cooperative attitudes toward their colleagues, and an interest in furthering their own knowledge.

THE USE OF RESOURCE MATERIALS

A variety of educational materials serves to awaken the interest of the pupils and to render more effective the work of the teacher. The materials for the Los Angeles enrichment program were chosen to meet the following five criteria: (a) the provision of vital experiences and a stimulating environment; (b) the strengthening of basic skills; (c) increased understanding and appreciation; (d) stimulation of creative activity; and (e) encouragement of self-expression and active participation. (4) A list of equipment required to use the varied materials selected for the Enrichment Demonstration Center follows the references for this chapter, together with listings of audio-visual aids and library books provided for the 750 gifted pupils enrolled in the center. Materials for specific lessons are included with the course outlines and lesson plans in later chapters of this work.

SUMMARY

The development of a practical enrichment program is facilitated by the use of appropriate resources of personnel and materials. Teachers, who represent the foundation of the program, may need the help of other persons with special competencies in the use of equipment, materials, methods, and procedures. Resource specialists in the areas of subject matter, guidance, methods, and media may be useful in planning enrichment and in making it operational.

When the program for the Los Angeles Demonstration Center was planned, resource persons and materials were carefully chosen. As the cornerstone of the program, teachers should enjoy teaching and working with children, be cooperative toward their colleagues, and wish to further their own learning. In addition to the teacher, specialists in subject matter, guidance, methods, and media are helpful in guiding the program.

Selected References

General Professional Materials

1. *Administration: Procedures and School Practices for the Academically Talented Student in the Secondary School.* Washington, D.C.: National Education Association, 1960.

2. Brademas, John. "The Foundation of Our Educational System – Teachers of High Quality," *NEA Journal,* LV (December, 1965), 17.

3. Cary, Joyce. *Art and Reality: Ways of the Creative Process.* New York: Harper & Brothers, 1958.

4. *Catalog of Audio-Visual Materials for Fifth and Sixth Grades.* Publication No. EC-211. Los Angeles: Division of Instructional Services, Audio-Visual Section, Los Angeles Unified School District, 1962.

5. Combs, Arthur. "The Personal Approach to Good Teaching," *Educational Leadership,* XXI (March, 1964), 369-76, 399.

6. *Organizing for Improved Instruction.* American Association of School Administrators and Association for Supervision and Curriculum Development. Washington, D.C.: National Education Association, 1963.

7. *The Pursuit of Excellence: Manpower and Education.* Rockefeller Brothers Fund. New York: Doubleday & Company, Inc., 1958.

8. Raths, Louis. "What Is a Good Teacher?" *Childhood Education,* XL (May, 1964), 451-56.

9. "Traits of a Good Teacher," *CTA Action,* November 20, 1964, p.7. (California Teachers Association newspaper, published semimonthly, Burlingame, Calif.)

10. Ward, Virgil. *Educating the Gifted, an Axiomatic Approach.* Columbus, Ohio: Charles E. Merrill Books, Inc., 1961.

Literature

Adventure Stories

Aiken, Joan. *The Wolves of Willoughby Chase.* Garden City, N.Y.: Doubleday & Company, Inc., 1963.

Battle Stations: True Stories of Men in War. Edited by Margaret C. Scoggin. New York: Alfred A. Knopf, Inc., 1953.

Hewes, Agnes. *Spice Ho! A Story of Discovery.* New York: Alfred A. Knopf, Inc., 1947.

Muhlenweg, Fritz. *Big Tiger and Christian.* New York: Pantheon Books, Inc., 1964.

Animal Stories

Adamson, Joy. *Born Free: A Lioness of Two Worlds.* New York: Pantheon Books, Inc., 1960.

Animals. Edited by Stanley Kegler. New York: Scholastic Book Services, 1961 (paperback).

Meek, Sterner P. *Omar: A State Police Dog.* New York: Alfred A. Knopf, Inc., 1964.

Sewell, Anna. *Black Beauty.* New York: Dell Publishing Company, Inc., 1963.

Biography

Founders of America. EBF FILMSTRIP SERIES NO. 8910. Wilmette, Ill.: Encyclopaedia Britannica Films, Inc. [n.d.]. Six filmstrips.

THE GREAT LIVES SERIES (92 volumes). New York: Macmillan Co., 1933–1950.

Kunitz, S. J. *Junior Book of Authors.* New York: H. W. Wilson Co., 1962.

Profiles in Courage. Sets I, II, III; 26 films. New York: Robert Saudek Associates [n.d.]. Films, 16mm., sound, 48 min.; teacher's guide to each film; based on book by John F. Kennedy and prepared as television series by National Broadcasting Company.

Drama

Drama I. Compiled by Marjorie Barrows. LITERARY HERITAGE SERIES. New York: Macmillan Co., 1962.

Lamb, Charles, and Mary Lamb. *Tales From Shakespeare.* New York: Macmillan Co., 1950.

Wright, Louis B. "The Britain That Shakespeare Knew." *National Geographic,* CXXV (May, 1964), 613-67.

Essays

American Essays. Edited by Charles B. Shaw. New York: New American Library, Inc. [1963] (paperback).

British and American Essays. Compiled by Carl L. Anderson and George W. Williams. New York: Holt, Rinehart & Winston, Inc., 1959.

McClay, Harriet L., and Helen Judson. *Story Essays* (Revised edition). New York: Henry Holt & Company, Inc., 1947.

Nonfiction I. Edited by Jarvis E. Bush. LITERARY HERITAGE SERIES. New York: Macmillan Co., 1963.

Fantasy

Du Bois, William Péne. *The Twenty-One Balloons.* New York: Viking Press, Inc., 1947.

Grahame, Kenneth. *The Wind in the Willows.* New York: Heritage Press, 1959.

L'Engle, Madeleine. *A Wrinkle in Time.* New York: Farrar, Straus and Cudahy, Inc., 1962.

Folk Tales

Aesop's Fables. Edited by Louis Untermeyer. Wayne, N.J.: Golden Press, Inc. 1965.

Historical Fiction

Brink, Carol R. *Caddie Woodlawn.* New York: Macmillan Co., 1952.

Hunt, Irene. *Across Five Aprils.* Chicago: Follett Publishing Company, 1964.

Jones, Ruth F. *Boy of the Pyramids.* New York: Random House, Inc., 1952.

Wilder, Laura Ingalls. *By the Shores of Silver Lake.* New York: Harper & Brothers, 1953.

Modern American Fiction

Beim, Jerrold, and Lorraine Beim. *Two Is a Team.* New York: Harcourt, Brace and Co., 1945.

DeJong, Meindert. *The Wheel on the School.* New York: Harper & Brothers, 1954.

Taylor, Sydney. *All-of-a-Kind Family.* Chicago: Wilcox and Follett Publishing Company, 1951.

Myths

Bulfinch, Thomas. *Mythology.* Volume I: *The Age of Fable.* New York: New American Library, Inc., 1964.

Grant, Michael. *Myths of the Greeks and Romans.* New York: New American Library, Inc., 1964.

Hawthorne, Nathaniel. *The Golden Touch.* New York: McGraw-Hill Book Company, 1966.

Novels

Dickens, Charles. *A Christmas Carol.* New York: Dell Publishing Company, Inc., 1964 (paperback).

Melville, Herman. *Moby Dick.* New York: Dell Publishing Company, Inc., 1961 (paperback).

Verne, Jules. *Around the World in Eighty Days.* New York: Dell Publishing Company, Inc., 1961 (paperback).

Poetry

Arbuthnot, May. *Time for Poetry.* New York: William R. Scott, Inc., 1961.

Ciardi, John. *John J. Plenty and Fiddler Dan.* New York: J. B. Lippincott Company, 1963.

Understanding Poetry. Six color filmstrips. New York: McGraw-Hill Text-Films, 1966.

Short Stories

Golden Tales of the Far West. Edited by May L. Becker . New York: Dodd, Mead & Company, 1935.

Short Stories I. Compiled by Virginia Alwin. LITERARY HERITAGE SERIES. New York: Macmillan Co., 1962.

A Treasury of Sea Stories. Compiled by Gordon Aymar. New York: A. S. Barnes & Co., Inc., 1948.

Other Subject Areas

Art

Borea, Evelina. *The High Renaissance Italian Painting.* Book, 24 color slides, viewer. New York: McGraw-Hill Book Company, 1963.

Bouleau, Charles. *The Painter's Secret Geometry, a Study of Composition.* New York: Harcourt, Brace & World, Inc., 1963.

Châtelet, Albert. *Impressionist Painting.* Book, 24 color slides, viewer. New York: McGraw-Hill Book Company 1962.

Encyclopedia of World Art. New York: McGraw-Hill Book Company, 1959–1965.

Fine Art Reproductions (Fifth edition). Edited by Anton Schutz. Greenwich, Conn.: New York Graphic Society Publishers, Ltd., 1965.

Gettings, Fred. *The Meaning and Wonder of Art.* New York: Golden Press, Inc., 1964.

Werner, Alfred. *Painting by the Post-Impressionists.* Book and 24 color slides. New York: McGraw-Hill Book Company, 1964.

Astronomy

Allen, Richard. *Cryogenics.* Philadelphia: J. B. Lippincott Company, 1964.

The Astronomer at Work. One filmstrip. New York: Audio-Visual Division, Popular Science Publishing Co. [n.d.].

Baker, Robert H. *Introduction to Astronomy.* Princeton, N.J.: D. Van Nostrand Co., Inc., 1960.

Hall, Donald A. *Elements of Astronomy and Physical Geography.* Saginaw, Mich.: Trippensee Planetarium Co., 1963.

Communication Skills

Altick, Richard D. *Preface to Critical Reading (Fourth edition).* New York: Holt, Rinehart & Winston, Inc., 1960.

Corbin, Richard K., and Others. *Guide to Modern English.* Glenview, Ill.: Scott, Foresman & Co., 1960.

Crank, Doris H., and Others. *Words: Spelling, Pronunciation, Definition, and Application.* New York: McGraw-Hill Book Company, 1962.

Gainsburg, Joseph C. *Advanced Skills in Reading.* Books 1 and 2. New York: Macmillan Co., 1962.

Nathan, Norman. *The Right Word.* Boston: Houghton Mifflin Co., 1962.

Geography

Adler, Irving. *Rocks and Minerals; and the Stories They Tell.* New York: Alfred A. Knopf, Inc., 1956.

Beiser, Arthur, and the editors of *Life. The Earth.* New York: Time, Inc., 1962.

Carson, Rachel L. *The Sea Around Us.* New York: New American Library, Inc., 1963.

Gaskell, Thomas F. *World Beneath the Oceans: the Story of Oceanography.* Garden City, N.Y.: Doubleday & Company, Inc., 1964.

Logic

Allen, Layman E. *WFF'N PROOF: The Game of Modern Logic.* New Haven, Conn.: Autotelic Instructional Materials Publishers, 1962 (programmed material).

Brant, Vincent, and Mervin L. Keedy. *Elementary Logic for Secondary Schools.* New York: Holt, Rinehart & Winston, Inc., 1962.

Lasker, Emanuel. *How to Play Chess.* New York: Crown Publishers, Inc., 1964.

Suppes, Patrick, and Shirley Hill. *First Course in Mathematical Logic.* Waltham, Mass.: Blaisdell Publishing Co., Inc., 1964.

Mathematics

Adler, Irving. *The Giant Golden Book of Mathematics: Exploring the World of Numbers and Space.* New York: Golden Press, Inc., 1962.

Bendick, Jeanne, and Marcia Levin. *Mathematics Illustrated Dictionary.* New York: McGraw-Hill Book Company, 1965.

Bergamini, David, and the editors of *Life. Mathematics.* New York: Time, Inc., 1963.

Davis, Robert B. *Discovery in Mathematics,* Student Discussion Guide. Reading, Mass: Addison-Wesley Publishing Co., Inc., 1964.

Hogben, Lancelot Thomas. *The Wonderful World of Mathematics.* Grades five through nine. Garden City, N.Y.: Doubleday & Company, Inc., 1955.

Mathematics. Grade five, Part I, and grade five, Part II. School Mathematics Study Group. New Haven, Conn.: Yale University Press, 1960.

Mathematics. Grade six, Part I, and grade six, Part II. School Mathematics Study Group. New Haven, Conn.: Yale University Press, 1960.

Mathematics. Set 1 – six filmstrips. New York: McGraw-Hill Text-Films, 1966.

Mathematics for Junior High School. Vols. I and II. School Mathematics Study Group. New Haven, Conn.: Yale University Press, 1960.

O'Malley, Richard H. *Enrichment Topics in Basic Mathematics.* Reading, Mass.: Addison-Wesley Publishing Co., Inc., 1963 (a programmed text).

Spooner, George, and Others. *Mathematics Enrichment.* Program A (1962); Program B (1962); Program C (1963). New York: Harcourt, Brace & World, Inc.

Music

The Art of the Prima Ballerina. Richard Bonynge, London Symphony Orchestra. Two records with booklet (Lon., mono 7213; stereo 2213).

Baldwin, Lillian. *Music for Young Listeners.* Three volumes – The Green Book, The Crimson Book, and The Blue Book. New York: Silver Burdett Company, 1951.

Bernstein, Leonard. *Leonard Bernstein's Young People's Concerts for Reading and Listening.* Five records and one book. New York: Simon and Schuster, Inc., 1962.

Copland, Aaron. *Music and Imagination.* New York: New American Library, Inc., 1959.

Copland, Aaron. *What to Listen For in Music* (Revised edition). New York: McGraw-Hill Book Company, 1957.

Hanson, Howard. *The Composer and His Orchestra.* Vol. III (one record, 50357). The Eastman-Rochester Orchestra. New York: Mercury Records.

Instruments of the Orchestra. Album, E.M.I. Records, Ltd.: HMV, mono 7 eg 8672-5; stero GES 5820-3. Accompanying book, *Instruments of the Orchestra,* by John Hosier. Toronto: Oxford University Press, 1961.

Keyboard Junior. New Haven, Conn.: Keyboard Publications, Inc. (monthly magazine).

Music Lovers Encyclopedia. Compiled by Rupert Hughes and revised and edited by Deems Taylor and Russell Kerr. New York: Garden City Publishing Co., 1939.

The Science of Sound. One album and one book (FX 6007). New York: Folkways Records & Service Corp.

Tovey, Donald Francis. *Essays in Musical Analysis.* Vols. I-VI. New York: Oxford University Press, 1935–1939.

Reference Works

Encyclopaedia Britannica (24 volumes). Chicago: Encyclopaedia Britannica, Inc., 1964.

Webster's Third New International Dictionary. Unabridged. Springfield, Mass.: G. & C. Merriam Co., 1961.

Science

Asimov, Isaac. *Words of Science and the History Behind Them.* Boston: Houghton Mifflin Co., 1959.

Beauchamp, Wilbur L., and Others. *Science Is Explaining.* Glenview, Ill.: Scott, Foresman & Co., 1963.

Beauchamp, Wilbur L., and Others *Science Is Understanding.* Glenview, Ill.: Scott, Foresman & Co., 1964.

Compton's Illustrated Science Dictionary. Editor-in-Chief, Charles A. Ford. Chicago: F. E. Compton Co., 1963.

Watson, Jane Werner. *The Sciences of Mankind.* New York: Golden Press, Inc., 1960.

Statistics

Underwood, Benton J., and Others. *Alternate Workbook to Accompany Elementary Statistics.* New York: Appleton-Century-Crofts, 1954.

Underwood, Benton J., and Others *Elementary Statistics.* New York: Appleton-Century-Crofts, 1954.

Recommended Equipment

Headset for listening post
Motion picture projectors
Oriental abacus
Overhead projector and intermediate starter kit
Plane and solid geometric forms
Resonator bells
Slide and filmstrip projectors
Tape recorder
Transcription machine

Part Two
The Teacher Training Program

Chapter VI

Inservice Teacher Training

Throughout the three-year period of the program's operations, teachers at the Los Angeles Demonstration Center of California Project Talent were given inservice training sessions for one day each semester and for two hours at biweekly intervals. The project consultant, Mary P. Broderick, directed the sessions with the help of educational specialists from various fields.

ACTIVATING CHANGE

Like other educational innovations, the inauguration of the enrichment program required initiative, self-confidence, and faith in other persons. In discussing resistance to change in the classroom, Francis Chase (1)[1] makes the following seven points:

- Either the new knowledge should be adapted to existing patterns or older knowledge should be reformulated to accommodate the new.
- Statements of new relationships should be scrutinized by specialists as well as by members of the wider academic community.
- The significance of the new knowledge should be disseminated through a series of interpretations.
- The knowledge and its implications should be built into new instructional materials sufficiently diverse to meet the needs of all learners.
- Teachers should be aided in assimilating the new generalizations and in understanding the supportive evidence and how it was acquired.
- Teachers should also be aided in determining methods of presenting the knowledge.
- Teachers should be ingenious in adapting their own behavior to the new knowledge.

In planning inservice training, the consultant considered each of Chase's suggestions.

DEVELOPMENT OF EFFECTIVE TEACHERS

The United States Commissioner of Education, Harold Howe II, says that the function of the teacher is to translate the theorist's concepts, the researcher's evaluations, and the businessman's products into better schooling. The teacher must convert educational planning into reality, for without successful implementation in the classroom, any new educational idea or technique will fail. (3)

Frank Wilson observes that the first step in training teachers of enriched curriculums should be to inform them of those characteristics of gifted pupils that are not shared by the average child. Citing opinions obtained from "superior" teachers of the gifted, Wilson's study lists the following functions (6) as being particularly important in teaching the gifted child:

- To foster a sense of social responsibility, a desire to serve society, and a recognition of the worth of other persons
- To create an environment in which the gifted can participate efficiently in group discussions in wholesome social relations
- To develop a classroom atmosphere conducive to good mental health
- To teach the gifted to use problem-solving methods in research and independent study and to evaluate their own progress
- To understand the social and emotional problems that might accompany a high mentality
- To develop a flexible, individualized, and enriched curriculum that meets the pupils' needs and that [illegible] as identical, stereotyped demands

[1] Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

Teaching as an Art

Teaching is an art which, like other arts, requires dedication, perception, humor, training, and hard work. William James says that the artist-teacher utilizes his knowledge of the science of learning to teach with ingenuity and originality. (4) Gilbert Highet notes that unlike inducing a chemical reaction, teaching does not consist of applying formulas. (2) The teacher's art rather resembles that of a painter or music composer than that of the laboratory researcher, because teaching cannot proceed mechanically by rote or by rule. According to George Stern, teaching is an artistic craft in the broad meaning of that term, which suggests a carefully developed skill directed toward an aesthetic or applied end. (5)

Stern adds that since techniques constitute the vehicle for the teacher's communication, the study of those techniques is as relevant to preparing programmed communication for teaching machines as it is to teaching by persons. But teaching also involves spontaneous communication, which is a form of self-expression requiring genuine creativity. The product of this creation has no tangible shape, nor is it ever repeated. (5)

Ways of Releasing Potentials

At the Los Angeles Demonstration Center, the teachers sought, tested, and refined different methods of releasing potentials. These methods, which were discussed in training classes, demonstrated in classrooms, and improved through practice, included the following measures:

- Observing and listening to pupils attentiveiy
- Freely communicating with pupils to improve interaction
- Differentiating responses to pupils according to their individual needs
- Regarding the development of the pupil as the chief goal in teaching subject content
- Maintaining a school environment that encourages empathy and cooperation
- Placing learners in various roles
- Permitting pupils to discover and to exercise their own resources
- Questioning pupils skillfully at identifiable levels of thinking
- Guiding pupils to discover order, pattern, and meaning in their work
- Stimulating affective responses and psychomotor skills and observing their relevance to intelectual development
- Supporting experimentation
- Stretching the minds and abilities of the pupils through creative expression, critical appreciation, and scientific discovery

PROCEDURES FOR TEACHER EDUCATION

The project consultant to the demonstration center scheduled meetings to coincide with the interests and needs of the teachers, supervisors, and administrators concerned with enrichment. The consultant conferred with many different educators in establishing the program. Conferences served to clarify needs and problems and to facilitate classroom work, including methods of instructing small groups.

Inservice Meetings

Biweekly inservice training meetings were held from 3:45 to 5:45 p.m. in the central administrative offices of the Los Angeles Unified School District. The two-hour sessions were devoted to presentations of problems, discussions of new content to be introduced for specific pupils or classes, planning of innovations, listing of instructional materials, and identification of problem areas for future study. The number of participants at the meetings increased from eight persons during the first year to 16 the second year and to 25 the next year. Interest in the program also attracted many visitors to the sessions.

The inservice class sessions were ordered in psychological sequence according to the same pattern as this book. The definition of enrichment and its philosophy introduced the training course, after which the rest of the first semester was devoted to the topics summarized in Chapter II of this work. The teachers also discussed the rationale for curriculum building described in Chapter III and the presentation of learning opportunities portrayed in Chapter IV.

As the program became operational in the classrooms, instructional materials were chosen and tested. Chapter V provides lists of materials that proved useful and describes the services of resource persons who offered specialized help on specific problems at the training sessions. The teachers studied the content of the various subject matter fields used to develop creative expression, critical appreci-

ation, and scientific methodology as part of their inservice training; this subject content is depicted in chapters VII, VIII, and IX, respectively.

Workshops

Workshops varying in duration from a day to a week also contributed to inservice training. A day per semester was utilized to study problems of common concern, and occasionally workshops were scheduled on a Saturday to provide a two-day sequence. During the summer week-long workshops were held.

The format for one workshop provided for the teachers to identify a particular problem for submission to a specialist by the project consultant. The specialist provided certain instructional materials for use by the teachers on an experimental basis and then gave a demonstration lesson based on those materials and other related ones. At other workshops the consultant also presented demonstration lessons.

Observation Lessons

Inservice training provided for teachers at the enrichment center also included planned observation lessons of classes in session. About 125 demonstration lessons were presented during the course of the three-year project in the kindergarten and in grades one through six. Chapters XII, XIII, and XIV contain examples of the course outlines, lesson plans, and descriptions of the learning centers used in the demonstrations. Before visiting the classes, the observers were oriented by the consultant and the school principal and provided with a copy of the lesson plan to be used. Each observation period was followed by a discussion led by the consultant, who answered questions pertaining to the program.

A total of 14 demonstration lessons were filmed for the purpose of training teachers and disseminating information on enrichment. Chapter XV presents a detailed discussion of the films, together with information on their distribution. Also useful in the teacher training session were the many photographs taken of classes in session and a colored filmstrip, phonograph record, and guide entitled "Enrichment Programs for Intellectually Gifted Students" discussed in Chapter X.

PURPOSE OF TEACHER TRAINING

A recurrent problem in teacher training is how to challenge teachers without threatening them. The teacher feels challenged when confronting a task which he can perform; he is threatened by a task that he considers as being beyond his capabilities. When training courses are so paced as to promote his professional growth, the teacher becomes committed to his work. The emphasis upon levels of thinking and upon the stages of learning has implications for teacher training, which should be continual to provide proper pacing. The teacher should be cognizant of his own learning process, the better to guide that of his pupils. Inservice training can be of real assistance in helping the teacher to assess his performance and to increase his creativity in the classroom.

SUMMARY

Inservice training for teachers results in improved schooling for pupils. The staff of the Los Angeles Enrichment Center developed promising methods of releasing pupil potential to serve as models for future programs for the gifted. Teaching procedures practiced at the center have been described, demonstrated, and filmed for use in inservice training. In planning classes for teachers, educators should consider their individual readiness, motivation, and levels of thinking, together with the pertinent theories of learning.

Selected References

1. Chase, Francis. "School Change in Perspective," in *The Changing American School.* Sixty-fifth Yearbook of the National Society for the Study of Education, Part II. Edited by John I. Goodlad. Chicago: University of Chicago Press, 1966.

2. Highet, Gilbert. *The Art of Teaching.* New York: Alfred Knopf, Inc., 1950.

3. Howe, Harold. "Tolstoi and Teachers," *NEA Journal,* LV (May, 1966), 19.

4. James, William. *Talks to Teachers on Psychology and to Students on Some of Life's Ideals.* New York: W. W. Norton & Company, Inc., 1958.

5. Stern, George. "Measuring Noncognitive Variables in Research on Teaching." *Handbook of Research on Teaching: A Project of the American Educational Research Association.* Edited by N. L. Gage. Chicago: Rand McNally & Co., 1963.

6. Wilson, Frank. "The Preparation of Teachers for the Education of Gifted Children," in *Education for the Gifted.* Fifty-seventh Yearbook of the National Society for the Study of Education, Part II. Edited by Nelson B. Henry. Chicago: University of Chicago Press, 1958.

Chapter VII

The Development of Creative Expression

As indicated in Chapter IV, one of the three general areas chosen for enrichment at the Los Angeles Demonstration Center of Project Talent was the development of creative expression through a threefold language arts curriculum in reading improvement, literature, and communicative skills, oral and written. To extend creative capacities of children, teachers and other educators should be aware of both the characteristics of creative persons and the nature of creative processes. Through studying creative action, teachers become increasingly adept at stimulating creativity in an environment conducive to its nurture. Because of his significant role in inspiring creative talent, the teacher should develop strong, reciprocal rapport with his pupils, according to E. Paul Torrance. (14)[1]

NATURE OF THE CREATIVE PERSON

The term *creative* connotes much more than "being possessed of a high degree of intelligence, competence, or skillfulness." The dictionary defines *creative* as "having the power or quality of presenting a new conception in an artistic embodiment." The essential word in that definition is "new," for to be creative is to be unique or at least original: "to create" means to originate, to discover, or to invent something new.

David Ausubel says that to be truly creative, a person must discover something original not only in terms of his own experience but also in terms of human experience. (1)

Other writers on the subject list numerous components of creativity that the teacher should identify and develop in his pupils. Calvin Taylor describes a creative person as able to define problems, to sense ambiguities, to test hunches, to predict consequences, to infer causes, to evaluate revisions, and to "brainstorm," which involves tossing his ideas uncritically into an arena of group thinking to solve a problem or to perform a task. (12) The broad range of attributes ascribed to creative persons would imply a multiplicity of creative talents to be promoted in the classroom. Perceptivity is closely related to creativity, according to Donald MacKinnon. MacKinnon writes that a creative person is one who is interested, curious, receptive and open to new experiences – indeed, one who actively pursues those experiences that lead to the fullest possible life. (7) Such a one might say with Ulysses in words ascribed to him by Tennyson:

> I cannot rest from travel. I will drink
> Life to the lees . . .
> . . . I am become a name;
> For always roaming with a hungry heart
> Much I have seen and known; . . .
> I am a part of all that I have met;
> Yet all experience is an arch wherethrough
> Gleams that untraveled world, whose margin fades
> Forever and forever when I move.
> How dull it is to pause, to make an end,
> To rust unburnished, not to shine in use!
> As though to breathe were life. Life piled on life
> Were all too little . . .
> And this gray spirit yearning in desire
> To follow knowledge like a sinking star,
> Beyond the utmost bound of human thought.

The legendary Ulysses or Odysseus, as portrayed by Homer, Tennyson, and other writers, was shown as being highly creative in that he was at once sensitively aware of his environment, open to novel experiences, and keenly perceptive. Teachers striving to encourage creativity in their classes should promote a similar awareness and openness to experience.

The following personality traits are listed as distinguishing creative persons: being independent of judgment, questioning of authority, and intrinsically motivated; acting on whim and impulse; possessing a lively sense of humor; being concerned with problem formulation; and being alert to scan alternatives. (4)

The ten components of creativity as enumerated by Ruth Strang and reported by Louis Fliegler (5) are the following:

- Sensitivity to the worlds of nature and of man and to the problems therein
- Keen perception of significant details in the environment

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

- Ability to observe relationships between perceptions and ideas and to combine them into original, coherent patterns
- Ability to perceive and to express the uncommon
- Fluency of ideas
- Acceptance of the discipline necessary to master the techniques for expressing ideas
- Flexibility in modifying ideas or patterns
- Capacity for wholehearted attention and concentration
- Objectivity in evaluating one's products
- Satisfaction in the creative process

That appreciation for the creative works of another itself requires creativity and that creativity in one person may well engender it in another are illustrated by John Keats in his sonnet, "On First Looking into Chapman's Homer." That poem effectively distills the sense of rapture implicit in the moment of creative discovery – whether the discovery be made by a poet, an astronomer, or an explorer. Like Tennyson, Keats is indebted to Homer for his inspiration. Both English poets also exemplify the criteria specified in the preceding paragraph. The Keats sonnet reads:

> Much have I travelled in the realms of gold
> And many goodly states and kingdoms seen;
> Round many western islands have I been,
> Which bards in fealty to Apollo hold.
> Oft of one wide expanse had I been told
> That deep-browed Homer ruled as his demesne:
> Yet did I never breathe its pure serene
> Till I heard Chapman speak out loud and bold;
> Then felt I like some watcher of the skies
> When a new planet swims into his ken;
> Or like stout Cortez, when with eagle eyes
> He stared at the Pacific – and all his men
> Looked at each other with a wild surmise –
> Silent, upon a peak in Darien.

In presenting this sonnet to his class, the unimaginative English teacher would probably content himself with the comment that it was Balboa and not "stout Cortez" who discovered the Pacific, that the poem is rich in simile and metaphor, and that "some watcher of the skies" is a circumlocution for an astronomer; but to the creative teacher the poem presents a world of possibilities for awakening creativity and appreciation in his pupils.

As has been indicated, many researchers have identified an openness to new experiences as one of the most striking characteristics that mark creative persons. Rollo May defines creativity as the result of an intensively conscious person's encounter with his world. (8) Carl Rogers describes it as an awareness of the feelings and reactions discovered within one's self coupled with a sensitivity to all persons and experiences offered by the environment. (11) As previously mentioned, the personage of Ulysses depicted in the innumerable sagas that he inspired well typifies those descriptions of creativity. Another literary figure who finally achieves that awareness and openness that are the hallmark of the creative person is Emily Webb (Gibbs) in Thornton Wilder's *Our Town.* In Act III of the play, after her death, she says: "We don't have time to look at one another . . . Oh, earth, you're too wonderful for anybody to realize you. Do any human beings ever realize life while they live it? – every, every minute?" The stage manager tells her that saints and poets perhaps do realize such awareness, implying that few other persons do. Thornton Wilder himself, as a novelist, playwright, scholar, critic, and lecturer, displayed a great deal of highly versatile creativity.

NATURE OF THE CREATIVE PROCESS

The complex process of creativity is not yet thoroughly understood; however, the consensus of many psychologists appears to agree in identifying five stages in creative production:

a. Orientation, when the problem is defined
b. Preparation, when the mind is saturated with all available data
c. Incubation, when the conscious mind rests while the unconscious probes the problem
d. Illumination, when the solution occurs to the thinker
e. Verification, when a critical, often scientific, evaluation occurs

The preparatory stage is the time when the ideas for the painting, song, or story are collected for mulling over during the incubation period to emerge as a full-fledged product during the illuminatory stage. (5) James Coleman remarks that though a moment of sudden inspiration or illumination can clarify a problem, that moment usually represents the culmination of painstaking, meticulous work previously labored over at length. (3) Coleman would thus agree with Thomas A. Edison's oft-quoted observations that "Genius is 1 percent inspiration and 99 percent perspiration" and "There is no substitute for hard work."

J. P. Guilford has contributed significantly to an understanding of the creative processes through his work on

the intellect's structure, which is summarized in Chapter II. Teachers interested in developing their pupils' creative potentials will also profit from reading Guilford's publications listed in the bibliographical entries to Chapter II, which reproduces his model of the structure of intellect.

Of the five types of intellectual operations shown on that model, divergent thinking is the most important for creative potential. Guilford's factor-analytic studies verified the accuracy of previously posited hypotheses as to the components of creativity, as well as to other intellectual qualities. By intercorrelating test scores compiled from a number of examinees, Guilford isolated four distinct factors of creativity – fluency and flexibility of thought, originality, and elaboration – all of which fall in the category of divergent-thinking. Of the six kinds of intellectual products, the most significant for creativity is transformation, because much creative effort requires transforming something known into a statement not previously cognized.

Despite the preponderance of factors relating to creativity found in divergent thinking processes with transformations as products, Guilford found that many other abilities also contribute to creative performance. One of these is sensitivity to problems – an ability which is an evaluative operation listed under semantic content. Another type of creative thought, redefinition, is classified in the category of transformations as a convergent-thinking factor; redefinitions may be semantic, symbolic, or figural in content.

Guilford's factor analyses did not isolate a unitary ability to analyze or to synthesize; he therefore concludes that such ability depends on general aptitudes, which differ according to the particular task of analysis or synthesis involved. Basic to creativity, as to all intellectual functioning, are cognition, memory, and evaluation.

A review of Guilford's work is helpful in developing pupils' thinking abilities in many areas besides the creative one. Chapter XII of this publication presents outlines of lesson plans and course contents that demonstrate the application of Guilford's theoretical structure to the practical realm of the classroom.

Jerome Bruner believes that the inquiry into creativity may be equated with the search for excellence by mankind and that such inquiry may bring a new dignity to humanity. Seven conditions of creativity listed by Bruner are: effective surprise, which creates new perspectives; detachment and commitment, which include a departure from the obvious; passion and decorum, which demand a willingness to free one's impulses in one's work and which imply a respect for form and materials; freedom to be dominated by the object; deferral and immediacy, which include the impulse to exploit an idea; internal drama, which results in the resolution of conflict and the coalition of the set of identities comprising the person; and individual abilities, which include such personal characteristics as energy level, intelligence, endurance, alertness, and perseverance. (2)

The theory of synectics is concerned with the growth in creative capacity through insight into the free associatory concepts in man's preconscious mind. Synectic theory holds that an increase in creative efficiency may be effected through understanding the psychological processes underlying behavior and through a recognition of the role of the emotional component in the creative process. The theory implies that teachers should become aware of their own stages of creative development in teaching and synchronize their lessons with the recognized stages of the creative process. (6)

Many creative persons have described the joy they derived from their work and the compulsion they felt to express themselves. In a symposium recorded in the book, *The Creative Process,* 38 outstanding persons in the fields of art, literature, and science described in their own words how they chose their particular forms of expression and mastered the necessary techniques for their work. (4a) One such contributor was Thomas Wolfe, who described in an excerpt from his work, *The Story of a Novel,* the intensity with which he approached *Of Time and the River.* Wolfe said:

> . . . Never in my whole life have I lived so fully, have I shared so richly in the common life of man as I did during these three years when I was struggling with the giant problem of my own work.
>
> For one thing, my whole sensory and creative equipment, my powers of feeling and reflection . . . had reached the greatest degree of sharpness that they had ever known . . . (4a)

Henry James also analyzed in detail his own powers of invention in the prefaces to *The Ambassadors*, *The American*, and other novels from his pen.

In his introduction to *The Creative Process,* the editor, Brewster Ghiselin, echoed the sentiments of James Coleman in emphasizing the necessity for hard work in order to produce creations of merit. (4a) Ghiselin writes:

> Even the most energetic and original mind, in order to reorganize or extend human insight in any valuable way, must have attained more than ordinary mastery of the field in which it is to act, a strong sense of what needs to be done, and skill in the appropriate means of expression. It seems certain that no significant expansion of insight can be produced otherwise, whether the activity is thought of as work or not. Often an untutored beauty appears in the drawings of children, and we rightly prize the best of them . . . , but they have scarcely the

power to open the future for us. For that, the artist must labor to the limit of human development and then take a step beyond. The same is true for every sort of creative worker.

That step beyond is stimulated by labor upon the limits of attainment.

NATURE OF AN ENVIRONMENT CONDUCIVE TO CREATIVITY

An environment conducive to creativity stimulates positive though intangible attitudes, reactions, and interactions. Such an atmosphere provides freedom for children to err in trying new ideas; a plethora of materials available for instant use; a classroom schedule permitting the pursuit of individual interests and independent study; long-range planning; and cooperative relationships among teachers and pupils.

E. Paul Torrance describes teacher-pupil relationships that inspire creativity as those in which the teacher relates to his pupils as persons in their own right and in which the teacher coexperiences ideas and events with his class members. (14) Without creative teachers, creative talent will remain for the most part unrecognized and undeveloped. Torrance recommends six guidance procedures to the teacher who would develop creativity in a gifted pupil: provide a "refuge" for the thinker; be his "sponsor" or patron; help him understand his divergence from the norm; encourage him to communicate his ideas; and assist his parents and friends to understand him and to recognize his creative talents. (15) Torrance also believes that gifted pupils should be encouraged to work out the full implications of their ideas. Often original thinkers fail to fulfill their potential because they do not follow through on their thinking sufficiently to make an important discovery, to reach a logical conclusion, or to complete a creative production. (13)

Hughes Mearns writes of the psychological significance of self-discovery in creative performance. He relates his own experiences as an English teacher at the Lincoln School of Columbia University, where he freed his students to express themselves originally by implanting in them a faith in their individual ability. Even these students, who gave small outward indications of being creative, responded to that approach. (9)

In order to further the growth of creativity in the classroom, many educators have urged teachers to encourage gifted pupils to stretch their minds to the utmost in attaining the highest standards of performance of which they are individually capable. To utilize one's capacities is to enhance them.

THE CONTRIBUTION OF BACKGROUND INFORMATION TO CREATIVITY

Although not a guarantee of creative expression, the accumulation of a broad background of knowledge sets the stage for creative processes and is essential as a preparatory step. A popular misconception about creativity is that somehow productions and inventions may occur like a bolt from the blue, springing unbidden from an intellectual vacuum. Such is obviously not the case, however. The incubation and insight steps in the creative cycle do not proceed miraculously or spontaneously from a mental void, for lacunas in the mind are not noted for their productivity. Karl Pribram says that inventions spring from previous knowledge of the discoverers, who transfer old facts to new interpretations and then test the validity of these new theories against the familiar tenets. Pribram cites as an example the composer following familiar structure and form as a basis for creating a new composition. The poet also may use traditional forms within which to fashion original concepts in his own style. (10)

The Enrichment Demonstration Center at Los Angeles provided broad background knowledge in the language arts for the pupils as a basis on which to develop creative expression. This chapter outlines for the use of teachers the material presented in critical reading, literature, and communication curriculums.

READING SKILLS

The enriched reading program encompassed the teaching of skills in critical reading, study habits, and vocabulary building. All aspects of reading should concern teachers of the gifted child, who usually enjoys reading and instructs himself to a degree. The teacher should concentrate on refining those skills involving evaluation, interpretation, and diction. While many pupils read extensively and understand individual word meanings, they need professional help in such areas as thinking critically, making valid inferences, and appreciating the full significance and style of literary works. Especially important to gifted pupils, too, is the ability to locate and organize information. The "Selected References" of this chapter list under the heading of "Reading Skills" some of the books used at the Los Angeles center.

The following schema indicates the type of information that was used to enrich the curriculum of the gifted in reading, studying, and vocabulary building.

OUTLINE OF INFORMATION RELATED TO READING SKILLS

I. Reading Comprehension

Evaluation: Judgment and comparison

Inference and Implication: Deductive and inductive reasoning

Interpretation: Critical analysis of the thought and mood

Denotation and Connotation: Dictionary definitions and suggested meanings

Diction: Word choice and art of vocal expression

II. Study Skills

Location: Skimming; scanning; signal words; use of textbook, reference works, card catalog, graphs, maps, tables, charts; and use of files

Organization: Précis writing, summarizing, outlining, note-taking, and classifying

III. Vocabulary Building

Word Structure: Roots and affixes; syllabification; pronunciation; inflected forms

Phonetic Symbols: Speech sounds as an aid to pronunciation

Context: Clues to particular meanings

Figurative Language and Imagery: Figures of speech, comparisons, and sound effects

Derivations: Words derived from the Germanic, Latin, Greek, and Romance languages

Word Categories: Synonyms, homonyms, antonyms, homographs, colloquialisms

LITERATURE

Creative expression was also encouraged at the Los Angeles center through a study of the various categories of children's literature, together with the following more advanced literary forms: fantasy; historical fiction; poetry; mythology; folk tales, legends, and fables; biography; adventure and animal stories; short stories; essays; the novel; and drama. To provide the gifted pupil with an understanding of himself and other persons, the teaching of modern American fiction was emphasized. The thorough study of a single literary category promoted invention in that form on the part of the pupils.

The following material presents samples of the types of information used and the literary elements considered at the demonstration center in studying all of the literary forms identified in the foregoing.

The Study of Fantasy

In presenting fantasies, the teachers considered the following usual topics:

- Theme
- Choice of subject
- Plot
- Characterization
- Style
- Setting
- Mood

The Study of Historical Fiction

Choice of subject
- Life of an age, period, or moment from the past
- Historical events
- Invented occurrences
- Stories of historical value written as accounts of contemporary life

Plot
- Well defined; lively
- Reconstructed life of a previous generation
- Real happenings or fictitious plots
- Descriptive style

Characterization
- Characters from the past
- Hero or heroine – a believable person
- Portrayal of the hearts and minds of the people of the historical period
- Utilization of either real personages or a combination of both real and fictitious persons

Authenticity
- Historical accuracy
- Realistic situations

Feeling of the everyday life of the time
Clear sense of history in the presentation of events of the period

Setting
Previous generations
Atmosphere, spirit, and excitement of another period
Physical environment and feelings of the age

Mood
Adventurous
Mysterious
Exciting
Inspiring
Thoughtful

Theme
Joys and hardships of a previous generation
Issues of the time
Universal theme; i.e., growth and maturation
Necessary requisites to life
Appreciation of an inspiring heritage
Importance of the past as retained in the present

The Study of Poetry

Definition
Crystallization of experience in musical words
Communication of human thought and feeling through sensory images and emotional responses
Elusive combination of ideas and emotions

Content
Adventure and accomplishment
Historical events
Deeds of ordinary men, of great men
Biographical accounts
Achievements of the human spirit
Statements of ideals
Everyday happenings
Recall of a familiar experience in an original way
Weather and the seasons
The loveliness of the revolving seasons
Wonder of effective contrasts in nature
Humor
Nonsense rhymes
Amazing animals
Descriptions of funny, eccentric characters
Amusing situations
Fantasy
Magical, mysterious happenings
Imaginative persons and places
Other creatures, neither animal nor human
Animals
Comical or real
Domestic pets
Farm, zoo, or wild animals
Personal relationships
Growth of abilities
Feelings of accomplishment
Innate desire to retain individuality
Stability of own personality
Family life
Favorite persons, places, things

Satisfactions
Rhythm – response to a measured beat
Rhyme and auditory response
Sounds and arrangements of words
Language patterns of lines
Imagery
Stimulation of responses of sight, touch, taste, and smell
The beauty of the commonplace
Vivid, fresh pictures painted in words
Heightened emotional response
Increased sensitivity to an idea or mood (sadness, remorse, gaiety, exhilaration, anticipation, wonder, excitement, fear of danger)
Enjoyment of the story element in poetry: mystery, romance, conflict, adventure, humor

Forms
Ballad
The earliest poems; originally, the literature of the people
Short narrative poems adapted for singing or lyrical effect
Popular ballads handed down from one generation to the next
Literary ballads with known authors
Stories of heroic deeds, romance, feuds, tragedies
Narrative verse
Relates a particular event, episode, or story
May utilize lyrical, descriptive, or free verse
Limerick
Five-line nonsense verse with the first and second lines rhyming, the third and fourth lines rhyming, and the fifth line usually ending in a surprise or humorous statement
Unusual spelling, oddities, humorous twists
Lyrical verse
Usually personal or descriptive poetry with no particular length or structure
Derived from the word "lyre," refers to poetry that sings
Free verse
Descriptive, unrhymed prose-poetry
Depends on rhythm or cadence for its poetic form
May use some rhyme, alliteration, and pattern
Though looking different on a page, sounds much like other poetry when read aloud

The Study of Myths

Definition

An imaginary story dealing with gods and goddesses or beings conceived as divine

A story of forgotten origin whose plot relates historical events explaining a natural phenomenon, institution, practice, or belief

Origin

Explanations of the earth, sky, and human behavior by primitive man who related events to forces: (a) as a concept of a power in human form who controlled the phenomena of nature; (b) as a complex system of gods who represented such virtues as wisdom, purity, or love; and (c) as a stage of worship in an organized form

Desire to propitiate mysterious forces

Ancestor worship

Fear and wonder

Necessity of explaining customs

Human tendency to clothe thought in figurative language

Greek, Roman, Norse, Chinese, Japanese, African, Icelandic, North American Indian, and Mayan Indian stories

Characterization

Immortal gods who possessed supernatural powers in human form

People of the past or of other places

Gods who controlled the forces of nature and the destiny of man

Themes

Emotions, including love, hate, jealousy, and envy

Creation of the earth and people

Customs, seasons, and movements of the sun and moon

Relationships among the gods and between the gods and men

Style

Short story construction

Allegory

Realistic conversation

Classes

Culture myths

Stories in which a hero in the form of a man, god, or animal imparts the arts of life to man

Nature myths

Stories in which the phenomena of nature are described

Theogonic myths

Stories which narrate the origin of gods

Etiological myths

Stories of events describing origins of rites and customs

The Study of Folklore (Folk Tales, Legends, Fables)

Definition

Accounts of an event or events that are actual, legendary, or fictitious

Imaginative compositions intended to entertain

Unusual or incredible narratives

Origin

Imaginative expressions of events in human life

Accounts of customs, taboos, rules, and beliefs

Tales told by one storyteller to another over long periods of time

Variations in stories told long before being written down

Common reactions of man to phenomena and events

Tales originating in India and spreading to Europe

Similar stories originating in many regions relating to the historical development of societies

Astral, mythological theory of origin of the moon and sun, night and day, seasons (every natural phenomenon stimulated mythical explanations)

Expression through dreams or unconscious drives of personality – emotional needs, frustrations, wishes

Relation of folklore to anthropological studies of cultures

Themes

Enchantment

Expression through the charm of tiny people, the long sleep, bewitchment, and magic powers

Magic

Description through objects such as rings, flying ships, tablecloths, harps, lamps

Transformation of persons to animals or vice versa

Tasks and trials

Foolish wishes or moralizations

Trickery of animals and persons

Explanation of land formations, day and night, seasons, animal behavior

Characterization

Monumental odds overcome by the hero in attaining wealth or position

Possession of human or superhuman characteristics by animals

Development of unique heroes who help create a country

Portrayal of heroes as boasting, exaggerating, bombastic, comic, or poetic individuals

Few but well-defined characters

Style
- Descriptive prose
- Broad exaggeration
- Dialect and conversations
- Figurative expressions (simile, metaphor, onomatopoeia, alliteration)
- Idiomatic expressions
- Immediate involvement of the reader in the introduction
- Defined conflict developed with vitality
- Abrupt conclusions (e.g., "which was probably just as well")

Mood
- Humorous feelings
  - Happenings described in gay conversation
  - Clever wit of a central character
  - Antics of fools and simpletons
- Frontier spirit
  - Consistent perseverance
  - National loyalty
  - Regional pride

The Study of Biographies

Choice of subject
- Events and persons worthy of emulation

Characterization
- Persons presented as human beings with shortcomings and virtues
- Worthy subjects that come alive
- Background of lives truthfully presented
- Character revealed through actions, conversations, and thoughts

Style
- Narrative approach
- Dramatized events and personalized subjects in fictionalized biography
- Invented dialogue and subjects' unspoken thoughts based on research

Theme
- Author's interpretations of the multidimensional facets of the subject's life

Authenticity
- Insight into the character of the subject
- Accuracy of historical detail
- Respect for verifiable reporting

The Study of Adventure Stories

Elements of Adventure
- Suspense
- Action
- Conflict

Characterization
- Heroes with admirable skills, personalities, and relationships
- Authentic backgrounds of persons

Setting
- Vivid portrayal of ways of living
- Authentic regional or historical backgrounds

Style
- Descriptive prose
- Exciting situations

Themes
- Conflict of man against nature
- Appreciation of others
- Struggle for survival or for triumph over persons, places, things
- Realistic misfortunes of a hard life

The Study of Animal Stories

Choice of Subject
- Life cycle stories of animals seeking survival
- Realistic stories portraying actual animal behavior

Character Development
- Animal characters created as being consistent with their species, yet imbued with human qualities such as courage, loyalty, endurance, pride, and love
- Qualities such as patience, curiosity, and skill emphasized
- Predominance of animals over persons

Themes
- Love of nature
- The struggle of living things
- Lessons of such virtues as loyalty, kindness, fortitude, and compassion
- Cruelty of humans toward animals
- Suffering as a result of loving

Style
- Brief introduction usually leading to quick action
- Development of suspense in well-paced stories
- Relationship of present incidents to preceding events in a series of stories
- Simple, exciting plots with authentic information about animals

Setting
- Sights, sounds, smells of the locale vividly described
- Feeling of the region reflected by the use of dialect

Mood
- Personal kindness
- Tender care
- Sorrowful feelings
- Humorous situations
- Emotional warmth
- Dramatic, noble dignity

The Study of the Short Story

Plot
- Outcome probable without the use of chance, coincidence, or *deus ex machina*
- Events interrelated with originality and ingenuity
- Dramatic sequence of happenings
- Suspense, conflict, and foreshadowing

Characterization
- Believable characters revealed through what they say and do and what others say about them
- People individualized through specific details
- Dialogue interesting and natural
- Dialect when appropriate

Setting
- Time and place of the action
- Essentials
  - Is vital to the story
  - Influences characters
  - Contributes to mood and atmosphere

Theme
- Central concept of story
- Truth or observation about life and people
- Significant idea

Mood
- Atmosphere of setting
- State of mind
- Tone of feeling

Style and Technique
- Vivid narrative
- Concrete detail
- Figurative language
- Portrayal of rapidly moving events
- Specific wording with exactness of usage

The Study of the Essay

INFORMAL OR PERSONAL ESSAY

Definition
- A literary composition of an interpretive nature
- A personal reminiscence or account focused on an experience – sometimes in the form of a journal, a diary, or a letter
- An account in which the author's interpretation or re-creation of a personal experience is as important as the event described
- Distinguished from a treatise or dissertation by being less formal and systematic
- Distinguished from a history or biography by treating a single aspect of a subject rather than its whole scope

Purposes
- Revelation of the author's feelings about his subject
- An appeal to the reader's feelings through expression of the author's feelings
- Vicarious participation by the reader in the recounted events

Tone
- Varied (e.g., whimsical, satirical, sentimental, humorous)
- Means by which the author communicates his feelings

Style and Technique
- Narrative prose style – conversational, humorous, or poetic
- Use of language that is moving, stimulating, and pleasing
- Suspense and dramatic intensity developed by a recounting of incidents
- Specific, meaningful settings created in vivid detail
- Closeness to the events expressed through realistic dialogue

FORMAL ESSAY

Definition
- A literary composition analytical in nature, such as a magazine article
- An account explaining a process or idea, interpreting facts, or analyzing reasons
- A factual narration of a subject chosen to inform, instruct, or persuade

Purposes
- Attention to the special significance of a subject
- Reflection on a previously neglected idea
- Recommendation of a course of action or a way of life
- Presentation of developments in science, medicine, politics, or other areas of human endeavor
- Satisfaction of the needs for enjoyment, adventure, knowledge of the world, and understanding of human problems
- Information about people or events in the present and in the past
- Information regarding how things are done and made
- Speculation about the future

Tone
- Serious because of important or significant facts and experiences
- Intellectual in appeal rather than emotional

Style and Technique
- Narrative prose style
- Direct and logical presentation of material
- Limited or personal viewpoint
- Considerable freedom of style and method, but not looseness
- A brief account or a long account (in most instances, of substantial length)
- May take the form of a systematic classification of several parts of the subject under a series of headings

The Study of the Novel

Definition
- Fictitious prose narrative portraying realistic characters and natural actions in a plot
- Wide assortment of works including the following: imaginative, fanciful tales; slightly fictionalized biographies approaching historical fact; literature illustrating historical, social, or psychological truths
- Lengthy tale that may exceed a half million words, although the average is closer to a hundred thousand words
- Narration that includes a diversity of impressions and events

Plot
- A sequence of incidents leading to a climax
- Involved conflicts

Characterization
- Insights into human behavior
- Numerous persons described in detail
- Realistic delineations of people and their traits

Settings
- Time – usually in a specific period of the past; often in the present (contemporary)
- Placement – can vary from a few to many places

Theme
- Historical, believable pictures of a period, of events, and of people
- Modern topical problems; for example, automation, crowded conditions, racial integration, the young executive, lawlessness, family problems
- Message of general, abiding interest

Mood
- Vivid, realistic pictures of the life and culture of the setting
- Wide range of atmosphere

Style and Technique
- Provocative topics included to arouse interest
- Suspense created and maintained effectively
- Skillful use of literary aids; e.g., imagery, rhythm, dialogue
- Artful simplicity
- Realism or impressionism as appropriate

The Study of Modern American Fiction

Purposes
- Unify group feeling
  - Develop relationships among children
  - Create atmosphere of friendliness and acceptance
- Build concept of self by response to questions:
  - What kind of a person am I?
  - What are my roles in society to be?
  - What do others think of me?
- Relieve tension
  - Mirror interactions with people, places, and things
  - Gain feelings of worthiness, successfulness, acceptance
- Learn about adult roles
  - Choose a vocation
  - Accept responsibilities
- Develop character
  - Expand inner-directed behavior as a life force
  - Unfold other-directed behavior with sensitivity to problems and expectations of others

Subjects
- Problems of personal development
- Maturation of social values
- Conformity of peer-group relations
- Expectations of life
- Forces impinging upon persons
- Information about the world and people
  - Communication of facts
  - Interpretation of social relationships
  - Growth in understanding of self and others

Themes
- Growth
  - Feelings about one's own size or about one's self-concept
  - Evolvement of maturation process
  - Development of family relationships as an aid to the individual who is wholesomely nurtured or as a barrier to the person who is deprived
  - Importance of courage to meet life's demands
  - Understanding
    - Causes of behavior (e.g., need for friends or status)
    - Basic needs for achievement, recognition, respect, love

Similarities of human problems (e.g., fear of new situations, preparation for new experiences, values of honesty and responsibility, insecurities and joys of growing and adjusting, expectations of society, importance of fair play and good sportsmanship, reactions to emotions)
Learning to live with physical disabilities
Physical handicaps as barriers to self-realization
Importance of the faith of the family
Value of independence
Tensions created by groups
Possessive friendships
Anxiety from insecurity
Desire to make impressions
Facing strange situations
Development of conscience and a set of values
Emergence of adulthood
Development of individuality
Manifestations of increasing independence
Expansion of resourcefulness
Challenges of recognizing and accepting the needs of others
Acceptance of differences
Understanding the values of heterogeneity
Acceptance of different ethnic, religious, and racial groups
Awareness of certain likenesses in all persons

Characterization
Persons of vitality and sincerity
Absence of sentimentalism
Natural, realistic descriptions of people and human conduct

Style
Avoidance of didacticism, which could hinder understanding
Avoidance of clichés or purple patches
Economic use of literary devices
Achievement of a natural flow of language
Directness, simplicity
Use of realism or impressionism as appropriate
Ability to mirror human nature, to reflect deep and universal values (ideas and concepts that are common not only to Americans but to people of other lands and cultures as well)

The Study of Drama

Definition
A composition that is presented in prose or verse, arranged for enactment by dialogue or pantomime, and intended to portray human life or behavior or simply to tell a story; usually written in prose and most commonly set up for dialogue
An art form that combines skills of writing, speech, movement, and staging
A literary type designed to be performed by actors on a stage
A literary form that includes the following:
Tragedy, with an inevitable disaster resulting from the protagonist's defeat because of (a) his own weakness; or (b) an external force
Comedy, with a happy ending resulting from the protagonist's victory over opposing forces
Melodrama, with focus on action and suspense
Farce, with high humor and dramatic effect achieved by the absurd and the far-fetched
A play written for the purpose of entertainment, with story appeal for people of different times and places, with recognizable situations that give insight into human nature, and with ideas and attitudes that are of universal significance
A literary composition divided into acts and scenes indicated by curtain falls or changes in the time or place of the action

Elements and Structure
Plot
Includes a series of incidents or events that comprise the action of the story
Begins with the exposition, which indicates prior action, the present state of affairs, major characters, and situations that will lead to conflict
Develops with complications through a series of episodes related to the basic conflict
Reaches the major climax and minor crises as the protagonist attempts to resolve the internal or external conflict and succeeds or fails in a significant decision, critical discovery, or vital encounter
Continues with denouement as the dramatic action reveals the outcome of the situations, falling action as no new peaks of interest occur, and final resolution
Contains the element of conflict as a struggle between two opposing forces, ideas, or beliefs that may be internal (e.g., struggle to overcome some weakness in character) or external (e.g., between the protagonist and nature, society, or other persons)
Includes subplots which, interwoven with the main plot, may help or hinder the protagonist

Characterization
Main character, the protagonist, who is opposed by the antagonist
Major characters usually revealed through actions requiring a change in personality, behavior, or attitude as a result of internal conflicts or as a result of external forces over which he has no control

Minor characters usually static or occasionally stereotyped

Dialogue
- Reveals the character and makes him credible
- Advances the plot
- Contains occasionally a particularly eloquent speech or monologue
- Sometimes includes ideas of significance beyond the plot

Stage Directions
- Instructions printed in italics and enclosed in parentheses
- Indications of what is occurring on stage or how the characters feel, react, or think
- Comments on a character role or a situation
- Suggestions regarding a particular mood
- Ideas for sound effects
- Clues to interpretations

Setting
- Background of time and place appropriate to the action
- Locale that contributes atmosphere and mood
- Description of scenes appropriate to the plot
- Detailed account if the setting is unusual or is of major importance to the story
- Setting identified only briefly if typical or the same throughout the play
- Limited number of places, since each change of scene interrupts the story and adds to the expense of production

Theme
- Philosophic conclusion
- Natural outgrowth of the action
- Serious statements about people in familiar experiences
- Commentaries on human behavior through the characters, their problems, and their solutions to the problems
- Problems of the practical versus the romantic approach to life
- Views of life's tensions, dilemmas, conflicts, decisions, joys, or sorrows

Techniques
- Illusion of reality through scenes, properties, illustrations, stage directions, and characters' use of scenery and properties
- Dramatic movements with entrances, exits, and curtains
- Contrasts in lighting and sound effects
- Minor climaxes
- Elements designed for audience empathy with sentimental appeal of positive and negative characters
- Exaggeration of banter with short, crisp conversational remarks
- Thorough denouement with an unraveling of complications, accounting of plot threads, resolving of problems
- Subtle outcomes revealed through actions and dialogue that imply but do not state
- Use of devices such as hyperbole, parody, irony, inference, caricature, allusion
- Development of plot through external action (e.g., physical movements, gestures, facial expressions, on- or off-stage happenings) or internal action (e.g., thoughts, feelings, mental or emotional conflict)
- Development of a character by what he says, how he says it, how he reacts to people and situations
- Creating suspense by inducing uncertainty and anxiety as to the outcome

COMMUNICATIVE SKILLS

Among the communicative skills taught at the Enrichment Demonstration Center were listening, speaking, discussing, reading, dramatizing, grammar, punctuation, word usage, spelling, and composition. To instill in their gifted pupils an appreciation of language, teachers at the center were well grounded in the fundamentals of English composition and usage. The following material presents a sampling of the information provided in classes in communicative skills at the demonstration center. Reference works that were used appear at the end of this chapter.

Elements of Oral Communication

Listening Skills
- Learning through records, tapes, speeches, lectures, and discussions
- Interpreting and evaluating ideas objectively and critically
- Extending vocabulary
- Acquiring a basis for creative expression through literature and the arts
- Responding to literature and the arts as a basis for critical appreciation
- Organizing significant ideas

Speaking Skills
- Achieving proper vocal qualities with attention to volume, tempo, pitch, and tone
- Acquiring the proper vocal techniques for public speaking
- Acquring clear enunciation and correct pronunciation
- Presenting ideas logically and clearly
- Evaluating speeches to improve their presentation and content

Discussion Skills
- Gathering information on which to base discussion

Participating intelligently in discussions
Distinguishing facts from opinions
Learning to lead discussions
Summarizing to conclude discussions
Participating in special kinds of discussions, including forums, dialogues, panel and round-table discussions, symposiums

Reading Skills
Using vocal skills effectively while reading aloud poetry, literature, creative writing, plays, summaries, directions, reports, minutes, and articles

Dramatizing Skills
Reciting with dramatic effectiveness assigned roles and dialogues

Elements of Written Communication

Grammatical Skills
Types of sentences
Sentence fragments and run-on sentences
Parts of a sentence, including subjects, predicates, objects, and complements
Clauses and phrases
The eight parts of speech
The ten most common grammatical errors to be avoided, including incorrect formation of plural nouns, pronoun reference, verb disagreement, incomplete constructions, dangling modifiers, ambiguities, overuse of superlatives, shift in point-of-view

Punctuation Skills
Use of period, question mark, and exclamation mark to conclude sentences
Use of comma and semicolon to separate clauses and items in a series
Other uses of comma
Avoidance of unnecessary punctuation
Use of parentheses, colon, dash, brackets, and quotation marks

Skills in Word Usage and Spelling
Use of concrete and abstract words
Descriptive words
Denotation and connotation
Synonyms and antonyms
Contextual meanings of words
Four word functions – to name, to assert, to modify, and to connect
Idiomatic usage
Use of dictionary to determine word meaning, pronunciation, spelling, etymology, derivatives, and the like
Spelling rules

Composition Skills
Objectives in writing
Analysis and organization of topic
Transitions
Mechanics
Considerations in writing sentences and paragraphs
Unity and coherence
Outlining ideas and collecting material
The first draft and revisions

SUMMARY

The enriched offerings in creative expression resulted from effective teacher training in the language arts, including literature and the structure and form of language. Ample knowledge of a particular facet of subject content frees the learner to release his creative impulses within that area. The staff of the Los Angeles center were effective in developing the creative potentials of their pupils in both oral and written expression.

Selected References

Creativity

1. Ausubel, David. *The Psychology of Meaningful Verbal Learning.* New York: Grune & Stratton, Inc., 1963.

2. Bruner, Jerome S. "The Conditions of Creativity," in *Contemporary Approaches to Creative Thinking.* Edited by H. E. Gruber and Others. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963.

3. Coleman, James. *Personality Dynamics and Effective Behavior.* Glenview, Ill.: Scott, Foresman & Co., 1960.

4. *The Creative Organization.* Edited by Gary Steiner. Chicago: University of Chicago Press, 1965.

4a. *The Creative Process: A Symposium.* Edited by Brewster Ghiselin. New York: New American Library (Mentor paperback). Reprint of hardback edition published by the University of California Press, 1952.

5. *Curriculum Planning for the Gifted.* Edited by Louis Fliegler. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1961.

6. Gordon, William. *Synectics.* Evanston, Ill.: Harper & Row Pubs., 1961.

7. MacKinnon, Donald. "What Makes a Person Creative?" *Saturday Review*, XLV (February 10, 1962), 15-17.

8. May, Rollo. "The Nature of Creativity," in *Creativity and Its Cultivation.* Edited by H. Anderson. New York: Harper & Brothers Publishers, 1959.

9. Mearns, Hughes. *Creative Power: The Education of Youth in the Creative Arts* (Second revised edition). New York: Dover Publications, Inc., 1958 (paperback).

10. Pribram, Karl. "Neurological Notes on the Art of Education," in *Theories of Learning and Instruction.* The Sixty-third Yearbook of the National Society for the Study of Education, Part I, pp. 78-110. Chicago: University of Chicago Press, 1964.

11. Rogers, Carl. "Toward Becoming a Fully Functioning Person," in *Perceiving, Behaving, Becoming.* 1962 Yearbook, Association for Supervision and Curriculum Development. Washington, D.C.: National Education Association, 1962.

12. Taylor, Calvin. "A Tentative Description of the Creative Individual," in *A Source Book for Creative Thinking.* Edited by Sidney J. Parnes and Harold F. Harding. New York: Charles Scribner's Sons, 1962.

13. Torrance, E. Paul. "Creative Thinking Through School Experiences," in *A Source Book for Creative Thinking.* Edited by Sidney J. Parnes and Harold F. Harding. New York: Charles Scribner's Sons, 1962.

14. Torrance, E. Paul. *Education and the Creative Potential.* No. 5 of THE MODERN SCHOOL PRACTICES SERIES, College of Education, University of Minnesota. Minneapolis: University of Minnesota Press, 1963.

15. Torrance, E. Paul. *Guiding Creative Talent.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962.

Additional References on Creativity

Creativity: Progress and Potential. Edited by Calvin W. Taylor. New York: McGraw-Hill Book Company, 1964.

Creativity and its Cultivation: Addresses Presented at the Interdisciplinary Symposia on Creativity [at] *Michigan State University, East Lansing, Michigan.* Edited by Harold H. Anderson. New York: Harper & Brothers Publishers, 1959. (Cited under entry number 8.)

Getzels, Jacob W. and Philip W. Jackson. *Creativity and Intelligence: Explorations with Gifted Students.* New York: John Wiley & Sons, Inc., 1962.

Guilford, J.P., Paul R. Christensen, and Robert C. Wilson. *A Bibliography of Thinking, Including Creative Thinking, Reasoning, Evaluation, and Planning.* Los Angeles: University of Southern California (Department of Psychology), July, 1953.

Productive Thinking in Education. Edited by Mary Jane Aschner and Charles E. Bish. The National Education Association and the Carnegie Corporation of New York. Washington, D. C.: The National Education Association, 1965.

Scientific Creativity: Its Recognition and Development. Edited by Calvin W. Taylor and Frank Barron. New York: John Wiley & Sons, Inc., 1963.

Whiting, Charles S. *Creative Thinking.* REINHOLD MANAGEMENT SCIENCE SERIES. New York: Reinhold Publishing Corporation, 1958.

Literature

(See also the materials listed under "Literature" at the end of Chapter V.)

American Essays. Edited by Charles B. Shaw. New York: New American Library, Inc., 1963.

Arbuthnot, May Hill. *Children and Books* (Revised edition). Glenview, Ill.: Scott, Foresman & Co., 1957.

Arbuthnot, May Hill. *Time for Fairy Tales Old and New.* Glenview, Ill.: Scott, Foresman & Co., 1952.

Arnstein, Flora J. *Adventure into Poetry.* Stanford, Calif.: Stanford University Press, 1951.

A Basic Book Collection for the Elementary Grades. Prepared by the American Library Association. Chicago: American Library Association, 1960.

Bement, Douglas. *Weaving the Short Story.* New York: Ray Long and Richard R. Smith, Inc., 1931.

Caldecott Medal Books: 1938-1957. Edited by Bertha Mahony Miller and Elinor W. Field. Boston: The Horn Book, Inc., 1957.

Dobler World Directory of Youth Periodicals. Edited by Lavinia G. Dobler. New York: Schulte Publishing Company (published irregularly).

Egri, Lajos. *The Art of Dramatic Writing.* New York: Simon and Schuster, Inc., 1960.

Eight Great Comedies. Edited by Sylvan Barnet and Others. New York: New American Library, Inc., 1963.

Eight Great Tragedies. Edited by Sylvan Barnet and Others. New York: New American Library, Inc., 1963.

Heaton, Margaret, and Helen B. Lewis. *Reading Ladders for Human Relations* (Revised edition). Washington, D.C.: American Council on Education, 1955.

Huck, Charlotte, and Doris A. Young. *Children's Literature in the Elementary School.* New York: Holt, Rinehart & Winston, Inc., 1963.

Illustrators of Children's Books, 1744-1945. Edited by Bertha E. Mahoney and Others. Boston: The Horn Book, Inc., 1947.

Illustrators of Children's Books, 1946-1956. Edited by Ruth H. Viguers and Others. Boston: The Horn Book, Inc., 1958.

Meckel, Henry C. "Research on Teaching Composition and Literature," in *Handbook of Research on Teaching.* Edited by N. L. Gage. Chicago: Rand McNally & Co., 1963.

Newbery Medal Books: 1922-1955. Edited by Bertha Mahony and Elinor W. Field. Boston: The Horn Book, Inc., 1955.

Plot Outlines of 101 Best Novels. Edited by Margaret Gillett and E. A. Grozier. New York: Barnes & Noble, Inc., 1962.

Promoting Personal and Social Development Through Reading. Proceedings of the Annual Conference on Reading, 1947. Compiled and edited by William S. Gray. Chicago: University of Chicago Press, 1947.

Read, Herbert. *This Way, Delight.* New York: Pantheon Books, Inc., 1956.

The Reader's Companion to World Literature. Edited by Lillian Hornstein and Others. New York: New American Library, Inc., 1963.

Readings in Applied English Linguistics (Second edition). Edited by Harold B. Allen. New York: Appleton-Century-Crofts, 1958.

Sandburg, Carl. *Early Moon.* Grades five through eight. New York: Harcourt, Brace and Co., 1930.

Schindler, Alvin W., and Others. "Developing a Sense of Time and Chronology," in *Skills in Social Studies.* Twenty-fourth Yearbook. Washington, D.C.: National Council for the Social Studies, 1953.

Sheridan, Marion C., and Others. *The Motion Picture and the Teaching of English.* New York: Appleton-Century Crofts, 1965.

Smith, Lillian H. *The Unreluctant Years; a Critical Approach to Children's Literature.* Chicago: American Library Association, 1953.

Oral and Written Communication

(See also the materials listed under "Communication Skills" at the end of Chapter V.)

Altick, Richard D. *Preface to Critical Reading* (Fourth edition). New York: Holt, Rinehart & Winston, Inc., 1960.

Burriss, Eli E., and Lionel Casson. *Latin and Greek in Current Use.* New York: Prentice-Hall, Inc., 1945.

Corbin, Richard K., and Others. *Guide to Modern English.* Grades nine through twelve. Glenview, Ill.: Scott, Foresman & Co., 1960.

Diederich, Paul B., and Osmond E. Palmer. *Critical Thinking in Reading and Writing.* New York: Holt, Rinehart & Winston, Inc., 1955.

English for the Academically Talented Student in the Secondary School. National Education Association – Project on the Academically Talented Student. Edited by Arno Jewett. Washington, D.C.: National Education Association, 1960.

Grant, Phil S., and Others. *Correctness and Precision in Writing.* Boston: Houghton Mifflin Co., 1953.

Hildreth, Gertrude. *Teaching Spelling.* New York: Holt, Rinehart & Winston, Inc., 1955.

Nathan, Norman. *The Right Word.* Boston: Houghton Mifflin Co., 1962.

Parker, William Riley. "The Case for Latin," *PMLA,* LXXIX, Part 2 (September, 1964), 3-10.

Roberts, Paul. *The Roberts English Series: A Linguistics Program.* Textbook and teacher's edition, workbook, tests, and two LP recordings. New York: Harcourt, Brace & World, Inc., 1966.

Strickland, Ruth G. *Language Arts in the Elementary School* (Second edition). Boston: D. C. Heath & Co., 1957.

Warriner, John E., and Others. *English Grammar and Composition.* New York: Harcourt, Brace & World, Inc., 1958.

Reading Skills

Adventures in Modern Literature. Teacher's manual and reading tests. Edited by Robert Freier and Arnold L. Lazarus with Herbert Potell. New York: Harcourt, Brace & World, Inc., 1956.

Altick, Richard D. *Preface to Critical Reading* (Fourth edition). New York: Holt, Rinehart & Winston, Inc., 1960.

Better Readers for Our Times. Vol. 1. International Reading Association – Conference Proceedings. Edited by William S. Gray and Nancy Larrick. New York: Scholastic Magazines, 1956.

Crank, Doris H., and Others. *Words: Spelling, Pronunciation, Definition, and Application.* New York: McGraw-Hill Book Company, 1962.

Fries, Charles. *Linguistics: the Study of Language.* New York: Holt, Rinehart & Winston, Inc., 1964.

Gainsburg, Joseph C. *Advanced Skills in Reading.* Books 1 and 2; teachers' annotated edition. New York: Macmillan Co., 1962.

Lamb, Marion M. *Word Studies.* Cincinnati: South-Western Pub. Co., 1963.

Madden, Richard, and Thorsten Carlson. *Success in Spelling.* Teacher's guide for grades one and two. Sacramento: California State Department of Education, 1959.

Mathews, M. M. *Words: How to Know Them.* New York: Holt, Rinehart & Winston, Inc., 1956.

Morse, Horace T., and George H. McCune. *Selected Items for the Testing of Study Skills and Critical Thinking.* Washington, D.C.: National Council for the Social Studies, 1964.

Palmer, Osmond E., and Paul B. Diederich. *Critical Thinking in Reading and Writing.* Text, pretest, posttest. New York: Holt, Rinehart & Winston, Inc., 1955.

Reading Teacher. Newark, Del.: International Reading Assn. (published eight times a year).

Spelling

Anderson, Paul S. *Resource Materials for Teachers of Spelling.* Minneapolis: Burgess Publishing Co., 1959.

Emery, Donald W. *Variant Spellings in Modern American Dictionaries.* Champaign, Ill.: National Council of Teachers of English, 1958.

Gates, Arthur. *A List of Spelling Difficulties in 3876 Words.* New York: Teachers College Press, Columbia University, 1937.

Greene, H. A. *New Iowa Spelling Scale.* Iowa City, Iowa: University of Iowa, 1954.

Mersand, Joseph. *Spelling Your Way to Success.* Woodbury, N.Y.: Barron's Educational Series, Inc., 1959.

Rinsland, Harry D. *A Basic Vocabulary of Elementary School Children.* New York: Macmillan Co., 1953.

Chapter VIII

The Development of Critical Appreciation

The areas of music, painting, and sculpture were enriched to develop critical appreciation of gifted pupils at the Los Angeles Demonstration Center. There the staff prepared guidelines to aid the teachers in presenting the forms and structures of artistic composition. Teacher training programs provided background information on the arts, and much of this information is outlined in the pages that follow.

ARTISTIC APPRECIATION AND EXPRESSION

Numbered among the goals of education is an understanding of man's cultural heritage as recorded in his art forms. Robert Reynolds writes that the private nature of art contributes to personality development by encouraging pupils to express the impulses, aspirations, and ideas springing from their own experiences and relating to the experiences of others. (13)[1] This viewpoint reflects that of Leonardo da Vinci, who wrote: "A good painter is to paint two main things, namely man and the working of man's mind." (8b) Of the subjects appropriate for artists, the Spanish painter Francisco Goya said: "Painting, like poetry, selects from the universe what it considers best for its own end. It is able to concentrate circumstances and characteristics which nature scatters among a crowd of individuals." (15)

Children respond to art forms both emotionally and intellectually. Experimentations with various types of artistic endeavor enable pupils to express the particular artistic values of greatest significance to them. George Santayana says that everyone has a sense of beauty and a need for aesthetic experiences. (14) The human tendency to react to "the true, the good, and the beautiful" indicates that the affective psychological processes of feeling, receiving, responding, and valuing require more attention from educators. The teacher also should recognize the functional interdependence of the cognitive and affective domains and realize that the intellect can enrich the emotions by directing their expression towards appropriate goals that emerge from the fusion of knowledge with cultural ideals.

Inspiration evolves from the creative use of the imagination, which in turn may be stimulated by music. As a corollary, musical structure may be fully comprehended only by giving free vent to the imagination. Aaron Copland observes that music appreciation requires the listener to surrender himself completely to musical experience and to evaluate that experience critically. (5) William C. Hartshorn says that the key to appreciating music is to recognize melodic or rhythmic patterns as repeated in identical or in altered form. (10) Children learn to involve themselves in music from sequential lessons that encourage them to listen, to relate, and to respond creatively.

According to contributors to the NEA Project on the Academically Talented Student, some gifted pupils require instruction in the arts every semester as a basis for future careers as architects, city planners, designers, musicians, sculptors, or artists. Those students who are not planning such professional careers also require direct artistic experiences in order to enrich their lives and to become aware of the contributions of the arts to their cultural heritage. (2)

THE STRUCTURE AND FORM OF ARTISTIC COMPOSITION

Gifted pupils require a knowledge of the elements and organizational principles of music, painting, and sculpture in order to evaluate artistic productions in those areas. A committee formed in Los Angeles to suggest enriched musical activities stressed the school's role in guiding the musical development of gifted children. Significant creative activity may spring from the insights acquired through learning musical forms, elements, and content and through studying musical theory. (7)

Inasmuch as the recognition of pattern in a mass of abstract ideas involves the ability to analyze and infer, the pupil increases his rational powers in learning to perceive such patterns. By challenging the listener to detect elements of form within the abstract, the rendition of musical works contributes to his skills of analysis and inference. (4) To become broadly educated, the child should learn the major musical forms and experience them emotionally, according to the 1960 NEA Project on the Academically Talented Student. Pupils should learn how the particular musical idea of a composer dictates his choice of form. (9)

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

Before attempting to compose, the pupil should acquire an extensive knowledge of musical elements, structure, and form, in the opinion of Karl Pribram. Symphonic music adheres to strict rules of theme, rhythm, and dynamics, which must be mastered by the incipient composer. An example given by Pribram is the work of Ludwig van Beethoven, who carried musical discipline far beyond its already complexly structured limits to add a new dimension to his orchestral works. Pribram concludes that creativity consists in imagination based on an awareness of rules and order. (12)

Jerome S. Bruner, whose *Process of Education* was discussed in Chapter II, says in that work that a study of structure lends permanent usefulness to learning because of its transfer potential and because of its promotion of intuitive and analytic thinking.[2] According to Bruner, intuitive thinking involves maneuvers based on an implicit perception of a total problem. Such thinking results from a familiarity with a realm of knowledge and its structure that facilitates mental shortcuts; however, the conclusions of such thinking must be rechecked by deductive or inductive analysis.

THE TEACHER'S ROLE IN PROMOTING ARTISTIC APPRECIATION

Coretta Mitchell urges elementary school teachers to teach their pupils the structures basic to art because surveys indicate that elementary grade teachers have greater influence in promoting the child's artistic conceptions than do art teachers. (11) Equal consideration should be given to structure of form and to meaning of content, for elegance of form without content leads to industrial layout, while unhampered emotion leads to sentimentalism or to wild generalities, according to Maurice Grosser. (8a)

Roy E. Dodson says that the art teacher's philosophy, whether consciously or unconsciously formed, determines the concepts, theory, and methods utilized in his instruction. The teacher may adopt any one of the following four major philosophies or any combination thereof: naturalism, idealism, realism, and pragmatism. As applied to art education, naturalism is usually exemplified by free expression, for the child is unrestricted in his choice of subject matter, medium, or style. The idealist adopts a model style or the work of a particular artist for emulation by his pupils, under the assumption that a pupil who is thoroughly grounded in art fundamentals can best learn by studying the work of others. The realist believes that creativity can be promoted by conveying an idea through rearranging visual forms, which are then reproduced as realistically as possible. The acquisition of skill through drill characterizes this type of training. Pragmatic instructors propose to achieve creative expression by applying the theories of learning, personality, and behavior in an attempt to avoid the extremes of rigid discipline and complete freedom. The resultant programs are partly eclectic in that they include concepts and practices from all philosophies of art education. (6)

Maxwell Anderson would have everyone participate in some form of artistic endeavor, no matter how minor his role, because through the pursuit of art the individual communes with the highest and best in the human spirit. Through creative art the participant can enrich himself by associating with the greatest minds of all ages. (1)

Although systematic knowledge is a *sine qua non* for teachers, their sense of the wonder and significance of phenomena is also essential. Rachel Carson says that for a child to keep intact his inborn sense of wonder, he needs the companionship of at least one adult – be he parent or teacher – with whom to share the joy and excitement implicit in the world around him. (3)

The following material consists of information that teachers should find helpful in developing the critical appreciation of gifted children. Books appropriate for teacher training are listed under "Supplementary Publications" in the list of references at the end of this chapter. Additional book titles may be found among the references to Chapter V.

MUSIC

Correlated Listening on Three Planes

Sensuous Plane

Sheer pleasure derived from the musical sound without conscious thought
Appeal of the music as an escape or consolation

Expressive Plane

Personal conception of the musical idea or picture
Subtle shadings of different parts; e.g., serenity or exuberance
Meanings inexplicable in words
Expressive quality of a single theme or of an entire selection

Musical Plane

Listening to notes and how they are manipulated
Awareness of musical elements
Attention to musical form and structure

Active Listening Involving Knowledge and Purpose

Knowledge of musical elements, structure and form
Simultaneous attitudes of subjectivity and objectivity

[2]See the Bruner citation in the unnumbered section, "Supplementary Publications," under "Selected References" at the end of this chapter.

Elements of Sound

Vibration

Cause of all sound; can sometimes be seen and felt
Regular vibrations – produce a note or musical sound
Irregular vibrations – produce sonorous shocks or noise
Musical sounds – produced by fundamental vibrations ranging between 40 and 4,000 per second, embracing seven octaves: 261 vibrations a second, the sound of middle C; 522 vibrations a second, the C above middle C; 1,044 vibrations a second, the C two octaves above middle C; 130 vibrations a second, the octave below middle C; 65 vibrations a second, the C two octaves below middle C

Frequency

Changes in air pressure: repeated at least 20 times per second before the brain perceives them as sound
The average human ear: incapable of hearing more than 20,000 vibrations per second
Audible frequency range: varies with different people of different ages

Pitch

Concerns highness or lowness of notes
Depends on the number of vibrations per second
    Human beings – may hear between 20 and 20,000 vibrations per second
    Children – often hear higher notes than adults
    Dogs – hear higher notes than children
Variations of musical notes from vibrating strings dependent upon length, tension, and thickness of string
Variations of musical notes from wind instruments dependent upon air inside instrument tube (air called a "column")
    Column in long wind instruments – slower vibration (low notes)
    Column in short wind instruments – faster vibration (high notes)
Strength of vibrations: loudness and softness of notes

Intensity

An objective, physical characteristic
Determined by the pressure variation and velocity of air particles

Loudness

Subjective, psychological impression experienced by a listener
Depends on intensity and frequency of sound vibrations

Resonator

Gives body and character to original vibrations
Magnifies the sound and gives it beauty
Examples:
    Body of violin
    Wooden sounding board over which the strings are stretched in a piano
    Spaces in the mouth and nose for a voice

Sympathy Vibrations

Sympathetic resonance of certain things or places independent of vibrations

Overtones

Tone color given to an instrument by adding tones to the fundamental one
Mixture of sounds from vibrations to give quality
Faint notes heard as blends of sounds that give timbre
Example:
    Vibration of a string in several sections
        Along the whole of its free length
        In two halves
        In three thirds
Change according to fundamental note
More from some instruments than others
Different ones from different instruments
High overtones – "bright" instruments
Low overtones – "mellow" instruments

Pure Notes

Usually never heard on an instrument
Sometimes heard on a recorder
Occasionally low, soft notes heard on a flute
Produced on a tuning fork: length of a tube filled with air and closed at one end which resounds to a tuning fork – one fourth of the length of the sonorous wave produced by the fork

Instruments of the Orchestra

STRINGS

Number in a Modern Orchestra

16 first violins
14 second violins
12 violas
10 cellos
 8 double basses

Violin

Most flexible of all instruments in range of expression
Smallest member of orchestral string section
Capable of playing the highest notes
First and second violins: same instrument playing different parts

Construction
- Length: approximately 2 feet
- Components: about 80 separate pieces
- Principal features
  - Hollow wooden box with slender wooden neck or finger board
    - Top of box usually made of pine
    - Rest of box made of sycamore wood
  - Strings
    - Four in number
    - Made of gut or wire
    - Stretched across the hollow box
    - Fixed at one end to the tailpiece; at the other end, to the tuning pegs
    - Tuned to G, D, A, E
    - G string thickest of the four; E string thinnest
  - Tuning pegs: help player to put strings under right tension to sound the four "open" notes
  - Bridge
    - Keeps strings from touching the body of the instrument
    - Conducts the vibrations from the strings to the box

Sound
- Vibrations induced by action of the bow, a wooden stick along which horsehairs are stretched and are treated with resin so that the strings of the violin are caught and pulled by the hairs
- Different notes (different vibrations) caused by action of bow on different lengths of the strings; lengths determined by points of contact where fingers are depressed
- Route of string vibrations: from the bridge to the end of the finger board to the belly of the violin to the back of the violin
- Interior vibrations: magnification of sound caused by vibrations inside the body of the violin

Makes
- The finest specimens made in Italy in the late sixteenth century and during the seventeenth century by the Stradivari, Guarnieri, and Amati families

Bowing techniques
- *Spiccato* – each note short and crisp
- *Saltallato* – bouncing bow up and down crisply on the strings
- *Martellato* – each note played strongly with a very short stroke
- *Col legno* – tapping of strings with the wooden part of bow
- *Sul ponticello* – weak sound with the bow on the string close to the bridge instead of about halfway between the bridge and the finger board where the bow is usually placed
- *Tremolo* – shivering effect by making the bow quiver rapidly
- *Vibrato* – warm, rich tone effected by making every note undulate
- *Con sordino* – muffled sound achieved by placing a mute on the bridge to deaden some of the vibrations
- *Harmonic* – weak, ghostly sound produced by placing a finger lightly halfway along the length of a vibrating string and allowing only the two halves to vibrate
- *Pizzicato* – plucking the strings with the fingers

Viola

Slightly larger than the violin, with thicker, longer strings
Bow heavier than that of the violin
Four strings tuned to C, G, D, A
Tenor of the violin family
Noted for warm, dark tone

Violoncello (Cello)

Longer, thicker strings than the viola
Used for playing lower notes
Four strings tuned to C, G, D, A
Plays bass line to support the string family as well as melodies

Double Bass

Sloping shoulders and flat back
Four strings tuned to E, A, D, G
Shorter bow than that of other stringed instruments
Usually plays the bass part an octave below the cellos
Strong, vibrant pizzicato sound

WOODWINDS

Instruments

Tubes of wood or metal
Air in tube: vibrates with the wind of the player's breath
Long columns of air – low notes
Short columns of air – high notes
Player's use of tongue – every note a clear start and finish; without tongue, smooth note-to-note sound

Flute

A tube 26½ inches long, cylindrical in shape, with a mouth hole cut near one end and sealed with a stopper
Sound produced by stream of air directed by player with lips against the opposite edge of mouth hole, where the stream of air is split
Low notes – soft and haunting
Higher notes – brilliant
Fast notes – crisp and clean
Flute held sideways

Piccolo

Half the size of a flute
Plays an octave higher than the flute
Plays the highest, shrillest notes in the orchestra

Clarinet

About 26 inches long and mainly cylindrical
Vibration created by a reed, which is a flat piece of cane, scraped down until almost paper-thin at the end that goes in the player's mouth
Mouthpiece – cushioned between the lips of the player
Range of sound and effects
Lowest – hollow, rich
Middle – creamy, golden
Highest – shrill

Bass Clarinet

Twice as long as the clarinet
Notes an octave lower than those of the clarinet
Bell end – made of metal and curved upward
Mouthpiece end – bent round so that player reaches reed
Looks like saxophone

Oboe

Double-reed instrument with a 25-inch-long tube that is conical (wider toward the bell)
Metal tube finely constructed
Has beautiful, plaintive sound quality for melancholy or nostalgic tunes
Ranks as one of the most expressive of all wind instruments

Cor Anglais

Large oboe with lower voice than that of oboe
Conical tube with double reed
Reed fitted into a curved metal mouthpiece about 9 inches long
Has expressive, melancholy voice
Used for playing slow tunes

Bassoon

Bass of the woodwinds
Double-reed instrument with a conical tube slightly over 8 feet long
Has wider double reed than the oboe
Double reed fixed into the end of a curved metal tube called the "crook"
Supported by the player with a sling
Upper register, expressive solos; lower register, gruff tones

Double Bassoon

Very flexible instrument
Length: 16 feet, doubled on itself four times
Sound: octave lower than bassoon, deep voice
Conical tube with double reed
Used only in fairly large orchestra

BRASS

Number in an Orchestra

Four horns
Two or three trumpets
Two tenor trombones
One bass trombone
One tuba

Construction and Operation

Brass tubes
Air in tube caused to vibrate by action of lips
Notes of the harmonic series selected by player, with lips at appropriate tension
Different lengths of tube provided by valve action at the touch of a finger

Trumpet

Cylindrical tube with cup-shaped mouthpiece
Usually 4 feet long if C is the fundamental note
Measures 4½ feet long if B flat is the fundamental note
Has bright, ringing sound
Sometimes muted by a cone-shaped device (straight mute) or a cup-shaped mute or "wow-wow" mute (popular music)

Cornet

Flexible and expressive
Same length as a B flat trumpet: 4½ feet

Conical tubing with valves like those of a trumpet
Played with more vibrato than a trumpet

Trombone

Three in orchestra – two tenors, one bass
Cylindrical tubing, quite straight, with deep, cup-shaped mouthpiece
Length of tube altered by player pushing in and out a section of tubing called the "slide"
Tenor trombone – 9 feet

Bass Trombone

Larger than tenor trombone; plays lower notes
Equipped with handle on its side so that player can reach it in the seventh position
Can be muted for certain effects
Occasionally slides from one note to the next in a "glissando"

Horn

Conical tube about 12 feet long, coiled in a circular shape
Tube widened toward the bell end
Length of tube column changed by valve action
Supported by player's right hand resting in the bell
Higher notes easily attained
Muted sounds made by putting a mute into the instrument or putting hand into the bell and making horn sound distant
Brassy sound made by player pushing his hand well into the bell and blowing hard
Normally a smooth, mellow tone that blends well

Tuba

Produces lowest notes in brass family
Contains 12 feet of wide, conical tubing
Produces its lowest natural note (fundamental note) with ease
Reinforces the bass instruments

Saxophone

Several varieties (soprano, alto, tenor, baritone, sopranino, and bass)
Vibrations produced by a single reed
Conical tube made of brass
Used in military bands and dance bands, not often in symphony orchestras

HARP

A plucked string instrument
Classified between the string family and percussion family
Regular member of orchestra
Strings cut to size (47, some colored)
  Long strings – low notes: farther away from player
  Short strings – high notes: nearest to player
  Each string capable of producing three different notes by means of the pedals
The harpist:
  Plays melodies
  Plays chords by quickly setting chord notes and playing them one after the other in "arpeggios"
  Plays "glissando" by sweeping fingers over strings
  Plays "harmonies" as string is plucked and touched halfway along its length with the side of the hand
  Creates a dry sound when the vibrating string is stopped after it is plucked (called "sons étouffés," which means "smothered sounds")
  Plays guitar-like sounds produced by plucking the string near the sounding board

PERCUSSION

Definition

Those instruments that are banged, tapped, or shaken to create percussive sounds
Two main types
  Those that produce definite notes
  Those that are played rhythmically to add sensuous or musical color

Timpani (Kettledrums)

Usually three and sometimes four in an orchestra
Each drum tuned to a different note
Skin (often calf) stretched over top of copper bowls and made tight or slack by the taps around the side so that the right notes are produced
Three drums different in size; largest drum – lowest notes
Different sticks used to produce varied tone quality – some rather soft, some hard

Bass Drum

Large drum that stands on its side
Sometimes has two drumheads
Played with single taps, or two sticks to get a roll
Often has the sound of thunder
Its sounds usually of indefinite pitch

Side Drum (Snare Drum)

Two drum heads
  Upper drum head struck by player
  Lower head – strings of gut or springy metal stretched across it (snares)
Procedure and effects: player hits top surface; each blow pushes skin; air is pushed inside the drum against bottom skin; bottom skin pushes against snares to give rattling noise

Cymbals

Two thin plates of brass
Player can:
  Clash them together loudly
  Sweep them along each other with a violent swish
  Gently brush them together to produce soft brassy sounds
  Hold up one of the plates and hit it with a soft stick
  Hang them on a stand and hit them with two sticks

Triangle

Metal rod in shape of a triangle with one corner open
Can produce a roll by having the beater moved rapidly up and down in one corner of the triangle

Gong

Large metal disc
Played with single strokes or with a roll

Tam-tam

Bigger metal disc than a gong
Produces a crashing sound

Tambourine

Small drum with one drumhead
Equipped with small metal disks on side that jingle when the drumhead is struck

Castanets

Two hollowed-out pieces of hardwood clicked together to create a Spanish mood
In an orchestra, usually mounted on a stick

Whip

Two flat pieces of wood hinged together to produce noise like a crack of a whip

Chinese Wood Block

Partly hollow block of wood
Gives "tock" sound

Maracas

Have appearance of rattle
Create South American mood

Claves

Two wooden sticks clicked together

Bongo Drums

Miniature timpani played with hands

Celeste

Miniature piano
Silvery and delicate sound produced from it as keys operate hammers that strike metal plates

Xylophone

Contains strips of hardwood, each tuned to a note and laid out like a piano keyboard
Wooden or rubber beaters or mallets used by player

Glockenspiel

Made like a xylophone
Contains bars of solid metal
Sounds like a celeste but has a harder tone

Tubular Bells

Metal tubes hung in a frame
Sound like church bells
Top of each tube hit with a wooden mallet

Vibraphone

Large-size glockenspiel with two rows of tuned metal bars
Under each bar, a tube that acts as a resonator to the bar
Tiny fan in each tube driven by electricity
Musical process:
  Bar hit by player
  Sound picked up by resonator
  Throbbing effect produced by fan

Growth of the Orchestra

String Family

During the late seventeenth century – violins at the French court, then to England, then to rest of Europe
Basic pattern of organizing the string orchestra by 1700

First violins; second violins; violas; cellos; double basses (playing the same part as the cellos, an octave lower)

Early string orchestra
- Grouped around a keyboard instrument, usually the harpsichord
- Keyboard instrument: leading the group and filling out the harmonies

The Classical Orchestra

To the end of the eighteenth century
- Composers – musical servants in aristocratic households
- At princely courts – orchestras of 20 to 60 players
- Conductor – played harpsichord or violin
- Instruments – accompanied singers

Development of the symphony orchestra
- Orchestras – played on their own
- Famous large orchestra in 1777 in Mannheim, Germany: ten violins, four violas, two oboes, two flutes, two clarinets, two horns, four cellos, four bassoons, four double basses, trumpets, and drums

Famous orchestral music composers in eighteenth century: Mozart, Haydn

Orchestra of Beethoven (1770-1827)
- More powerful for his strong, dramatic music
- More variety of tone color with trombones
- Piccolo and double bassoon – woodwind section
- Horns – increased to three or four
- Violins – played higher

Orchestras of Berlioz and Wagner
- Berlioz (1803-1869) in France
  - Book on orchestration written
  - Wind instruments – mutes added
  - Horns – "stopped" effect created
- Wagner (1813-1883)
  - Music for valved brass instruments– emphasized in *The Ring* (four music dramas)
  - Woodwind instruments
    - More expressive
    - Bass clarinet invented

Conductors

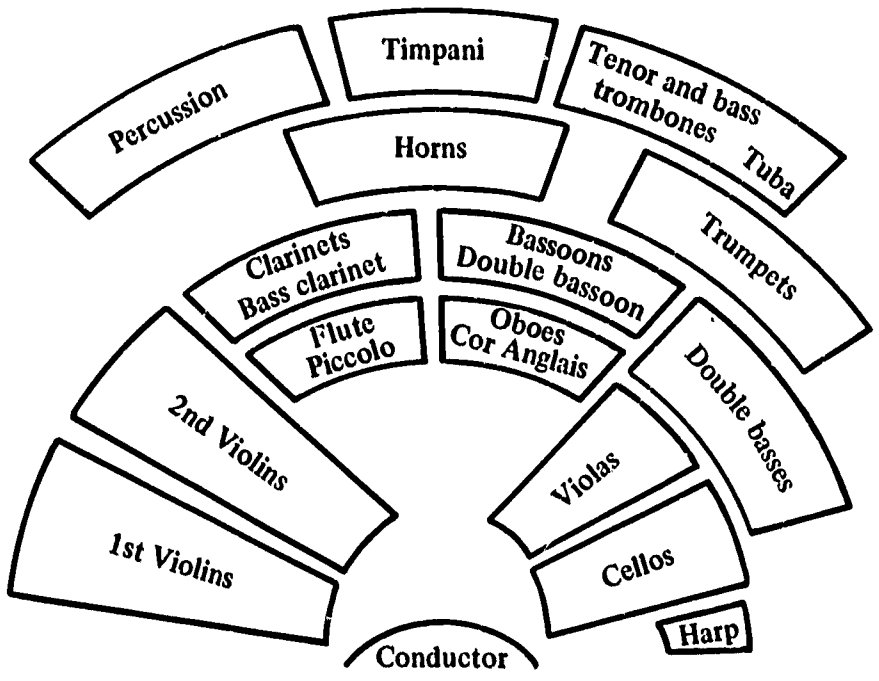
Eighteenth century
- Directing done from a keyboard instrument
- Beating time accomplished with a long staff when conducting was done in churches or large places

Nineteenth century
- Orchestra led by chief violinist, who waved his bow occasionally to give players a lead
- From 1820 on – orchestra led by conductor, who did not also play an instrument

Today's Orchestra

Symphony orchestra – 60 to 90 players
- Additional instruments brought in as "extras" when needed
- Percussion instruments, piano, and mandolin or guitar used by modern composers
- Size of orchestra dictated by style of music

Arrangement of Modern Orchestra



Music Elements

RHYTHM

Early Music

Beating of rhythm – the beginning of music

Savage tribes – use of bodily movement and basic rhythms

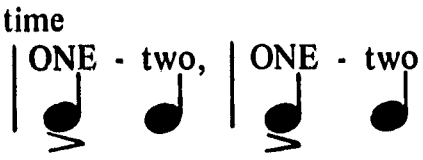
Written music not at first measured into metrical units as it now is

Measured music introduced into Western civilization about A.D. 1150

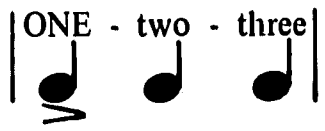
Until 1150, notated music intended to accompany prose or poetry

Measured Metrical Units

2/4 time



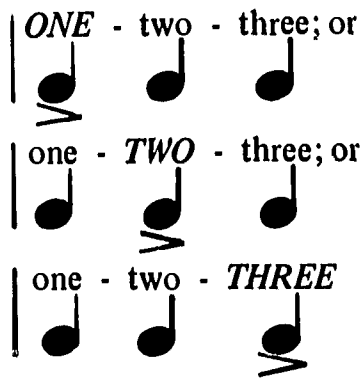
3/4 time



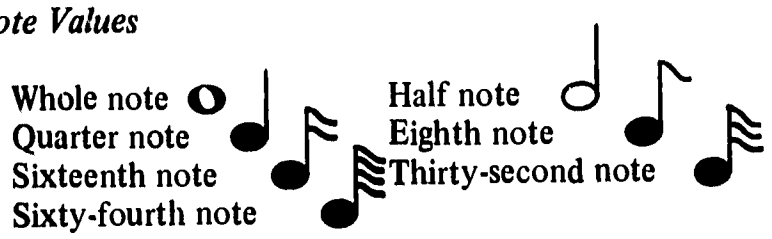
4/4 time

2/4 time doubled

6/4 time
3/4 time doubled
Stress
Accent marked
Normally falls on the first beat of each measure
May be on the second or third beat of each measure with irregular accents



Note Values



Time Values

Relatively fast or slow according to the tempo
Equivalent values of notes
Whole note – two half notes
Whole note – four quarter notes
Whole note – eight eighth notes
Example: four-quarter time
Four quarter notes in each measure
The equivalent of four quarter notes in each measure

Polyrhythms

Downbeats do not coincide

Example:	Right hand	1-2-3	1-2-3
	Left hand	1-2-3-4	1-2-3-4

Types exemplified by:
African drummers
Chinese or Hindu percussionists
Cuban rhumba bands
English madrigal singers
Jazz performers
Modern composers (e.g., Gershwin, Stravinsky, Bartók, Milhaud)

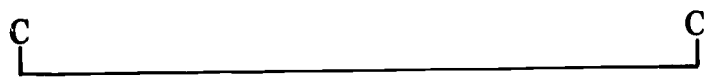
MELODY

Satisfying Proportions

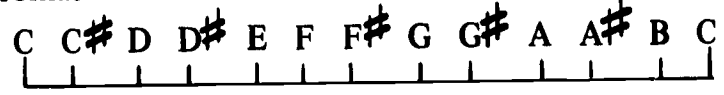
Sense of completion and inevitability
Long, flowing line
High and low points of interest
Climactic moment usually near the end
Variety of notes avoiding unnecessary repetitions
Sensitive, rhythmic flow
Expressive quality to arouse an emotional response in the listener
Resting points, or cadences, to divide the melodic line into more easily understood phrases

Scale Systems

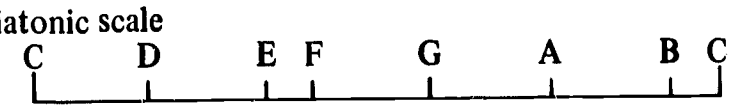
Certain arrangement of a particular series of notes based on a selected number of notes between a given tone and its octave
Four main systems of scale building: Oriental, Greek, ecclesiastical, and modern
Modern scale system
Octave span – 12 equal tones called semitones comprising the chromatic scale
Most music not based on chromatic scale but on the diatonic scale in the major mode (seven tones chosen from 12 chromatic ones arranged in an order: two whole tones followed by a half tone; three whole tones followed by a half tone)
A total of 12 different, but similarly constructed, diatonic scales in the major mode
Seven tones of a scale (1, 2, 3, 4, 5, 6, 7)
Key position of the scale – the position of tone 1
Example:
If tone 1 is on the note **B**, then the scale is said to be in the key of **B** (major or minor)
Degrees of relationships among seven degrees of the scale
First degree – tonic, tone 1
Fifth degree – dominant, tone 5
Fourth degree – subdominant, tone 4
Octave span:



Chromatic scale



Diatonic scale



HARMONY

History

Unknown until about the ninth century
Three principal kinds of early harmonic writing
Organum – single melody with same melody repeated in intervals of the fourth or fifth above, thirds and sixths proscribed

Descant – two independent melodies moving in opposite directions with no intervals between voices other than the permitted fifths, fourths, and octaves
Fauxbourdon (false bass) – introduced the intervals of the third and sixth

Chords

Sounding together of separate tones
Harmony – study of chords and their relationship to one another
Building of chords
From the lowest note upward in a series of intervals of a third
Example: A (as bottom note or root), then series of thirds on this root – chord A-C-E-G-B-D-F or 1-3-5-7-9-11-13
Three tones: 1-3-5, called a triad
Other chords: seventh chord, 7-5-3-1; ninth chord, 9-7-5-3-1; eleventh chord, 11-9-7-5-3-1; thirteenth chord, 13-11-9-7-5-3-1
Inversion of chords; for example, instead of the triad 1-3-5, such variations as 1-5-3, 5-1-3, or 3-1-5
Chord structure: the fact that chords built on the tonic, dominant, and subdominant degrees have the same attraction to one another as the tonic, dominant, and subdominant tones taken alone; also the fact that chords modulate, like single tones, when they move out of one key into another

TONE COLOR OR TIMBRE

Definition

Quality of sound the result of a particular medium of musical tone production
Subtle differences of some specific color in tone

Listening Objectives

Awareness of different instruments and their separate tonal characteristics
Appreciation of the composer's expressive purpose in using any instrument or combination of instruments

Development in Music History

Invention of instruments
Perfecting of instruments
Technical mastery of new instruments by players

Limitations of Instruments

Range
Dynamics
Execution and difficulties of execution

Single Tone Colors

String instruments
Violin (lyric, singing quality; pizzicato plucking – guitar-like effect; harmonies created by lightly touching the string to give a flute-like quality; muted to give veiled, sensitive sound)
Viola (contralto role in relation to violin's soprano; grave, expressive, sonorous, emotional quality)
Cello (baritone bass in relation to viola's contralto; sober, profound, serious, smooth, expressive sound)
Double bass (firm foundation for sounds of other string instruments)
Woodwind instruments
Flute (soft, cool, agile, feathery, liquid sound)
Oboe (nasal-sounding)
Clarinet (smooth, hollow, haunting sound)
Bassoon (plaintive in upper register; humorous staccato in lower register)
Brass instruments
Horn or French horn (soft, fluid tone)
Trumpet (sharp, commanding, brilliant sound)
Trombone (noble, majestic sound)
Tuba (spectacular sound of heavy quality to emphasize bass effects)
Percussion instruments
To sharpen rhythmic effects
To heighten sense of climax
To add color to other instruments

Mixed Tone Colors

Customary combinations
Trio – violin, cello, piano
Woodwind quintet – flute, oboe, clarinet, bassoon, horn
Clarinet quintet – flute, clarinet, and bassoon trio
String quartet – two violins, viola, cello
Symphony orchestra
Jazz band (rhythmic background – piano, banjo, bass, percussion; harmonic texture – trumpet, clarinet, saxophone, trombone; solo melody – any one instrument)

Fundamental Forms

SECTIONAL FORM

Two-part Form

Binary represented by A-B; B, a rearranged version of A
Used very little now, but used 1650–1750 for the clavecin and dance forms (allemande, courante, sarabande, gigue, gavotte, bourrée, passepied, and loure)

Examples: compositons of François Couperin or Domenico Scarlatti

Three-part Form

A-B-A
Minuet
Generic type form for nocturne, berceuse, reverie, ballade, elegy, waltz, étude, capriccio, impromptu, intermezzo, mazurka, polonaise
Examples: Haydn's "Minuet" from the *String Quartet, Op. 17, No. 5*

Rondo

A-B-A-C-A-D-A
Return to the principal theme after every digression
Usual type found as final movement of a sonata that is light and cheerful
Example: R. Strauss' *Till Eulenspiegel's Merry Pranks*

Free Sectional Form

Free arrangement of sections which together make a coherent whole
Any arrangement with musical sense (A-B-B; A-B-C-A; A-B-A-C-A-B-A)
Example: Chopin's "Prelude in C Minor"

VARIATION FORM

Basso Ostinato (ground bass – literally translated, "obstinate bass")

Easiest of variation forms to recognize
Short phrase repeated over and over in the bass part while upper parts proceed normally
Example: Sibelius' "Pastorale for Piano"

The Passacaglia

Entire composition founded on repeated bass part
Ground bass a melodic phrase
Slow and dignified in 3/4 time
Begins with a statement of the theme unaccompanied in the bass
Several variations of a similar pattern grouped together to give transition from one type of variation to the next
Example: Bach's *Passacaglia in C minor*

The Chaconne

Like the passacaglia
Stately, sober sound
Bass theme heard from the start with accompanying harmonies
Example: Brahms' *Fourth Symphony*

Theme and Variations

Original theme or borrowed theme at the beginning of composition
Five general types of variation: harmonic, melodic, rhythmic, contrapuntal, combination of all four
Example: Mozart's *Piano Sonata in A Major*

FUGAL FORM

All Types of the Fugal Form: counterpoint used when the texture is polyphonic

Imitation
Only one melody
One voice imitating another
Not necessarily starting on the same note with which the original voice begins
Canon
More elaborate imitation
Imitation from beginning of piece to end
Inversion
Turning a melody upside down
Melody moving in opposite direction from the original version of the melody; for example, the original moving an actave upward and the inversion an octave downward
Augmentation
Time value of notes doubled
Theme twice as slow as before; for example, a quarter note becoming a half
Diminution – opposite of augmentation
Halving note values
Theme moving twice as fast as originally
Cancrizans type – having crablike motion
Melody reading backward; for example, A-B-C-D becoming D-C-B-A
Rarely used

Fugue

Written in three or four voices, one voice predominating
Breathing spaces in each melodic line
Theme called "subject" – usually two or three measures long
Subject stated at beginning of fugue without accompaniment
All fugues: begin with exposition
Construction: example – four-voiced fugue (soprano, alto, tenor, or bass) (V-1, V-2, V-3, and V-4)
Subject heard in each one of the four voices one after another:

V-1 S. . . .
V-2 S. . . .
V-3 S. . . .
V-4 S. . . .

V-2 and V-4: known as "answers" to the subject

When second voice enters with the subject, the first voice does not stop; it adds a countermelody or counter subject (CS).

V-1 S. . . .CS. . . .
V-2 S. . . .CS. . . .
V-3 S. . . .CS. . . .
V-4 S. . . .CS. . . .

When subject and countersubject are exposed in any one voice, it is free to continue without restrictions as a so-called "free voice."

V-1 S. . .CS. . .XXFV. . .XX. . .
V-2 S. . .XXCS. . .XXFV. . .
V-3 S . . .XXCS. . .Fv. . .
V-4 S. . .CS. . .

General plan of a fugue:

Exposition (reexposition); episode 1; subject; episode 2; subject; episode 3; subject; *stretto* (imitation); cadence

Example: Bach's *Well-Tempered Clavier*

Concerto Grosso

Instrumental fugal form
Three or more movements
Example: Bach's *Brandenburg Concerti*

Chorale Prelude

Very expressive of thought and emotion
Less definite in outline than concerto grosso
Three types of variations on hymn choral tunes:
Keeping given melody intact while making the accompanying harmonies more interesting by increasing the harmonic complexity or by making the accompanying voices polyphonic
Variation on the theme with a bare melodic outline
Weaving of a fugue around the tune of a chorale
Example: Bach's *Orgelbüchlein*

Motets and Madrigals

Choral compositons sung without accompaniment
Written during fifteenth, sixteenth, and seventeenth centuries
Motet – short vocal composition on sacred words
Madrigal – short vocal composition on secular words
Examples: works of this type by Renaissance period composers – Palestrina in Italy; Orlando di Lasso in the Netherlands; Vittoria in Spain; Byrd, Wilbye, Morley, and Gibbons in England

SONATA FORM

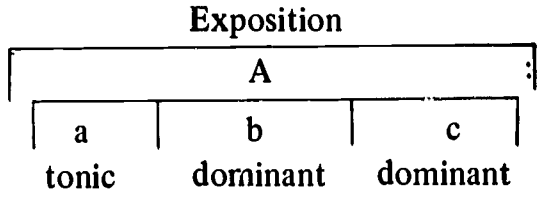
Sonata

First movement in sonata-allegro form
Second movement – slow movement in one of several forms; for example, theme and variations
Third movement – usually a minuet or scherzo; A-B-A, three-part form
Fourth movement – finale, in extended rondo form or sonata-allegro form

Sonata-Allegro (first-movement form)

Tripartite formula: A-B-A; each section a large division of music; each lasting five or ten minutes

Outline of form:



Exposition section
Thematic material exposed
First theme – dramatic, masculine, tonic key
Second theme – lyrical, feminine, dominant key
Closing theme – less important than other themes, in dominant key
Development section
Begins with a partial restatement of first theme
Freely combines material introduced in exposition
Modulates through a series of new and foreign keys
Sometimes adds new material
Recapitulation
Restates themes of exposition in the tonic key
Example: Beethoven's *Sonata No. 21 in C, Op. 53* ("Waldstein")

Symphony

Form of the sonata
Originated in the overture of early Italian opera called a "sinfonia"
Symphonic style perfected by Haydn
Form enlarged by Beethoven

Schumann and Mendelssohn: wrote less gigantic symphonies following Beethoven
Liszt, Berlioz, and Wagner: combined symphony with some programmatic ideas
Brahms, Bruckner, Tchaikovsky: went back to earlier symphonic style
Cyclic form of the symphony used by César Franck and others – a motto theme repeating to give a single, unifying thought

FREE FORMS

The Prelude

A generic name for compositions, generally written for piano and not specific in formal structure
A-B-A or free form
Example: Bach's "B Flat Major Prelude" from *Well-Tempered Clavier,* Book I

Symphonic Poem (tone poem)

Program music – depicting a mood, story, or idea
Descriptive music with literal description of a sound or sight by use of specific instruments or more poetic description by use of musical transcription of the phenomena (clouds, sea, country)
Examples: Beethoven's *Pastoral Symphony;* Debussy's *La Mer;* Respighi's *Fountains of Rome;* Sibelius' *Swan of Tuonela;* Smetana's *Má Vlast,* a cycle of six symphonic poems; R. Strauss' *Death and Transfiguration*

Opera and Music Drama

Opera

Drama sung instead of spoken
Libretto – the "book" of an opera
Recitative – that part of an opera which is neither spoken nor sung but half-sung, telling portions of the story
Not strictly a realistic form of art
All-inclusive form because it contains the symphony orchestra, the solo voice, the vocal ensemble, the chorus, ballet, pantomime, drama, and artistic stage settings
Character of music – either serious or light
Style of presentation – classical, romantic, impressionistic, "grand," realistic
Content – usually more substantial than that of operettas or musicals
Often noted for spectacular display – crowds of people, lights, costumes, scenery

Some significant opera composers:

Vincenzo Bellini	Modest Moussorgsky
Alban Berg	Wolfgang A. Mozart
Georges Bizet	Amilcare Ponchielli
Marc Blitzstein	Serge Prokofiev
Claude Debussy	Giacomo Puccini
Gaetano Donizetti	Henry Purcell
Umberto Giordano	Jean Philippe Rameau
Christoph von Gluck	Nikolai Rimsky-Korsakov
Charles Gounod	Gioacchino Rossini
George F. Handel	Camille Saint-Saëns
Engelbert Humperdinck	Alessandro Scarlatti
Leoš Janáček	Bedřich Smetana
Ruggiero Leoncavallo	Richard Strauss
Pietro Mascagni	Giuseppe Verdi
Jules Massenet	Richard Wagner
Gian-Carlo Menotti	Carl Maria von Weber
Darius Milhaud	Kurt Weill
Claudio Monteverdi	

Music Drama

An operatic form in which musical content and drama are equally important
Libretto and action not interrupted by set pieces
Vocal lines and orchestral work more interwoven (whereas in conventional opera the orchestra accompanies the aria)
Chief exponent: Richard Wagner

Contemporary Music

Creative Music – written to stir, excite, or exalt

Creative Artists

Vary in range of abilities and methods, scope, temperament, and expression
Impart many different kinds of musical experiences that require different levels of understanding of their idioms:
Fairly easy – Shostakovitch and Khachaturian, Francis Poulenc, Erik Satie, early Stravinsky, early Schoenberg, Virgil Thomson
Approachable – Prokofiev, Villa-Lobos, Ernest Bloch, Roy Harris, William Walton, Malipiero, Britten
Fairly difficult – late Stravinsky, Béla Bartók, Milhaud, Chavez, William Schuman, Honegger, Hindemith, Walter Piston
Very difficult – middle and late Schoenberg, Alban Berg, Anton Webern, Varèse, Dallapiccola, Krenek, Roger Sessions, Charles Ives
Understanding with repeated hearings, knowledge of the objectives of the composers, and ability to differentiate objectives of the composers

Musical Texture

Monophonic Texture

Simplest texture
Single, unaccompanied melodic line
Examples: Chinese or Hindu music, Gregorian chant

Homophonic Texture

Principal melodic line and a chordal accompaniment
Examples: Works of Italian opera composers, such as Caccini

Polyphonic Texture

Moves by separate and independent melodic strands that together form harmonies
Requires listening to separate strands of melody sung by separate voices, instead of hearing only the sound of all the voices as they happen from moment to moment vertically
Example: Hindemith's *Das Marienleben*

Musical Structure

Definition

Planned design that binds an entire composition together
Coherent organization of the artist's material

Structural Distinctions

Form in relation to a piece as a whole
Form in relation to separate, shorter parts of a piece

Structural Principles

Sectional or symmetrical repetition
- Two-part (binary) form
- Three-part (ternary) form
- Rondo
- Free sectional arrangement

Repetition by variation
- Basso ostinato
- Passacaglia
- Chaconne
- Theme and variations

Repetition by fugal treatment
- Fugue
- Concerto grosso
- Chorale prelude
- Motets and madrigals

Repetition by development
- Sonata (first movement form)

PAINTING

Art Elements

Color

Depends on the reflection of absorption of light by a given surface
Has three qualities: hue – name of a color; value – darkness or lightness of a color; intensity – dullness or brightness of a color
Cool colors – predominance of blue
Warm colors – predominance of yellow and red
Complementary colors – opposite colors on a color wheel; for example, red and green
Analogous colors – related colors on a color wheel; for example, colors that are adjacent
Monochromatic color scheme – based on various tints and shades of one color
Shades of colors – colors that are darker than those of middle value
Tints of colors – colors that are lighter than those of middle value

Line

Progressing movement, direction, or delineation that stimulates and expresses mood
Qualities of line – vertical, diagonal, curved, horizontal, straight, and rhythmic
Contour – the line that defines something

Form

Shape of mass or volume
Types of form – regular, irregular, defined, and suggested
Variety of shape contribues to good design

Chiaroscuro

Contrast of dark and light in composition
Differing degrees of dark and light on shapes in a painting

Texture

General structure of a surface area
Quality of the surface of materials; for example, rough or smooth
May be tactile or visual
Depends on the use of the medium

Art Principles

Dominance and Subordination

Main idea, purpose, or plan
Center of interest gained through use of size, color, dark and light, shape, contrast, texture
Emphasis of one part over another that is less evident

Proportion

Space divisions in relationship to one another; for example, equal amounts
Relation of parts to the whole and relation among parts

Balance

Visual equilibrium produced by arrangement of art elements; for example, a small form in relation to a large form or the distribution of dark and light
Symmetrical balance of parts or form

Opposition

Contrast of art elements to create visual tension; for example, contrast of direction of lines
Reverse of transition

Transition

Movement that unifies one art element with another
Reverse of opposition

Rhythm

Related movement by repetition of art elements arranged to achieve harmony

Repetition

Use of art elements in repeated ways to produce rhythm in design
Use of the same motif more than once to produce a pattern

SCULPTURE

Basic Information

Definition

The art of representing observed or imagined object three dimensionally in solid materials; ranks among the oldest, most popular, and most difficult to execute of the art forms

Types

Two main types: (a) statuary, which portrays figures in the round; and (b) relief, in which figures project from the background to which they are attached
Subsidiary types: busts, carvings, gargoyles, idols, mobiles, and the like

Materials

Clay, plaster, wood, stone, bronze, bone, ivory, concrete, plastics, wire, and so on

Influences

Reflects the individual vision of the sculptor as well as the cultural tastes and the social and religious views of the sculptor's environment
Indicative of the geographical and climatic conditions under which produced

Historical Periods

Primitive Sculpture

Dates from Old Stone Age, about 20,000 years ago
Rock engravings, incised drawings on bone, and relief carvings in stone found in prehistoric cave dwellings
Primitive sculpture still being produced by such primitive peoples of the present as the Bushmen of South Africa and some African Negroes
Characterized by power and simplicity

Egyptian Sculpture

Associated with the needs of religion; depicted the gods or so-called divine pharaohs
Used to decorate temples and tombs
Reflected concern with the afterworld
Introduced about 5,000 years ago during the period of the Old Kingdom, about 3500–2475 B.C.; continued almost unchanged for nearly 3,000 years
Followed rigidly prescribed rules, as did social and religious customs
Pharaohs represented as half human, half animal
Carved in colossal proportions of the hardest stone, like the great Sphinx at Gizeh and the four rock statues of Rameses II

Greek Sculpture

- Rooted in the earlier cultures of Crete, Mycenae, and Egypt
- Developed rapidly in the fifth and fourth centuries B.C.
- Reached its peak during the classic period of the Periclean Age in the latter half of the 400s B.C. with Phidias, Myron, and Polyclitus
- Most famous statues, such as the "Discus Thrower" or "Discobolus" of Myron, now known only through later Greek and Roman copies and later reconstructions of those copies
- Included among best known examples of Hellenistic sculpture: "Winged Victory" or "Nike of Samothrace," "Venus de Milo," and the "Laocoön" group

Roman Sculpture

- Original sculpture in stone, clay, and metal created by Etruscans and other early peoples of Italy
- Influenced enormously by Greek sculpture, which was imported to Rome after the conquest of Greece
- Portrait sculpture highly developed to depict political leaders
- Lacked the intellectual and aesthetic sensibilities of the Greeks

Medieval Sculpture

- Romanesque Period
  - Lasted from about A.D. 500 to 1150, but little sculpture made in Europe after fall of Roman Empire until about A.D. 1000
  - Inspired by the tenets of Christianity; rooted both in Rome and in Constantinople
  - Sculpture closely related to ecclesiastical architecture
  - Highly decorative, imaginative statuary in conventional forms
  - Characterized by medieval restraint and formality
- Gothic Period
  - Lasted from about A.D. 1150 to 1550
  - Large variety of subject matter, much of it still religious in nature
  - Churches and tombs decorated with figures of saints and kings
  - Church exteriors adorned with chimeras and gargoyles symbolizing the devil
  - Stylized, formal quality established by religion and tradition

Renaissance Sculpture

- Emphasis changed from the hereafter to man and his physical world
- Akin in spirit to the classical Greek and Roman sculpture
- Sharpest break from medieval past made by Donatello (about 1386–1466) whose "David" revived the ancient use of the nude figure and whose "Gattamalata" revived use of monumental figure on horseback
- Glazed figures of terra cotta introduced into Italian sculpture by Luca della Robbia (1400?–1482)
- Florence recognized as world center of Renaissance sculpture, producing such early Renaissance masters as Ghiberti, Brunelleschi, Verrocchio
- Spiritual struggle of mankind represented in High Renaissance in the unparalleled sculptures of Michelangelo Buonarroti (1475–1564), who was also a painter, architect, and poet; musculature of his powerful statuary shown in such famous works as "Moses," "Day and Night," "Pietà"

Post-Renaissance Sculpture

- Decline of Renaissance art signaled by use of lavish detail
- Great technical skill shown in sculpture
- Emphasis on the sweeping, restless forms initiated by Michelangelo
- Dramatic action portrayed in works of leading baroque sculptor, Giovanni Lorenzo Bernini (1598-1680), who was also an architect; Bernini's work inclusive of many Roman fountains and the series of 162 figures surmounting his imposing colonnade in front of St. Peter's Basilica
- Gay, light rococo style evolved in eighteenth century France exemplified by Jean Antoine Houdon (1741–1828), who sculpted a marble bust of Benjamin Franklin and full-length figures of George Washington
- Reverence for the ancients reflected in the formality and coldness of neoclassicism, which came as a reaction against the theatrical baroque and florid rococo styles in the latter half of the eighteenth century and the early nineteenth century; neoclassicism exemplified by Antonio Canova in Italy, John Flaxman in England, and Johann Schadow and Johann von Dannecker in Germany
- Intermingling of the twin currents of realism and romanticism in nineteenth-century France best exemplified in the work of Auguste Rodin (1840–1917), who exerted incalculable influence on the twentieth century; Rodin's statuary characterized by freer handling of material and bolder expression of feeling; works include "Le Penseur" ("The Thinker"), "The Kiss," and "Eternal Springtime"

Twentieth-Century Sculpture

- Characterized by strongly individualistic sculpturing, such as that of Jo Davidson and Jacob Epstein

Motivated many jointed constructions, including the mobiles of Alexander Calder and others
Inspired by many different influences, such as primitivism and religion
Interest in new materials and new possibilities for portraying change and movement
Experimentation with highly abstract forms that have no counterpart in nature
Employs contrasting materials as in the work of Constantin Brancusi

PERIODS OF ART AND MUSIC HISTORY

Being basically creative, man has always sought ways of releasing his creativity. Histories of the visual arts and music reflect man's progress in his social, political, economic, and religious life. Artists and musicians are molded by the periods and places in which they live. An understanding of artistic and musical principles, which remain constant, is necessary to develop critical appreciation.

A chronology of the arts, including music, painting, and sculpture, and an outline on impressionism as an example of an outstanding phase in the historical development of the arts are presented as follows.

Chronology

Prehistoric (Before 4500 B.C.)

Africa, China, Australia, North American continent, Spain, France (drawings, carvings, paintings, ritual dancing and ritual music)

Ancient (4500 B.C. to A.D. 450)

Asia (India, Buddhist rites; China, influence of Confucius)
The Americas (Mayan culture, North American Indian cultures)
Middle East and Mediterranean (Egyptian, Babylonian, Assyrian, Chaldean, Persian cultures)
Europe (Aegean, Grecian, Etruscan, Roman cultures)

Medieval (450 to 1300)

Asia (India, Hindu, Moslem culture; China, Tang and Sung dynasties; Japan, Fujiwara and Kamakura periods)
The Americas (Mayan, Inca, Pre-Columbian cultures)
Eastern Europe and Mediterranean (Islamic and Moslem cultures)
Western Europe (Dark Ages, Middle Ages, Gothic period)

Renaissance (1300 to 1600)

Asia (India, Mogul period; China, Ming Dynasty; Japan, Samurai established)
The Americas (Spanish influence; arrival of English; French colonization)
Europe and Mediterranean (Granada in Spain – Moorish art; Bagdad, Oriental and Islamic creative arts; Russia, icons; spread of Renaissance from Italy to the north)

Pre-Modern (1600 to 1850)

Asia (Japanese prints and industrialization; China, Manchu Dynasty)
The Americas (Portuguese in Brazil; classical architecture)
Eastern Europe and Mediterranean (Russia influenced by Western culture)
Western Europe (Baroque and Rococo periods)

Modern (1850 to Present)

Asia (post-World War II – Japanese influences; India's independence)
The Americas (heritage of the past, including Old World and New World contributions; new trends)
Eastern Europe and Mediterranean (African exploration)
Western Europe (neoclassicism, realism, impressionism, romanticism, expressionism)

Impressionism – A Significant Movement in Art and Music

Time

Last decades of the nineteenth century
First showing of artists' works in 1874

Style

Music characteristics
Music noted for its tonal color; i.e., the effect created by composers "painting" their impressions
Use of neomodality
Open fifths and octaves
Parallelism and other innovations in chord progression
Whole-tone scale (Debussy)
Extensive use of ninth chords
General vagueness of form
Avoidance of sharp outlines
Free rhythm
Less prominent regularity
Traditions of form and harmony discarded
Flowing melodic lines
Spanish effects (Ravel)

Use of extreme registers on the piano
Wide spacing of musical phrases
Art characteristics
Veiled appearances
Atmospheric impressions
Vagueness of dark and light
No sharply defined contours
Delicate appearance
Luminous quality
Interest in local scenes (France)
Ordinary objects viewed from unexpected angles or in unfamiliar ways
Undisguised brush strokes
Primary colors applied directly to the canvas
Colors blended in the eye of the beholder; for example, the fusing of blues and yellows into green
Subjects: rain, fog, sleet, snow; shimmering reflections on water or cobbled streets; and the like

Examples

Music
Claude Debussy (1862–1918)
Piano music (suites, images, preludes, études)
Orchestral works (tone poems and suites, such as *La Mer, Nocturnes, Ibéria,* "Prélude à l'Après-midi d'un Faune")
Opera *(Pelléas et Mélisande)*
String quartet
Sonatas
Rhapsodies
Maurice Ravel (1875–1937)
Orchestral works *(Rapsodie Espagnole, Boléro, La Valse)*
Ballets *(Daphnis et Chloé, Ma Mère l'Oye)*
Works for solo piano ("Gaspard de la Nuit," "Jeux d'Eau," "Le Tombeau de Couperin," "Sonatine")
Chamber music
Other composers: Roussel, France; Delius, England; Albéniz, Spain; Respighi, Italy; Scriabin, Russia; Griffes, United States

Art
Claude Monet (1840–1926)
"Poplars," "Haystacks," "Rouen Cathedral," "The Breakwater at Honfleur," "The Studio Boat," "Hotel des Roches Noires," "Le Jardin de l'Infante," "Quai du Louvre"
Édouard Manet (1832–1883)
"Artist's Garden at Versailles," "The Railway," "Guitarrero," "Concert at the Tuileries"
Edgar Degas (1834–1917)
"Place de la Concorde," "Duchess Morbilli," "New Orleans Cotton Office"
Pierre Auguste Renoir (1841–1919)
"Child in White," "On the Terrace," "Little Margot Bernard," "The Skaters," "The Boat"
Paul Cézanne (1839–1906: considered the father of modern art)
"The Black Clock," "The Card Players," "Maison du Pendu à Auvers," "Lazare," "Le Jugement de Paris," "Self-Portrait," landscapes of Provence
Camille Pissarro (1830–1903)
"Snow at Lower Norwood, 1870," "La Côte du Jallais à Pontoise, 1867," "Penge Station, Upper Norwood," "Dulwich College"
Alfred Sisley (1839–1899)
"Snow of Louveciennes, 1870," "View of Montmartre," "The Canal," "The Square at Argenteuil"
Camille Corot (1796–1875)
"Saint-André-du-MorVan," "The Sevres Road"
Eugène Boudin (1824–1898)
"Beach at Trouville"
Gustave Courbet (1819–1877)
"Calm Sea"
James Whistler (1834–1903)
"Courbet at Trouville"

SUMMARY

Man's cultural heritage is recorded in art forms, which both stimulate the imagination and encourage inspiration by providing children with an outlet through which to express their impulses, attitudes, and ideas. Artistic endeavor contributes to the personal development of the young.

Art forms are appreciated through analyzing the elements and principles of their structure. Knowledge of an art form stimulates creative composition within that form. Teachers should develop their own cognitive, affective, and conative abilities in order to guide their pupils more effectively in understanding and criticizing music, painting, and sculpture.

Selected References

1. Anderson, Maxwell. "Place and Purpose of Artist in Society." Address given at the Carnegie Institute of Technology. *New York Times,* October 17, 1937, Section XI, p. 3.

2. *Art for the Academically Talented Student in the Secondary School.* Conference on Art for the Academically Talented, 1959. Edited by Edwin Ziegfield. Washington, D.C.: National Education Association

(Project on the Academically Talented Student), 1961.

3. Carson, Rachel. *The Sense of Wonder.* Evanston, Ill.: Harper & Row Pubs., 1965.

4. *The Central Purpose of American Education.* Educational Policies Commission. Washington, D.C.: National Education Association, 1961.

5. Copland, Aaron. *Music and Imagination.* Cambridge, Mass.: Harvard University Press, 1952. Also, paperback – New York: New American Library, Inc., 1963.

6. Dodson, Roy E. "Defining Artistic Creativity," *Arts and Activities,* LV (March, 1964), 30-33.

7. *Enrichment Activities in Music for Intellectually Gifted Pupils in the Elementary Schools.* Instructional Bulletin No. EC-51. Los Angeles: Division of Instructional Services, Los Angeles Unified School District, 1962.

8a. Grosser, Maurice. *Critic's Eye.* Indianapolis, Ind.: Bobbs-Merrill Company, Inc., 1962.

8b. Grosser, Maurice. *The Painter's Eye.* New York: New American Library, Inc., 1961 (paperback).

9. Hartshorn, William. *Music for the Academically Talented Student in the Secondary School.* Music Educators National Conference. Washington, D.C.: National Education Association (Project on the Academically Talented Student), 1960.

10. Hartshorn, William. "The Role of Listening in a Balanced Program of Music Education," *California Journal of Secondary Education,* XXXIV (April, 1959), 234-40.

11. Mitchell, Coretta. "The Art Education of Elementary School Teachers," in *Art Education.* Sixty-fourth Yearbook of the National Society for the Study of Education, Part II. Edited by W. Reid Hastie. Chicago: University of Chicago Press, 1965, pp. 221-42.

12. Pribram, Karl. "Neurological Notes on the Art of Educating," in *Theories of Learning and Instruction.* Sixty-third Yearbook of the National Society for the Study of Education, Part I. Chicago: University of Chicago Press, 1964, pp. 78-110.

13. Reynolds, Robert. "Dare We Neglect the Arts?" *The California Journal for Instructional Improvement,* VIII (December, 1965), 34-44.

14. Santayana, George. *The Sense of Beauty.* New York: Dover Publications, Inc., 1955.

15. *Think* (Dwayne Orton, editor), XXVIII (November-December, 1962).

Supplementary Publications

Barach, Stephanie. *An Introduction to the Language of Music.* New York: David McKay Co., Inc., 1962.

Barkan, Manuel. *Through Art to Creativity: Art in the Elementary School Program.* Boston: Allyn & Bacon, Inc., 1960.

Brandt, Reford. *The Composition of Landscape Painting.* Corona del Mar, Calif.: The Press of the Rex Brandt School, 1959.

Bruner, Jerome S. *The Process of Education.* Cambridge, Mass.: Harvard University Press, 1962. Also, paperback – New York: Vintage Books, 1963.

Canaday, John. *Mainstreams of Modern Art.* New York: Simon and Schuster, Inc., 1959.

Cane, Florence. *The Artist in Each of Us.* New York: Pantheon Books, Inc., 1951.

Copland, Aaron. *What to Listen For in Music* (Revised edition). New York: McGraw-Hill Book Company, 1957.

Craven, Thomas. *A Treasury of Art Masterpieces from the Renaissance to the Present Day.* New York: Simon and Schuster, Inc., 1958.

De Francesco, Italo L. *Art Education: Its Means and Ends.* New York: Harper & Brothers, 1958.

Encyclopedia of Painting. Edited by Bernard S. Myers. New York: Crown Publishers, Inc., 1955.

Erdt, Margaret H. *Teaching Art in the Elementary School* (Revised edition). New York: Holt, Rinehart & Winston, Inc., 1962.

Gardner, Helen. *Art Through the Ages* (Fourth edition). New York: Harcourt, Brace and Company, 1959.

Gombrich, Ernest H. *The Story of Art* (Eighth edition). New York: Phaidon Publishers, Inc., 1956.

Harman, Carter. *A Popular History of Music.* New York: Dell Publishing Company, Inc., 1963 (paperback).

Hartshorn, William. "The Study of Music as an Academic Discipline," *Music Educators Journal,* XLIX (January, 1963), 25-28.

Janson, H. W. *History of Art.* New York: Harry N. Abrams, Inc., 1962.

Larkin, Oliver W. *Art and Life in America.* New York: Holt, Rinehart & Winston, Inc., 1960.

Lowenfeld, Viktor. *Creative and Mental Growth* (Third edition). New York: Macmillan Co., 1957.

Metropolitan Seminars in Art. Portfolios 1-12. Edited by John Canaday. New York: Metropolitan Museum of Art, 1958.

Miller, Hugh M. *History of Music* (Second edition, revised). New York: Barnes & Noble, Inc., 1960.

Miller, Hugh M. *Introduction to Music.* New York: Barnes & Noble, Inc., 1958.

Newmeyer, Sarah. *Enjoying Modern Art.* New York: New American Library, Inc., 1955.

The Praeger Picture Encyclopedia of Art. New York: Frederick A. Praeger, Inc., 1958.

Taylor, Calvin. "Effects of Instructional Media on Creativity," *Educational Leadership,* XIX (April, 1962), 453-58.

Tovey, Donald Francis. *Essays in Musical Analysis.* Volumes I-VI. New York: Oxford University Press, Inc., 1935–1939.

Vincent, Jean Anne. *History of Art.* New York: Barnes & Noble, Inc., 1955.

Watercolor Methods. Edited by Norman Kent. New York: Watson-Guptill Publications, Inc., 1955.

(Also see the music, painting, and sculpture references listed with the pupil materials in Chapter V.)

Chapter IX

The Development of a Scientific Approach

One of the three major areas chosen for enrichment at the California Project Talent Enrichment Demonstration Center was that of scientific discovery, methodology, and investigation. Before preparing their pupils' courses of study, teachers at the center received instruction and materials in astronomy, geography, mathematics, logic, research methods, and mathematical and astronomical geography.

THE SCIENTIFIC ATTITUDE

Richard E. Haney says that a scientific thinker combines the qualities of curiosity, rationality, suspended judgment, open-mindedness, criticalness, objectivity, honesty, and humility. (4)[1] In determining objectives in the affective domain of learning, David Krathwohl and others found that attitudes first emerge at the category termed "willingness to respond," which immediately follows the "acquiescence in responding" level. The taxonomy handbook on the affective domain by Krathwohl and his colleagues classifies the more advanced stages of attitude acquisition as the internalization of attitudes at five increasingly complex stages: satisfaction in response, acceptance of a value, preference for a value, commitment or conviction, and conceptualization of a value. The highest operational level in affective learning includes an awareness of how the particular value relates to those already held or to other values being formed. (5)

The scientific approach enables scientists to seek more accurate information through the interaction of observable phenomena with abstract ideas. Scientific work has been described as a restricted realm of experience involving largely cognitive thought processes. (6) Considering vision as a primary quality of a thinker, Ernest Dimnet holds that independence is the moral aspect of a capacity for vision; he says that a thinker is one who sees where other persons do not. (3)

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

TEACHER TRAINING IN THE SCIENTIFIC PROCESSES

To enrich their teaching with suitable learning opportunities for pupils, teachers should themselves master subject content and understand the levels of intellectual behavior. Educators charged with planning teacher training courses should provide a sufficiently broad factual background to stretch the teachers' levels of thinking. When the level of difficulty of inservice courses exceeds the participants' levels of thought, passive learning becomes inevitable. When the thought level exceeds the content level, the learner becomes bored. Among the most important concepts of learning readiness and pacing is the determination of the proper level of intellectual functioning, which is as significant in training teachers as it is in educating pupils.

Classes conducted for teachers in science, social science, and mathematics should instill an understanding of the scientific procedures of investigation and discovery. Skills in scientific inquiry include the following processes: the observation and reporting of investigations, formulation of questions, design and execution of experiments, participation in and reporting of field studies, the use of equipment for measuring, the documentation of evidence for findings, classification of materials and ideas, organization and interpretation of data, and the critical review and analysis of scientific literature. A broad scheme of inquiry aids children in identifying a sequence of goals. The inquiry approach is an inductive method of guiding pupils to discover ideas for themselves and to use those ideas in discovering new ones. Ritchie Calder writes that persons attempting scientific discovery should observe and choose facts, form hypotheses that relate and explain those facts plausibly, and perform repeated experiments to prove or disprove each hypothesis. (2)

A mastery of the basic structure of mathematics contributes to the effective teaching and retention of mathematical concepts, according to Francis J. Mueller. (7) The studies of William Brownell and others report a high positive correlation between meaning and rate of learning. (1)

Exposing pupils to adult-formed generalizations as listed factually in a textbook does not ensure an understanding of

the concepts involved. Teachers should teach their pupils the facts, incidents, and examples that have resulted in the promulgation of major rules, laws, and generalizations. In becoming involved in learning experiences that give meaning to concepts, pupils become committed to the importance of concepts; and this commitment leads to conviction.

Correlation studies of the arts and sciences emphasize the relatedness among the ideas, rules, and attitudes of these two disciplines. The interchange of learning between science and literature courses is also advantageous. Teachers should so organize their instruction as to identify this relatedness.

SELECTION OF CONTENT AREAS IN SCIENTIFIC FIELDS

The Los Angeles Demonstration Center sought to enrich instruction in science, social science, and mathematics. Included in those fields were logic and research methods, which were also studied in language arts classes. Astronomy was the science chosen for enrichment; geography was the social science. Course work in mathematical and astronomical geography correlated the studies in astronomy, geography, and mathematics.

Science was included in the enrichment program because of the importance of its two basic functions: to help persons orient themselves to their environment and to help change that environment. The study of science should contribute to self-knowledge, knowledge of the universe, an understanding of the history and social aspects of science, and the development of a scientific approach or attitude.

CONTENT OF SCIENTIFIC COURSES

The NEA project report on the academically talented student raises the question as to what scientific content is most appropriate for enrichment in relation to current scientific thought. The project's reporters recommend that students be made aware of the frontiers of scientific investigation; they also urge the inclusion of a unit of study on the universe and the solar system, with consideration of the modern theories of the origin and evolution of the universe, the galaxies, and the solar system. Pupils should be informed of the use of such equipment as radio telescopes, optical telescopes, and tools for analyzing light waves and radiation from space and of such aids to gathering information directly from space as rockets, satellites, and other space probe instruments. The NEA project reporters stress high-quality teaching in depth on a particular facet of a subject in preference to the superficial coverage of a diversity of material. (16)

THE STUDY OF ASTRONOMY

The science program at the demonstration center focused on astronomy because of the recent developments that have been made in this field, the opportunities offered to emphasize scientific investigation through firsthand field experiments, the possibilities for learning modern methods of studying the solar system as part of the universe, and the value of studying astronomy as an aid to understanding the order, beauty, and predictability of the universe. Stressing the basic structure of astronomy, teachers encouraged their pupils to emulate the scientist in his approach and methodology. References 8 through 15 and 17 through 20 to this chapter were used in teacher training. The references to Chapter V list additional resources. The material that follows identifies some of the background information on astronomy that proved useful to teachers in the Los Angeles enrichment program.

Definition

Astronomy is that science which deals with the nature and organization of the universe, including the heavenly bodies and their size, motion, distance from Earth, relative positions, and chemical composition.

The term is derived from the Greek. The first part, *astro*, means "star"; the second part, *nomy*, is a combining form that means "arrangement" or "management." Indeed, the Greeks were very much concerned with the heavens beyond the planet Earth.

Units of the Universe

The universe contains many types of material units, including planets, planetoids, satellites, comets, meteoroids, stars, and nebulas. These units exist in a highly complex cosmic organization, as highlighted in the following outline.

Organization of the Universe

The Sun

- A star relatively near the Earth, at a mean distance of 93 million miles
- Emits heat and light, both of which are essential to support life on Earth
- Density: 0.4 that of the Earth

Surface
Resembles the tops of columns of hot gases
Shows gaseous eruptions every few minutes
Irregular black "holes": relatively "cool" regions
Flares or "hot spots": called faculas
The phenomenon of auroras
Displays of northern or southern lights in the sky
Caused by interaction of streams of charged particles that shoot out from disturbed solar areas
Interfere with communication by causing magnetic storms
Solar corona
The uppermost layer of the solar atmosphere
Visible to the naked eye during a total eclipse of the sun
A glowing gas that produces both radio waves and light waves
Light of the sun
Has a brilliance of a billion trillion 1,000-watt bulbs
Is measured as 4×10^{33} ergs of energy per second

The Planets

Nine planets revolving around the sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto
Mercury closest to the sun, four tenths the Earth's distance from the sun
Pluto farthest away, 40 times the Earth's distance from the sun

Our Solar System

The sun at the center
The nine planets in orbit around the sun
Smaller planets known as asteroids or planetoids
A number of moons, known as natural satellites, that revolve around six of the planets
Comets
Meteoroids

Our Galaxy

Called the "Milky Way"
Contains nearly 100 billion stars
Outer surface like that of a lens or grindstone, circular-shaped on top
Spiral design formed by stars
Thick in the center
Thin at the edges
Contains great lump of stars called the "main sequence" (about 98 percent of all the stars in our galaxy); the sun, a main sequence star
Also contains large groups of stars called "loose clusters"; for example:
The Pleiades and the Hyades, which contain several hundred stars
The Big Dipper, a group of stars
Globular clusters of stars: contain thousands of stars; for example, the Hercules cluster

Other Galaxies

Millions of galaxies
Scale distance between them from 10 to 20 million miles
Three types
Irregular galaxies of ill-defined shapes with some spiral structure and hot, blue-white "Population I" stars with interstellar dust and gas
Spiral galaxies of nascent Population I stars and of established Population II stars
Elliptical galaxies usually of older Population II stars consisting of red giants, white dwarfs, and variable stars
Particular galaxies other than ours
The Large Magellanic Cloud
Less than 150,000 light years away
Visible to the unaided eye in the constellation Dorado
Dimensions: 12° by 4°
The Small Magellanic Cloud
Estimated distance of 164,000 light years away
Visible to the unaided eye in the constellation Tucana
Dimensions: about one half the diameter of the Large Magellanic Cloud
The local group of galaxies
Closer than 2 million light years
Contains 13 galaxies
The Andromeda Galaxy
Resembles our own galaxy
Moves with a speed of 180 miles per second due to the velocity caused by the rotation of our own galaxy

Remote Galaxies

Billions in number
Some as far as 2 billion light years away

Distances in the Universe

Some Data

Distance between the Earth and the sun – 93 million miles; mean distance from Earth to sun called the Astronomical Unit (A.U.)
Distance to our nearest star, Alpha Centauri – 25 trillion miles

The term "light year": measures the distances of stars and galaxies
One light year = the distance that a beam of light travels in one year
Distance covered by a beam of light in one second = 186,000 miles
One light year expressed by the following:

$$186{,}000 \times 60 \left(\frac{\text{seconds}}{\text{minute}}\right) \times 60 \left(\frac{\text{minutes}}{\text{hour}}\right) \times 24 \left(\frac{\text{hours}}{\text{day}}\right) \times 365\tfrac{1}{4} = 5{,}880{,}000{,}000{,}000 \text{ miles,}$$

or almost 6 trillion miles

Star nearest the solar system – 4.3 light years away
Diameter of our galaxy – about 100,000 light years; maximum thickness, 15,000 light years
Average distance between galaxies – approximately a million light years
Most distant object seen by the unaided eye – Andromeda Galaxy, a million and a half light years away

Artificial Earth Satellites

Definition

An object revolving about the earth in a circular or elliptical orbit

Information of Interest

First satellite, Sputnik I, launched by the U.S.S.R. on October 4, 1957
Launching a satellite: requires raising it to the proper height above sea level, orienting it in the proper direction, and giving it the proper speed; usually put into orbit by a multistage rocket
Primary purpose of initial stage rocket – to get the satellite through the thick part of the atmosphere
Other stages utilized to turn the satellite toward the horizontal and to increase its velocity
Typical rocket used to launch a satellite – consists of three stages and a nose cone
Once in orbit, satellite continues indefinitely as the forces acting on it cancel out, leaving a net force of zero
Far above the earth's surface, two forces that act on a satellite:
Force of gravity
Centrifugal force
Gravity and centrifugal force
Equal in magnitude and opposite in direction for a proper value of velocity
Cancel each other
Hence, satellite at proper speed continues to move in orbit
Friction within the the earth's atmosphere
Equilibrium between gravity and centrifugal force upset by friction between atmosphere and satellite
Causes or may cause the following:
Slowdown of satellite's forward speed
Decrease in centrifugal force brought about by decrease in satellite's speed
Approach of satellite to surface of earth in spiral path if gravity is greater than centrifugal force
Enough heat to burn satellite before it reaches ground (similar to burning of meteoroids)
Law of Inverse Squares
Has to do with gravity diminishing with distance
Gravitational field negligible at some 10 planet radii from planet
Orbiting of man-made satellites
Concepts and terminology
Permanent orbit: whole length of orbit outside atmosphere
Decline of an orbit: "braking ellipse" applied to orbit that is decaying or shrinking
Apogee and perigee
Aerodynamic heating
Best time to observe a satellite: at dawn or at dusk when sun is below horizon and observer is in a dark place while satellite is reflecting light from the sun
Satellites used to facilitate the following:
The acquisition of meteorological data for use by weather forecasters
The development of all-weather global navigational systems for airplanes and ships by a network of satellites that serve as radio beacons
Warnings of the possible launching of enemy missiles; the "eye in the sky" series
The acquisition of scientific information about micro-meteoroids, temperatures in space, radiation and magnetic fields, composition of the ionosphere, behavior of energetic particles, gamma rays, and the like
Geodetic observations; e.g., by Vanguard, which determined that the earth's geoid is slightly pear-shaped
Projects carried out by scientists of the United States and other countries with the aid of international satellites
Communication between distant areas on earth by reflecting radio microwaves from a man-made satellite; e.g., Echo
Testing of intercontinental transmission of telephone, television, teleprint, and facsimile radio signals by a medium-altitude, active-repeater satellite
Experimental projects in the employment of medium-altitude, active-repeater satellites for global communication links; e.g., Telstar

Testing of the feasibility of employing active-repeater satellites for long-distance communications; e.g., the Courier

Transmittal of the human voice from space; e.g., Score

Providing an operational satellite system for world-wide, all-weather navigation; e.g., Transit

Creating a radio-reflective band around the world by using short copper wires called dipoles; e.g., West Ford

Increased observation of the earth's atmosphere; e.g., Tiros and Nimbus

Unmanned Lunar and Interplanetary Spacecraft

Purposes

To acquire information about other celestial bodies

To aid in preparing for eventual landings of men on the moon and on other planets in our solar system

Examples of Vehicles

Pioneer
- Determined the extent of the Van Allen radiation belt
- Determined the density of micrometeoroids in space
- First observed the hydromagnetic oscillation of the earth's magnetic field

Ranger
- Series of spacecraft developed to gather data about the moon and to test elements of space technology required for future lunar and interplanetary missions
- Equipped with seismometer to report on lunar disturbances such as moonquakes and meteorite impacts
- Equipped with miniature television transmitter for sending detailed pictures of the moon's surface texture where the capsule lands

Surveyor
- Equipped with television cameras to take pictures while landing, scan the moonscape after landing, and monitor the spacecraft's instruments
- Built to analyze lunar surface material, check the moon's surface for strength and stability, and measure meteorite bombardment and moonquakes
- Built to advance man's knowledge of the moon and also to contribute to manned exploration by demonstrating technology for soft landing, by verifying the suitability of sites for manned landings, and by aiding the design of protective shielding for manned spacecraft and the astronauts' space suits

Lunar orbiter
- Assigned to photograph the moon's surface in order to locate landing areas for the Surveyor spacecraft and the Apollo lunar expedition
- Intended to contribute to our knowledge about the size, shape, and gravitational pull of the moon

Mariner
- Assigned to provide data for interplanetary space exploration
- Examples of data already provided:
  - The solar wind, consisting of electrified hot gases, constantly rushes outward from the surface of the sun.
  - The density, temperature, and velocity of the wind changes with variations in solar activity; e.g., solar flares.
  - The solar wind influences the amount and intensity of cosmic radiation of the solar system.
  - Interplanetary magnetic fields are created by the solar wind, which distorts the earth's magnetic field.
  - Interplanetary space has many weak magnetic fields.
  - The intensity and amount of cosmic radiation in space between Earth and Venus seem to be uniform.
  - Radio communication between Earth and spacecraft is possible in interplanetary space.
  - Small bits of matter in space, micrometeoroids, are fewer in interplanetary space than around Earth.

Manned Space Exploration

Purposes

To know more about the universe – first of all, our own solar system

To satisfy man's deep curiosity about outer space

To find ways of helping mankind, including future extraterrestrial colonization

Problems

Man's need for adequate oxygen; barometric pressure; temperature control; elimination of toxic agents

Heavy weight of equipment

Isolation; confinement; radiation

Variable efficiency; accuracy; reliability of man

Human requirements of rest, food, and relaxation

Dangers to man

Examples of Space Flights and Their Purposes

Project Mercury
- Orbit a manned spacecraft

Investigate man's reaction to, and abilities in, space flight
Recover man and spacecraft safely

Project Gemini
Determine how man will perform and how his abilities as pilot will be affected during prolonged flight
Develop techniques for orbital rendezvous and docking
Carry out scientific investigations of space that require the presence of man on a spacecraft
Show controlled entry landing at a chosen site

Project Apollo
Land American explorers on the moon and return them to earth

Examples of Space Launch Vehicles and Their Uses

LAUNCH VEHICLES	USES
Scout	Small explorer satellites and geoprobes (P-21)
Delta	Meteorological satellites (Tiros); communication satellites (Telstar, Echo, Relay, Syncom); scientific satellites (Explorers, Ariel)
Thor-Agena B	Scientific satellites (Alouette, Orbiting Geophysical Laboratory); applications satellites (Echo, Nimbus)
Atlas D	Project Mercury
Atlas-Agena B	Unmanned lunar and interplanetary probes (Ranger)
Atlas-Centaur	Surveyor spacecraft for landing on moon and orbiting around the moon; spacecraft of the Mariner type for exploring Mars and Venus
Titan II	Project Gemini
Titan III	X-20 (Dynasoar)
Saturn I	Project Apollo earth-orbital flights
Saturn IB	Project Apollo earth-orbital flights of command, service, and lunar excursion modules; orbital rendezvous rehearsals
Saturn V	Project Apollo lunar exploration mission
Nova	Space ventures beyond Apollo

Generalizations

- Like the other planets of the solar system, the Earth moves in relation to the sun, which also moves through space.
- The planets are held in their orbits around the sun by the forces of gravity and momentum.
- Planets shine by reflected sunlight.
- Many theories have been advanced to explain the origin of the solar system.
- The length of a planet's orbit varies with its distance from the sun.

THE STUDY OF GEOGRAPHY

Geography was the social science elected for enrichment at the demonstration center because of its significance in determining the relationship of human activity to the physical environment.

The Values Inherent in Geography

In discussing the importance of geographical study, Jan Broek observes that projects to advance underdeveloped countries abroad and to aid disadvantaged areas at home require a geographical knowledge of local mores and of the relationships between material and human resources. Such knowledge is also required to solve the problems concomitant with the depopulation of the agricultural areas, the rapid growth of suburbs, migration, changes in the character of business districts, shortage of mineral resources, and air and water pollution. (21)

The study of geography revolves around four major concepts: regional differences, space relations, man-land relations, and cultural landscape. According to Clyde Kohn, the following objectives of a social science program are attained through studying geography: (a) developing those modes of inquiry and substantive understandings that enable pupils to think critically and creatively about their environment; (b) identifying with and becoming emotionally attached to democratic ideals; and (c) anticipating social change and choosing desirable changes. (23)

Contribution of Social Science to the Scientific Approach

The social sciences afford many possibilities for developing scientific attitudes because of their potential for encouraging freedom of inquiry, infusing and integrating knowledge, and developing investigative skills. Within the field of social sciences, the subject of geography was chosen for enrichment because it provides a knowledge of the earth's physical and cultural features and their interrelationships, together with an understanding of the distribution of natural resources.

Teachers of the demonstration center focused their geographic presentations on the basic structure of the subject, using the scientific approach in stressing the major concepts. These concepts are listed on the pages that follow. Teacher reference works are numbered as 22 and 24 through 28 in the bibliographical entries to this chapter.

Definition of Geography

Both a natural and a social science, geography is concerned with the areal differentiation of the earth's surface as shown in the interrelationships of the individual elements, including climate, soil, vegetation, population, land use, and industries, together with the unit areas formed by the complex of those elements.

Concepts About Geography

The following concepts and generalizations were emphasized in the enrichment program and are listed here under the two categories, physical geography and cultural geography.

PHYSICAL GEOGRAPHY

Life on earth is influenced by the earth's shape, size, and set of motions. The shape of the earth causes an unequal distribution of sunlight, which in turn influences the circulation of the air and causes differences in both climate and vegetation.

Earth movements of rotation and revolution affect time and climate. Rotation of the earth on its axis causes night and day; seasons result from a combination of revolution, inclination, and parallelism of the earth's axis.

Earth movements and earth-sun-moon relationships are basic to the geography of outer space.

Weather, climate, and earth crustal movements affect the surface of the earth and cause regional differences in land forms, minerals, soils, and vegetation.

Climate is determined by sunlight, temperature, humidity, precipitation, atmospheric pressure, winds, rates of heating and cooling of land and water surfaces, irregular shape and distribution of land and sea areas, ocean currents, and mountain systems.

Because of various combinations of heat and moisture and their distribution, the earth is divided into climatic regions consisting of tropical, middle latitude, and polar lands.

The crust of the earth, consisting of various types of rocks, contains useful mineral deposits.

Soil, water, solar energy, and air are the natural resources most indispensable to man. The great source of all life on earth is heat from the sun.

Soil and vegetation cover the nonliving surface configuration and provide character and color to the landscape.

Major climatic regions coincide approximately with major vegetation zones. Natural vegetation is a great resource of man.

Soils are altered by nature and man. Nature combines the action of climate, vegetation, and animals on parent materials to produce regional variations in soils.

CULTURAL GEOGRAPHY

Man constantly seeks to satisfy his needs for food, clothing, and shelter; in so doing he attempts to adapt and exploit the earth. Man does not use all aspects of the natural environment, however.

The natural enviornment may set the broad limits of economic life within a region, but man determines its specific character within the limits of his culture.

Man must utilize natural resources. Groups of men develop ways of adjusting to and controlling their environment. Human change and the structure of civilization depend upon the extent of man's supply of energy and his ability to utilize and control it.

The processes of production, distribution, exchange, and consumption of goods have a geographic orientation and vary with geographic influences. The organization of economic processes within an area (spatial organization)

results from the kinds of resources, the stage of technology, and the sociopolitical attitudes of the population.

The location of production is controlled by the factors of land (natural resources), labor, and capital. In most cases the attainment of maximum efficiency, as motivated by competition for the factors of production, determines location of production. In some cases the location is determined by political or other social controls rather than by economic efficiency.

Since people generally prefer to live near their work, the location of production becomes significant in the distribution of the population.

The kinds of climate, soil, native vegetation, animals, and minerals influence the nature and extent of man's achievements within each region. The amounts and the kinds of food needed for health vary with climatic conditions and man's technology.

Human activities and cultural patterns are related to geographic location and to the particular era in which human beings live. People in different stages of civilization react differently to similar environments.

Man and animals may, by their activities, upset the balance of nature. Man, however, may also perform something positive, like a conservation project, to regain the balance.

Competition for the earth's natural resources sometimes results in political strife, even war.

Political cooperation and strife between nations are related to their geographic locations.

THE STUDY OF MATHEMATICS

As a major branch of scientific endeavor, mathematics is an important tool for inquiry, investigation, and logical thought. A study of mathematics encourages a precise, critical attitude in research and promotes respect for logical reasoning.

Mathematics as a Tool for Inquiry and Investigation

Including manipulative experiences and depending on a mastery of facts and techniques, mathematical study embodies the following four essentials: discovery and use of patterns in abstract materials; extension of "open-ended" mathematical situations by creative explorations; understanding of basic concepts, including variable function, transformation, implication, contradiction, axiom, theorem, linearity, matrices, and Cartesian coordinates; and clarity of thought. (37) Central to mathematical thought are the following attitudes and values: a belief that mathematics is discoverable, self-confidence, perseverance, flexibility, self-evaluation, recognition of the importance of intuition, and enthusiasm for challenge. (37)

Enriched Content in Mathematics

The subject content in mathematics at the Los Angeles center featured mathematical themes or ideas, which were presented in a series of related topics. In encouraging that approach, the National Council of Teachers of Mathematics proposes the following ten unifying themes: (a) structure; (b) operations and their inverses; (c) measurement; (d) graphical representation; (e) systems of numeration; (f) properties of numbers and the real number system; (g) statistical inference and probability; (h) language and theory of sets; (i) logical deductions; and (j) valid generalizations. (39)

Some educators believe that the child should be taught statistics in the elementary grades and that the collection of raw data should introduce that subject. After learning that such data must be organized and correlated before interpretation is possible, gifted children at the Los Angeles center were taught data summarization and other statistical processes.

Instructional Methodology

Robert Davis (36) prescribes the following teaching principles in developing mathematical ability:

- Large mathematical concepts should be presented in a sequence of smaller ones.
- Pupils should be assigned problems only after having been exposed to the general techniques and concepts required.
- Practice in one subject area should be obtained by exploring new material.
- Learning opportunities should motivate the pupil and stimulate his interest.
- Mathematical experiences should be informal.
- Only fundamental concepts and techniques should be presented.
- Discovery of concepts should be emphasized.

- Active roles of pupils and teachers should be encouraged.
- Patterns should become evident through mathematical experiences.
- Teaching should be geared to the child's age and interests.

Educators should take advantage of observational and experimental opportunities to increase their effectiveness in teaching mathematical order, structure, and foundations. Observation might include both classroom visits and filmed lessons. The National Council of Teachers of Mathematics has prepared a series of films on mathematical structure. (45)

Kenneth B. Henderson discusses the following four teaching methods appropriate for mathematics: "tell-and-do," "heuristic," "inductive," and "deductive." The stages of the tell-and-do method are: (a) state the item of knowledge to be presented; (b) clarify the information when necessary; (c) justify the item; (d) assign problems based on the item; and (e) make a transition to the next item to be taught. (41) The heuristic or discovery method requires the instructor – whether the teacher, programmed materials, or machine – to direct the attention of pupils to certain data. The responses of the pupils to those data dictate further instruction. The feedback from the pupil distinguishes the heuristic method from the tell-and-do. The role of the teacher resembles that of the pupil because both persons formulate certain hypotheses from the available data: the pupil, from the mathematical information; the teacher, from the pupil's reactions to those data. Both persons test their hypotheses in terms of new data becoming available; both converge on an acceptable conclusion in terms of the information – the pupil on the knowledge acquired, the teacher on an inference about the pupil's mastery of that knowledge.

Henderson describes the inductive method as the use of exercises constructed on familiar situations involving time, money, direction, and so on. The pupil discovers the fundamental principles to be learned by working the exercises. The method utilizes three stages: (a) presenting instances of information from which the pupils form hypotheses; (b) presenting evidence to confirm or to negate those hypotheses; and (c) stating the inferences warranted inductively from the conclusions drawn in steps (a) and (b). The deductive method described by Henderson uses authoritative statements of rules combined with extensive practice. Before drilling with the respective process, the teacher does not explain the rules applied to obtain the answers. By working many exercises, the child is expected to learn deductively the principles involved. (41)

Enrichment Information

The teacher training program at the Los Angeles Demonstration Center emphasized mathematics as a tool for inquiry and research. The following outline contains some of the information that was offered in inservice courses. Materials used by enrichment teachers are included among the "Selected References" at the end of this chapter as entries numbered 39, 43, 45, 49, 50, 53, 55 through 57, and 60 through 63.

Number

Beginnings of Number

One-to-one correspondence
  Accurate records
  Accounting
Counting
  Model groups in a system
  Recognition of number in a cardinal (how many) sense
  Recognition of number in a natural (which one) sense

Egyptian System of Notation

Hieroglyphics: a system of picture writing

Number symbols:

Hindu-Arabic	*Egyptian*
1	Vertical stroke
10	Heel bone
100	Coil of rope
1,000	Lotus flower
10,000	Bent line
100,000	Burbot
1,000,000	Astonished man

Governed by the principles of addition and repetition
Had a base of ten

The Abacus

Most ancient form of computing machine
Based on the principles of addition and repetition
Demonstrates the basic principles of the Hindu-Arabic system

Greek and Phoenician System of Notation

Greek and Phoenician number names with Hindu-Arabic equivalents:

Alpha (1); beta (2); gamma (3); delta (4); epsilon (5); vau (6); zeta (7); eta (8); theta (9); iota (10); kappa (20); lambda (30); mu (40); nu (50); xi (60); omicron (70); pi (80); koppa (90); rho (100); sigma (200); tau (300); upsilon (400); phi (500); chi (600); psi (700); omega (800); sampi (900)
Based on the principles of addition and multiplication
Had a base of 10
M introduced to represent ten thousand

Roman System of Notation

Roman numerals:
I (1); V (5); X (10); L (50); C (100); D (500); M (1,000)
Based on the principles of addition, repetition, multiplication, and subtraction

Hindu-Arabic System

Nonrepetitive system; a different symbol assigned for each of the early numbers
No significant compounding at each power of ten, but no limit to the number of compounding points possible
A system of scale ten (decimal)
Based on the principles of addition and place value

Hindu-Arabic Numerals

Did not contain the zero character in its earliest stages
An Indian inscription, dated A.D. 876, found to contain zero
Digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9): comprise all the symbolism required in this system
Operate as face value; for example, 7 represents seven of something
Operate as place value; for example, establishes whether something is units, tens of units, tens of tens of units (hundreds), tens of tens of tens of units (thousands)

Exponential Notation

Introduced by Descartes, the French philosopher and mathematician
Shorthand notation
Simplifies writing out the product of identical factors (such as N X N X N) by expressing the typical factor (known as the base) and then attaching to it a number (known as the power of the exponent) which tells how many times the factor is repeated
Numbers expressed in exponential form with the same base – may be multiplied by adding the exponents and may be divided by subtracting the exponent of the divisor from the exponent of the dividend

Numeration

Technique for expressing numbers of a system by words
Convenience dependent on consistency and simplicity
Numeration scheme (United States):

⇦	10^9	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
	Billions	Hundred millions	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units (ones)

Alternate Expressions of Number

Example: 7,000 (units implied) – has the following equivalent expressions: 7 thousands, 70 hundreds, 700 tens
Everyday illustration: decimal money scale and its two chief denominations (the dollar and the cent) – 7,500 units [cents] equals 75 hundreds [dollars]; 7,500 units [cents] equals 750 tens [dimes]

Other Scales of Notation

Choice of base (radix)
Base five
Separate symbols for the number concepts: absence (0); one (1); two (2); three (3); and four (4)
Quantity 5 expressed as 10 (one base group of five plus no units)
Quantity 6 expressed as 11 (one base group of five plus one unit)
Numbers expressed in various scales of notation:

Base ten	Base twelve	Base eight	Base five	Base three	Number-word (concept)
1	1	1	1	1	one
2	2	2	2	2	two
3	3	3	3	10	three
4	4	4	4	11	four
5	5	5	10	12	five
6	6	6	11	20	six
7	7	7	12	21	seven
8	8	10	13	22	eight
9	9	11	14	100	nine
10	T	12	20	101	ten

Work with Numbers

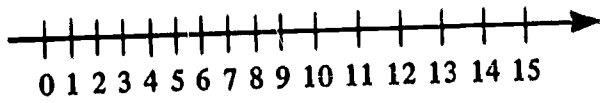
Synthesis
Combining groups of any size (addition)
Combining groups of equal size (multiplication)
Analysis
Separating a group into subgroups of any size (subtraction)
Separating a group into subgroups of equal size (division)
Comparison
Relationship in terms of deficiency or excess (subtraction)
Relationship in terms of measurement or ratio (division)

Various Concepts of Numbers

Number – a multipurpose item
Number – an attribute, like loyalty or texture
Number, like texture – characteristic of things and nonexistent apart from things; can be appreciated only in abstraction
Numbers especially associated with concrete objects (e.g., five books) – called "concrete" numbers
Numbers associated with specific units of measure – called "denominate" numbers
"Like" numbers – occur when concrete or denominate numbers agree in terms of objects or "somethings"
"Abstract" numbers – occur when number symbols are employed to convey a generalization (6 + 3 = 9)

Number as Discrete and Continuous

Discrete numbers – those applied to separate, unconnected situations
Continuous numbers – those based on a continuum with each specific number (an integer or fraction or both) being a unique measurement from a basic zero point
A *continuum:* can be illustrated by a number line starting with zero at the left and extending infinitely to the right:



Analysis

Subtraction

Definition
An analyzing operation which is the inverse of the process of addition; involves the breaking up of a group into two subgroups whose sizes may or may not be alike
An operation by which the number property of the missing addend is found when the other addend and the sum of the two addends are known
Principles
Only like numbers can be subtracted.
An equal increase in the minuend and the subtrahend produces no change in the remainder.

Division

Definition
An analyzing operation in which all of the subtrahends are alike and by which repeated subtraction processes occur
Terms
Dividend – the whole which in analysis is broken apart into factors
Divisor – the known factor
Quotient – the unknown factor which is sought; the solution
Principles
A quotient of the sum of several numbers divided by a given number is obtained either by adding the several numbers and dividing their sum by the given number or by dividing each of the several numbers by the given number and adding the resulting quotients.
The quotient remains unchanged if the dividend and divisor are multiplied or divided by the same number.

Synthesis

Addition

Definition
A synthesizing process of finding, without counting, the number property of a group formed by the combination of two or more groups
Principles
Only like numbers can be added.
The sum of an addition is unaffected by the sequence or order of its addends.

Multiplication

Definition
A synthesizing process of combining groups composed of like things of the same size
Terms
Multiplicand – the typical addend
Multiplier – the number of times the typical addend appears
Product – the result of the operation

Principles
The product of a multiplication is unaffected by the combinations by which the factors are grouped or by the sequence in which the factors are multiplied.
A product of a given number or the sum of several numbers is found either by adding the several numbers and multiplying their sum by the given number or by multiplying each of the several numbers by the given number and adding the resulting products.

Comparison

Relationships

Differences
Deficiency
Excess
Example: subtraction

Graphic Representations

Examples: Bar graph, circle graph, broken line graph

Measurement

Ratio, proportion, variation

Geometric Elements and Structure

Point

Does not occupy space
Indivisible; has no width, length, or thickness
Indicates a position in space
Represented by a dot
Never actually seen

Line

Produced by the motion and extension of a point
Has neither width nor thickness, but has length
Is abstract
Types of lines
Horizontal – a line that runs from left to right and is parallel to the surface of water at rest
Vertical – a line that runs straight up and down and is at right angles to a horizontal line
Oblique – a line that is neither vertical nor horizontal
Curved – a line that is changing constantly in its direction
Parallel – lines which lie in the same plane and never meet, no matter how far they are extended

Angle

The figure formed by two lines (called sides) drawn from the same point (called a vertex)
Kinds of angles
Right – when one straight line meets another in such a way that the two adjacent angles are equal or "right"
Acute – an angle less than a right angle
Obtuse – an angle greater than a right angle

Surface

Produced by the motion of a line
Has two dimensions – length and width
Is the exterior part of anything
Plane surface – a flat area produced by a straight line moving perpendicular to its own direction

Polygon

A plane figure bounded by straight lines, the sum of the sides being called the perimeter
Classified according to the number of sides it possesses
Kinds of polygons
Triangle, quadrilateral, pentagon, hexagon, heptagon, octagon
Many-sided regular polygon
Essential facts:
If the sides and the angles they form are equal, a "regular" polygon is created.
The smallest possible number of sides and angles is three.
As the number of sides and angles increases, the polygon becomes more like a circle.
A circle may be considered a regular polygon with an infinite number of sides.

Triangle

A polygon of three sides
Simplest of all polygons
Kinds of triangles
Right – a triangle with one right angle, the hypotenuse being the longest side and opposite the right angle
Acute – a triangle that has three acute angles
Obtuse – a triangle with one angle that is obtuse
Isosceles – a triangle with two equal sides
Scalene – a triangle with no two equal sides
Equilateral – a triangle with three equal sides

Quadrilateral

A polygon of four sides
Kinds of quadrilaterals
Square – a rectangle with four equal sides
Rectangle – a parallelogram with four right angles

Parallelogram – a quadrilateral in which both pairs of opposite sides are parallel
Rhombus – an equilateral parallelogram whose angles are oblique
Trapezoid – a quadrilateral having only two sides parallel
Trapezium – a quadrilateral in which no two sides are parallel

Circle

A plane figure bounded by a curved line which has every point equally distant from the center
Concentric circles – two or more circles that have the same center
Parts of circles
Circumference – boundary of the circle
Diameter – that chord which passes through the center of the circle
Radius – a straight line drawn from the center to any point on the circumference
Chord – a straight line joining any two points on the circumference
Tangent – a straight line having only one point in common with a circle
Arc – any portion of the circumference of a circle
Segment – the area of a circle included within a chord and its arc
Sector – the figure formed by two radii and the arc that they intercept

Solid

A portion of space bounded on all sides
Kinds of solids
Polyhedron – a solid whose faces are polygons; classified according to the number of faces it possesses
Kinds of polyhedrons
Hexahedron – a box having six sides
Octahedron – a polyhedron having eight sides
Prism – a polyhedron with two faces (called bases), equal and parallel, and lateral faces that are parallelograms
Parallelepipedon – a prism whose bases are parallelograms
Cube – a right parallelepipedon, the faces of which are squares
Right prism – a prism whose lateral faces are perpendicular to its bases
Truncated prism – the portion of a prism included between the base and a section made by a plane not parallel to the base and cutting all the lateral edges

Crystals

Polyhedrons of nature
Formed by the solidification of substances; e.g., freezing water – causes ice crystals that are hexagonal prisms
All crystals – polyhedral in shape and classified by the number of their sides

Pyramid

A polyhedron whose base is a polygon of any number of sides and whose lateral faces are triangles having a common vertex
Essential facts:
Regular pyramid – one whose base is enclosed by a regular polygon and whose vertex lies on the perpendicular to the base at the latter's center
Truncated pyramid – that portion of a pyramid included between its base and a plane cutting all its edges
Frustrum of a pyramid – that portion included between the base and a plane parallel to the base cutting all the edges
Square-based pyramid – one having four lateral faces

Cylinder

A figure formed by the rotation of a rectangle about one side, which remains stationary as an axis
Bases – plane circles
Sides – form a curved surface joining the bases
Right circular cylinder – formed by revolving a rectangle about one of the sides of a cylinder as an axis
A plane intersecting a right circular cylinder parallel with its base: forms a circle at the intersection
A plane intersecting a right circular cylinder not parallel to its base: forms an ellipse at the intersection

Sphere

A solid bounded by a curved surface of which every point is equally distant from the center
Circumscribed about a polyhedron when the vertices of the polyhedron lie on the sphere
Inscribed in a polyhedron when the faces of the polyhedron are tangent to the sphere
A great circle formed when a plane intersects a sphere and passes through the center of the sphere
A small circle formed when a plane intersects a sphere but does not pass through the center of the sphere

Cone

A solid figure uniformly tapering from a circular base to a point called a vertex

Altitude – perpendicular distance from the vertex to the base
Right circular cone formed by revolving a triangle with one right angle around a side of the right angle as an axis; may be considered a pyramid with an infinite number of sides

Conic Sections

Formed when a plane passes parallel to the base through the cone to form a circle at the intersection
Kinds of conic sections:
Hyperbola, parabola, ellipse

Variations of Basic Shapes

Cycloids and involutes
Common cycloid – a point on the circumference of a circle rolling smoothly on a straight line; a curve that resembles the curve on the edge of a fish scale
Prolate cycloid – a point within the circumference of a rolling circle; a curve that resembles the surface of a swelling sea
Curate cycloid – a point moving outside the circumference of a rolling circle; a curve that loops like a vine
Spirals
Curved lines
Logarithmic spiral – a plane curve that cuts all its radius vectors (a straight segment, or its length, from a fixed point to a variable point) at the same angle
Helix – a line curved like a wire wound around a cylinder

Descriptive Statistics

FREQUENCY DISTRIBUTIONS

Simple Frequency Distribution

A table; e.g., all score values listed in one column and the number of individuals receiving each score in the second column
Arrangement of data to facilitate interpretation of group statistics

Grouped Frequency Distributions

A table bringing together the single measures of individuals into a number of groups, each group containing an equal number of score units
Each group called an interval and identified by putting down the limits
Each interval: has a width of score values (*i* being the symbol used to indicate the width of the interval in any grouped frequency)
Degree of condensation determined by the number of score units included in each class interval
Number of intervals dependent on arbitrary choice; e.g., number determined by the number of cases, range of the measures, and the purpose for which the distribution is intended (usually 10 to 20 intervals)
Estimate of the needed *i* obtained by dividing the range of scores (the highest minus the lowest) by the number of intervals desired

GRAPHIC REPRESENTATIONS

Graphic Representations of Frequency Distributions

Histogram – a bar diagram with two axes, the horizontal base line (X axis or the abscissa) and the vertical line (Y axis or the ordinate)
Frequency polygon – a diagram drawn from a frequency distribution by plotting points over the midpoints of each interval, with the height of each point being determined by the appropriate frequency or percent
Cumulative frequency curve – a diagram formed by plotting cumulative frequencies (e.g., the total number of cases earning a certain score or below) derived from the distribution

General Procedures in Graphing Frequency Distributions

Selection of axes
Selection of size units
Labels of graph
Title of graph

Form of a Frequency Distribution

Bilaterally symmetrical – when the two sides of the polygon are identical in shape
Skewed – described in terms of degree and direction; distribution bunched together on one side of the average and tailing out on the other side
J curve – found in descriptions of certain behaviors wherein the large majority have none of the item to their credit and a few members have many
Rectangular distribution – when the frequencies in every class interval are the same
Normal curve – when the frequencies form a symmetrical, bell-shaped distribution

Graphic Representations of Other Types of Data

Line graph – used when comparing different groups, objects, or conditions in relation to a certain characteristic

Bar graph – used when different groups or objects do not vary along a continuum in relation to the characteristic differentiating them, but are a collection of discrete objects

PERCENTILES

Interpretations of Raw Scores

To give meaning to the scores
To determine the position of a particular score
To ascertain the relative position of an individual or his score in a group

Essential Facts

Percentile: a score at or below which a given percent of cases lie
Percentile scales
  Derived from percentages
  Contain 100 units
  Most commonly used, the quartile: first quartile, the twenty-fifth percentile; second quartile, the fiftieth percentile or median; third quartile, the seventy-fifth percentile
  Occasionally deciles used: first decile, tenth percentile; second decile, twentieth percentile
Obtained by inspecting a cumulative percentage curve by translating the given percent of cases into number of cases (n^{th} case); finding the score corresponding to the n^{th} case

Percentile Rank

A percentage defining the position of a score and its distribution
A value indicating the percent of cases in a distribution falling at or below this score
Obtained by subtracting from the score the lower real limit of the interval in which it is contained; dividing the result by the width of the interval; multiplying this quotient by the number of cases in the interval; adding the product obtained to the cumulative frequency of the interval below the one in which the score falls

MEASURES OF CENTRAL TENDENCY

Arithmetic Mean

Measure of the average
Equal to the sum of measures divided by their number
Formula: $M = \frac{\Sigma X}{N}$

Mode

That score which occurs most frequently in ungrouped data
The midpoint of the interval with the greatest frequency in grouped data
May be computed or estimated by general inspection of the data

Median

That point above which 50 percent of the cases fall and below which 50 percent of the cases fall
Another name for the fiftieth percentile or the second quartile

Comparison of Uses

Mode – for obtaining a quick, rough estimate of central tendency; indicates the typical
Median – for identifying certain peculiarities such as marked skewness and missing cases; indicates the middle
Mean – for determining nearly symmetrical distribution; indicates the average

VARIABILITY

Kinds of Variability

Intraindividual variability – differences within individuals
Interindividual variability – differences among individuals

Descriptions of Variability

Range – the distance from the lowest to the highest score in a distribution; the highest score minus the lowest score; a rough index of variability
Standard deviation – the root mean square deviation that represents each score; obtained by finding the mean by summing the raw scores and dividing by the number; subtracting the mean from each raw score to obtain each deviation (x); squaring each deviation (x) value; summing the x^2 and then substituting directly into the formula
z score
  Value that indicates how far a raw score deviates from the mean in standard deviation units
  Uses
    Way of expressing a person's position in a distribution
    Comparison of the same person with himself in two different score distributions; e.g., the relative position of a person on two different tests

MATHEMATICAL AND ASTRONOMICAL GEOGRAPHY

Gifted pupils benefit particularly from correlated units of study. Indeed, the ability to interrelate knowledge from various fields characterizes the intellectually gifted.

Interdisciplinary units of study further the superior ability of talented pupils to perceive complex relationships, to generalize, and to comprehend abstractions. Correlated units are particularly suitable in the elementary school because of the general nature of the schooling there, the wide range in pupil abilities and interests, and the importance of broadening intellectual horizons of young gifted pupils. (52)

Mathematical and astronomical geography, which is concerned with the relations of the earth to the solar system, requires a detailed knowledge of astronomy, geography, and mathematics. This area lends itself to enrichment because it develops an understanding of the immensity of the universe and its relationships. Background information for teachers in this field follows. Reference 51 to this chapter cites a book for teacher reference; additional works on the topic are included with the pupil materials at the end of Chapter V.

Planetary Relations of the Earth to the Solar System

Distances

Circumference of the earth at the equator – about 25,000 miles
Average distance between the earth and the sun – about 92,900,000 miles (1 astronomical unit)
Speed of light – about 186,000 miles per second
Light from the sun – requires approximately 500 seconds or 8 ⅓ minutes to reach the earth

The Earth

The third planet from the center of the system, 1 A.U. (astronomical unit) away from the sun
A geometrical form similar to an oblate spheroid; slightly flattened at the poles
Has an equatorial diameter of 7,927 miles
Has a polar diameter of 7,900 miles
Its gaseous atmosphere includes: nitrogen, oxygen, argon, carbon dioxide, water vapor, and traces of other elements and compounds; nitrogen equal to 78 percent, oxygen to 21 percent
Consists of four concentric spheres: the crust, the 3- to 25-mile-thick outermost sphere, which projects above the surface of the oceans to form the continental land masses; a mantle, a solid shell 1,800 miles thick, which is below the crust; the molten outer core and the solid inner core below the mantle

Basic Motions of the Nine Planets

Rotation – each planet rotating on its own axis
Revolution – each planet revolving around the sun in a counterclockwise direction as viewed from the north; each planet moving in an ellipse

Some Definitions of Terms Used in Locating Celestial Objects

Celestial Sphere – the sky, represented as a large sphere with the earth in the center; imaginary, since celestial objects are not at the same distance from the earth

Visible Horizon – the apparent meeting of the celestial sphere and the terrestrial surface; loosely, "where the sky meets the ground"

Zenith – a point on the celestial sphere directly over an observer's head

Astronomical Horizon – distance from the zenith measured by an angular distance of 90^{o} in all directions

Nadir – point on the celestial sphere directly below an erect observer's feet; in that part of the sky below the horizon and therefore not visible; always directly below the zenith

Azimuth – An arc of the horizon measured between a fixed point (as true north) and the vertical circle passing from the zenith through the center of an object (as a star)

Altitude – apparent angular position of a star above the horizon; found by measuring the angle between the astronomical horizon and the star along the line through the star and the zenith

Poles of the Earth – two points on the surface of the earth at the ends of the earth's axis

Celestial Poles – intersection of the earth's axis extended out into space and the celestial sphere; north and south celestial poles

Earth's Equator – an imaginary circle described upon the surface of the earth dividing the earth into two equal parts at an angular distance of 90^{o} from each of the earth's poles; separates the surface of the earth into the northern and southern hemispheres

Latitude – angular measurement north or south of the equator; for example, the point halfway between the equator and the north pole: fixed at 45° north latitude

Celestial Equator – a great circle formed above the earth's equator dividing the distance between the celestial poles equally

Meridians – prime meridian: a great circle through the Royal Observatory in Greenwich near London, England, and the north and south poles intersecting the equator at right angles; other great circles, usually 15° apart, drawn on maps through the north and south poles, usually at regular intervals

Longitude – an angular distance east or west of the prime meridian

Celestial Meridian – a great circle that passes through the north and south celestial poles and the zenith; can be used to note the apparent turning of the celestial sphere as the objects in the sky appear to move from east to west as the earth rotates from west to east

Ecliptic – a great circle on the celestial sphere which represents the apparent path of the sun around the sky as the earth revolves around the sun; its position defined by the plane of the earth's orbit considered as intersecting the celestial sphere

The Equinoxes – the two points of intersection of the ecliptic and the celestial equator; the vernal and autumnal equinoxes; the earth's axis of rotation inclined to the path of the ecliptic at an angle of 66½°

The Solstices – the positions where the ecliptic and the celestial equator are most widely separated between the equinoxes; positions called the summer and winter solstices

Ascension – distances measured from the vernal equinox eastward

Declination – angular distances measured north or south of the celestial equator on the celestial sphere

LOGIC

A study of logic provides the techniques for assessing thoughts and aids in developing precise thinking in all subject areas. (55) Patrick Suppes advises that a knowledge of logic can extend the mathematical experiences of the able pupil. (66) Richard Corbin and others observe that everyone uses the principles of logic every day; when such principles are applied incorrectly, unsound reasoning results and faulty conclusions are reached. The study of inductive and deductive reasoning aids in logical thought. (59) Richard Altick encourages the study of logic to improve reading and other communicative skills. He believes that persons often fail to detect falsehoods by not recognizing the faulty reasoning behind them.

At the Los Angeles Demonstration Center, logic was incorporated in the enriched classes in reading, English, science, social science, and mathematics. Books and other materials used in the enrichment program by teachers are listed with "Selected References" for this chapter as numbers 69, 70, 72, 74, and 76 through 85.

Elements in the Study of Logic

Inductive Reasoning

Development of a mental pattern is related to what is happening after several observations have been made.
Observations may indicate gradual or rapid changes.
Observations always indicate a regular or recurring point.
Only one counterexample or contradiction is needed to disprove a conclusion.

Deductive Reasoning

This type of reasoning is the basis of mathematical proof.
The conclusion of an argument must be true if the information on which it is based is true.
All the ideas that form the starting point of a deductive argument are true or assumed to be so; they are called the hypotheses of the argument.
The goal of a deductive argument is called the conclusion of the argument.
The correctness or validity of an argument is the burden of concern.

Venn Diagrams

These are aids to introducing simple deductive arguments; however, they are not formal proofs.
Circles or other closed figures in different positions illustrate the relationships described by ideas using the adjectives *all, no,* and *some.*
One Venn diagram that satisfies the conditions of the hypothesis but not those of the conclusion renders the argument invalid; an example of this is called a counterexample.

Sentences and Statements

One branch of logic, called "statement calculus," requires declarative sentences to have two properties:

(a) the sentence must not be meaningless or nonsensical; and (b) the sentence must be either true or false.

Sentences that contain pronouns such as "he" are called open sentences; the pronouns are called variables because they can be replaced by names of suitable objects or persons.

A variable should clearly indicate a set of persons whose names can replace the variable; this set is called the replacement set or the domain of the variable.

The word "or," symbolized by "V," is a connective in sentences; the resulting sentence is called the disjunction of the individual sentence.

Negation is used to deny the truth or falsity of a sentence; the symbol for negation is the curl ~, called a tilde, which is written to the left of the letter representing the sentence.

Single lower-case letters, such as *p*, *q*, and *r*, are used to represent open sentences.

Single upper-case letters, such as *P*, *Q*, or *R*, represent statements.

The use of the conditional "if . . . then . . . " forms a compound sentence called a conditional sentence or a sentence of implication.

A serious error of logic is to assume that the antecedents and the consequences in a conditional sentence have the same meaning; when the antecedent and consequence of a conditional sentence are interchanged, the resulting sentence is called the converse of the original conditional sentence.

Procedures and Problems in the Use of Logic

Testing the Validity of Arguments

Every argument has a corresponding conditional sentence whose antecedent represents the premise or conjunction of premises and whose consequence represents the conclusion of the argument.

An argument is valid if the conclusion is a logical consequence of the hypothesis.

Common Difficulties in Defining and Evaluating a Problem

Faulty assumptions and attitudes
Rigid mental set
Defensive orientation
Emotion and stress
Oversimplification

Sources of Error to Be Avoided

Overgeneralizing from limited experience
Misapplying general rules
Mistaking correlation for causation
Failing to recognize multiplicity of causes
Thinking in terms of stereotypes

Helps in Decision Making

Accepting a reasonable level of satisfaction
Avoiding impulsive action
Reducing the negative aspects of choice
Preparing to back up a decision
Developing values as guides
Maintaining a reserve of resources

RESEARCH METHODS

Research is a formal process for seeking new information by applying the scientific method systematically. The process requires objective curiosity, accurate investigation, and logical analysis.

Teaching Research Methods as Enrichment

Although research methods are normally introduced at the college level, gifted pupils should learn these concepts much earlier as tools for learning. The excitement inherent in exploring the unknown through original research spurs and stimulates the gifted child to further learning. Research methodology can aid pupils in developing self-concepts by making them aware of their own creative thought processes.

Teachers in the Los Angeles center found that the research process motivated pupils to form good study habits and to acquire skills in reading critically, in locating and organizing data, in using statistics and graphs, in writing and typing as required to prepare research papers. The teaching faculty of the center reported that the use of the typewriter significantly improved the organizational abilities, communicative skills, and study attitudes of their pupils as they undertook research of their own.

The use of research methods formed a significant part of the enriched curriculum of the Los Angeles Demonstration Center. Background information concerning research and the related skills involved in writing a research paper follows. Resources for teachers are provided in the "Selected References" at the end of this chapter.

Types of Research

Historical Research (Historiography)

Focuses on changes, developments, ideas, practices, growth or deterioration, events, movements

Includes investigating, reporting, analyzing, and interpretating events of the past
Involves forming generalizations useful in knowing the past, understanding the present, and predicting the future
Describes the results of experiments that have taken place over periods of time

Descriptive Research

Focuses on conditions, behaviors, and functions of the present
Usually involves comparisons or contrasts
Describes conditions existing in nature and society

Experimental Research

Focuses on cause-effect relationships
Includes laboratory and field experiments
Describes the effects of proposed procedures or changes
Describes the results of controlling certain factors

Guidelines for a Research Paper

Choosing a Subject

Identify a subject of genuine interest and choose one area of this subject for concentrated study.
Formulate a concise controlling idea to develop.
Locate material pertaining to the subject.

Gathering Information

Use controlling idea as a guide for choice of material.
Record your own observations.
Interview other persons.
Read books, magazine articles, pamphlets, newspapers, and other materials as necessary.
Compile a working bibliography from the card catalog in the library.
Select the most useful material (about 10 to 15 sources) for intensive reading.
Use the most recent material for reference.
Use works by recognized authorities in the subject field.
Use sources presenting two or more different opinions if authorities disagree on the topic.

Reading and Taking Notes

Use note cards.
Write with ink.
Put one point, fact, quotation, or idea on each card – or a few closely related ideas on each card.
Write a heading on each card to indicate that part of the subject to which the information pertains.
Number each card to identify the number of the source from the bibliography.
Make certain to record page numbers on the cards.
Skim materials; then return to them and read them carefully.
Take notes on what seems useful to the development of the topic.
Quote a source directly when an author has expressed himself exceptionally well or when his exact statement of authority is needed.
Summarize important points when necessary to do so.
Distinguish between fact and opinion.

Sorting Notes and Outlining the Paper

Sort notes into categories.
Choose one type of outline.
Use cards for outline headings, subheads, and details.
Develop a workable outline.

Writing the First Draft

Determine readership to whom the paper is to be addressed.
Choose a style that is appropriate to the content.
Write rapidly to get pertinent ideas on paper and cover the ground as thoroughly as possible.
Always spell correctly; use dictionary – never guess.
Use one side of a sheet of paper; double-space your writing or typing.
Mark places where footnotes are needed.

Revising the First Draft

Let some time elapse between writing the first draft and revising it.
Consider the content in terms of details, smooth progression, accuracy of facts and opinions, relevant material, and beginning and ending.
Consider the style and the mechanics of composition.
Recheck spelling.

Preparing the Final Copy

Leave wide margins.
Type the manuscript.
Number the pages as you proceed.
Add footnotes.
Include a title page.
Draw up a table of contents.
Prepare an accurate bibliography.
Prepare the foreword and the preface if these have not already been written.
Prepare and insert whatever appendixes are considered useful.
Proofread the total manuscript.

Using the Scientific Approach

Steps to Be Followed

Exploration of existing knowledge
Identification of the problem
Definition of the problem
Statements of hypotheses
Collection and organization of data
Analysis of data
Confirmation, modification, or rejection of hypotheses by testing
Extension of some hypotheses
Formulation of conclusions
Communication of results

ADDITIONAL BACKGROUND MATERIALS PREPARED

In addition to the training materials prepared in astronomy, geography, mathematics, logic, and research methods, other inservice training materials that were used at the center are not presented herein. Such other materials included the following: mathematical design and order in nature, shapes of sound waves, the artist's use of geometrical elements and principles, the study of meteorology, and geology as related to geography.

Selected References

Scientific Approach

1. Brownell, William A., and Others. *Meaningful vs. Mechanical Learning: A Study in Grade 3 Subtraction.* Duke University Research Studies in Education. Durham, N.C.: Duke University Press, 1949.

2. Calder, Ritchie. *Science in Our Lives.* New York: New American Library, Inc., 1962.

3. Dimnet, Ernest. *The Art of Thinking.* Greenwich, Conn.: Fawcett Publications, Inc., 1963.

4. Haney, Richard E. "The Development of Scientific Attitudes," *The Science Teacher,* XXXI (December, 1964), 33-35.

5. Krathwohl, David, and Others. *Taxonomy of Educational Objectives – Handbook II: Affective Domain.* New York: David McKay Co., Inc., 1964.

6. Margenau, Henry, David Bergamini, and the editors of *Life. The Scientist.* New York: Time, Inc., 1964.

7. Mueller, Francis J. *Arithmetic: Its Structure and Concepts.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1961.

Astronomy

8. Bergamini, David, and the editors of *Life. The Universe.* New York: Time, Inc., 1962.

9. Blough, Glenn, and Others. *Elementary School Science and How to Teach It* (Revised edition). New York: Holt, Rinehart & Winston, Inc., 1958.

10. Brandwein, Paul F. *Substance, Structure, and Style in the Teaching of Science.* New York: Harcourt, Brace & World, Inc., 1965.

11. Clarke, Arthur C., and the editors of *Life. Man and Space.* New York: Time, Inc., 1964.

12. Craig, Gerald. *Science for the Elementary-School Teacher.* Boston: Ginn & Company, 1958.

13. De Santillana, Giorgio. *The Origins of Scientific Thought.* Chicago: University of Chicago Press, 1961.

14. Hoyle, Fred. *The Nature of the Universe.* New York: New American Library, Inc., 1962.

15. Hynek, Joseph A., and Norman D. Anderson. *Challenge of the Universe.* New York: McGraw-Hill Book Company, 1962.

16. *Project on the Academically Talented Student: Science for the Academically Talented Student in the Secondary School.* Report of a Conference Sponsored Jointly by the National Education Association Project on the Academically Talented Student and the National Science Teachers Association. Chairman: Robert R. Donaldson. Washington, D.C.: National Education Association, 1959.

17. Ronan, Colin A. *Man Probes the Universe.* Garden City, N.Y.: Doubleday & Company, Inc., 1964.

18. *Science: Chemistry, Physics, Astronomy.* Editorial Board: J. Bronowski and Others. Garden City, N.Y.: Doubleday & Company, Inc., 1960. (Doubleday Pictorial Library)

19. *Science Curriculum Development in the Elementary School.* Sacramento: California State Department of Education, 1964.

20. *Space, the New Frontier.* Directed by James Dean. Washington, D.C.: Office of Educational Programs and Services, National Aeronautics and Space Administration, 1964.

Geography

21. Broek, Jan O.M. *Geography, Its Scope and Spirit.* Columbus, Ohio: Charles E. Merrill Books, Inc., 1965.

22. Jarolimek, John. *Social Studies in Elementary Education.* New York: Macmillan Co., 1959.

23. Kohn, Clyde F. "The Geography Component," in *Focus on the Social Studies.* Washington, D.C.: Department of Elementary School Principals, National Education Association, 1965.

24. Michaelis, John. *Social Studies for Children in a Democracy.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1956.

25. Pounds, Norman, and Edward Cooper. *World Geography.* Text and teacher's manual. Cincinnati: South-Western Pub. Co., 1961.

26. *Readings in World History.* Edited by Leften S. Stavrianos and Others. Boston: Allyn & Bacon, Inc., 1962.

27. *Social Studies Framework for the Public Schools of California.* Prepared by the State Curriculum Commission. Sacramento: California State Department of Education, 1962.

28. *Social Studies in the Elementary School.* Fifty-sixth Yearbook of the National Society for the Study of Education, Part II. Edited by Nelson B. Henry. Chicago: Distributed by the University of Chicago Press, 1957.

Mathematics

29. Adler, Irving. *The New Mathematics.* New York: New American Library, Inc., 1963.

30. Arkin, Herbert, and Raymond R. Colton. *Statistical Methods* (Fourth edition, revised). COLLEGE OUTLINE SERIES. New York: Barnes & Noble, Inc., 1956.

31. Bell, Eric Temple. *Men of Mathematics.* New York: Simon and Schuster, Inc., 1937.

32. Bendick, Jeanne, and Marcia Levin. *Mathematics Illustrated Dictionary.* New York: McGraw-Hill Book Company, 1965.

33. Bergamini, David. *Mathematics.* LIFE SCIENCE LIBRARY SERIES. Morristown, N.J.: Silver Burdett Company, 1963.

34. *Breakthroughs in Mathematics.* Edited by Peter Wolff. New York: New American Library, Inc., 1963.

35. Davis, Robert B. *Discovery in Mathematics.* Reading, Mass.: Addison-Wesley Publishing Co., Inc., 1964.

36. Davis, Robert B. "The Evolution of School Mathematics," *Journal of Research in Science Teaching,* I, No. 3 (1963), 260-64.

37. Davis, Robert B. "Math Takes a New Path," *The PTA Magazine,* LVII (February, 1963), 8-11.

38. Einstein, Albert. *Relativity: The Special and General Theory.* New York: Crown Publishers, Inc., 1961.

39. *The Growth of Mathematical Ideas.* Kindergarten and grades one through twelve. Twenty-fourth Yearbook of the National Council of Teachers of Mathematics. Washington, D.C.: National Council of Teachers of Mathematics, 1962.

40. Gundlach, Bernard H. *The Laidlaw Glossary of Arithmetical-Mathematical Terms.* River Forest, Ill.: Laidlaw Brothers, 1961.

41. Henderson, Kenneth B. "Research on Teaching Secondary School Mathematics," in *Handbook of Research on Teaching.* A Project of the American Educational Research Association. Edited by N. L. Gage. Chicago: Rand McNally & Co., 1963.

42. Henderson, Kenneth B., and Others. *Modern Geometry, Its Structure and Function.* Text, motion pictures, filmstrips. New York: McGraw-Hill Book Company, 1962.

43. Hogben, Lancelot. *Mathematics in the Making.* New York: Doubleday & Company, Inc., 1960.

44. Jurgensen, Ray C., and Others. *Modern Geometry: Structure and Method.* Boston: Houghton Mifflin Co., 1963.

45. *Mathematics for Elementary School Teachers.* Produced by the National Council of Teachers of Mathematics. Washington, D.C.: National Council of

Teachers of Mathematics. (Textbook is correlated with the film series of the same title, available from United World Films, Inc.)

46. Morgan, Frank M., and Jane Zartman. *Geometry: Plane, Solid, Coordinate.* Boston: Houghton Mifflin Co., 1963.

47. Mueller, Francis J. See entry number 7.

48. Ravielli, Anthony. *An Adventure in Geometry.* New York: Viking Press, Inc., 1957.

49. *TEMAC.* Programmed Learning Materials. "Ratios and Proportions." Chicago: Encyclopaedia Britannica, Inc., 1963.

50. Underwood, Benton J., and Others. *Elementary Statistics.* New York: Appleton-Century-Crofts, 1954.

Mathematical and Astronomical Geography

51. Hall, Donald A. *Elements of Astronomy and Physical Geography.* Saginaw, Mich.: Trippensee Planetarium Co., 1963.

52. *Project on the Academically Talented Student: Social Studies for the Academically Talented Student in the Secondary School.* Washington, D.C.: National Education Association, 1960.

Logic

53. Allen, Layman E. *WFF: The Beginner's Game of Modern Logic.* New Haven, Conn.: Autotelic Instructional Materials Publishers, 1963 (programmed material).

54. Allen, Layman E. *WFF'N PROOF: The Game of Modern Logic.* New Haven, Conn.: Autotelic Instructional Materials Publishers, 1962 (programmed material).

55. Altick, Richard D. *Preface to Critical Reading* (Fourth edition). New York: Holt, Rinehart & Winston, Inc., 1960.

56. Ayer, Alfred Jules. *Language, Truth, and Logic* (Second revised edition). New York: Dover Publications, Inc., 1960.

57. Brant, Vincent, and Mervin L. Keedy. *Elementary Logic for Secondary Schools.* New York: Holt, Rinehart & Winston, Inc., 1962.

58. Brumfiel, Charles E., and Others. *Geometry.* Reading, Mass.: Addison-Wesley Publishing Co., Inc., 1960.

59. Corbin, Richard K., and Others. *Guide to Modern English* (Grades 11 and 12). Glenview, Ill.: Scott, Foresman & Co., 1963.

60. Dewey, John. *Essays in Experimental Logic.* New York: Dover Publications, Inc., 1960.

61. Korner, Stephan. *Conceptual Thinking, a Logical Inquiry.* New York: Dover Publications, Inc., 1959.

62. Langer, Susanne K. *An Introduction to Symbolic Logic* (Second revised edition). New York: Dover Publications, Inc., 1953.

63. Lewis, Clarence I., and Cooper H. Langford. *A Survey of Symbolic Logic.* New York: Dover Publications, Inc., 1960.

64. Lewis, Clarence I., and Cooper H. Langford. *Symbolic Logic* (Second revised edition). New York: Dover Publications, Inc., 1959.

65. McCall, Raymond J. *Basic Logic: The Fundamental Principles of Formal Deductive Reasoning* (Second edition). New York: Barnes & Noble, Inc., 1952.

66. Suppes, Patrick. "Mathematical Logic for the Schools," in *Teaching Gifted Students: A Book of Readings.* Edited by James J. Gallagher. Boston: Allyn & Bacon, Inc., 1965.

67. Suppes, Patrick, and Shirley Hill. *First Course in Mathematical Logic.* Waltham, Mass.: Blaisdell Publishing Co., Inc., 1964.

Research Methods

68. Corbin, Richard K., and Others. See entry number 59.

69. Evans, John C. *Touch Typewriting.* New York: Barnes & Noble, Inc., 1948.

70. Smith, Samuel, and Others. *Best Methods of Study* (Third edition, revised). New York: Barnes & Noble, Inc., 1958.

71. Watson, Jane Werner. *The Sciences of Mankind.* New York: Golden Press, Inc., 1960.

Chapter X

Formats for Lesson Plans and Study Units

The staff of the Enrichment Demonstration Center of Los Angeles designed formats for daily and weekly lesson plans and for long-range plans in the various courses offered. Several of these formats are reproduced in this chapter.

THE PLANNING OF FORMATS

A daily lesson plan should contain a statement of objectives, background information, instructional materials, procedures, follow-up work for independent study, and suggestions for related activities. Each lesson should provide for motivation, guiding questions, activities, and an evaluation. Examples of daily lesson plans used in the demonstration center are reproduced in Chapters XII, XIII, and XIV of this publication. It should be noted, also, that 14 demonstration lessons of California Project Talent are available on film. (1, 2, 3)[1]

A weekly lesson plan should outline the structure of classroom learning centers; should indicate activities for independent work, specific problems for solution, and instructional materials; and should prescribe the use of certain instructional aids, such as bulletin boards.

A lesson plan in the social sciences should specify the goals to be sought in terms of cognitive, affective, and conative learning; pupil needs; references; language activities; opportunities for correlated work; and major generalizations. Detailed planning of a social science unit contributes to the teacher's perspective and facilitates the selection of appropriate means for developing concepts, reinforcing ideas, and evaluating learning.

A lesson plan in mathematics or science should contain the major concepts to be grasped, the projected target dates and activities, assignments for independent work, and opportunities for correlated work in the learning center. In summarizing the values of long-range plans, Maxine Dunfee and Julian Greenlee note the following benefits to pupils: improved motivation, growth in affective learning, correlation of studies, variety of experiences, and improvement in summarization and generalization. (4)

Professional literature currently stresses the need for knowing the pupils' ability levels and for extending their capacities through increasingly difficult assignments. The framework for applying J. P. Guilford's concept of intellectual functioning as described in Chapter II is illustrated in a series of lessons filmed for California Project Talent. (1) The framework utilizing Jerome Bruner's educational theories in course outlines is applied in another series of filmed observation lessons. (2) The application of the *Taxonomy of Educational Objectives: Cognitive Domain* to classroom practices is shown in the third film series of Project Talent. (3)

FUNDAMENTALS OF PLANNING

In their endeavors to raise the level of thinking, enrichment teachers in the demonstration center considered two functions: (a) planning specific sequences of activities on increasingly complex levels; and (b) identifying their own guiding questions at different levels of thought. The teachers thus learned to identify specific levels of intellectual functioning, to state their purposes in those terms, and to phrase their questions at the specified levels of thought. Furthermore, in order to improve their evaluative measures, the teachers of the Los Angeles center considered the formulation of test questions for use at the various levels. (5)

EXAMPLES OF FORMATS

The following are several examples of formats that were used by the Los Angeles Demonstration Center in planning lessons, study units, and courses of study for the enrichment program.

(The formats follow.)

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

Daily Lesson Plan

The general format devised for the daily lesson plan consisted of the following steps:

I. PURPOSES

II. BACKGROUND

III. MATERIALS

IV. PROCEDURE

A. Motivation

B. Guiding questions

C. Activity

D. Evaluation

V. INDEPENDENT STUDY

VI. RELATED ACTIVITY (next lesson or independent project)

Other Formats

The following pages illustrate formats that were designed for weekly lesson plans, the scope of social science, and long-range planning for science and mathematics.

WEEKLY LESSON PLAN

Subjects	Monday	Tuesday	Wednesday	Thursday	Friday
	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*

*Purpose; procedures; outcomes; plans for learning centers (areas for independent study, specific problems to be solved, materials, bulletin boards).

SCOPE FORMAT FOR SOCIAL SCIENCE

Major Objectives

Knowledge and understanding

Attitudes and appreciations

Skills and work habits

Plan for Study

Needs	Information references	Reference reading	Construction	Dramatic representation	Oral and written language	Science	Mathematics	Creative rhythms	Art	Music
Summary and Transition: (statement of major generalization leading into new area of study)										
Summary and Transition: (statement of major generalization leading into new area of study)										
Summary:										

Major Generalizations

(From the social sciences)

LONG-RANGE PLAN
FOR SCIENCE AND MATHEMATICS

Concepts	Date	Instructional period	Independent work	Learning center

Selected References

1. *Development of Creative Expression Through a Study of the Literary Element of Characterization.* Five films: "Cognition," "Memory," "Convergent Thinking," "Divergent Thinking," and "Evaluation." California Project Talent. Hollywood, Calif.: Acme Films and Videotape Laboratories, Inc.

2. *Development of Critical Appreciation Through a Study of the Fundamental Forms of Music.* Three films: "Acquisition," "Transformation," and "Evaluation." California Project Talent. Hollywood, Calif.: Acme Films and Videotape Laboratories, Inc.

3. *Development of Scientific Discovery, Methodology, and Investigation Through a Study of Graphic Representation of Statistical Information.* Six films: "Knowledge," "Comprehension," "Application," "Analysis," "Synthesis," and "Evaluation." California Project Talent. Hollywood, Calif.: Acme Films and Videotape Laboratories, Inc.

4. Dunfee, Maxine, and Julian Greenlee. *Elementary School Science: Research, Theory, and Practice.* Washington, D.C.: Association for Supervision and Curriculum Development, National Education Association, 1957.

5. "Making Your Own Tests." Filmstrips, records, and manual. Berkeley, Calif.: Educational Testing Service.

(Also see the science, social science, and mathematics materials listed with the pupils' references in Chapter V.)

Part Three
Implementation of the Program

Chapter XI

Application of Enrichment in the Classroom

After defining the philosophy and objectives of enrichment and setting eligibility standards for pupil participation in the program, educators concerned should devote considerable care to choosing the particular subject fields to be enriched. When the appropriate content has been selected, the next phase of implementation is to consider data sources, the choice of learning opportunities, and the availability of resources in personnel and materials. Thereafter, a program for teacher preparation should be established on the basis of the curricular areas elected. The final steps in establishing the program consist in organizing the gifted pupils into learning groups, providing for individualized learning experiences, and preparing creative classroom environments.

ADMINISTRATIVE AND INSTRUCTIONAL ROLES

The strategic roles of administrators and teachers also require thoughtful consideration so that their respective functions may be clearly delineated and their responsibilities well defined.

Role of the School Administrator

As in any other educational innovation, a high order of administrative talent is required to launch an enriched curriculum. Summarizing the functions of the school principal, Clayton Buell maintains that his ability is a *sine qua non* in providing leadership for both the faculty members and the student body. (1)[1] Robert Eaves says that grade school principals should activate positive changes in the classroom through recognizing individual differences in pupils and varying ability levels within the faculty. Principals should also be foresighted, honest of purpose, and trustful of their teachers. (5)

In introducing enrichment, the school principal should organize cluster groups of pupils of similar abilities in each classroom. Certain problems arose in clustering at the Los Angeles Demonstration Center because of the difficulties inherent in grouping pupils according to compatibility of interests, abilities, and maturity levels within the different grades. To solve that problem, certain principals abolished grade-level organization and introduced nongraded or multigraded classrooms. The reorganization of classrooms in turn required a reevaluation of educational objectives and a reorganization of learning opportunities to meet the new objectives. Based on the needs of individual pupils, those innovations reflect the ingenuity and high caliber of leadership required in educating for individual excellence. (4, 8)

The Central Role of the Teachers

The conversion of educational planning into reality demands the skill and cooperation of the faculty members, for without successful implementation in the classroom, all new ideas, techniques, and devices are of no avail. (7) The teacher's role is to adapt masses of knowledge to the children's educational needs. The teacher's art lies in performing that role so as to heighten the pupil's curiosity and to inspire him with a heuristic interest and ability to pursue further learning on his own.

Previous chapters in this publication contain a discussion of the personal and professional characteristics desirable in teachers engaged in enrichment, together with teacher training courses in the enrichment process and courses in content areas given for teachers at the Los Angeles Demonstration Center. The teachers there mastered the techniques and subject content in varying degrees of competency. The author's experience at the demonstration center indicated that only through teacher preparation for their roles in the project and through teacher participation in planning the program could the aims of enrichment be truly realized.

The basic responsibility of administrators, supervisors, and faculty members in enriching curriculums is to fashion and to evaluate learning opportunities appropriate for challenging the gifted child. Their tasks of planning and implementing the project were found difficult but not insurmountable at the Los Angeles center.

[1]Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

CLASSROOM ORGANIZATION

The enrichment program of California Project Talent was designed for self-contained classrooms, which arrangement enabled the teachers to know their pupils well and to provide them with individual guidance. The self-contained classroom had the further advantages of permitting flexibility in time schedules, of facilitating the matching of individual needs with the appropriate materials and experiences, and of correlating different subject content within units of study. (9) Those classrooms also facilitated the organization of learning groups, promoted individualized learning experiences, and aided in developing a creative learning environment.

Organization of Groups

Because group processes encourage certain learning, research in group dynamics affords challenging implications for classroom organization. O. L. Davis, Jr., defines a group as an aggregate of persons who interact and cooperate with one another in working toward a mutually accepted goal. (2) He says that grouping for a particular purpose aids in utilizing the intelligence and the creativity of the group's members. Groups organized to achieve a common goal represent great diversity, as do all groups, but the diversities themselves enrich the learning of the participants.

Organization of Individualized Work

Individualized instruction enhances the pupil's opportunities to achieve excellence in a field of particular interest to him. The organization of individualized work in the classroom encompasses two fundamental educational steps: (a) cultivating the ability to make decisions; and (b) creating the desire to make those decisions.

Classroom Learning Environment

A superior classroom environment positively influences the learning that occurs in it. William Van Til writes that in order to promote adequate personality development, the classroom should be considered as a laboratory for self-discovery – a laboratory that encourages exploration and originality. Situations wherein all pupils receive the same treatment are not conducive to the provision of adequate experiences for all children. (10) Because the release of individual potential is the prime purpose of individualized instruction, educators should encourage an enthusiasm for discovery and create a learning environment conducive to discovery. Robert DeHaan and Ronald Doll relate the concept of discovery to three aspects: (a) the learners' discovering their own mental, emotional, aesthetic, and social interactions; (b) the learners' qualities being discovered by others; and (c) the learners' discovering the value and worth in other persons. (3)

The Los Angeles center encouraged warm, supportive human relationships in an atmosphere free from fear and tension in classrooms where orderliness was based upon mutual respect and good will. The attractive surroundings stimulated intellectual curiosity through bulletin boards, displays, models, and specimens. Teachers kept systematic records of pupil progress and continually evaluated pupil achievement toward well-defined goals. The center was also characterized by learning opportunities that were at once purposeful, satisfying, and diversified; by varied, multilevel instructional materials; by cooperative, long-range plans; by flexible organization; and by the correlation of course content.

Organization of Learning Centers

Learning centers organized in the classroom all featured a particular problem for solution. Each learning center contained such items as informational resource files, globes, manipulative materials, files of pupils' work and other individual records, audio-visual equipment, one or more tables and chairs, and reference materials; and it offered to the pupils a series of questions for independent study and for individual projects. A bulletin board at each such center presented material to motivate interest, to provide reference sources, or to summarize learnings.

Each classroom featured its own library, containing a wide range of titles related both to subject areas and to individual interests. An area adjacent to the library shelves provided space for pupils to consult encyclopedias, dictionaries, thesauruses, atlases, and other reference materials.

The listening center in each classroom contained a tape recorder, a record player, a listening attachment with jacks and earphones, and a collection of tapes and records. The viewing center contained a screen, a slide projector, filmstrips, and slides. This area was so located in the classroom as to cause a minimum of noise or other distractions.

Yet another type of learning center was related to the various subject matter areas such as art, music, reading, arithmetic, language, and science. Each such center contained a file of supplementary information; a file of children's independent work; paintings, structures, and models prepared by the pupils; kits of sequential material on the particular subject content; books related to the field; manipulative materials; a question in problem solving or a summary statement of acquired information; independent study questions; and suggestions for individual projects.

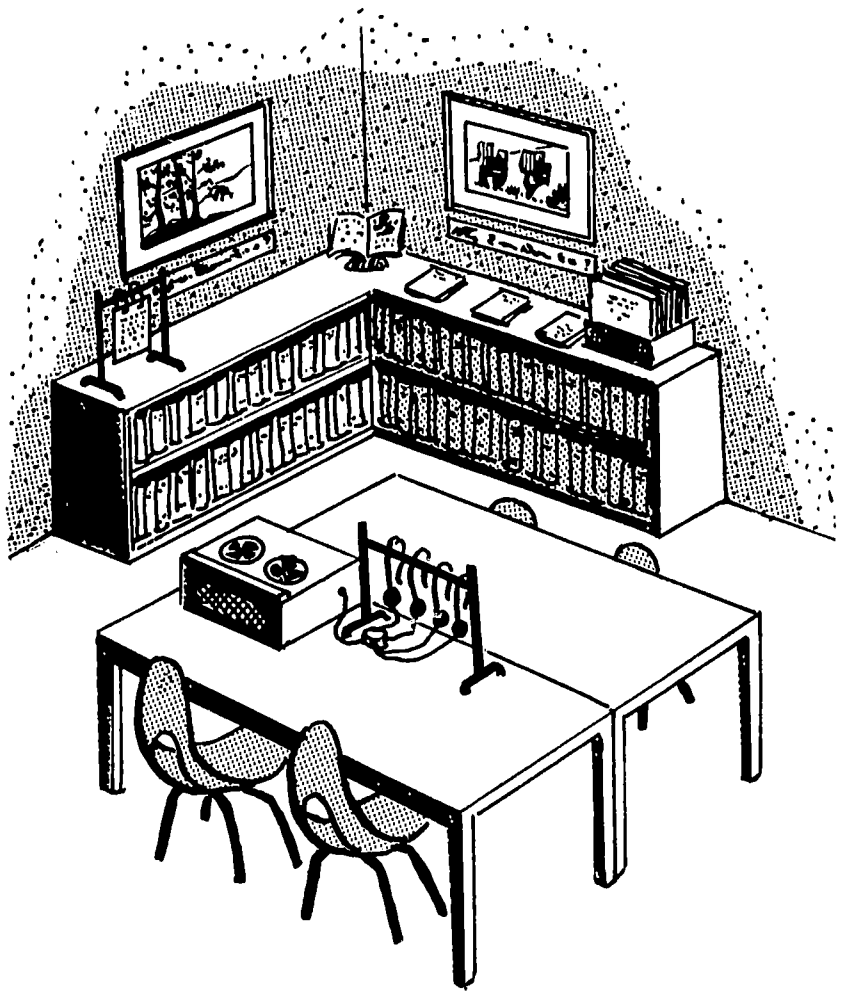


Figure 1. One of Several Different Kinds of Learning Centers

Because enrichment programs demand the ready accessibility of all learning materials, many classrooms combined the three kinds of learning centers within a single working area. Learning centers encouraged independent work by providing space for activities involving creative expression, scientific experiment, and other such types of individual study. The centers were also used for pupil seminars and for teacher-pupil conferences on individual projects.

Values of Learning Centers

Besides their value in encouraging gifted children to study independently, the purposes of the classroom centers were to encourage the pupils to work for extended time spans, achieve interrelated learnings, work with abstractions, summarize and generalize effectively, evaluate critically, reason logically, and evolve original ideas.

Other advantages provided by such centers were to stimulate interest with the varied instructional materials and to solve problems with resource materials, including filmstrips, recordings, and slides. Such opportunities for reading, listening, and observing helped the pupils by clarifying content, accelerating learning rates, and increasing retention of information.

SOUND FILMSTRIP ON THE PROJECT

Under the auspices of California Project Talent, the Audio-Visual Section of the Los Angeles Unified School District prepared a colored filmstrip showing children at work in various learning centers, together with a phonograph record narrated by Mary P. Broderick. A printed guide accompanies the filmstrip and record to inform educators on how the learning environment provided at the demonstration center motivated children to explore and to work independently. (6) Although they are not for sale, the color-sound filmstrip and guide may be borrowed from any of the 20 regional curriculum materials depositories located throughout the state. The Bureau of References Services (formerly the Curriculum Laboratory) of the California State Department of Education will provide the addresses of the other depositories. Each depository has two filmstrips, records, and guides, one copy of which may be circulated, while the other is always available for study at the depository. Besides the color-sound filmstrip, California Project Talent also presented 14 films in three series, as indicated in Chapter XV.

ACTUALIZATION OF ENRICHMENT

As has been pointed out often in this publication, the basic responsibility of educators who are concerned with enrichment is to provide appropriate learning opportunities for the gifted child. The following three chapters present specific examples of the opportunities that were offered in the fields of creative expression, critical appreciation, and scientific attitudes at the Enrichment Demonstration Center of Los Angeles.

Selected References

1. Buell, Clayton E. "The Principal as Educational Leader of His School," *The Bulletin of the National Association of Secondary-School Principals,* XLVIII (March, 1964), 144-57.

2. Davis, O. L., Jr. "Grouping for Instruction: Some Perspectives," *The Educational Forum,* XXIV (January, 1960), 209-16.

3. DeHaan, Robert F., and Ronald C. Doll. "Individualization and Human Potential," in *Individualizing Instruction.* Sixty-fourth Yearbook, Association for Supervision and Curriculum Development. Washington, D.C.: National Education Association, 1964.

4. Dufay, Frank R. *Ungrading the Elementary School.* West Nyack, N.Y.: Parker Publishing Co., 1966.

5. Eaves, Robert W. "The Challenge to Leadership," *The National Elementary Principal,* XL (October, 1960), 55.

6. *Enrichment Programs for Intellectually Gifted Students.* Prepared in cooperation with the U. S. Department of Health, Education, and Welfare, Office of Education, and the California State Department of Education. Presented by California Project Talent. Los Angeles: Los Angeles Unified School District [n.d.]. Filmstrip, color, 73 frames; sound on phonograph record, two sides, 33-1/3 rpm, LP; and filmstrip guide.

7. Howe, Harold. "Tolstoi and Teachers," *NEA Journal,* LV (May, 1966), 19.

8. Parker, Don H. *Schooling for Individual Excellence.* New York: Thomas Nelson & Sons, 1963.

9. Snyder, Edith Roach. *The Self-Contained Classroom.* Washington, D.C.: Association for Supervision and Curriculum Development, 1960.

10. Van Til, William. "The Positive View of Self," in *Perceiving, Behaving, Becoming.* Association for Supervision and Curriculum Development. Washington, D.C.: National Education Association, 1962.

Chapter XII
Enrichment Through Creative Expression

To initiate their enriched curriculums in creative expression, teachers of the Los Angeles Demonstration Center first chose from a list of proposed topics a subject in which they were particularly interested, proficient, or well informed. After closely examining the content of the area chosen, the teachers prepared a long-range plan for a unit of study. Organized according to the format presented in Chapter XI, the units were prepared under the assumption that a thorough acquaintanceship with a certain literary form releases the pupil's creative capacity within that form by encouraging invention and freedom of expression. Each course outline was based on increasingly difficult levels of the five intellectual operations delineated by J. P. Guilford, whose theoretical model appears in Chapter II.

ENRICHED UNITS OF STUDY IN CREATIVE EXPRESSION

This chapter presents a sample unit of study, together with examples of daily lesson plans, as taught at the Los Angeles center to develop written creative expression through literature. Representative of the type of lessons presented at the center are the sample lesson plans from the unit, which focus on characterization in the story, *Call It Courage,* by Armstrong Sperry. That unit of study, which follows the regular format for enriched course work, includes the following information: purpose, background information, materials, procedures, follow-up with independent study, and related activities.

The unit portrayed in this chapter is concerned with a study of characterization through a sequence of experiences involving courage. Five filmed observation lessons from this unit, produced at the center and available to educators, are listed with the references appended to chapters X and XV.

The lesson plans included in this chapter follow the prescribed format and illustrate the practical application of Guilford's theoretical structure of intellectual functioning. A description of the learning centers involved and a list of the materials used accompany each of the lesson plans.

The unit outline opens with learning experiences based on cognition. The chapter concludes with lesson plans from different grade levels applying Guilford's theories on the intellect to the teaching of various literary forms.

COURSE OUTLINE IN CREATIVE EXPRESSION

This course outline constitutes a framework for the study of characterization through experiences related to *courage* – an important quality of character.

Cognition

Specific Purposes

To learn the value given to courage by the Polynesians of Hikueru.

To understand Mafatu's relationship to his people and to discuss that kinship orally and in writing.

Materials

Call It Courage, by Armstrong Sperry, pages 7 through 13.

Content

One of the three principal divisions of Oceania, Polynesia comprises those islands in the Pacific lying east of Melanesia and Micronesia and extending from the Hawaiian Islands south to New Zealand. Polynesians greatly admire the quality of courage.

When Mafatu was three years old, a hurricane killed his mother and thus enkindled in him an abiding fear of the sea. His father, the tribal chief, who had christened Mafatu "Stout Heart," was ashamed of the boy because of his terror. Older islanders blamed the spirit Tapapau for the lad's fear. Girls laughed at him; boys shunned him; his stepmother ignored him. His stepbrothers mocked him and claimed that Mafatu's fear angered Moana, the sea god. The fishermen would not permit him to join them on fishing expeditions because they felt he brought bad luck. Mafatu spent his time making spears, nets, and shark lines. He

befriended a dog, Uri, and an albatross, Kivi. But because of the contempt in which the other islanders held him, Mafatu wanted desperately to escape from Hikueru.

The Author

Written in 1940, *Call It Courage* won for its author the Newbery medal for children's literature in 1941. Besides being a writer, Armstrong Sperry is also known as an illustrator of children's books. An American, Sperry has authored other children's works, including the following: *Little Eagle, Navajo Boy; Danger to Windward; Thunder Country; Frozen Fire; South of Cape Horn;* and *The Amazon.*

Born in New Haven, Connecticut, in 1897, Sperry attended Yale Art School. After serving in the United States Navy in World War I, he studied art in New York City and later spent two years in the South Pacific. Sperry's interest in the sea was inspired during his boyhood from hearing his grandfather spin yarns of his adventures as a sea captain in the South Seas.

Background Information

For many centuries men had been afraid of the sea. As late as the nineteenth century, many persons still believed that the oceans were bottomless except for the shallow fringe of water around the coastal areas. It was widely believed that when ships sank, they stopped in midwater a mile or two down because of the water's increased density at that depth. While sea water does indeed become somewhat denser with depth, the slight increase in density is not nearly sufficient to support a ship.

To understand the origin of the ocean, one must have some knowledge of how the earth began. Most theorists now agree that this planet started as a great globe of hot gas and cosmic dust that eventually condensed into a solid mass. In gradually cooling off, the gases became a molten liquid before separating into their component materials. The heaviest of those components, which is thought to consist largely of iron, sank toward the center of the earth to form its core. Having a total radius of about 2,150 miles, the core is composed of a solid center surrounded by liquids. The core is enveloped in a wrapping of rock called the mantle, which is approximately 1,800 miles deep and which comprises the bulk of the planet. Atop the mantle is the third layer, the crust, which is a thin skin averaging 20 miles in depth and forming the surface of the earth. The first solid layer of the planet to be formed, this crust originally floated on top of the molten mantle rock. As the mantle cooled, the solidifying crustal rock emitted huge quantities of steam, which combined with other gases to form the earth's atmosphere. As the earth's surface cooled sufficiently to support water without boiling it, the rains began to fill the great basins that eventually became oceans. The continental (granitic) rocks clustered in groups separated by deep chasms. During the millions of years of the earth's existence, vast changes have occurred both on the land and on the sea floors.

PROCEDURE

Motivation

The teacher stimulates the children's interest in characterization as a basis for original stories to be written by the class. The pupils will want to learn more about character by studying some of its aspects. The pupils analyze courage as a facet of character preparatory to using characterization in their own writing.

Guiding Questions

What is the setting of the story of Mafatu?

What did Mafatu most fear? What caused that fear?

What did Mafatu's name mean?

How did Mafatu's father feel about him? The other boys? The girls? How did Mafatu's stepbrothers feel about him? How did his stepmother treat him? What did the old people think about him?

Activity

Read and discuss the story under the guidance of the teacher.

Evaluation and Summary

Although Mafatu's people are unknown to us, they reveal their attitudes through their actions. What values do they revere? Are they thinking clearly in making demands of Mafatu? Do they have a right to demand courage of him?

Independent Study Assignments

List each character in the story and indicate his attitude toward Mafatu. Describe qualities in the character of each person.

Summary and Transition

The pupils analyze the Polynesians' worship of courage and their indifference to Mafatu. The pupils wonder whether Mafatu will gain courage or will escape from Hikueru.

They try to decide what the boy ought to do.

RELATED ACTIVITIES

Pupil Assignments

The following assignments may be given to enable the pupils to acquire knowledge in the fields of oceanography and geobiology:

- Read *Let's Read About the Sea, Seashores*, and *All About Whales.*
- Study the exhibits, "Marine Life" and "Tropical Shells."
- Make a field trip to Cabrillo Marine Museum in San Pedro to observe sea birds on the beach and the breakwater. Collect seashells, grunion eggs, and seawater.
- Review sound motion pictures. Observe underwater life and investigate the relationship of plants and animals in *Life in the Sea.* Learn about tides and fish inhabiting tide flats in *Animal Life at Low Tide.* Study the characteristics, habits, and importance of invertebrate animals dwelling on or near the beach in *Beach and Sea Animals.*
- Discover how scientists study the ocean by photographing plants and animals in shallow depths, by exploring the deepest ocean floor in special crafts such as the bathyscaphe, and by using research instruments to map vast areas of the ocean floor in the film, *What's Under the Ocean?*

Memory

Specific Purposes

To recall the fury of the hurricane in Mafatu's babyhood and to discuss orally its relationship to his fear of fishing.

To recall the work that the tribe assigned to Mafatu and to write about the interaction between Mafatu and his tribe.

Materials

Call It Courage, pages 13 through 18.

Content

Polynesian youth learned to kill swordfish and sharks by starting with smaller fish called bonitos. As the boys sharpened their knives and spears and tested their shafts, only Kana was friendly to Mafatu, who heard the other youths scorn him as a coward. Deciding that he could no longer remain on Hikueru, Mafatu resolved to face the sea god, Moana.

Background Information

Men have long supplemented their diets with food from the sea. The cycle of oceanic food production begins when animal plankton, including euphausids, eat algae. Plankton, in turn, feed a suborder of the whale family called the whalebone whale. Blue sharks and cod devour herring, which are also prey to fishermen and sea birds. Remora eat blue sharks; giant squid attack sperm whales; sand sharks eat lobsters and hermit crabs of the shallow seas. The decaying bones of these sea inhabitants in turn provide nutrients for the algae. The annual growth in fish averages a billion tons. The consumption of smaller fish by larger ones maintains a balance in the fish population.

The wind, heat from the sun, and rotation of the earth cause the formation of strong ocean currents. The wind drives the surface currents. Currents near the surface and at deeper levels result from the sun's heat. The earth's rotation moves whole oceans westward and also causes certain winds. The steady winds pushing the surface currents blow from one direction. Tropical winds blow along the equator westward; farther north and south from the equator, the winds blow eastward. The winds cause three large currents: the Gulf Stream, the Humboldt Current, and the Labrador Current.

PROCEDURE

Motivation

Curiosity as to whether Mafatu will show courage on the island stimulates further reading.

Guiding Questions

What does Mafatu's refusal to go fishing have to do with his mother's death?

Why was the boy sometimes unhappy with his name?

Why did Mafatu decide to prove his courage to himself?

Activity

Read and discuss under the guidance of the teacher.

Evaluation and Summary

Although Mafatu's tribe scorned and shamed him, he faithfully performed his tasks. Mafatu's fear of the sea kept

him from fishing. How was Mafatu's fear justified? What was the value of his tasks?

Independent Study Assignments

List the tasks given to Mafatu. Indicate their usefulness. What type of person was Kana? How did he reveal some of the qualities of his character?

Summary and Transition

Pupils recall the tribe's predominant feelings about courage, remember the fury of the hurricane when Mafatu was a boy of three, understand the boy's motivation to leave Hikueru, and wonder whether Mafatu will prove his courage.

RELATED ACTIVITIES

Pupil Assignments

- Listen to underwater sounds in the recording, *Sounds of the Sea.*
- Determine how geobiologists map the climate of past periods.
- Experience vicariously the feeling of a seafaring adventure. Sing "Call of the Sea," "Viking Songs," and "Canoe Song." Listen to themes from the orchestral suite *La Mer:* "From Dawn to Noon on the Sea," "Play of the Waves," and "Dialogue of the Wind and the Sea."
- View the art prints listed at the end of this chapter.
- Analyze fearfulness and determine whether fear has a useful purpose (e.g., as a warning of danger). Determine how to go about overcoming undesirable fears.
- Listen to, recite, and discuss the poem "Do You Fear the Wind?"
- Read and discuss the book, *The Island of the Blue Dolphins,* and compare the situation of the girl with that of the boy in *Call It Courage.*

Convergent Thinking

Specific Purpose

To synthesize a comprehension of the tribe's behavior and Mafatu's feelings and relate this synthesis in oral and written expression to his venture on the sea.

Materials

Call It Courage, pages 35 through 79.

Content

Mafatu decided to go to a distant island to make a place for himself among strangers. He would return to Hikueru only when he had proved himself, hoping to hear his father say, "Here is my son, Stout Heart – a brave name for a brave boy." Mafatu left Hikueru in his canoe with his dog Uri, a half dozen drinking nuts, and his fish spear. The boy was happy to have Kivi, the albatross, along. As his canoe rode through the Pacific on an ocean current, Mafatu wondered what his father and the boys would say. After going through a hurricane, he landed on a mountainous island.

The South Pacific circle of currents has carried both ancient and modern explorers on their discoveries. Thor Heyerdahl, a Norwegian, believed that centuries ago the Indians of Peru left their continent to settle in the South Sea Islands by sailing across the Pacific Ocean. Heyerdahl and five others sailed from Peru in 1947. The South Equatorial Current carried them across the Pacific to the Tuamotu Islands in the South Seas; this remarkable venture showed that the South Equatorial Current could have carried the Peruvian Indians westward hundreds of years before. It took Heyerdahl and his crew 101 days to make the 4,300-mile trip. The courses of the slow-moving surface currents of the oceans are determined by the prevailing winds in each hemisphere. Heyerdahl's voyage on his raft "Kon-Tiki" (named after a Polynesian sun god) showed also that the Humboldt and South Equatorial currents of the South Pacific could have carried the Polynesians from their islands to Peru.

PROCEDURE

Motivation

The desire to learn how Mafatu resolves his fierce resentment at being called a coward motivates further reading.

Guiding Questions

What was the logical thing for Mafatu to do to improve his status?

How did Mafatu gain courage as he started his adventure on the sea?

What gave him an overwhelming desire to live?

Activity

Read and discuss under the guidance of the teacher.

Evaluation and Summary

Wishing to prove himself to his father and to the tribe, Mafatu ventures out on the sea, determined to conquer his fear of it. How does he show responsibility to himself and to his fellow men?

Independent Study Assignments

Summarize the events in the story that contributed to Mafatu's self-doubt. Record the page and line of each event and explain how it influenced his flight on the sea to the mountainous island.

Summary and Transition

Pupils may be expected to interrelate the tribe's behavior, the fears of Mafatu, nature's harsh law of survival on sea and land, the values of companionship, and the threats of loneliness; pupils will also wish to learn whether Mafatu could survive on the island.

RELATED ACTIVITIES

Pupil Assignments

- Consider various qualities of character.
- Read and discuss the poem "The Wreck of the Hesperus" to determine what one quality in the father was largely responsible for the wreck.
- Read and discuss the poem "Solitude" to decide what kind of person would equate solitude with happy living.
- Read and discuss the story "Fisherman" to decide whether the characters are defeated by outside forces or by their own weakness and ignorance.
- Read the short story "Albert Schweitzer." Analyze the character of a man who would leave security and fame at home and dedicate his life to alleviating misery in the jungle.
- Ascertain the scientific principles of boat construction by research, experimentation, and analysis.
- Study the filmstrip "Why Things Float."
- Read to learn how gravity makes things float and conduct suggested experiments, using the textbook *Science Is Explaining.*

Divergent Thinking

Specific Purposes

To speculate on what might have occurred later in Mafatu's life if the circumstances of his boyhood had been different.

To interpret orally and in writing the manifestations of courage in Mafatu's life on the mountainous island.

Materials

Call It Courage, pages 35 through 79.

Content

Having arrived safely on the mountainous island, Mafatu found food and water, made a fire, discovered a volcano, and learned that the "eaters-of-men" (savages from the Smoking Islands) lived on the southwest part of the island, where they worshiped their idol. Mafatu courageously took a spearhead from the savages' sacred platform. Acquiring self-confidence and an inner peace, the boy made nets, knives, shark lines, shellfish hooks, and other implements. Grateful for possessing the skills and abilities necessary for survival under the demanding conditions of the island, Mafatu made clothes; built himself a raft, a canoe, and a house; killed a shark and a boar; and made a necklace from the boar's teeth. He enjoyed the companionship of Uri and Kivi.

Background Information

It was formerly believed that the floor of the ocean was composed of "abyssal plains," which are the flat pools of sediment on seabeds. A physicist and oceanographer of the Woods Hole Oceanographic Institution of Massachusetts, J. B. Hersey, verified that abyssal plains are not quite flat by using an echo sounder, which records changes in depth of one fathom. Some flat plains in the Pacific Ocean, especially those around volcanic islands, differ from abyssal plains. Normally volcanoes erupt and lava flows into the sea around a volcanic island; however, occasionally lava may pour out from huge cracks in the seabed itself to form a flat plain in the absence of a nearby island. Studying such plains, W. Menard and his colleagues of the Scripps Institution of Oceanography at La Jolla, California, have recently obtained significant new information about the seabed of the Pacific.

Much underwater scenery in the ocean is caused by volcanoes, which may continually grow in height because of increasing lava eruptions until the volcanoes finally emerge above the ocean surface as new islands. Since about three miles separate the ocean floor from the water's surface,

many volcanoes never penetrate the ocean's surface; oceanographers plot the peaks of such underwater volcanoes with an echo sounder.

While studying underwater volcanoes, H. Hess of Princeton, New Jersey, discovered flat-top underwater islands that he called "guyots," after a famous nineteenth century geologist named Arnold Guyot. Although guyots somewhat resemble volcanoes, they have flat tops. That flatness is ascribed to the fact that at one stage in their development, the peaks of the guyots probably penetrated through the sea's surface as islands, which then slowly sank over long periods of time, gradually wearing away their tips as they sank. Although most underwater volcanoes and guyots developed millions of years ago, occasionally a new island still rises from the sea. Besides the volcanic islands and guyots, mountain ranges also emerge from the ocean floor.

The ocean floor is dented with trenches, caused by folds in the earth's crust. The average trench continues down below the ocean surface to a depth of 5,000 fathoms, where the valley rounds off at the bottom. Averaging about 50 miles in width, trenches are particularly common in the western part of the Pacific Ocean. Some of them are about six miles deep – about twice the average depth of the ocean floor. The deepest trenches yet discovered run southward from east of Japan and the Mariana Islands and westward toward the Philippine Islands. Other trenches are located south of the equator next to the Kermadec Group and the Tonga Islands.

PROCEDURE

Motivation

Interest in Mafatu's lonely existence on the strange island motivates the pupils to continue reading to learn whether Mafatu can conquer his fear.

Guiding Questions

How else might Mafatu have acquired courage had he not found the spearhead on the sacrificial platform?

If Mafatu had not recovered his courage, how might he have developed in his later life?

If his mother had not died, what kind of man might Mafatu have become?

What might have been the result had Uri the dog become lost in the storm and had Kivi failed to return?

Activity

Pupils read and discuss the story under the guidance of the teacher.

Evaluation and Summary

Mafatu becomes completely Polynesian and rejoices in the ancient fierceness of his race, fearing nothing and enjoying his life. How does his endurance relate to the virtue of courage?

Independent Study Assignments

Enumerate the events that lent Mafatu courage on the island. Relate each of these events to earlier occurrences in his life. Mention other ways in which the author might have depicted Mafatu's growth in courage.

Summary and Transition

Pupils consider indications of Mafatu's courage, which they relate to his fears, doubts, and moral and ethical qualities. They wonder whether he returns home to receive the plaudits of his family and friends.

RELATED ACTIVITIES

Pupil Assignments

- Read and discuss the following books: *The Quest of Galileo, The Orphans of Simitra, Three Without Fear, Dangerous Journey, Amelia Earhart, Of Courage Undaunted, Little House in the Big Woods, Little House on the Prairie, By the Shores of Silver Lake,* and *The Long Winter.*

- Read and discuss the short stories, "Providence to Our Aid" and "Spring Victory."

- Discern the type of courage shown through loyalty to family members in the face of hardships.

- Observe the qualities of physical courage and perseverance in overcoming hardships as shown in adventure stories, biographies, and historical fiction.

- Listen to the recordings, "Paul Revere's Ride," "Daniel Boone: The Opening of the Wilderness," "The Winter at Valley Forge," and "Log Cabin in the Wilderness."

Evaluation

Specific Purposes

To apply value judgments to synthesized understanding of persons and events in the story through oral discussion.

To generalize learning orally on courage as a quality of character.

To include characterization as a literary element in the pupils' own stories.

Materials

Call It Courage, pages 79 through 95; *The Quest of Galileo,* by Patricia Lauber; *The FDR Story,* by Catherine O. Peare; *Seeing Fingers: The Story of Louis Braille,* by Etta DeGering; *Follow My Leader,* by James B. Garfield; *The Door in the Wall,* by Marguerite DeAngeli; *The Island of the Blue Dolphins,* by Scott O'Dell; *Robert Louis Stevenson: His Life,* by Catherine O. Peare; and *The Orphans of Simitra,* by Paul-Jacques Bonzon.

Content

Chased in his canoe by the cannibalistic man-eating savages, Mafatu prayed to Maui for help on the windless sea. Sharks pursued his canoe. In a rage Mafatu called to Moana the sea god, whom he blamed for his mother's death and for his own fear, which had turned his people against him. Suddenly Mafatu lost his fear of the sea. Accompanied by Uri and Kivi, Mafatu returned to his native island. Alighting on the beach resplendent with his spear and his boar's-tooth necklace, he addressed his father: "My Father, I have come home." His father warmly responded: "Here is my son come home from the sea. Mafatu, Stout Heart. A brave name for a brave boy!"

Background

The sea's surface is topped by waves, of which the highest point is the crest; the lowest point, the trough. The distance between the crests of waves is called the wave length. The speed and the wave length determine the period of a wave, which is the time required for the wave to pass a fixed point from crest to crest. Only gales blowing across hundreds of miles can produce the largest waves, which may reach heights of about 60 feet.

The "fetch" refers to the distance run by waves under the force of the wind. The longer the fetch, the longer and faster are the individual waves. The wind speed determines the length of time required for waves to increase to their maximum size. The wind also determines the height of the wave's crest, which is limited by the length. When a wave's height reaches one seventh of its length, the wave becomes steep and breaks; but a strong wind may blow off the wave's top before it attains its full height to form whitecaps, which may be found on windy, stormy days.

Oceanic storms complicate wave patterns. Waves may originate at one place while others are reaching that spot from a storm center several miles away. These traveling waves grow rapidly before breaking. High waves may even be found in areas where there is little wind because large waves retain their energy for a long while, sometimes traveling hundreds of miles from the storm center of their origin. Swells are formed by waves that become smoothly spaced and roundly crested in moving away from driving winds. Shallow water retards the waves, causing breakers to approach the beach at an angle. Currents in the open seas serve as breakwaters by breaking up wave patterns and creating new ones. Large, powerful waves breaking against a shore may either wear away or build up the coastline. When the sand washed by the waves onto a beach is blown over the high tide line, sand dunes are formed that may develop into grassland when plants take root in them.

PROCEDURES

Motivation

Continued reading is motivated from interest in learning about the reception Mafatu receives from his tribe when he returns home.

Guiding Questions

What is your opinion of the standards of courage held by Mafatu's tribe? Were they just? Why?

Would you have lost your courage in Mafatu's place? How would you have improved your reputation with the tribe?

What did Mafatu do to regain his courage? What circumstances helped him to do so? Which circumstances in the plot were the most important?

How do stories like Mafatu's help you to improve your life?

What aspects of courage have you read about in other books?

What is courage? How do we portray it in our own lives?

How did the author make his characters seem like real persons?

Evaluation and Summary

Mafatu fought the sea and won, sustaining himself by his own wit and skill. He had faced death courageously. Upon his return home, he heard his bravery extolled by his father before the whole tribe.

Independent Study Assignments

Trace the development by the author of Mafatu's character; list sequentially the thoughts and events that reveal aspects in the boy's character.

Summary and Transition

Pupils may be expected to feel that Mafatu was courageous in reacting to his tribe's indifference toward him by fighting the seas and that he faced death fearlessly. The children will probably conclude that courage is the inner strength enabling a person to do his duty to himself and to his fellows against great odds. They may observe that authors portray character in their use of dialogue, in motivating the actions of each individual by a description of his temperament and personality traits, and by foreshadowing his probable future development. The teacher will request pupils to use characterization in writing original stories.

RELATED ACTIVITIES

Pupil Assignments

- Listen to the ABC television show, "Discovery '64 – The Voyage of Christopher Columbus."
- Discover how different types of courage may be of the same quality but of different caliber.
- Read *Profiles in Courage,* by John F. Kennedy, or watch the two sets of 16 NBC television films made from that series by Robert Saudek Associates. Available through I. Q. Films, Inc., the films on each of the 16 persons represented consist of two 25-minute reels, accompanied by a teacher's guide. RCA Victor recording VDM 103 presents the sound track of the first set of eight films. Senator Edward M. Kennedy narrates the recording. Allan Nevins served as historian on the project. In reading the book or watching the films, note how the subjects treated displayed courage either through their unswerving devotion to a principle or through their advocacy of conciliation.

DAILY LESSON PLANS FOR CLASSES IN LITERATURE

The examples of daily lesson plans in literature described in this section were designed for children of varying age levels at the Los Angeles Demonstration Center. Materials used in providing a classroom environment conducive to concomitant learning are listed with each lesson outline. Each lesson plan is followed by a description of its application to an intellectual operation from J. P. Guilford's "Structure of Intellect" model of 126 cubes depicted in Chapter II.

Lesson Plan I

GRADE LEVEL: Kindergarten
AGE LEVEL: Between four and a half and five and a half

Specific Purposes

To develop an appreciation for stories and books by reading, by listening to stories, and by writing original stories.

To become aware of characters in stories by listening to stories.

To learn about actual animal behavior by listening to realistic stories.

To develop creative expression through studying literature.

Background

The children have identified the characters, the main ideas, and the subjects of stories, pictures, books, records, and films to which they have been exposed. The class has cared for a live guinea pig and has dictated individual and group stories.

Materials

A written experience chart listing the general topics studied.

PROCEDURE

Motivation

Interest in reading books, interest in animals, recall of stories, rereading of the experience chart, and the desire to

write their own stories motivate children to work in the listening center, at the library table, and on mats.

Guiding Questions

Who is in the story?

How does the character look?

What is the character doing?

Are the characters true to life?

Activities

The pupils go to study centers: (a) to the listening center to hear a phonograph reording of "The Poky Little Puppy"; (b) to the library table to read animal stories in picture books; (c) to the reading circle to read the picture, "Chipmunks." The children return to the group to share ideas and to discuss findings (subject of the story and realistic animal behavior) under the guidance of the teacher. The pupils summarize findings that all stories read and heard were about animals. They speculate on ideas for their own creative stories about animals. The children dictate their stories. (How does the animal look? How does the animal act? What is he doing?)

Evaluation and Summary

After reading their own stories and those of other children, the pupils conclude that all stories written during this class period are animal stories.

Independent Study Assignments

The children are asked to think of other animal characters about which to write.

RELATED ACTIVITIES

Independent Projects

The children are introduced to a new recording for the listening center, a new book for the library table, new pictures for the literature file, and another live animal in the play yard.

PRACTICAL APPLICATION OF GUILFORD'S "STRUCTURE OF INTELLECT"

Cognition

The children demonstrate their understanding of the stories and their characters.

Memory

The children remember the many stories they have heard and recall examples from them to illustrate their knowledge of fictional characters.

Convergent Thinking

The children explain why all the stories read are animal stories.

Divergent Thinking

After speculating on possible animal characters for depiction in original stories, the children dictate their own animal stories.

Evaluation

Later the children will think evaluatively on their use of animal characters and will evaluate their own and other pupils' original stories as to the realism manifested in animal behavior.

CLASSROOM ENVIRONMENT

Learning experiences and environment in the Los Angeles center's classrooms were planned to meet the many dimensions of the intellect. Teachers emphasized extension of reasoning, recognition of relationships, satisfaction of intellectual curiosity, fulfillment of a wide range of interests, and stimulation of ability to work independently.

The enriched classroom environment provided for the academically talented kindergartners should include the following learning centers:

Language Arts Center

Name cards
Reading-readiness materials (reading textbooks in three sets from state series; single copies of preprimers)
Collection of picture books and stories related to animals
Literature file (nursery rhymes, poetry, pictures)
Record player, headsets, and collection of phonograph records

Art Center

Bulletin board – art processes (tempera dripping on starch and water; hanging panel of tissue lamination)
Art file (concepts arranged according to topic, shape, texture, and media)
Children's art work filed in boxes

Art materials (near sink area); art kits (string, stamp, sponge, rubbings, clay, tempera and crayon sets)

Mathematics Center

Bulletin board chart showing geometric shapes in the environment
Manipulative materials having geometric shapes
Mathematics books (for use with small groups)
Manipulative objects (individual flannel boards and flannel objects, individual chalkboards, equipment for measurement)
Mathematics file (set cards, perception cards, number and numeral cards)

Social Science Center

Informational picture about ships on bulletin board
Information file box
Single-copy social science books
Toys

Science- and Music-Correlated Center

Science file
Science books
Music file box (blank notation patterns of songs)
Musical instruments
Music books
Bulletin board display of animal pictures and corresponding musical notation of folk songs

Lesson Plan II

GRADE LEVELS: First and second
AGE LEVELS: Six, seven, and eight

Specific Purposes

To evaluate and analyze folk tales or folklore literature in the literary category; to develop creative expression through a study of the literary category of folklore literature.

Background

The pupils have read, heard, and analyzed well-known folk tales as well as unfamiliar selections to broaden their backgrounds. They have applied value judgments to folk tales. The children have summarized several criteria of that literary category from books they have read and heard. They have recalled stories learned elsewhere. They have shown a need to improve their skills in arranging a sequence of events. They have shown an appreciation of the illustrations in several folk tale books and have drawn folk tale characters in art experiences. The children desire to locate other folk tales.

Materials

List of elements of folk tales composed by the group; flannel board; the book, *Blind Men and the Elephant,* Lillian Quigley; record player and earphones; the record, "Best Loved Fairy Tales," Volume II, *Childcraft,* Mercury Recording – selection: "Three Billy Goats Gruff"; sequence pocket charts. Supplementary readers: *I Know a Story* and *It Happened One Day.* Collection of library books (folk tales): *Nail Soup,* Margot Zemach; *Stone Soup,* Marcia Brown; *Hansel and Gretel,* Grimm and Humperdinck; *Nibble, Nibble, Mousekin,* Joan Anglund; *Just Say Hic,* Barbara Walker; "Lazy Jack," in *It Happened One Day*; *Three Billy Goats Gruff,* Marcia Brown; *Oniroky and the Carpenter,* Tadashi Matsui. Art process material and children's artwork.

PROCEDURE

Motivation Activities and Independent Study

Interest in folk tales is furthered by listening to a flannel board story, "The Blind Men and the Elephant." Children refer to their chart of elements of folk tales in comparing and contrasting that story with previously learned ones (for example, "Chicken Little," "Puss and Boots," "Sleeping Beauty and Rose Red," "Jack and the Beanstalk," "The Wave," "Snow White and the Seven Dwarfs," and so forth.

Guiding Questions

What kind of a story is this?

How did we learn this today? What are the other ways you might learn about this story?

What words do we know that have "folk" in them? Why is that a clue?

What parts of the story made you think this was a folk tale?

What happened to illustrate the element of repetition in this story?

Which story had a part like this?

What parts in other folk tales can we compare? Which were alike? Which were different?

When was this story first told? When did it take place? How do you know this? Where could we check? Let's look in the book to find out.

What else shall be add to our list to show another way of telling whether a story is a folk tale? How will this help you in your reading?

Evaluation and Summary

The pupils add to their list of characteristics of folk tales. The children realize that not all folk tales have all the elements listed and conclude that there are possibly other elements of folk tales yet to be found.

RELATED ACTIVITIES

Independent Project

The pupils have heard recordings of folk songs and have sung folk songs; they have recalled the folk songs and have read the musical notation; they are learning to accompany the singing of folk songs on melody bells and autoharps. The children are learning the origins of songs and have a globe, maps, and books (*American Folk Songs,* Ruth Seeger; *Music in Our Town,* grade two; *Music Through the Day,* grade one). The pupils have learned a folk dance and have originated some of the actions. As a continuing activity, they will later build on this interest in geography by investigating the culture of people in other countries.

PRACTICAL APPLICATION OF GUILFORD'S "STRUCTURE OF INTELLECT"

Cognition

The children know elements of the folk tales that they have read.

Memory

The children remember the many tales of folklore read, recall examples of them, and illustrate their understanding of the literary category.

Convergent Thinking

The children have selected the folklore elements in many tales, which they have analyzed in summaries.

Divergent Thinking

The children re-create their folk tales. In their play, "Chicken Licken," they add characters and adjust the plot, using the language approach to reading. In writing about their favorite character, they speculate as to his imagined actions and as to possible changes in the plot.

Evaluation

The children are thinking evaluatively about the elements of folk tales. They can evaluate a new story according to the characteristics of folklore, comparing and contrasting some of the same elements. They will observe that not all folk tales contain all the characteristics.

CLASSROOM ENVIRONMENT

In planning learning experiences and the classroom environment, two teachers in the Los Angeles enrichment program sought to challenge the many dimensions of the intellect.

It was found that the following learning centers can make positive contributions to a classroom environment that is challenging to gifted pupils:

Music Center

See "Related Activities."

Reading Center

Class stories and illustrations
Favorite poetry file

Mathematics Center

Abacus
Number line
Story-problem file
Manipulative blocks for forming sets
Place-value chart
Independent work folder
Clock kits
Manipulative disks
Perception cards
Fact cards – addition, subtraction
Individual flannel boards
Geometric figures
Place-value kits
Money kits
Textbooks – Greater Cleveland Mathematics Program, levels 1 and 2
Supplementary textbooks

Science Center

Rock and soil samples
Magnifying lenses

Record of science experiments
Informational books (textbooks – single-copy books for reference)
Diagram of earth's core and strata
Problem-solving question: "What makes up the earth?"

Social Science Center

Record of temperatures of milk in various stages
Graph to show changes and comparisons
Thermometer to find temperature on graph
Study print of situations requiring temperature measurement
Picture and story files
Information books (for example, *How We Get Our Dairy Foods, Milk for You, The Dairy*)
Children's construction work
Experiment (hot and cold liquids)
Samples of thermometers used for meat, candy, milk, the human body, and so forth

Lesson Plan III

GRADE LEVELS: Third and fourth
AGE LEVELS: Seven, eight, and nine

Specific Purposes

To recall in a group discussion evaluations and analyses of fantasies; to evaluate as a group a new story according to the criteria of fantasy previously summarized; to develop creative expression through a study of fantasy.

Background

The pupils have read, heard, and analyzed fantasies in stories and books. They have heard recordings of "Winnie the Pooh," "More Winnie the Pooh," and "Pinocchio." They have read fantasies in the following books: *Once Upon a Storytime, Treat Shop, Finding New Neighbors, Sam and the Firefly.* The children have read the following single-copy library books: *Cyrano the Cow,* Don Freeman; *Our Veronica,* Roger Duvoisin.

Materials

Art print: "Stowing the Sail, Bahamas," Winslow Homer. Story: "The Little Red Lighthouse and the Great Gray Bridge," Hildegarde Swift; books: *Friends Far and Near, Treat Shop.* Record: *Grand Canyon Suite,* Ferde Grofé.

PROCEDURE

Motivation

The teacher stimulates discussion of the importance of the lighthouse by showing an art print of a storm at sea ("Stowing the Sail, Bahamas," Winslow Homer). The teacher asks the following questions: What might be endangering these people? Who could help?

Guiding Questions

In the story about the little red lighthouse, how did this same thing happen? How would you describe this story? Why is this considered a fantasy?

What characteristic did you find in this story? Where else have you found this characteristic?

What special elements of fantasy did we talk about today? What element of fantasy should we add to our list of the characteristics of fantasy?

Activities

The pupils discuss the story as a fantasy. Some read independently at the learning centers.

Evaluation and Summary

The children summarize their knowledge of the elements of fantasy (plot, characterization, and setting) and locate them in their new story. They add an element of fantasy to their list of known characteristics. They decide to read more fantasies to locate other elements, such as style, mood, and theme.

Independent Study Assignments

The children read "Flyaway at the Air Circus" in *Treat Shop* to discover another characteristic of fantasy – talking machines.

RELATED ACTIVITIES

Independent Projects

The teacher introduces "Cloudburst" from *Grand Canyon Suite* and art prints by Winslow Homer related to storms. The story, "The Little Red Lighthouse and the Great Gray Bridge," illustrates cooperative action.

PRACTICAL APPLICATION OF GUILFORD'S "STRUCTURE OF INTELLECT"

Cognition

The children understand some elements of fantasy pertaining to plot, characterization, and setting.

Memory

The children remember many fantasies and recall examples of them to illustrate their knowledge of the criteria of that literary category.

Convergent Thinking

Having located some elements of fantasy in many stories, the children find another element in today's story. They review their list of elements of fantasy and decide to read more such stories to discover additional ones.

Divergent Thinking

Later the pupils will write original stories of this genre.

Evaluation

Later the children will evaluate the fantasies that they read in terms of theme, mood, and style as well as of the additional elements pertaining to plot, characterization, and setting with which they are already familiar. Then they will compare and contrast many fantasies, including their own, in terms of the literary criteria.

CLASSROOM ENVIRONMENT

The classroom of the enrichment center contained the following learning centers:

Language Arts Center

California state series reading textbooks
Single-copy books (for example: *Petunia,* Roger Duvoisin; *The Giant,* William DuBois; and *Charlotte's Web,* E.B. White)
Record player and earphones
Problem-solving question: "What elements of fantasy do you find in these pictures from *Winnie the Pooh*?"
Story record (for example, "Winnie the Pooh," read by Maurice Evans)
Book: *Winnie the Pooh,* A. A. Milne
Prints of water color drawings by Ernest Shepard
Picture dictionaries and word file boxes

Science Center

Group science picture (water cycle)
Problem-solving question: "How do we explain the water cycle?"
Experiments (plant growth, water cycle)
Chart showing relationship of plant growth and human health
Magnifying glass
Weather and climate kit, Science Research Associates
Science picture information file
Slide and filmstrip projector
Filmstrips related to rivers and lakes
Tape recorder and earphones
Teacher-prepared tape: "How Our Deserts Are Formed," with follow-up written material related to the tape
Temperature line graph for Los Angeles
Independent activity to graph rainfall in two areas
Water table (aquarium)

Art Center

Art supplies (brushes, paints, and so forth)
Chart of art elements
Materials of different textures
Magnifying glass, prism
Color discs in color wheel
Problem-solving questions: "How can we use primary hues to get other ones?" "How many hues can you find in our light rays?" "What textures can we see in nature?" "What elements did the artist Jackson Pollock use in his composition?"
Art file boxes for children's art work
Single-copy books (Caldecott awards for illustrations); e.g., *Randolph Caldecott,* Mary Gould Davis
Illustrators: (a) Marcia Brown for *Once a Mouse;* (b) Virginia Burton for *The Little House;* (c) Robert McCloskey for *Make Way for Ducklings*; and (d) Leonard Wisegard for *The Little Island*

Music Center

Chart rack of familiar and new songs
Rhythm instruments
Autoharp
Resonator bells
Chart with musical notation of "The Frog and the Mouse," in *Music Now and Long Ago*
Chart with a musical pattern from the song, "The Frog and the Mouse"
Problem-solving question: "Can you find this pattern in our song?"
Book: *Frog Went A-courtin'*, John M. Langstaff (Caldecott Award illustrator, Teodor Rojankovsky)

Social Science Center

Chalk map of Los Angeles basin with acetate overlay
Problem-solving question: "Why was the Los Angeles basin a good place for a city?"
Textbooks; single-copy books
File box of informational pictures and teacher-prepared stories
Realia pertaining to study of Los Angeles
Chart rack with summary chart of children's reading and bibliography
Outline map of California (rainfall)
Globe of the world
File of children's maps
Geography books (for example, *California and the West*)
House set for El Pueblo (Los Angeles as a village)
Children's construction work tools

Mathematics Center

Problem-solving question: "How are musical notes like fractions?"
Acetate-covered boards with independent work
Math Workshop for Children, Encyclopaedia Britannica Press
Answer sheets for follow-up work
Manipulative materials
Combination study cards
Number lines
Single-copy books (for example, *Numerals*, Irving and Ruth Adler; *Instant Math*, Ann Cutter; *Fun with Figures*, Mae and Ira Freeman; *The Wonderful World of Mathematics*, Lancdo and Lancelot Hogben; and *Arithmetic Can Be Fun*, Munro Leaf)

Lesson Plan IV

GRADE LEVELS: Fifth and sixth
AGE LEVELS: Ten and eleven

Specific Purposes

To evaluate short stories and express one's self in a discussion; to analyze short stories in relation to plot, characterization, setting, mood, and theme; to apply value judgments to synthesized comprehension of short stories.

Background

After having studied many short stories, the children know that the literary elements are called plot, characterization, setting, mood, and theme. They have evaluated short stories and have summarized their learnings as follows: To evaluate short stories, the critic considers (a) plot (originality, ingenuity, clarity, effectiveness of the opening situation, and probability of the outcome); (b) characterization (believable, lifelike characters – not caricatures or stereotypes – interesting dialogue and dialect, if appropriate); (c) setting (contribution to mood and atmosphere, influence upon characters, importance to the story); (d) theme: What idea, truth, or observation is conveyed? Why is it significant?; and (e) style and technique (rapid-moving narrative, emotional impact).

Materials

"The Milk Pitcher" by Howard Brubaker and "Rikki-Tikki-Tavi" by Rudyard Kipling, in *Short Stories I*, edited by Virginia Alwin. Other stories and books with a child hero or heroine: *Ace Pitcher*, John Gartner; *The Fighting Shortstop*, Richard T. Flood; and so forth. Chart summarizing the children's knowledge of literary elements.

PROCEDURE

Motivation

The children are motivated by their interest in short stories as a literary form; by their memory of analyses of previously read stories; and by a desire to read more short stories.

Guiding Questions

What literary elements did you notice in the short story, "The Milk Pitcher"? Was any one literary element stronger than another in this story?

How did the author develop the main character?

Why did Phil emerge at the end as a likable human being?

How does the development of characterization by Howard Brubaker in "The Milk Pitcher" compare with that by Rudyard Kipling in "Rikki-Tikki-Tavi"? How is it similar or how is it different?

Activities

Children read and discuss under the guidance of the teacher. They locate parts of the story to illustrate the author's use of literary elements.

Evaluation and Summary

Characterization is a predominant literary element in "The Milk Pitcher," which has only a slight plot. Phil, the main character, has fine attitudes toward work, school, and

teamwork; he respects his parents, teachers, and coaches. He has a good-natured disposition; a likable, positive personality; and a fine sense of humor. Phil fulfills his potentialities. He is unique – just as each human being is unlike any other. "The Milk Pitcher" is a typical short story because it is a fictional work that has singleness of effect, unity, and brevity.

Independent Study Assignments

Read another short story, "The Mission," Hugh B. Cave. Analyze the main character, Yolande. Describe her character. Locate parts of the story that show the development of Yolande. What was her goal? Describe the relationship between Yolande's character and her goals.

RELATED ACTIVITY

Independent Projects

The teacher introduces other stories and books with a child as hero; for example, *Ace Pitcher* and *The Fighting Shortstop*.

PRACTICAL APPLICATION OF GUILFORD'S "STRUCTURE OF INTELLECT"

Cognition

The group knows the literary elements of a short story.

Memory

The group remembers the many short stories that they have read and can recall examples of them to illustrate the criteria for that literary form.

Convergent Thinking

The group has analyzed the literary elements of a short story in many stories and has summarized their findings on a chart.

Divergent Thinking

The group has speculated on how the various authors might have written their stories differently. Some children have considered a subject or character for a short story of their own.

Evaluation

The group evaluated the short story by analyzing one, thus applying value judgements to that literary form.

CLASSROOM ENVIRONMENT

The classroom of the Los Angeles enrichment center where this class was taught provided the following centers:

Creative writing center
Social science center (Latin America)
Architecture center (modern cities in Latin America compared to old cities)
Plant life experimental center
Music center
Newspaper center
Mathematics center
Art center (landscapes, sculpture, design, study of the post-impressionists)
Science center (insects, earth's development – minerals, electricity, meteorology, astronomy, plant life)
Depth study center (filmstrips, slides)
Reference center

Selected References

Art Prints

Bradbury, Bennett. "Ground Swell."

Homer, Winslow. Four prints: "The Boatman," "Breezing Up," "Diamond Shoal," "Eight Bells."

Books

Bonzon, Paul-Jacques. *The Orphans of Simitra.* New York: Criterion Books, Inc., 1962.

Daugherty, James. *Of Courage Undaunted.* New York: Viking Press, Inc., 1951.

DeAngeli, Marguerite. *The Door in the Wall.* New York: Doubleday & Company, Inc., 1949.

DeGering, Etta. *Seeing Fingers: The Story of Louis Braille.* New York: David McKay Co., Inc., 1962.

Du Soe, Robert C. *Three Without Fear.* New York: Longmans, Green & Co., Inc., 1947.

Garfield, James B. *Follow My Leader.* New York: Viking Press, Inc., 1960.

Hamori, László. *Dangerous Journey.* New York: Harcourt, Brace & World, Inc., 1962.

Lauber, Patricia. *The Quest of Galileo.* New York: Doubleday & Company, Inc., 1959.

O'Dell, Scott. *The Island of the Blue Dolphins.* Boston: Houghton Mifflin Co., 1960.

Parlin, John. *Amelia Earhart: Pioneer in the Sky.* Champaign, Ill.: Garrard Press, 1962.

Peare, Catherine Owens. *The FDR Story.* New York: Thomas Y. Crowell Company, 1962.

Peare, Catherine Owens. *Robert Louis Stevenson: His Life.* New York: Holt, Rinehart & Winston, Inc., 1955.

Sperry, Armstrong. *Call It Courage.* New York: Macmillan Co., 1940.

Wilder, Laura Ingalls. *By the Shores of Silver Lake; Little House in the Big Woods; Little House on the Prairie;* and *The Long Winter.* New York: Harper & Brothers [n.d.].

Essays

Kennedy, John F. *Profiles in Courage.* New York: Harper & Row Pubs., 1961.

Exhibits

"Marine Life"; "Tropical Shells." *Fifth and Sixth Grades Audio-Visual Materials.* Publication No. EC-211. Los Angeles: Los Angeles Unified School District, Division of Instructional Services, 1962.

Filmstrips

"Why Things Float." *Third and Fourth Grades Audio-Visual Materials.* Publication No. EC-207. ELEMENTARY SCIENCE SERIES III. Los Angeles: Los Angeles Unified School District, Division of Instructional Services, 1960.

Poetry

Garland, Hamlin. "Do You Fear the Wind?" in *Poetry I, Literary Heritage.* Edited by Richard Corbin. New York: Macmillan Co., 1962.

Longfellow, Henry Wadsworth. "The Wreck of the Hesperus," in *Poetry II, Literary Heritage.* Edited by Stanley R. Peterson. New York: Macmillan Co., 1962.

Pope, Alexander. "Solitude," in *Poetry II, Literary Heritage.* Edited by Stanley R. Peterson. New York: Macmillan Co., 1962.

Short Stories and Feature Stories

"Albert Schweitzer" and "Providence to Our Aid," in *Adventures in Modern Literature* (Fifth edition). Edited by Herbert Potell and Others. New York: Harcourt, Brace & World, Inc., 1962.

"Fishermen" and "Spring Victory," in *Short Stories II, Literary Heritage.* Edited by Elizabeth Scheld. New York: Macmillan Co., 1961.

Songs, Themes, and Records

"Call of the Sea," "Canoe Song," "Viking Songs." in *Music Around the World.* CALIFORNIA STATE SERIES. Sacramento: California State Department of Education, 1958.

Debussy, Claude. *La Mer.* Themes: "From Dawn to Noon on the Sea," "Play of the Waves," and "Dialogue of the Wind and the Sea," in *Music Around the World.* CALIFORNIA STATE SERIES. Sacramento: California State Department of Education, 1958.

"Log Cabin in the Wilderness," "Daniel Boone: The Opening of the Wilderness," "Paul Revere's Ride," and "The Winter at Valley Forge." *Fifth and Sixth Grades Audio-Visual Materials.* Publication No. EC-211. Los Angeles: Los Angeles Unified School District, Division of Instructional Services, 1962.

Sounds of the Sea. Folkways Record No. 6121. Folkways Records and Service Corp. Recorded by the Naval Research Laboratory.

Sound Motion Pictures

Animal Life at Low Tide, Pat Dowling Pictures; *Beach and Sea Animals* and *Life in the Sea,* Encyclopaedia Britannica Films; *What's Under the Ocean?* Film Associates of California.

Textbooks

Andrews, Roy Chapman. *All About Whales.* New York: Random House, Inc., 1954.

Let's Read About the Sea. Edited by Kay Ware and Others. St. Louis: Webster Publishing Co., 1958.

Science Is Explaining. Edited by Wilbur Beauchamp and Others. Glenview, Ill.: Scott, Foresman & Co., 1963.

Zim, H. S., and Lester Ingle. *Seashores.* New York: Golden Press, Inc., 1955.

Supplementary References
(For research and motivation)

Our Wonderful World. 18 vols. Edited by Herbert S. Zim. New York: Grolier, Inc., 1967.

The World Book Encyclopedia. 20 vols. Chicago: Field Enterprises Educational Corp., 1968.

Chapter XIII

Enrichment Through Critical Appreciation

Enriched classes in critical appreciation should focus intensively on a narrow subject field to acquaint pupils with a limited content in depth as a basis for critical analysis and evaluation of the arts. At the Los Angeles center, the enriched curriculum in critical appreciation followed the pattern and procedures recorded in this publication. The center's faculty members stated their objectives, chose particular resources and learning opportunities, received training in subject matter, and prepared lesson plans.

As an example of a unit of study to promote critical appreciation in music, this chapter presents a course outline that focuses on the sonata form of music. This outline, or framework, was originally part of a more extensive study called "Development of Critical Appreciation Through a Study of the Fundamental Forms of Music." Three observation lessons were filmed to show a class working at three different levels of intellectual functioning. Chapter XV contains a discussion of those films.

The examples of daily lesson plans included in this chapter are based on the practical application of Jerome Bruner's description of the stages of learning. Each lesson plan provides a description of the learning centers within the classroom at the appropriate part of the unit. The course outline and individual lesson plans cite reference materials that were used in the Los Angeles program.

IMPLEMENTING ENRICHMENT IN CRITICAL APPRECIATION

In beginning enrichment courses in the appreciation of various art forms, the teachers first selected a specific area in the arts from a list of proposed topics previously developed. Each teacher chose a field of particular personal interest or one in which he was especially proficient or well informed. After studying the subject content extensively, the teachers prepared long-range plans for a unit of work presenting information conducive to sound analysis and criticism.

The teachers organized their units at increasingly difficult levels of content on the basis of the three stages of intellectual functioning described by Jerome Bruner and summarized in Chapter II. Each course included lessons at the acquisition, transformation, and evaluation stages of learning. The teachers phrased guiding questions appropriate to different intellectual levels and stated their purposes in terms of the content levels of intellectual behavior required.

COURSE OUTLINE IN CRITICAL APPRECIATION

This course outline constitutes a study of the sonata form of music through experiences related to the *sonata allegro* form (or first movement form).

Acquisition

Specific Purposes

To learn about the first movement (allegro) of Schubert's *Symphony No. 5 in B Flat Major* by listening to a recording, reading reference books, singing the themes, and reading charted themes while listening to the music.

To learn about the sonata allegro as a musical form by the same methods of listening to examples, reading, and singing the themes.

To learn to identify the sonata allegro form by recognizing the introduction, exposition, development, recapitulation, and coda.

Materials

Recording and score of the first movement of the *Symphony No. 5 in B Flat Major,* by Franz Schubert (1797-1828).

Content

Schubert wrote his fifth symphony in one month when he was nineteen years old. The work reflects its composer's admiration for the gay, light music of W. A. Mozart.

The Composer

Schubert was born in 1797 in the modest Lichtental district of Vienna, Austria. Although the name "Schubert"

means "shoemaker," Franz's ancestors had been forest laborers or small landholders in Moravia until his own generation, when his father became a parish teacher. His mother, a Silesian, came from a family of locksmiths, gunmakers, and innkeepers.

After studying the violin with his father, Schubert entered the Royal Seminary on a choral scholarship in 1808 and sang in the choir of the court chapel. To obtain the scholarship, Schubert passed a music examination for which he was prepared by Michael Holzer, the Lichtental choirmaster under whose direction he had played the violin at Sunday Mass. Schubert enjoyed his days at the seminary, which he left when his fine treble voice broke in 1813. During the following academic year, he attended the teacher training college of St. Anna; thereafter he taught briefly. At the age of nineteen Schubert abandoned his teaching career to devote himself to composing. That same year his fifth symphony appeared.

Schubert's first public success as a composer came with the performance in 1814 of his *Mass No. 1 in F Major,* which he himself conducted. By 1815 Schubert had written more than 150 songs. In 1827 he wrote the "Winter Journey" song cycle, which reflected his sorrow over Beethoven's death the year before.

On November 19, 1828, Schubert died of typhoid fever, leaving many unfinished works. The spontaneity of his musical thought had often led him to abandon a composition that he was not inspired to complete. Perhaps the most famous of his unfinished works is the *Symphony No. 8 in B Minor,* which is also known as his "Unfinished Symphony." That work is considered as Schubert's most perfect orchestral poem in pathetic vein.

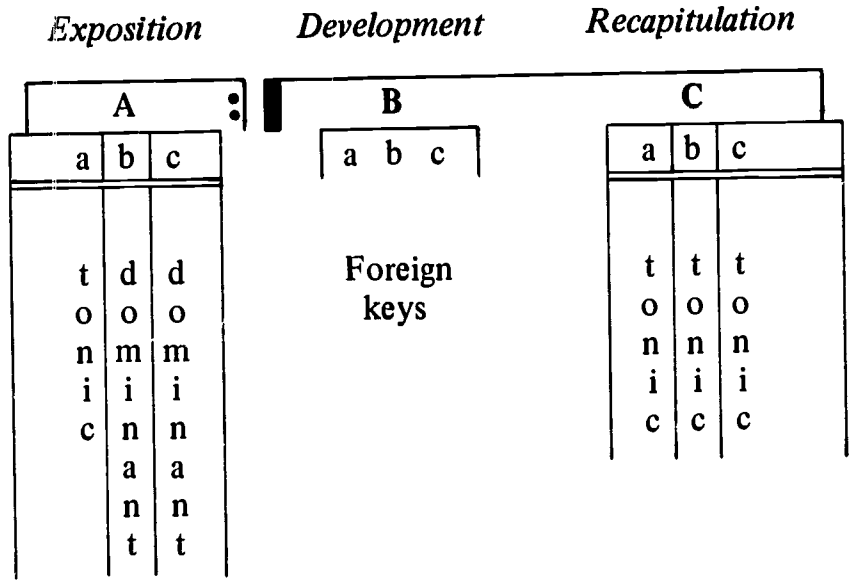
Regarded as the father of the "art song," Schubert produced a richer treasury of songs and song cycles than did any other single composer. Besides his vocal creations, Schubert composed nine symphonies, six masses, 15 quartets and other chamber works, and innumerable other types of compositions, including sonatas, sonatinas, overtures, choral works other than masses, dances, fantasies, and incidental music for plays.

Background Information – the Sonata Form

As originally used, a sonata simply meant a musical composition for instrumentalists as opposed to a cantata, which was written for vocalists. Derived from the Italian word *sonare,* meaning "to sound," the term "sonata" now refers to a composition for one or two instruments consisting of three or four movements contrasted in rhythm and mood but related in tonality, sentiment, and style. Many sonatas have been written for the piano alone and for other instruments with piano accompaniment.

Although the use of the term "sonata" itself is usually reserved for compositions for solo instruments with or without accompaniment, a symphony is actually a sonata for orchestra; a string quartet is a sonata for four stringed instruments; a concerto is a sonata for one or more solo instruments with orchestral accompaniment. Most overtures are written in the form of the first movement of a sonata.

The term "sonata form" is applied to the forms of the first movement, which consists of the following parts: (a) the exposition of the principal and secondary themes; (b) the development of one or more themes; and (c) the recapitulation of all themes followed by a coda. Although the sonata form may refer to an entire work consisting of three or four movements, the sonata form proper, as outlined in the foregoing, means the specific type of musical structure generally found in the first and often in the last movement of an entire sonata. It is known as the sonata allegro or first movement form because almost all first movements of sonatas are written in allegro (fast) tempos. The tripartite formula A-B-A is used to designate the exposition, development, and recapitulation of the sonata allegro or first movement form. A chart outlining that form follows:



The first theme of the exposition section, which is dramatic (or masculine) in nature, is always in the tonic key; the second theme, which is lyrical (or feminine) in character, is in the dominant key; the closing theme, of lesser importance, is also written in the dominant. The development section freely combines the material introduced in the exposition into other keys and sometimes adds new thematic material. The recapitulation restates the themes of the exposition more or less literally in the tonic key.

The sonata form is largely the creation of Karl Philipp Emanuel Bach, a son of Johann Sebastian Bach. Living in

the eighteenth century, the younger Bach was one of the first composers to experiment with the sonata form, which was later defined by both Haydn and Mozart. Beethoven, Schumann, and Brahms extended the use of the sonata form.

Musical structure is the coherent organization of the artist's material. The usual method of analysis is to select a particular form and to illustrate its use by one or several composers. Such analysis reveals that composers seldom fit their works neatly to the form; they normally choose as a model a particular structure, which they freely interpret in unique patterns. The content of each composition determines its musical form.

Composers all approach their work differently. Schubert wrote spontaneously, sometimes producing a song a day. Beethoven, on the contrary, reworked his themes repeatedly. Traditionalist composers, such as Johann Sebastian Bach and Palestrina, perfected the musical style of their times by beginning with an established pattern rather than with a theme. Their opposites are the experimentalists, like Moussorgsky, who favor experimentation rather than theory and who use trial-and-error approaches to composition.

PROCEDURE

Motivation

A pupil who has read *Schubert: A Critical Biography,* by Maurice J. Brown, in his literature class now discusses this work with the other children to arouse interest in the life of this composer. Following the discussion, the teacher plays a record revealing the theme from the first movement of Schubert's *Symphony No. 5 in B Flat Major* to awaken interest in the music of Schubert and in the sonata form of music.

Guiding Questions and Activities

After playing the entire first movement (allegro) of Schubert's symphony, the teacher asks: "What repeated melodies or sections do you hear?" The teacher then replays the recording through the first melody (Theme 1) as the pupils follow the theme on the charted notation of the music.

The teacher next replays the recording as the children read the charted notation and identify the short transition and Theme 2.

In Theme 1, the children discover the ascending pattern of the I, V, and IV chords; the descending scale pattern; and the distinctive, uneven rhythmic figure. The pupils also observe that Theme 1 contains the first three tones of the major tonic chord: B flat-D-F. The teacher points out that Theme 2 is written in the dominant key of F major. After the introduction, themes 1 and 2 form the exposition of the first movement.

Introducing the development section of the movement, the teacher asks: "What melody do you hear in this part of the allegro movement?"

After observing the variant in Theme 1 developed in the key of B flat major, the pupils discuss the repetition of the variant by different instruments on different pitches in the development.

Selected children play themes 1 and 2 on musical instruments, together with the transition and variants of Theme 1. The teacher replays the entire movement and has the children follow it on the chart. The teacher asks: "What themes are included in the next section of this movement?" The children discover that the movement concludes by returning to themes 1 and 2 and to their related transitions. They observe that Theme 1 in this recapitulation is played in the subdominant key of E flat major and that Theme 2 is recapitulated in the tonic key of B flat major.

After another transition, the full orchestra plays the coda, which consists of scalelike passages followed by a series of chords.

Evaluation and Summary

The teacher and pupils summarize their information about the sonata allegro form and the music of the first movement of Schubert's fifth symphony on a chart or chalkboard, as follows:

INTRODUCTION

SECTION A: EXPOSITION
- Theme 1 } B flat major (tonic)
- Theme 1 }
- Transition
- Theme 2 } F major (dominant)
- Theme 2 }
- Transition

SECTION B: DEVELOPMENT
- Variant in Theme 1 is developed in B flat major (tonic).

SECTION A: RECAPITULATION
- Theme 1 } E flat major (subdominant of B flat major)
- Theme 1 }
- Transition
- Theme 2 } B flat major
- Theme 2 }
- Transition

CODA

Full orchestra, playing scalelike passages followed by a series of chords, completes the movement.

Independent Study Assignments

While listening independently in the classroom music center to the recording of the fifth symphony's first movement, the pupils follow the score and identify the various parts.

Summary and Transition

Know that the first movement from the fifth symphony of Schubert is written in the sonata allegro form, which consists of an introduction, exposition, development, recapitulation, and coda. Relate information about the musical elements of rhythm, melody, harmony, and tone color and facts about orchestral instruments to an interpretation of the symphony's first movement.

RELATED ACTIVITIES

Pupil Assignments

- Listen to another example of the sonata form, Beethoven's *Piano Sonata No. 21 in C Major, Op. 53,* the "Waldstein"; study Aaron Copland's analysis of that sonata in Appendix III of *What to Listen For in Music.*

- Listen to the seond movement of Schubert's *Symphony No. 5 in B Flat Major* and to his "Unfinished Symphony" (*Symphony No. 8 in B Minor*); study the notation of the latter's themes and the cello part in *New Music Horizons.*

- To trace the development of modern music notation and to learn more about Schubert's contributions, listen to the transcriptions of "Sons of Guido" and "Music – A Language and an Art."

- To learn more about Austrian music, listen to the transcription "Austria" in *The World's Music in America.*

- Read the following books on Schubert: *Schubert; Memoirs by His Friends,* by Otto E. Deutsch; *Music for Young Listeners* (Volume I, *The Green Book),* by Lillian Baldwin; *Schubert: A Musical Portrait,* by Alfred Einstein; *Curtain Calls for Franz Schubert* and *Franz Schubert and His Merry Friends,* by Opal Wheeler and Sybil Deucher; and *Unfinished Symphony,* by Madeline Goss.

- By listening to recordings, compare sonatas for violin and piano by J. S. Bach, Mozart, Beethoven, Schubert, Schumann, Dvořák, Debussy, Hindemith, and Copland.

Transformation

Specific Purpose

To transfer knowledge of the four elements of music – rhythm, melody, harmony, and tone color – by interpreting them in the first movement of Schubert's *Symphony No. 5 in B Flat Major.*

Materials

Recording and score of the first movement (allegro) of the Schubert symphony.

The transcriptions of "Strings and Keyboards" and "Sonata and Symphony."

Content

As previously indicated, every sonata allegro or first movement form retains the tripartite pattern of exposition, development, and recapitulation. The varied themes of the exposition are usually designated by "a," "b," and "c." Although it is difficult to generalize about the exposition, the first theme usually has a strong, dramatic, affirmative quality in contrast with the second theme, "b," which is characterized by a more lyrical quality. Both the "a" and "b" themes may actually contain several subthemes or consist of a series of themes, but the juxtaposition of one theme or group of themes with another of contrasting mood is the essence of the expository section and determines the character of the entire sonata allegro form. The contrast in themes creates a sense of dramatic struggle. The last theme (or themes), "c," concludes the exposition. In the scores of the classical sonatas or symphonies, the double bar with the repeat sign indicates the end of the exposition and its repetition in the same form.

Another important factor of the exposition is the transition that bridges the moods of the "a" and "b" themes. The transition, which may be either short or rather elaborate, never equals in significance the "a" and "b" themes.

The development gives the sonata allegro its special character, because no other musical form reserves a special division for extending musical themes previously introduced. After beginning with a partial restatement of the first theme, the development usually modulates through a series of other keys that signal a return to the original

tonality to begin the recapitulation, which repeats the exposition. Almost always slow in tempo in contrast with the exposition, the introduction may be quite independent of the following allegro, or it may be a slow version of the first expository theme to lend a feeling of unity. The coda, which presents the musical material in a new way, leads to an epilogue or conclusion. Although the structure indicated in the foregoing generally typifies the sonata allegro form, its construction is far from rigid, varying widely with particular works of music.

PROCEDURE

Motivation

The children listen for rhythmic patterns as the teacher plays a recording of the first movement of the symphony.

Guiding Questions and Activities

After playing the recording, the teacher asks: "How did Schubert develop Theme 1 rhythmically? Theme 2?" The pupils identify, write on the chalkboard, and clap the most important rhythmic patterns in themes 1 and 2. The teacher asks: "How does the composer transmit a feeling of liveliness in his music?" The pupils point out instances of legato and staccato styles of playing.

The teacher asks: "How did Schubert create the dramatic and lyrical feelings in this movement?"

The children point out the use of particular instruments to lend such feelings to certain sections. They recognize that in measures 2 and 4 of Theme 1 of the exposition, bass strings imitate the melody previously played by the violins. They observe the repetition of Theme 1 with a countermelody being rendered by the flute. They note how contrasting instruments give depth to the dramatic passages of the development and how stringed instruments and flutes provide lyricism to the movement.

Evaluation and Summary

The allegro movement of the symphony is written in a gay rhythm and has a delicate quality. It is scored for stringed and wind instruments but for no percussion.

Independent Study Assignments

In the classroom music center, listen to the transcriptions "Strings and Keyboards" and "Sonata and Symphony." Examine the use of the various instruments in providing different tonal effects.

Summary and Transition

Realize the relationship of the elements of music as expressed by the instruments of the orchestra in the first movement of Schubert's symphony. Decide to evaluate your own interpretations of the sonata allegro form.

RELATED ACTIVITIES

Pupil Assignments

- Read *Schubert's Songs,* by Richard Capell; *How to Read a Score,* by Gordon Jacob; and *The Art of Judging Music,* by Virgil Thomson.
- View the films, *String Choir* and *Listening to Good Music – The String Quartet.*
- Listen to the transcription, "The Wonderful Violin," and watch the filmstrip, "Fundamentals of Stringed Instruments" (Part I, Violin).

Evaluation

Specific Purposes

To appraise interpretations of the first movement of the Schubert *Symphony No. 5 in B Flat Major.*

To evaluate generalizations about that movement by recalling them in a group discussion.

Materials

Recordings: *Sonata in F Major for Violin and Piano,* by Wolfgang Amadeus Mozart, and the Schubert fifth symphony.

Books: *What to Listen For in Music,* by Aaron Copland; *Music for Young Listeners* (Volume I, *The Green Book*) by Lillian Baldwin; and *Essays in Musical Analysis* (Volume I, *Symphonies*) by Donald Francis Tovey.

Score: First movement of *Symphony No. 5 in B Flat Major,* by Schubert.

Content

The content includes all previously learned knowledge about the sonata allegro form, the elements of music, and the instruments of the orchestra. In developing their musical themes, composers use the four essential elements of rhythm, melody, harmony, and tone color. Every musical composition reflects the individuality of its composer and the influence of his period. A composer's style

results from the interaction of his personality with all aspects of his environment.

Critical listening to music involves consideration of the musical conductor and the performer or performers, as well as of its composer. The listener should understand the composer's style to obtain an idea of how effectively the artist conveys that style. Music evokes responses on three levels or planes: the sensuous, the expressive, and the musical. On the sensuous plane, the listener surrenders himself to the pleasure of the musical sound. On the expressive plane, he appreciates the meaning of the musical moods. On the musical plane, he enjoys the manipulation of the musical notation.

Active music listening develops critical appreciation by increasing the pupil's perception of elements of form within the abstract. Design is evident in the repetition of melodic lines or rhythmic patterns in either identical or altered form. Listening that focuses on the structure and interrelationships of the constituent elements develops critical appreciation.

PROCEDURE

Motivation

After interpreting, interpolating, extrapolating, and translating information about the first movement of the Schubert fifth symphony, the children check their own judgments by analyzing the sonata allegro form.

Guiding Questions and Activities

The teacher asks, "How is the first movement of the Schubert fifth symphony representative of the sonata allegro form?"

In evaluating their learning, the pupils review the parts of the movement, the moods created by the instruments, and the rhythmic patterns, illustrating the latter on the chalkboard.

To verify their judgments regarding the sonata allegro form, the pupils review selections from Aaron Copland's *What to Listen For in Music* and Donald Tovey's *Essays in Musical Analysis* (Volume I, *Symphonies*).

Evaluation and Summary

Teacher and pupils cooperate in diagraming and outlining the sonata form on the chalkboard. An illustration of the form was presented earlier in this chapter.

Independent Study Assignments

In the classroom music center, listen to Theme 1 of the Schubert symphony to compare it with Mozart's *Sonata in F Major for Violin and Piano.* Compare the notation as found on page 204 in the essays by Donald Tovey. Determine why Theme 1 of the first movement of the Schubert symphony is referred to as "Schubertized Mozart."

RELATED ACTIVITIES

Pupil Assignments

- Listen to the first movement of Mozart's *Symphony No. 40 in G Minor* while following the score. Identify the exposition, development, and recapitulation.
- Listen to Beethoven's *Symphony No. 5 in C Minor* and follow it on the score. Identify the various themes and sections.
- Read the following books: *The Joy of Music,* by Leonard Bernstein; *Exploring Music,* by Vincent Jones and Bertha Wingert Bailey; *More Essays from the World of Music,* by Ernest Newman; and *Learning to Listen,* by Grosvenor Cooper.

DAILY LESSON PLANS FOR CLASSES IN MUSIC AND ART

Examples of daily lesson plans in music and art as used in the Los Angeles Enrichment Demonstration Center follow. These examples typify enrichment procedures and indicate their application to lessons for children of various ages. A classroom environment that meets the many intellectual needs of gifted pupils is described in each lesson plan, together with lists of the required materials.

The application of Bruner's stages of learning is demonstrated in an art lesson and in a correlated lesson in art, music, and history. These stages, described in Chapter II, are acquisition, transformation, and evaluation.

Lesson Plan I – Art

GRADE LEVELS: Third and fourth
AGE LEVELS: Seven, eight, and nine

Specific Purposes

To evaluate paintings in a group discussion; to analyze the artists' use of art elements (color, line, form, value, texture) and art principles (dominance and subordination,

proportion, balance, opposition, transition, rhythm, repetition).

Background

Through many experiences, the pupils have gained an appreciation for art. They are learning about art elements and principles through numerous viewing, drawing, and painting experiences.

Materials

Art prints: "Montmarte," Maurice Utrillo; "The Bridge," Paul Cézanne; "French Farmhouses," Maurice de Vlaminck; "The Tiger," Franz Marc. Chart of art elements and principles. Recording: *Pictures at an Exhibition,* Moussorgsky.

PROCEDURE

Motivation

Enjoyment of art prints and a study of art elements and principles lead to the desire to discuss art experiences and to evaluate paintings.

Guiding Questions

What do we know about art elements? What do we know about art principles? Look at this print of a painting. How well does it illustrate artistic elements and principles? (Teacher repeats with a series of prints.) Why are art elements and art principles of value to us as appreciators of art?

Activities

Under the guidance of the teacher, the children recall their knowledge of art elements and principles. While looking at the prints, the pupils analyze and evaluate them in relation to the artists' use of art elements and principles.

Evaluation and Summary

The children analyze the value of art elements and principles both to the artist and to the viewer.

Independent Study Assignment

The children analyze and evaluate art prints and slides in the art center.

RELATED ACTIVITY

Independent Project

The teacher introduces the musical recording of *Pictures at an Exhibition,* by Modest Moussorgsky, as an independent activity for the listening center. The teacher asks the children to visualize their impressions of the music.

PRACTICAL APPLICATION OF JEROME BRUNER'S "STAGES OF LEARNING"

Acquisition

The children have acquired information about art elements and principles.

Transformation

The children have applied their knowledge of art elements and principles to analysis of paintings.

Evaluation

The children think critically in generalizing their learning about art elements and principles and in evaluating art prints.

CLASSROOM ENVIRONMENT

The classroom environment is planned to promote the teacher's efforts in meeting the many dimensions of the intellect.

In the Los Angeles enrichment center, the classrooms used the following learning centers:

Literature Center

Collection of single-copy library books dealing with fantasy; collection of sets of literature readers with sections on fantasy (e.g., *After the Sun Sets, Treat Shop,* and *Ranches and Rainbows*). Art print related to fantasy: "Sun and Rocks," by Charles Burchfield; chart of the criteria of the literary category of fantasy.

Art Center

Chart listing art elements and principles; art print: "Breton Landscape with Farmhouse," Paul Gauguin; collection of art slides analyzing art elements and principles. Viewlex projector and viewing screen; file of art prints; painting and drawing area furnished with equipment and supplies.

Music Center

Johann Sebastian Bach's life history in *Music for Young Listeners* (Volume III, *The Blue Book*). Collection of musical recordings; record player with connector box, headsets, and earphones; music books, autoharp, song bells. Art print related to music: "Le Concert Orange," Raoul

Dufy. Themes of music recordings (musical notation on strips).

Functional Supply Center

Files of class work for parent conferences (e.g., spelling work, graphs of children's progress, stories and illustrations); homework file; correction crayons; name cards, attendance cards, library cards, paper.

Social Science Center

Books relating to the study of the post office as a community service agency; informational pictures (e.g., post office, transportation methods); file of informational material. Industrial arts work (e.g., letter-sorting boxes and mailbox). Map of local post offices marked with ZIP codes. Folders with collections of children's stories. Viewlex projector; transcription machines with headsets, connector box, earphones; sound filmstrip: "How a Bank Serves the Community."

Mathematics Center

Match books; problem-solving written material; combination cards, fraction cards, multiplication facts, fraction disks, number sentences; hook-and-loop board with a large array of numbers; small individual array boards; chart rack with pertinent material (e.g., calendar, codes).

Science Center

Science books; microscope and other equipment; records and displays of experiments.

Lesson Plan II – Art, Music, and History

GRADE LEVELS: Fifth and sixth
AGE LEVELS: Nine, ten, and eleven

Specific Purposes

To evaluate the relationship of impressionistic art and music.

In a group discussion, to analyze artists' and composers' utilization of the art elements of texture and tone color; to use this knowledge in judging the similarities and differences of impressionism as applied to art and music.

Background

Having had many experiences in art, music, science, and literature, the pupils have developed an appreciation of painting, sculpture, music, and poetry from studying art elements and principles, musical elements, acoustics, and the history of impressionism. They have compared Renaissance art with impressionistic art. They have actually seen the shapes and forms of sound waves made by orchestral instruments. They have sung and heard impressionistic, classical, and romantic compositions. They have composed a song and several simple piano compositions in impressionistic vein.

Materials

Music books, piano, and flute for singing activities; recordings of both piano and orchestral version of "Clair de Lune," by Claude Debussy. Art prints of representative impressionists: Cézanne, Renoir, Van Gogh, Monet.

PROCEDURE

Motivation

The interest that has been developed in texture has enabled the pupils to perceive a relationship between music and art, particularly works of the impressionistic period.

Guiding Questions

What are the elements of impressionistic art and music? Why do the composers or painters who use this style leave much to the imagination? What information do they provide? What do they omit? Why?

Is there a logical organization to impressionistic music? Is it similar in art? Different? How and why?

How can we evaluate impressionism? How does our own composition compare with other impressionistic music? To what extent does it resemble the other?

Activities

The children hear and sing original compositions and listen again to familiar impressionistic music. The teacher's questions stimulate the analysis and evaluation. The children's judgments are based on their level of knowledge and ability. Some of the children work independently at the art and music centers.

Evaluation and Summary

Tone color and texture exist in both artistic and musical works. In art, tone color and texture are produced by different shading, blending, and mixing of colors. In impressionistic music, the chords move in a parallel manner; they are often rolled seventh, ninth, and eleventh chords. Each instrument of the orchestra has a particular tone color, which the composer combines with others to "paint"

his picture. Harmony creates more textures. Certain combinations of instruments and harmonies produce the "impressionistic sound." In both art and music, impressionism is marked by *apparent* lack of structure and form.

Independent Study Assignment

Exploration of modern painting and music for an anlysis of structure and form and a comparison with the painting and music of the impressionistic period.

RELATED ACTIVITY

Independent Project

The teacher introduces art slides, books, and musical recordings for further independent work in assessing the contributions of various artists; for example, Volume I of *Impressionism,* Albert Skira; and *Drawings of the Masters – French Impressionists,* edited by Ira Moskowitz.

PRACTICAL APPLICATION OF JEROME BRUNER'S "STAGES OF LEARNING"

Acquisition

The children have learned about artistic and musical elements.

Transformation

The children have applied their knowledge of those elements in analyzing paintings and musical compositions. They have used their knowledge in interpreting impressionistic music and art. They have interpreted musical impressionism through singing. They have created original music and artistic works in the impressionistic style.

Evaluation

The children will criticize musical compositions and art prints in relation to impressionism. They will evaluate the relationship of impressionistic art and music and analyze the artists' and composers' use of texture and tone color.

CLASSROOM ENVIRONMENT

The classroom in which this class was offered in Los Angeles contained the following learning centers:

Correlated Art, Music, Science, and Mathematics Center

Art books; projector, filmstrips on art elements; art prints of significant works created by impressionist painters (Monet, Utrillo, Pissarro, Renoir); artists' biographies; file of art prints for use in studying eras in art history. Books on music history; record file of classical, romantic, impressionistic, and modern music; photographs of orchestral instruments; charts of musical themes.

Music appreciation books (e.g., *What to Listen For in Music,* Aaron Copland; *Young People's Concerts,* Leonard Bernstein; and *Instruments of the Orchestra,* John Hosier).

Music chart of vibrations per second of middle C on the piano; music chart of overtones when G is played on the piano; music chart of the first 16 overtones from one note (low G).

Record player and earphones; experimentation area with oscilloscope and wave motion machine; recording: "Science of Sound," Bell Telephone Laboratories; science textbooks and single-copy books; mathematical diagram of the vibrations of a violin's A string (whole-length, two-halves, and three-thirds vibrations); books related to the mathematical study of frequencies such as *The Giant Golden Book of Mathematics,* Irving Adler; mathematics file and mathematics books.

Social Science Center

Books on American history; periodical file, atlas, map of the Overland Trail, information file; current problem-solving question noted on a poster or on the chalkboard.

Language Arts Center

Literature collection; books on reading and writing skills; picture file with questions intended to stimulate creative expression; chart of literary criteria of biography; kit of materials for developing critical reading skills.

Selected References

Books

Baldwin, Lillian, *Music for Young Listeners.* Vol. I *(The Green Book).* Morristown, N.J.: Silver Burdett Company, 1951.

Bernstein, Leonard. *The Joy of Music.* New York: Simon and Schuster, Inc., 1959.

Brown, Maurice J. *Schubert: A Biography with Critical Digressions.* New York: St. Martin's Press, Inc., 1958.

Capell, Richard. *Schubert's Songs* (Second edition). New York: Macmillan Co., 1957.

Cooper, Grosvenor. *Learning to Listen: a Handbook for Music.* Chicago: University of Chicago Press, 1957.

Copland, Aaron. *What to Listen For in Music* (Revised edition). New York: McGraw-Hill Book Company, 1957.

Deutsch, Otto E. *Schubert: Memoirs by His Friends.* Translated by Rosamond Ley and John Nowell. New York: Macmillan Co., 1958.

Einstein, Alfred. *Schubert: A Musical Portrait.* New York: Oxford University Press, Inc., 1951.

Goss, Madeleine. *Unfinished Symphony: The Story of Franz Schubert.* New York: Henry Holt and Co., 1941.

Jacob, Gordon. *How to Read a Score.* Oceanside, N. Y.: Boosey and Hawkes, Inc., 1944.

Jones, Vincent, and Bertha Wingert Bailey. *Exploring Music.* Boston: C. C. Birchard & Co., 1941.

Kaufmann, Helen. *The Story of One Hundred Great Composers.* New York: Grosset & Dunlap, Inc., 1943.

Newman, Ernest. *More Essays from the World of Music.* New York: Coward-McCann, Inc., 1958.

Thomson, Virgil. *The Art of Judging Music.* New York: Alfred A. Knopf, Inc., 1948.

Tovey, Donald Francis. *Essays in Musical Analysis.* Vol. 1, *Symphonies.* New York: Oxford University Press, Inc., 1935.

Wheeler, Opal, and Sybil Deucher. *Curtain Calls for Franz Schubert.* New York: E. P. Dutton & Co., Inc., 1941.

Wheeler, Opal, and Sybil Deucher. *Franz Schubert and His Merry Friends.* New York: E. P. Dutton & Co., Inc., 1939.

Filmstrip

"Fundamentals of Stringed Instruments." Part I (Violin), Set 1. *Third and Fourth Grades Audio-Visual Catalog.* Los Angeles: Los Angeles Unified School District.

Instruments

Autoharp
Clarinets
Piano
Resonator bells
Violins
Other orchestral instruments

Motion Pictures

Gregor Piatigorsky. World Artists, Inc., 26 min.

Instruments of the Orchestra. British Information Services, 20 min.

Listening to Good Music – The String Quartet. Encyclopaedia Britannica Films, Inc., 14 min.

String Choir. Encyclopaedia Britannica Films, Inc., 12 min.

Recordings[1]

Beethoven, Ludwig van. *Piano Sonata No. 21 in C, Op. 53* ("Waldstein"); *Symphony No. 5 in C Minor, Op. 67.*

Mendelssohn, Felix. *Symphony No. 4 in A Major, Op. 90* ("Italian").

Mozart, Wolfgang Amadeus. First movement, *Symphony No. 40 in G Minor.*

Schubert, Franz. Last movement, *Sonata in B Flat Major for Piano, Op. Posth.*; first and second movements, *Symphony No. 5 in B Flat Major*; *Symphony No. 8 in B Minor* ("Unfinished").

Scores

Beethoven, Ludwig van. *Symphony No. 5 in C Minor, Op. 67.*

Mendelssohn, Felix. *Symphony No. 4 in A Major, Op. 90* ("Italian").

Mozart, Wolfgang Amadeus. First movement, *Symphony No. 40 in G Minor.*

Schubert, Franz. First movement (allegro), *Symphony No. 5 in B Flat Major.*

[1]Many other listings of recordings may be found in the comprehensive *Schwann Long Playing Record Catalog* (published monthly). Boston: W. Schwann, Inc. (137 Newbury St., 02116).

Songs

"The Brook," in *Music in Our Country*. CALIFORNIA STATE SERIES. Sacramento: California State Department of Education, 1958.

New Music Horizons. Morristown, N. J.: Silver Burdett Company, 1949. Songs: "The Alpine Hunter," "Cradle Song," and "Invocation."

"Wandering," in *Music Around the World*. CALIFORNIA STATE SERIES. Sacramento: California State Department of Education, 1958.

Transcriptions

Audio-Visual Materials, Secondary Grades. Publication No. 579. Audio-Visual Section, Division of Instructional Services. Los Angeles: Los Angeles Unified School District, 1961. Standard School Broadcasts: No. 239A, "Austria"; No. 506D, "Horns and Trumpets"; No. 505B, "The Science of Sound"; and No. 508C, "Sons of Guido." 30 min. each.

(Also consult the references belonging to chapters V and VIII for listings on music and other branches of the fine arts.)

Chapter XIV

Enrichment Through a Scientific Approach

The subject fields of natural and social sciences and mathematics were chosen to promote scientific discovery, methodology, and investigation at the Enrichment Demonstration Center of California Project Talent. Organization of enriched courses in this area proceeded according to the successive stages described in previous chapters of this publication. In beginning to enrich courses in the realm of science, educators first chose certain specific curricular areas for intensive study in order to provide solid groundwork for their pupils in the content selected before involving them in the concomitant scientific processes.

Chapter XIV presents a framework for studying graphic representations of statistical information. This framework is an example of a course outline for a mathematics study unit intended to develop in the gifted learners a scientific approach. Besides the necessary reference materials, the chapter includes sample lesson plans that illustrate the application of the levels of educational objectives as outlined by Benjamin Bloom and his committee in their *Taxonomy of Educational Objectives – Handbook I: Cognitive Domain.*

IMPLEMENTING ENRICHMENT IN A SCIENCE CURRICULUM

Science teachers in the Los Angeles center began their programs by choosing a specific topic from the many subjects proposed in the initial planning for enrichment in this area. Each teacher selected a topic of special interest to himself or one in which he was already well versed. After studying the content in his particular field, the teacher prepared a unit of study according to the format illustrated in Chapter X. Study units exemplified the six classes of intellectual functioning described in the first *Taxonomy* handbook, edited by Bloom. The teachers aimed their lessons toward specific goals in one of the six classes identified in the handbook: knowledge, comprehension, application, analysis, synthesis, and evaluation.

The teachers' abilities to formulate specific purposes in terms of levels both of content and of intellectual behavior contributed to their skill in developing the various dimensions of the children's intellectual functioning. The levels of the teachers' intellectual behavior when questioning and otherwise interacting with their pupils determined the levels of intellectual response elicited from the pupils.

A series of six filmed observation lessons exemplifying class progress toward goals in each of the six different categories of the taxonomy was made to demonstrate parts of the unit on graphing. These six films are listed with the references for Chapter X of this publication; Chapter XV provides information regarding their distribution.

OUTLINE OF SCIENTIFIC EXPERIENCES IN THE AREA OF MATHEMATICS

The outline that follows covers the scope and sequence of scientific experiences in the area of mathematics. Specifically, the outline constitutes a framework for studying graphic representations of statistical information.

Knowledge

Specific Purpose

To learn that a graph shows the correspondence between the elements of two different sets.

Materials

San Fernando Valley Times
The New Exploring Numbers: pages 169, 234, 238, 242, 243
The New Understanding Numbers: pages 18, 56, 59, 68, 90, 127, 143, 171, 198, 214, 302
Modern Arithmetic Through Discovery (grade four): pages 196-200
Modern Arithmetic Through Discovery (grade five): pages 202-10
Modern Arithmetic Through Discovery (grade six): pages 196-207, 253
Enlarging Mathematical Ideas: pages 8, 36, 38
Extending Mathematical Ideas: pages 91-93

Content

A graph is a diagram that tells a number story pictorially. Every graph has a pertinent title, together with

a scale to aid in its interpretation. A graph is used to portray the relationship of facts within one set of data or to show the correspondence between elements of one set with those of another. Types of graphs include bar, rectangle, circle, and line graphs; pictographs; or a combination thereof. Graphs serve to organize compactly groups of data by means of understandable pictures. The two main kinds of data are counts and measurements.

A pictograph visualizes facts in the form of pictures; it is closely related to a scale in which a line of a given length represents a certain quantity. As used on a graph, the term "scale" expresses the relationship between a space and the number of objects, distances, or amounts that it represents. Primarily used to make quick comparisons, a pictograph is normally less accurate than a table of data.

One form of pictograph is the bar graph, and some graphs combine pictures with bars. Single-bar graphs are more easily read than multiple ones. Only the length of the bars varies; their widths and the spaces between them are always equal.

In the rectangle graph, sometimes called the 100 percent single-bar graph, the entire length of the rectangle represents 100 percent of a quantity. This graph is used to compare a part with the whole.

Involving the same principle as rectangle graphs are circle graphs, in which the entire circle represents 100 percent of a quantity. The circle graph is divided into sectors, each one representing a subdivision or percentage of the total quantity.

Line graphs, commonly used when time is a variable, require the use of two scales, horizontal and vertical. The particular value assigned to each scale is written beside the line that represents it. The numbers are given in ordered pairs, each of which locates a single point on the graph.

The scales of broken-line and curved-line graphs may begin at some point other than zero. A straight-line graph depicts the relationship between two changing quantities in a line whose slope is constant. If the data deal only with positive values, then the graph would be located in the first quadrant.

A more complex type of straight-line graph uses ordered pairs in coordinated axes. Two number lines – one horizontal and one vertical – represent the two axes. The label "O" designates the intersection point of the axes, called the origin. The same unit of measurement is used on both axes. The horizontal line is called the X axis; the vertical line, the Y axis. The horizontal distance is the abscissa; the vertical distance, the ordinate. The first number (X) of the ordered pair (X,Y) is always located by counting along the X axis, and distance is measured from the origin O. The second number (Y) is measured along the Y axis from O. The intersecting lines of the graph separate the plane into four equal parts, known as quadrants. Beginning with the upper right quadrant numbered I, and then moving counterclockwise, each quadrant is numbered consecutively with the Roman numerals, II, III, and IV. All coordinates in quadrant I are positive numbers; all in quadrant III are negative ones. In quadrant II, X is negative and Y is positive; the reverse is true of quadrant IV.

Constructing a graph. The following principles apply to graph construction:

- Coordinate lines should be kept to a minimum; curves should predominate.
- The source of the data should appear at the lower left of the graph.
- Footnotes should be placed under the graph to its right.
- To make the graph more readily comprehensible, curves, segments, and details should be minimized.
- A scale caption should indicate the units used. The X-axis scale caption is centered directly beneath the X axis, while the Y-axis caption appears at the top of that axis or sometimes along its side.
- To avoid a misleading comparison, the zero point should be indicated on the scale at the Y axis.
- A scale break may indicate the omission of a zero point.
- To indicate the size of variations in the graph, the scales of value should appear along the X and Y axes.
- The scale on the Y axis should run from the lowest value at the bottom of the graph to the highest value at the top. The scale on the X axis should run from the lowest value at the left to the highest at the right.

Elements of line graphs. A line or a curve indicates variation in data. Points are plotted according to their respective values on X and Y scales, and straight lines connect these points.

Elements of logarithmic charts. Neither zero nor base lines are required. The horizontal axis of semilogarithmic charts serves as a basis for arithmetic scales. Because their logarithms form an arithmetic progression, geometric progressions form straight lines when plotted on logarithmic paper. Equal rises or falls indicate equal changes in percent.

Equal slopes on a logarithmic chart indicate equal rates of change. Logarithmic charts are used to compare proportions of rates of change or to show the relationship of two or more widely differing series.

Elements of silhouette charts. Positive and negative deviations from a zero or base line are depicted by filling in the area between that line and the curve. Construction requires plotting points to indicate the deviation from the base line, connecting those points, and filling in the area between the curve and the line.

Elements of band charts. Band charts illustrate variations in components as well as in the totals. Construction proceeds by first plotting the variation in the largest component, shading it in, adding the next component to the first segment, plotting the result, and thus continuing through all the component parts.

Elements of high-low graphs. Fluctuations (high and low values) are indicated for each period. Construction requires plotting the lowest and highest values within a period, then connecting the low points of each period and the high points of each period.

Elements of histograms. Also called rectangular frequency polygons, histograms depict a frequency distribution (a) by erecting vertical rectangles; and (b) by using size of class interval as the width and frequency of class interval as the height.

Elements of bar charts. Subdivided absolute bar charts are constructed by determining the proportions of each component and arranging the components of each bar with the largest subdivisions at the bottom.

Simple percentage bar charts show percent values by the length of the bar. Subdivided percentage bar charts make use of rectangular bars of the same width and length constructed on the same base; the base with the length represents 100 percent. Each bar is divided into segments according to percent of the total figure which each subdivision represents.

PROCEDURE

Motivation

Discuss the growth of the San Fernando Valley, using the local newspaper to obtain statistics on residential and industrial growth. The pupils will probably express curiosity about the graphic presentation of information in the newspaper.

Guiding Questions

When did the greatest increase in population occur? What interval shows the greatest increase in industrial growth? What was the industrial trend between 1950 and 1960? Was the increase in residential growth constant during each ten-year interval?

How is information depicted graphically on a time line? (See page 169 in *The New Exploring Numbers.*) What is the earliest year shown on the time line? The latest year? One inch on the time line represents 40 years. How many inches represent 80 years? Each inch on the line is divided into four parts. How many years are represented by ¼ inch?

In about what year was the use of ether discovered? Was it nearer 1840 or nearer 1850?

How does a chart show information graphically? (See page 234 in *The New Exploring Numbers.*) Find the total number of children who received stars. (The school had an enrollment of 203 children.)

What information is shown on the picture chart, "Planting Flowers," on page 238 of *The New Exploring Numbers*? Which of the flowers is the tallest? Which is the shortest? How much taller than the hyacinth is the late tulip? (Use measurements to the nearest inch.) For which flower is the bulb planted deepest in the ground? About how deep?

What specific facts do we gain from the "Graphs of Temperature and Rainfall" on pages 242 and 243 in *The New Exploring Numbers*? The first graph shows the average monthly temperature for what city? In what month is the average temperature in Indianapolis nearest 60° F.? 40° F.? 70° F.? 55° F.?

What data about electricity do we learn from the time line in "The Magic of Electricity" on page 68 in *The New Understanding Numbers*? Point to the mark that shows the year 1850, the year 1860, the year 1830. What was invented approximately 30 years after the motion picture projector?

Study the bar graph on page 198 of *The New Understanding Numbers* and then compute the percent of accidents that occur while children are going to school. Tell how many accidents occur on school grounds, in school buildings, at home, in other places. Where do the fewest accidents occur? The most accidents?

By reading the circle graph on page 171 in *The New Understanding Numbers*, determine the source of the average American farmer's income. How many cents of every dollar come from dairy products? How many from

poultry and eggs? How much less than one quarter of every dollar comes from dairy products and from poultry and eggs?

Read the picture graph, "Baseball Booster Buttons Sold," on page 196 in *Modern Arithmetic Through Discovery* (grade four). Who sold the most buttons? How many did he sell? How many buttons did Mike sell? How many more did he sell than Joe? How many times as many?

Read the bar graph, "Hotel Guests," on page 197. In which month did Mr. White have the greatest number of guests? How many more guests were there in June than in May?

Study the horizontal bar graph, "Television," on page 203 of *Modern Arithmetic Through Discovery* (grade five). After the first week, Betty realized she had spent too much time watching television. How many fewer hours did she watch it the second week?

Study the vertical bar graph, "Piano Practice," on page 203. What is the difference between the hours of practice for the first and second weeks? The first and fourth weeks?

Study the table of information, "Gas Sales for Week of February 14," on page 204. On which two days was the most gas sold? On what day was the least gas sold? What was the total number of gallons sold during the week?

Read the bar graph, "Attendance at the Princeville County Fair," on page 207. What was the total attendance for the six days? Between what two days did attendance differ the greatest?

Study the line graph, "Population of Park City," on page 209. In what ten-year period did the least change take place? The greatest change?

From the pictograph on page 210, determine how many more cars were registered in 1960 than in 1940.

Read the bar graph, "Weekly Income of Teen Times Readers" on page 196 in *Modern Arithmetic Through Discovery* (grade six). What information does the title of the graph give? What does the vertical scale show? How is it labeled? What is the difference in the income of the boys in the twelve- through fourteen-year-old group and the boys in the fifteen- through seventeen-year-old group?

Read the line graph, "Normal Monthly Precipitation – Duluth, Minnesota, and Miami, Florida," on page 199. What does a one-unit space represent on the horizontal axis? On the vertical scale? Which city receives the greatest amount of precipitation in one month?

In the pictograph, "1960 Population of Selected States," on page 202, how many people does one symbol represent? How do you know this? Which state shown on the graph has the greatest population? How can you tell this?

On the divided-bar graph, "How the Family Income Is Used," on page 205, what decimal number best represents the part of each $100 that was used for food? For clothing? For other expenses?

From the circle graphs on page 207, can you figure out who spends a greater part of their money on food – boys or girls? A greater part on clothing? A greater part on personal care?

The relationship shown on the number line on page 8 of *Enlarging Mathematical Ideas* can be written in four different ways; n stands for the missing number. In what four ways can you write what is shown on the number line? What does n stand for? On the four number lines on page 36 of *Enlarging Mathematical Ideas*, give a whole number for one point that lies between the points labeled 1 and 3.

On page 91 of *Extending Mathematical Ideas*, how is each number in the second row related to the number listed above it?

In the table on page 93 of *Enlarging Mathematical Ideas*, each number in the right-hand column is how many times the number opposite it in the left-hand column?

Activities

Study newspaper graphs under the direction of the teacher. Study the time line on page 169 of *The New Exploring Numbers*; also the chart on page 234 and the graphs of temperature and rainfall on pages 242 and 243.

Study the time line on page 68 of *The New Understanding Numbers*; also the bar graph on page 198 and the circle graph on page 171.

Study the picture graph on page 196, the bar graph on page 197, and the line graphs on pages 199 and 200 of *Modern Arithmetic Through Discovery* (grade four).

Study the horizontal and vertical bar graphs on pages 202 and 203, tables of information on pages 204 through 206, bar graphs on page 207, line graphs on pages 208 and 209, and the pictograph on page 210 of *Modern Arithmetic Through Discovery* (grade five).

Study the graphs on pages 196 through 207 and on page 253 of *Modern Arithmetic Through Discovery* (grade six).

Learn the relationship shown on a number line that can be written in four different ways. (See page 8 of *Enlarging Mathematical Ideas*.) There is a one-to-one correspondence between number pairs and points on a graph.

Use variables in problems. (See page 93 of *Extending Mathematical Ideas*.)

Evaluation and Summary

Know the unifying concepts that underlie the preparation of graphs.

Independent Study Assignments

Show ability to read graphs by answering the following questions:

In *The New Exploring Numbers*: questions on pages 169, 234, 238, 242, and 243.

In *The New Understanding Numbers*: questions on pages 18, 56, 59, 68, 90, 127, 143, 171, 198, 214, and 302.

In *Modern Arithmetic Through Discovery* (grade four): questions 1-a, -b, -c, -d and 2-a, -b, -c on page 196; questions 1 through 5 on page 197; question 1 on page 198; questions 1, 2, 3 on page 199; question 1 on page 200.

In *Modern Arithmetic Through Discovery* (grade five): questions 2 through 5 on page 202; questions 1-a, -b, -c, 2-a, -b on page 203; questions 1, 2, 3 on page 204; question 4 on page 206; questions 11, 12 on page 207; questions 1-a, -b on page 208; questions 1-a, -b, -c and question 4 on page 210.

In *Modern Arithmetic Through Discovery* (grade six): questions 1 through 4 on page 196; questions 1 through 5 on page 199; questions 1 through 4 on page 202; questions 1 through 5 on page 205; questions 1, 2 on page 206.

Show familiarity with relationships shown on a number line by solving problems 1 through 5 on page 8 of *Enlarging Mathematical Ideas*.

Show knowledge of using number pairs in graphing by answering questions 1 through 4 on page 91 of *Extending Mathematical Ideas*.

Show ability to use variables by answering questions 1 through 8 on page 93 of *Extending Mathematical Ideas*.

Summary and Transition

Graphs show arrangement and organization of data. By investigation, learn the usefulness of graphing as a technique for summarizing data.

RELATED ACTIVITIES

Pupil Assignments

- Study the sound motion pictures, "The Story of Our Money System" and "Story of Weights and Measures."
- Graph information historically on time line, table, or pictograph.
- Study the following filmstrips for information on graphs: "Graphs," Set 1; "Graph Uses," Set 2; "Definitions and Key Words"; "Deductive Reasoning"; and "Induction, Analysis, and Indirect Reasoning."
- Read *Composition: Pictures as Structures*, Metropolitan Museum of Art Seminars. Analyze the artist's use of mathematical structure.
- Analyze the artist's use of grids or graphs in relation to balance and composition.
- Read *The First Book of Architecture*. Graph the historical periods from 500 B.C. to the twentieth century.
- Read *The Painter's Secret Geometry: A Study of Composition Art*. Study the rectangular graph used by Puvis de Chavannes in "Decoration of the Large Amphitheatre of the Sorbonne" on page 209. Study the use of a grid in relation to the artist's plan for his painting. Using graph paper, plan a composition for a painting of your own.
- Visit an electronics firm to gather data related to the manufacture of radios and television receivers. Graph the statistical information collected.
- Study *Instruments of the Orchestra*, pages 5 through 56, and listen to the accompanying record. Graph the growth of the orchestra (1700–1900), using the table of information on page 50.
- Graph world series all-time records in the American League and the National League, using the *World Series Encyclopedia*.
- Relate graphing skills to science problems centered on astronomy and space travel. After gathering data on the aerospace industry, graph facts on the military and civilian production of aircraft in the United States between 1915 and 1960. Refer to *Compton's Pictured Encyclopedia and Fact-Index* for data.

- Read "Project Relay" in *NASA Facts*. Record and graph information regarding milestones in space communications.

- Read *The Six Orbits of Sigma 7*, concerning Walter M. Schirra's space flight, October 3, 1962 (National Aeronautics and Space Administration). Trace the chronology of Project Mercury flight tests from August 21, 1959, to October 3, 1962, on a time line or on a rectangular graph.

- Compare the payload weights of the NASA Sounding Rockets. Make a graph of the data gathered.

- Refer to appropriate source material for information on the national launch vehicle program. (See the NASA publication, *Space Launch Vehicles*.) Graph statistics regarding the stages, propellants, thrust, maximum diameter, height, payload, first NASA launch, and use of Scout, Delta, Thor-Agena B, Atlas D, Atlas-Agena B, Titan II, Titan III, Centaur, Saturn, Advanced Saturn, and Nova.

- Compare graphically the sizes of the Gemini and Apollo spacecraft from information in "Footprints on the Moon" by Hugh L. Dryden in the March, 1964, issue of the *National Geographic Magazine*.

- Graph the sizes of the planets in relation to the earth from data in *The Nature of the Universe*, by Fred Hoyle.

Comprehension

Specific Purpose

To learn how data are collected and to gain skill in translating mathematical verbal material into symbolic statements (and vice versa); in interpreting data; and in determining implications, consequences, and effects by means of graphs and tables.

Materials

Modern Arithmetic Through Discovery (grade five): pages 203, 207, 208 through 210; and (grade six): pages 196 and 203
The New Understanding Numbers: pages 171 and 213
Extending Mathematical Ideas: page 9
Graph paper with different sizes of squares (e.g., eighths of an inch or tenths of an inch)
Teacher-prepared material or *Discovery in Mathematics*

Content

Data may be collected from either primary or secondary sources. Data from primary sources are obtained by questionnaire, interview, or letter; from secondary sources by compiling information secured by other agencies.

Since measurements are only approximate, a single measurement may lack the accuracy necessary for certain scientific work; therefore, many measurements of the same thing are taken under similar conditions. This forms a set of data. Graphs and tables are useful devices for measurement and summarization.

I. The Collection of Data

The following essentials of data collection are listed for consideration and implementation:

Elements of collecting data by the interview method. Advantages of the interview method are that a high degree of accuracy is possible when data are obtained directly from the source, and material is obtained that cannot be secured through a questionnaire. Information can be checked personally. Disadvantages are that only a small number of samples can be obtained, and recording the interview involves a subjective factor.

Elements of collecting data by the questionnaire method. The questionnaire method should utilize easily understood questions; follow a logical sequence of questions; be concise; call for responses indicated by *yes* or *no*, checks in blank spaces, or numerical clues. It should facilitate tabulation of data. Advantages of this method are that a large area may be canvassed for data, which can be assembled inexpensively. Disadvantages are that questions cannot be answered without a supplementary explanation; results may be unreliable; some persons may not answer the questionnaire.

Advantages and disadvantages of using data compiled from secondary sources. A disadvantage of using secondary sources is the inability of verifying the data obtained by the primary source or of verifying the accuracy of the results because of lack of knowledge of the statistical techniques used. Another disadvantage is possible prejudice in choice of source material and techniques, as well as lack of representative samples. Advantages are the economy of time and expense since data are already compiled; also, the shift of responsibility for accuracy.

II. Graphs

The unit of measurement used on the vertical graph is often greater than that on a horizontal one. The line graph

always has two scales, and a bar graph has a scale and a label. Both kinds of graphs have two axes. The line graph is useful for indicating changes over a period of time, such as changes in weight as heights change or changes in value as amounts change. Pictographs are easy to understand but have limitations if required to give accurate values for symbols. For linear measurements, graph paper (cross-section paper) should be used.

Elements of extended types of bar charts. Two kinds will be considered here. First, pictorial bar charts: these present pictures of different heights for comparative purposes. Second, loss and gain bar charts: on these the bars extend from a zero line; when horizontally constructed, bars representing losses extend to the left, and bars representing gains extend to the right; when vertically constructed, the bars above the horizontal line represent profits, and the bars below the line represent losses.

Elements of area diagrams. Geometric shapes, such as circles or squares, contrast quantities by comparing figures with varying areas. Pie charts are circle-shaped diagrams divided into sectors, each of which indicates the proportionate size of a component part of the whole. The circle equals 100 percent, or 360°; therefore, each percent equals 360° divided by 100, or 3.6. The sectors are usually arranged clockwise. Comparison of charts must involve uniform size of sectors. Wording and percents are placed horizontally on each sector. A legend may be used to indicate the meaning of any shading, coloring, or crosshatching.

Elements of solid diagrams. Construction utilizes geometric forms to illustrate comparisons in the volumes of the figures.

Elements of map graphs. Pictorial representation presents data in a geographic distribution. Construction utilizes shading, crosshatching, dotting, coloring, or pinning with flags, pins, or tacks.

III. Tables

A statistical table is a systematic arrangement of numerical data presented in columns and rows.

Elements of general-purpose tables. Tables present varied information on the same subject; present data in an orderly, logical manner; constitute a form that can be used with ease for reference purposes; allow inclusion of actual figures; and present original data.

Elements of special-purpose tables. Rounded numbers may be used; selected material may be concisely presented to facilitate interpretation; and data may be utilized to emphasize relationships.

PROCEDURE

Motivation

The usefulness of graphs in summarizing data leads to the desire to prepare graphs for interpreting relationships.

Guiding Questions

Study the bar graphs on pages 203 and 207 of *Modern Arithmetic Through Discovery* (grade five). How does the scale for the vertical bar graph differ from that for the horizontal bar graph? Add the attendance for Saturday and for Sunday. Compare that sum with the sum of the attendance for the six days. Which is easier for making comparisons – the bar graph or the table on the opposite page?

What symbol would you use to represent the data on page 202 of *Modern Arithmetic Through Discovery* (grade six)? What symbol might you select for a pictograph to show the number of books in five different libraries? The number of houses constructed in each of four towns? The number of votes cast for each of three candidates?

What is the proportion of the money the average American farmer obtains from meat animals to his total cash income? Refer to the circle graph on page 171 of *The New Understanding Numbers.*

Use the graph on page 214 of *The New Understanding Numbers* to determine the consequences if a driver of a car with good brakes is going 50 mph and suddenly he sees a child on the road about 50 yards ahead. Will he be able to stop the car in time? How does the graph help you to tell?

Study "Weekly Income of Teen Times Readers" (allowances and earnings) on page 196 of *Modern Arithmetic Through Discovery* (grade six). Can you make comparisons as quickly by glancing at the table as by looking at the graph? Which provides more precise information?

Activities

Study the graph on page 207 of *Modern Arithmetic Through Discovery* (grade five). Make a bar graph or a table to compare the attendance for Saturday with that for Sunday at the Princeville County Fair.

Make a pictograph to represent the data in the table on page 203 of *Modern Arithmetic Through Discovery* (grade six). Compare the number of students enrolled in academic courses with those enrolled in vocational ones.

Learn from reference books the chief sources of income for farmers in California. Make a circle graph showing the sources of income in relation to one another.

Evaluation and Summary

Graphs show relationships among facts so that translation, interpretation, and extrapolation are possible.

Independent Study Assignments

Show ability to understand graphs by writing answers to problems in *Modern Arithmetic Through Discovery* (grade five), page 208, questions 1-a, -b and questions 2-a, -b, -c.

Demonstrate skill in translating verbal material into symbolic mathematical material by solving problems in *Modern Arithmetic Through Discovery* (grade five), page 209, questions 3-a, -b, -c, -d, -e, -f and questions 4-a, -b, -c, -d, -e; page 210, questions 1-a, -b, -c and questions 2, 3.

Illustrate competency in determining implications, consequences, and effects (that are in accordance with the conditions described) by solving problems in *The New Understanding Numbers*, page 214.

Show ability to reorder data and apply scientific method by completing question 5, page 9, *Extending Mathematical Ideas*. Complete the bar graph given by drawing a bar that represents the product of each pair of factors indicated. The height of each bar should represent the product.

Collect graphs of various types and interpret them.

Using *The New Understanding Numbers*, write additional questions requiring extrapolation of data to show trends or tendencies: bar graphs, pages 56, 127, 198, 214; circle graphs, pages 90, 171; dot maps, page 143; picture graphs, pages 18, 59, 302; and time line, page 68. Do the same using *The New Exploring Numbers*: bar graphs, pages 88, 243; line graph, page 242; picture graphs, pages 234, 238; and time line, page 169.

Using *Discovery in Mathematics* or teacher-prepared material, including problems, review open sentences and signed numbers. The types of problems include finding the "truth set" in open sentences, making tables and graphs to represent truth sets, finding equations for the graphs, writing problems for given examples, devising quadratic equations, writing a story for a given problem, and so forth.

Summary and Transition

A graph should emphasize the relationships among the facts in a set of facts. Work on the prediction of probable effects from the application of knowledge.

RELATED ACTIVITIES

Study Assignments

- Read *This Is NASA*. Record data concerning advanced types of spacecraft; graph the facts.
- See the motion picture, *High Temperature Materials*. Record information about the effects on various materials of high temperatures to determine suitability of the materials for high-temperature applications.
- Compare the statistical information regarding moon travel in *From the Earth to the Moon*, by Jules Verne, with the most recent data concerning planned flights to the moon.
- Graph data on the atmosphere at different levels above the surface of the sea. Use *The Prentice-Hall Book About the Stars* for a reference.
- Discover the masses of some stars and also their luminosity. Graph the results, using *What Is Science?* and other reference sources.
- Relate the graphic method to the study of temperature, pressure, and wind velocity. Read *Reader's Digest Science Reader*, Red Book, pages 128 through 133. Graph comparative readings for fahrenheit, centigrade, and kelvin thermometers. Experiment with the barometer, the hydrometer, and the anemometer. Graph weather patterns.
- Trace the history of scientific thought through the use of a graph or a time line. Refer to *The Book of Scientific Discovery* and *The Origins of Scientific Thought*.
- Relate graphing skills to social science. Use graphs to interpret the economics of Latin America through the following topics: "The Aztecs," "Guatemala," "The Need for Land Reform," and "Industrial Growth." Reference materials should include *Readings in World History*. Study the history of cycles in relation to the growth of civilization. Graph significant cycles (e.g., business statistics). Use *Mainsprings of Civilization* for data as well as other references.

Application

Specific Purposes

To learn to apply the principles of graphic representation by using mathematical abstractions in concrete situations.

To recall the principles of supply and demand; to determine the utilization of these principles in predicting the effect of supply and demand in particular situations.

Content

Analysis of data takes the form of descriptive statistics or numbers derived from organized data. Two types of descriptive statistics may be derived to summarize a frequency distribution. One of these usually presents an idea of the magnitude of measurements or numbered counts by computing a number that represents the middle or center of the distribution.

Measures of central tendency – mean, median, and mode – help to determine a frequency distribution.

Descriptive statistics that show the center of distribution are called measures of central tendency. Another type indicates the variability or spread of the measurements from the center. These descriptive statistics are called measures of dispersion or of variability. The range – the difference between the largest and smallest measurements of a distribution – is not completely reliable. The standard deviation is a more accurate measure of variability.

When two number lines are constructed in the same plane to intersect at the 0 point of each line, each point of the plane may be associated with an ordered pair of real numbers. For work of an elementary nature, it is convenient to arrange the two number lines perpendicularly. This restriction is not a mathematical necessity, as René Descartes, who originated the concept, used axes that intersected obliquely.

"Supply" is a set of amounts to be offered at each of a series of prices if the seller cannot raise the price. "Demand" is a set of amounts wanted at each of a series of prices if the buyer cannot lower the price. The amount that buyers will take at various prices is shown on a "demand schedule"; the amount that sellers will offer at various prices is shown on a "supply schedule." A change in demand involves a shift from one supply schedule to another. Demand curves generally slope down to the right because more supplies will be bought at low than at high prices. Supply curves generally slope up to the right because fewer goods will be offered at low prices than at high ones.

The concepts of demand and supply are meaningful only in a purely competitive situation. Competitive firms are sellers whose offerings make up supplies; they are also buyers demanding services and products from others. They sell to other firms and to eventual consumers; they buy from other firms and from owners of productive resources. The actual and anticipated production costs of the sellers are extremely important in determining supply. The time period for which the sellers are making decisions will help to determine which costs will be considered. When a farmer decides whether to pick certain vegetable crops, he considers only the added costs of picking, but he will plant crops for the next season only if he anticipates a price sufficient to cover all the costs. If the time period reviewed is very long relative to the production processes of an industry, planned sales (output) will be based on an estimate of all costs. Depending on the time lapse involved, a schedule of the amounts to be sold at a series of prices may be either a long-run or a short-run supply schedule.

A determination of the quantities and prices of goods must take into consideration the differences in seller responses with regard to short-run and to long-run plans. The lowest price necessary to induce a seller to offer a given quantity will depend in part on the time period involved. In competitive industry, market price is determined through the action of thousands of individual buyers and sellers, who push prices up and down toward a point at which the amount that buyers want and the amount that sellers offer are equal. Price is increased when buyers want more than sellers offer, and it is forced down when buyers want less than sellers offer. This process is described as the law of supply and demand. This law is a statement of tendencies toward an equilibrium position attained when no single individual can improve his position within the opportunities available. Changes occur when this stabilized condition does not exist.

Principles of table construction. The title above the table indicates the nature of the data presented, the locality covered, and the time period embraced. The source information indicates the authority for the data, verifies them, and serves as a reference. Footnotes to explain figures in tables are placed immediately beneath the table and are indicated by symbols or letters. The arrangement of data – alphabetically, geographically, by magnitude, or by other customary classification – facilitates analysis. Columns are numbered or lettered for reference purposes.

PROCEDURE

The teacher guides the pupils in making use of effective methods relating to the subject area. He utilizes a simple graph figure drawn on the chalkboard or a poster board. The graph should be of the supply-demand type showing price along the vertical axis and quantity along the horizontal axis.

Motivation

The challenge to use their knowledge of graphs by applying principles in order to predict probable effects motivates the pupils.

Guiding Questions

In the figure of the graph, the original supply and demand curves are drawn in unbroken lines. Changes in conditions indicated in the problems that follow are shown by drawing new curves with broken lines. Shifts in curves (either supply or demand, or both) change the points of intersection. What points of intersections of the curves apply to the new conditions? Use letters (A, B, C, D, or E) to indicate the new intersection points. Assume that no other changes occur in supply or demand than those specified. Assume also that no restrictions interfere with a free market.

Automobiles. New union agreements that have almost eliminated labor grievances have been made. Buyers with urgent demands for new cars have been supplied.

Butter. It is winter, and production is lowest. Taxes on oleomargarine have been eliminated.

Oysters. Chesapeake Bay oysters are slowly succumbing to a sickness induced by increasing pollution of the bay.

Activity

Pupils recall general principles of supply and demand and determine their use in each situation. They mark the appropriate letters at the points of intersection of the curves that apply to the new conditions.

Evaluation and Summary

Knowledge of principles of graphic representation aids in predicting the probable effect of a change in a situation that was previously stable.

Independent Study

Apply specific principles of graphic representation to new fictional situations presented by the teacher.

Summary and Transition

The rules of graphing specific facts are useful in predicting the probable effect of changed conditions. Analyze the elements of a graph.

RELATED ACTIVITIES

Pupil Assignments

- Study "The True Story of an Election." Compare registration figures statistically.
- Study the work of social scientists in the fields of anthropology, archaeology, economics, geography, historical research, political science, psychology, sociology, and statistics. Read *The Sciences of Mankind: Social Scientists at Work Today in Many Challenging Fields* and other references. Synthesize graphically the data collected.
- Use knowledge of graphs in additional mathematics work. Study and graph the curve of normalcy in relation to the probability theory after reading *Mathematics* (LIFE SCIENCE LIBRARY SERIES).
- After reading *The World of Science* and *Elementary Statistics*, work out problems on graphs in the *Alternate Workbook to Accompany Elementary Statistics.*
- Study the precise definitions given in *The Laidlaw Glossary of Arithmetical-Mathematical Terms.*
- Work problems stated as equations and practice plotting equations on a line graph. Use *Discovery in Mathematics* as a student discussion guide.
- Learn more about the number line from *Realm of Numbers.*
- Learn the speed of the earth around the sun and study how this is computed in *The Story of Mathematics.* Graph the statistics.

Analysis

Specific Purpose

To learn to recognize which facts or assumptions are essential to a main thesis or to the argument supporting that thesis by analyzing the relationship between the yearly income of certain families and the medical attention they receive.

Content

A circle graph may represent pictorially the correspondence between two sets of things. Circle graphs are customarily used to represent such correspondence when one set deals with numbers and the other set deals with objects or nonnumerical concepts. The elements of the two sets are formed in ordered pairs. A sector of a circle represents a certain fractional part of the circle's area. In the circle graph, the sectors emphasize not only the various magnitudes but also the ratio of the magnitude of each second component to the magnitude of the sum of all the second components. For this reason the sum of all second

components must refer to a meaningful entity. For example, such a sum is meaningful if it refers to the total number of votes cast in an election or to the total number of dollars spent last year by the government. In set terminology, the area of the entire circle represents a set of which the sector areas represent subsets. The ordered pairs represented by a circle graph involve second components as subsets.

The science of statistics helps with extracting information from raw data so that discoveries and descriptions of relationships can be made and expressed in a precise manner.

Research is controlled observation in a field of study. Statistics is a tool applied to actual research situations. Statistical methods are useful for describing and interpreting concrete experiences.

Graphic representations are used extensively in technical work, since the outstanding features of group performance are most readily grasped in this form.

A fundamental problem in research is the selection of comparable groups of subjects at the beginning of the experiment. If groups are not comparable originally, conclusions drawn may be in error regardless of whether the conditions did or did not have any different effects in the course of the experiment. The groups for an experiment must be so chosen that they would not differ except for a sampling error if they were tested under the same conditions.

One research method for obtaining comparable groups is "random sampling," whereby every member of the population from which the sample is taken has an equal chance of being chosen. For an experiment two groups are needed, both of which are random samples.

Another type of grouping for research is "matched samples." By this is meant that for each member of the population there is another member who is similar or in some way related. Whenever a sampling of pairs of individuals is made from a population, each sample is not drawn randomly. However, a random sampling of the pairs is drawn; the two persons forming a pair are drawn simultaneously but randomly with respect to any other pair. Then groups are formed by assigning one member of each pair to a different group.

PROCEDURE

Motivation

Analyzing the elements of a graph motivates the pupils to solve the stated problems.

Guiding Questions

The following tabulation represents the relationship between the yearly income of certain families and the medical attention they receive:

Family income	*Percent of family members who received no medical attention during the year*
Under $1,200	47
$1,200 to $2,999	40
$3,000 to $4,999	33
$5,000 to $9,999	24
$10,000 and over	14

Conclusion: Members of families with small incomes are healthier than members of families with large incomes. Which of the following assumptions would be necessary to justify this conclusion?

- Wealthy families had more money to spend for medical care.
- All members of families who needed medical attention received it.
- Many members of families with low incomes were not able to pay their doctor bills.
- Members of families with low incomes often did not receive medical attention.

Activities

Construct circle graphs with the given data. Analyze the given facts. Study the relationship of ideas represented by the facts and decide which of the assumptions justifies the conclusion.

Evaluation and Summary

Through analyzing the facts known in a situation, additional facts can be learned and organization of the data can be perceived.

Independent Study Assignments

Analyze additional problems with assumptions prepared by the teacher. Make graphs of different types to illustrate known data.

Summary and Transition

Knowledge and application of graphic representations are useful in learning data and perceiving relationships.

Synthesize learnings by making individual graphs based on unique information that leads to the deduction of propositions and relationships.

RELATED ACTIVITIES

Pupil Assignments

- Practice graphing number sentences with one and two variables. Plot numbers after referring to pages 107 through 116 of *Modern Mathematics.*
- Study circles, lines, and angles in *Fun with Figures.*
- Study the similarity between a multiplication table and a graph in *The New Mathematics,* pages 21 through 24.
- Study graphs and gravity by reading *The Wonderful World of Mathematics.*
- Study practical uses of graphs, diagrams, and maps as described in the book, *Industrial Arts Drawing.*
- Strengthen understanding of sets for use in equations and graphs by working in *Mathematics Enrichment:* Programs A, B, and C.
- Discover the relationship of scales, angles, and lines to graphs. Report on their use in mechanical drawing, as described in *An Introduction to Mechanical Drawing.*

Synthesis

Specific Purpose

To synthesize learnings of graphic representation by making individual graphs based on unique information that leads to the deduction of propositions and relationships.

Content

In addition to all previously learned content related to graphic representation, the pupils need information, insights, and experiences to broaden and deepen their learnings.

Anthropologists use graphs to record data regarding people of the past. Archaeologists and historians use them in compiling historical records. Geologists and geographers use them in studying changes of climate, the rise and fall of the seas, the movement of glaciers, the advance or decline of moisture in deserts, the rate of rock formation, and the rate of ground-water deposits. Physicists and chemists use graphs to record experimental data. Sociologists working in public assistance and counseling and guidance also make use of them. Psychologists utilize them in statistical analyses of measurement and testing. Economists use them in analyzing and reporting data on financial trends and in preparing hypotheses on future conditions.

PROCEDURE

Motivation

Pupils are motivated by their resolution to use graphs in solving a problem that is based on new knowledge and that allows for discovery of generalizations from symbolic representations.

Guiding Questions

What fictional situation will you create? What resource books will you use? How will you tabulate your new information? On what basis will you make your predictions?

Activity

Pupils identify an area of unique interest; then they locate resource material, gather information, organize data, analyze tabulations, graph information, formulate hypotheses, and modify hypotheses based on changed conditions.

Evaluation and Summary

Graphic presentation of information aids analysis and application of data in situations requiring solution or prediction.

Independent Study Assignments

Practice the process of synthesis by doing problems assigned by the teacher. For example, assume that several authorities were asked to participate in a round-table discussion of juvenile delinquency. They were given the following data for City X and for communities A, B, and C within City X:

Juvenile delinquency rate (annual arrests per 100 persons aged five through nineteen):

City X as a whole	4.24
Community A	18.1
Community B	1.3
Community C	4.1

Average monthly rental:

City X as a whole	$60
Community A	42
Community B	100
Community C	72

Infant death rate (per 1,000 births):

City X as a whole	52.3
Community A	76.0
Community B	32.1
Community C	56.7

Birth rate (per 1,000 inhabitants):

City X as a whole	15.5
Community A	16.7
Community B	10.1
Community C	15.4

How would you explain the differences in these juvenile delinquency rates in the light of the foregoing data? What proposals would you make for reducing the juvenile delinquency rate in each of the three communities?

Summary and Transition

Knowledge of graphic representation is useful in understanding data and perceiving relationships. Resolve to synthesize learning by making individual graphs based on unique information that leads to the deduction of propositions and relationships.

Evaluation

Specific Purposes

To judge the value of the graphic method of organizing data by recalling the accuracy of reporting facts graphically in other lessons.

To judge the graphic method of presentation in relation to other ways of reporting data.

Content

All previously learned content related to graphic representation is included or implied.

Political scientists record graphically what people think by using public opinion polls, samplings, and surveys. Political scientists also study the development of nations and traditional political systems.

Cultural anthropologists study human beings as members of society. They analyze family cultures and nations in their search for patterns and proposals to improve world conditions.

Demographers work with political scientists to study population pressures and world resources. Graphs are useful in recording the research of these social scientists.

A graph is a mathematical device offering the following advantages: a quick visual reference; a picture of otherwise detailed, involved relationships by representations of numerical data on scales; the vivid impact of information; and a rational analysis of data.

Some disadvantages to the use of graphs follow: possible misinterpretations; large inaccuracies due to small errors in calculations; and deliberate altering of scales to give a false picture – for example, to promote propaganda.

PROCEDURE

Motivation

Extensive experience with graphs leads pupils to want to evaluate them.

Guiding Questions

What is the main advantage of organizing data? How do you decide whether to use a line graph or a bar graph to present data? How does graphing aid in problem solving? What difficulty might you have in making a pictograph that you would not have in making a line or bar graph?

Compare the types of graphs and their usefulness in relation to specific purposes. Compare graphs to an outline method of gathering data. Which is more useful? When?

Activity

Under the guidance of the teacher, discuss the value of the graphic method of representing data.

Evaluation and Summary

Graphing is a useful method of organizing data.

Independent Study Assignment

Solve problems such as the following:

A housing concern made some experiments on methods of heating houses. A room was constructed with walls that could be heated or refrigerated at the same time that air of any temperature was being circulated through the room. Several individuals were asked to record their sensations as the conditions were varied.

Trial	Wall temperature	Air temperature	Sensations
	(°F.)	(°F.)	
1	85	85	Uncomfortably hot
2	85	50	Uncomfortably hot
3	70	85	Comfortable
4	70	70	Comfortable
5	70	50	Comfortable
6	50	50	Very cold
7	50	70	Uncomfortably cold
8	50	85	Cold

How do you explain a person's sensation of "coldness" in a room where the air temperature is 85° F. and the wall temperature is 50° F.? Consider the following:

- Make all the suggestions that you can to explain why a person is cold in a room where the wall temperature is 50° F. Give reasons why you believe each suggestion will explain the phenomenon.
- What kinds of evidence would you want to collect upon which to evaluate your suggested hypotheses?
- Analyze the suggestions that you have made and select the one you believe to be the best explanation. Give your reasons for your selection.

Summary

A graph is a pictorial expression of a particular topic. A graph indicates the pairing of the elements of one set with the elements of another set. The correspondence is shown in all graphs, which organize data to present a compact picture that is useful for applying mathematical abstractions, analyzing facts to perceive relationships, synthesizing information to generate hypotheses, and evaluating propositions to solve problems.

DAILY LESSON PLANS FOR DEVELOPMENT OF THE SCIENTIFIC APPROACH

The following pages present daily lesson plans used in the Los Angeles Enrichment Demonstration Center to develop scientific attitudes. The classroom environment in which each lesson was conducted is described in each example.

The practical application of the *Taxonomy of Educational Objectives: The Classification of Educational Goals – Handbook I: Cognitive Domain* to each lesson plan follows each outline. The *Taxonomy* is discussed in Chapter II.

Lesson Plan I – Social Science

GRADE LEVELS: First and second
AGE LEVELS: Six, seven, and eight

Specific Purposes

To illustrate information previously gained regarding different temperatures of milk by constructing a bar graph.

To develop a scientific approach through the problem-solving process.

Background

The children have analyzed, synthesized, and evaluated the use of graphs to show relationships and comparisons. They have gathered information from studying the dairy farm in a social science unit.

Materials

Charted large graph paper, construction paper, masking tape, scissors, chalkboard, chalk.

PROCEDURE

Motivation

A bar graph on which the temperatures of milk are plotted motivates the children to record known information mathematically.

Guiding Questions

Why is milk delivered to your house cold? Do you think milk is kept at this temperature all the time? At what temperatures did we find milk during processing? – In the cow? In the tank truck? In the pasteurizer? In the bottle? (Write temperatures on the board as children say them.)

We have been recording our arithmetic and spelling scores every week. What have we done? How can we show these temperatures of milk in a similar way? (Put up a large piece of graph paper; have construction strips ready.) How shall we label the axis?

Activity

The children label the graph. The teacher provides strips of construction paper and asks, "How can we use these strips?" The pupils place strips on the graph according to the temperatures to be plotted.

Evaluation and Summary

The children state their observations on the rise and fall of milk temperatures from the cow to the milk bottle. They explain why the graph gives them a quick picture of the differences in temperature. Other groups of children work independently at different learning centers. One group will be working from a taped lesson on geometric shapes. A second group will be working at the viewing center with slides related to geometric shapes in art. A third group will be at the mathematics-art center identifying pictures with geometric shapes and manipulating geometric figures.

Independent Study Assignments

The children's independent work is to prepare a bar graph based on ages at which children like to play various games.

RELATED ACTIVITIES

Independent Project

The teacher introduces additional mathematics enrichment material to the children for independent work at the mathematics center. This material is related to the children's study of artists' use of mathematics and to work that is in progress at the mathematics- and art-correlated learning center. Books include *An Adventure in Geometry,* Anthony Ravielli; *The Meaning and Wonder of Art,* Fred Gettings; *Fun with Figures,* Mae and Ira Freeman; *The Giant Golden Book of Mathematics,* Irving Adler; *Pencil, Pen, and Brush,* Harvey Weiss; *The Story of Numbers,* Patricia Lauber; *Arithmetic Can Be Fun,* Munro Leaf; and *The Wing on a Flea,* Ed Emberley. The teacher also introduces a new art print – "The Church," by Lyonel Feininger – which is related to artists' use of geometry.

PRACTICAL APPLICATION OF
TAXONOMY OF EDUCATIONAL OBJECTIVES

Knowledge

The children know specific facts about graphs and have learned about social science from the dairy farm.

Comprehension

The children understand the relationship of one bar to another and the total meaning of the bar graph. They understand reasons for the varying temperatures of milk.

Application

The children will apply knowledge of graph construction to facts learned in social science.

Analysis

The children will critically examine bar graphs during future lessons before analyzing the organizational principles of graphing.

Synthesis

The children will learn later to deal with abstract relations of graphs and their data to predict solutions to problems based on those data.

Evaluation

The children will learn to interpret graphs effectively, judge their excellence, analyze their effectiveness, and compare and contrast the values of different kinds of graphs.

CLASSROOM ENVIRONMENT

The classroom in which this lesson was taught included the following learning centers:

Correlated Mathematics and Art Center

Diagram that shows the ratio at which a dimension will decrease as it is projected toward the vanishing point.

Art prints (e.g., "Sight of a Village," by Lyonel Feininger, with overlay showing geometric shapes), photographs, mathematics books, art books, geometrical shapes. Viewing center (slides of art prints with mathematical emphases).

Literature Center

Collection of single-copy books of fairy tales (e.g., *The Coconut Thieves*, Catharine Fournier; *Goose Girl,* Marguerite de Angeli; and *Pulcinella,* Rose Laura Mincieli). Chart of criteria of the literary category of fairy tales.

Music Center

Record player and earphones, collection of records, musical instruments. Question for study: What are the

names and values of these notes? Chart of scale and notation; music theme charts (e.g., theme from "Little White Donkey," *Adventures in Music*, grade two).

Language Arts Center

Handwriting chart, spelling file, word file boxes, dictionaries. Children's stories related to social science; reference books (e.g., *The First Book of Words*); Spelling Study Kit (Science Research Associates).

Social Science Center

Reference charts, informational pictures on bulletin board, construction work, picture file, reference books, globe.

Science Center

Chart of recent scientific problem-solving experiences: How do seeds grow? Which way will the roots grow? What do seeds need?

Recent experiments to observe and manipulate. Science textbooks. New science problem: How does a thermos keep liquids hot or cold? Science books (e.g., *Prove It*, Rose Wyler and Gerald Ames).

Lesson Plan II – Social Science

GRADE LEVELS: Third and fourth
AGE LEVELS: Seven, eight, and nine

Specific Purposes

To synthesize research related to a study of the following social science problem: Why did settlers come to California's Central Valley? Why was their feeling about this area different from that of the early Spanish settlers?

To synthesize pertinent current news articles as contributions to the class discussion period that follows the reference reading time.

Background

The children have studied California history and geography. They know about the Indian, rancho, and mission periods of California history. They have studied the life and work of the trappers in relation to California history. They have learned that although the Spanish settlers did not settle in the Central Valley, many other settlers did come to this area. Some children have done individual work related to the problem to be solved, using periodicals for data.

Materials

Tape recorder, projector, and filmstrip. Teacher-prepared informational material. Books and periodicals: *California Yesterdays*, I. Richards; *Early California*, I. Richards; "Opinion Section," *Los Angeles Times*, January 10, 1965; *Saturday Review*, January 9, 1965; *Life*, January 8, 1965; *California Homes*, Winter, 1965; *Holiday*, February, 1965; *Westways*, January, 1965, November, 1964, and October, 1964; *Desert*, January, 1965; *Los Angeles*, January, 1965; *Friends*, December, 1964.

PROCEDURE

Motivation

The children recall the social science problem started by the group during its last reference period. Using a map of California, the pupils state hypotheses as to why settlers came to the Central Valley, even though the Spanish settlers did not.

Guiding Questions

Why did settlers come to California's Central Valley area? Why did they feel differently about this area than did the early Spanish settlers?

Activities

The class recalls the problem. An individual states it for the teacher to record on the chalkboard. The class hypothesizes possible answers to the question and then begins its multitext reference work. Some children read teacher-prepared material, periodicals, or books; some view filmstrips; some listen to tapes; and some work with the teacher to synthesize individualized efforts.

Evaluation and Summary

The pupils discuss information gained from references and other media. They summarize the favorable and unfavorable conditions created by climate, land formations, materials available for tools, and the nature of the population.

Independent Study Assignment

The children use their geography books for a detailed comparison of the climate and soil conditions in various regions of California.

RELATED ACTIVITY

Independent Project

The teacher introduces for individual reading the December, 1964, edition of *American Heritage* containing the article, "Golden Days in California."

PRACTICAL APPLICATION OF
TAXONOMY OF EDUCATIONAL OBJECTIVES

Knowledge

The class knows about the settlement of California, and they have learned about the geographical regions of the state.

Comprehension

The class understands the importance of the historical and geographical influences on California's past and present.

Application

The class has applied its knowledge of the history and geography of California to current social science problems.

Analysis

The class has analyzed the relationship of California's history to its geography.

Synthesis

The class will derive proposals from its varied reference material.

Evaluation

The class will evaluate its proposals in a group discussion.

CLASSROOM ENVIRONMENT

This classroom environment included the following learning centers:

Correlated Music, Science, and Mathematics Center

Diagrams of the Pythagorean theorem related to mathematics, music, and science. Art prints: "The Old Refrain," Harnett; "The Yellow Violin," Dufy; "Musical Forms," Braque. Bell Telephone Laboratories' experimental equipment on acoustics; informational recording, "Science of Sound"; suggested science experiments related to sound; science books on acoustics (book sets and single copies). Record player, earphones, headsets, connector box; music books; tuning forks.

Mathematics Center

Mathematics books (e.g., ***The Giant Golden Book of Mathematics, The Meaning and Wonder of Art***). Problem-solving question: "How are mathematics and art related?" Mathematical diagrams, geometric designs, geometric mobiles. Individual work for written follow-up.

Literature Center

Collection of animal stories; chart of the criteria of the literary category of animal stories.

Art Center

Art print (still life): "Pommes et Oranges," Paul Cézanne; collection of California flower prints; file of still-life prints; collection of slides of still-life paintings; viewlex projector; still-life tapestry work; biographies of artists and books on art.

Social Science Center

Social science informational file; textbooks and reference books; bibliography chart. Art prints: "Ranch Scene," Brayer; "Home on the Desert," Dixon; "Rancheria," Hurd.

Lesson Plan III –
Social Science, Reading, and Logic

GRADE LEVELS: Fifth and sixth
AGE LEVELS: Ten, eleven, and twelve

Specific Purposes

To summarize in a group discussion the current problems related to a study of India.

To recall in discussion the development of politics, economics, and culture in India; to discuss likely solutions to current Indian problems; to discuss reactions to political, economic, and cultural problems by formulating an original prognosis.

To evaluate sources of information in relation to denotation and connotation; to evaluate prognosis in relation to logical thought.

Background

The children have summarized numerous articles from periodicals related to India's current problems in the areas

of religion, health, politics, economics, and culture. They have background information on the history and geography of India.

The children know that sensitivity to connotation is essential to profitable reading, since words may produce an emotional reaction. They know that personal connotations result from the experience of the individual and that general connotations result from the common reactions of most people to a specific word. In analyzing propaganda, the pupils have collected some current examples of good and bad propaganda; they have analyzed written accounts and have discovered oversimplification, misunderstanding, and handed-down prejudice. They have concluded that much of the intolerance and bias that trouble modern society are based on stereotypes, which fact discourages rational reactions and open-mindedness in forming opinions.

The children have often reasoned inductively and deductively. They have used the Venn diagrams in logic to aid in introducing simple deductive arguments. They have worked with valid and invalid arguments and with tautologies; and they have tested the validity of arguments.

Materials

Current periodicals related to problems of India. Wall maps of the world: "Cereal Crops," "Density of Population," "Coal, Iron Ore, and Copper," Finch World Products Series. Globe, atlas, encyclopedias, geography textbooks, teacher-prepared materials; projector; slides of art prints of East Indian artists.

PROCEDURE

Motivation

Children's interest in current problems of India arises from their study of the history, politics, economics, and culture of the country.

Guiding Questions

What are the current problems in India? What is your source of information? What is your solution to the problem? What are other possible solutions to these problems in India? What original prognosis for the future can we make from what we know? Is this prognosis logical?

What personal or general connotations were evident in the periodicals that you read? Did you notice any oversimplification, misunderstanding, or prejudice in those articles? Is that argument valid? Why? Is that prognosis logical? Why? Is that a reasonable deduction?

Activities

The children discuss current problems related to the history, politics, economics, and culture of India. They propose solutions and formulate a prognosis for the future of India. They examine the logic of the prognosis and analyze the reasoning involved.

Evaluation and Summary

The pupils judge the reliability of their periodical reading and summarize the factual information related to India. They judge the reasonableness of their own solutions and their prognosis for the future of the country.

Independent Study Assignments

The teacher directs the children to learn more about the way in which people of India view the West. The teacher asks the children to read "Gandhi Looks at the West," by Mohandas K. Gandhi, and "Nehru Looks at the West," by Waldemar Kaempffert, in *Readings in World History,* edited by Leften S. Stavrianos and others.

RELATED ACTIVITIES

Independent Project

The pupils analyze slides of the art of India to determine the cultural influence of society on the work of the artists.

PRACTICAL APPLICATION OF *TAXONOMY OF EDUCATIONAL OBJECTIVES*

Knowledge

The pupils have acquired a considerable amount of information on the history, geography, politics, economics, and culture of India.

Comprehension

The pupils understand the significance of social science problems in relation to their current study of India.

Application

The pupils have applied their knowledge to current problems in India.

Analysis

The pupils have seen the relationship of the various social science problems and have followed organizational principles for solutions to current problems in India.

Synthesis

The pupils will formulate a prognosis for the future of India.

Evaluation

The pupils will judge their prognosis for the future and their processes of reasoning according to the rules of logic. They will evaluate their sources in relation to connotation.

CLASSROOM ENVIRONMENT

This classroom provided the following learning centers:

Correlated Art and Music Center
(Emphasis on painting and music of the Renaissance)

Art books (e.g., on the high Renaissance – Leonardo da Vinci, Raphael, Michelangelo); laminated art prints of Renaissance paintings, large art prints (e.g., those of Botticelli); art slides – prints of outstanding works of the masters; projector and screen. History books (e.g., *Your World Past*); Los Angeles Unified School District's publications of *Artists' Biographies.* Pictures of musical instruments of the Renaissance period (e.g., lute, oliphant, recorder). Independent music-listening activities; for example, recordings of Renaissance period music: "Jacobean Consort Music," Jacobean Ensemble, London; "Italian Music in the Age of Exploration," Fleetwood Singers, Lyrichord; "A Treasury of Music of the Renaissance," Elektra.

Science Center

Experimentation area (crystal building, magnetism, and electricity). Matter and energy kit, earth's crust kit; science books (textbooks and single copies of reference books).

Mathematics Center

Books on logic, logic problems for independent study, and exploring mathematics. Geometry filmstrips; projector and screen. Three-dimensional geometric shapes; mathematics textbooks and reference books; mathematical games, chess games.

Mathematical and Astronomical Geography Center

Terrestial and celestial maps; globe; map projections of different types; map and globe kit for independent work. Problem-solving question: "How do you find a position on the earth's surface?" Geography and astronomy books. Independent projects on geography, astronomy, and mathematical geography.

Social Science Center

Child's painting of India; social science books (e.g., *Readings in World History*); periodicals, atlas, art slides of India, slide viewer, world maps. Individual work related to the following problem: "Compare phases of the culture of India with those of the cultures of Mexico and the United States."

Language Arts Center

Diction center: recording of Edward Teller's "Conquest of Space" (to be analyzed in terms of qualities of diction); tape recorder to record and analyze pupils' own voices.

Literature center: collection of historical fiction; chart of criteria of historical fiction; mimeographed material on evaluating historical fiction – for independent study.

Reference library: programmed material for organizational skills; resource file.

Selected References

Art Books and Portfolios

Bouleau, Charles. *The Painter's Secret Geometry: A Study of Composition Art.* New York: Harcourt, Brace & World, Inc., 1963.

Canaday, John. *Composition: Pictures as Structures.* Metropolitan Seminars in Art. New York: Metropolitan Museum of Art, 1958.

Chase, Alice Elizabeth. *Famous Paintings: An Introduction to Art for Young People.* New York: Platt & Munk Co., Inc., 1951.

Craven, Thomas. *The Rainbow Book of Art.* Cleveland, Ohio: World Publishing Co., 1956.

Moore, Lamont. *The First Book of Architecture.* New York: Franklin Watts, Inc., 1961.

Field Trips

It's Worth a Visit. Catalog of School Journeys for Elementary Grades. Publication No. EC-146. Los Angeles: Los Angeles Unified School District, Audio-Visual Section, Division of Instructional Services, 1960.

Filmstrips

"Definitions and Key Words"; "Deductive Reasoning"; "Induction, Analysis, and Indirect Reasoning"; "Mistakes in Thinking." Curriculum Films, 1947. *Audio-Visual Materials, Secondary Grades.* Los Angeles: Los Angeles Unified School District, Audio-Visual Section, Division of Instructional Services, 1961.

Graphs. Set 1: "Graph Uses"; Set 2: "Plotting Graphs." The Jam Handy Organization, 1944. *Audio-Visual Materials, Secondary Grades.* Los Angeles: Los Angeles Unified School District, Audio-Visual Section, Division of Instructional Services, 1961.

Mathematics Books

Adler, Irving. *The New Mathematics.* New York: New American Library, Inc., 1960.

Asimov, Isaac. *Realm of Numbers.* Boston: Houghton Mifflin Co., 1959.

Bergamini, David. *Mathematics.* LIFE SCIENCE LIBRARY SERIES. Morristown, N.J.: Silver Burdett Company, 1963.

Brueckner, Leo J., and Others. *The New Exploring Numbers.* New York: Holt, Rinehart & Winston, Inc., 1957.

Brueckner, Leo J., and Others. *The New Understanding Numbers.* New York: Holt, Rinehart & Winston, Inc., 1957.

Davis, Robert B. *Discovery in Mathematics.* Reading, Mass.: Addison-Wesley Publishing Co., Inc., 1964.

Freeman, Mae, and Ira Freeman. *Fun with Figures.* New York: Random House, Inc., 1946.

Glazener, Everett R., and Coly Clark. *Industrial Arts Drawing.* Austin, Tex.: Steck-Vaughn Co., 1963.

Gundlach, Bernard H. *The Laidlaw Glossary of Arithmetical-Mathematical Terms.* River Forest, Ill.: Laidlaw Brothers, 1961.

Harman, Earl W. *An Introduction to Mechanical Drawing.* Boston: Allyn & Bacon, Inc., 1963.

Hogben, Lancelot. *The Wonderful World of Mathematics.* Garden City, N.Y.: Garden City Books, 1955.

Marks, John L., and Others. *Enlarging Mathematical Ideas.* Boston: Ginn & Company, 1961.

Marks, John L., and Others. *Extending Mathematical Ideas.* Boston: Ginn & Company, 1961.

Morton, Robert Lee, and Others. *Modern Arithmetic Through Discovery.* Books 4, 5, and 6 for grades four, five, and six, respectively. CALIFORNIA STATE SERIES. Morristown, N.J.: Silver Burdett Company, 1963.

Neely, Henry. *Triangles; Getting Ready for Trigonometry.* New York: Thomas Y. Crowell Company, 1962.

Ruchlis, Hyman, and Jack Engelhardt. *The Story of Mathematics: Geometry for the Young Scientist.* Irvington-on-Hudson, N.Y.: Harvey House, Inc., Publishers, 1958.

Spooner, George, and Others. *Mathematics Enrichment.* Program A (1962); Program B (1962); Program C (1963). New York: Harcourt, Brace & World, Inc.

Underwood, Benton, and Others. *Alternate Workbook to Accompany Elementary Statistics.* New York: Appleton-Century-Crofts, 1954.

Underwood, Benton, and Others. *Elementary Statistics.* New York: Appleton-Century-Crofts, 1954.

Watson, Jane W. *The World of Science: Scientists at Work Today in Many Challenging Fields.* New York: Simon and Schuster, Inc., 1958.

Williams, S.M., and Others. *Modern Mathematics in the Elementary and Junior High School* (Second edition). Syracuse, N.Y.: L. W. Singer Company, Inc., 1965.

Music Recording and Book

Instruments of the Orchestra. Album, E.M.I. Records, Ltd.: HMV, mono 7 eg 8672-5; stereo GES 5820-3. Accompanying book, *Instruments of the Orchestra,* by John Hosier. Toronto: Oxford University Press, 1961.

Reference Books

Britannica Junior Encyclopaedia. 15 vols. Chicago: Encyclopaedia Britannica, Inc., 1967.

Compton's Pictured Encyclopedia and Fact-Index. 15 vols. Chicago: F. E. Compton Co., 1967.

Comstock, Anna. *Handbook of Nature-Study.* (Twenty-fourth edition). Ithaca, N.Y.: Comstock Publishing Associates, 1939.

Debenham, Frank. *The Global Atlas: A New View of the World from Space.* New York: Simon and Schuster, Inc., 1958.

Goode, John. *World Atlas; Physical, Political, and Economic* (Tenth edition). Chicago: Rand McNally & Co., 1957.

Hechtlinger, Adelaide. *Modern Science Dictionary for the Space Age.* Indianapolis, Ind.: Bobbs-Merrill Company, Inc., 1959.

Janson, Horst, and Dora Janson. *The Story of Painting for Young People: From Cave Painting to Modern Times.* New York: Harry N. Abrams, Inc., 1952.

Tannenbaum, Beulah, and Myra Stillman. *Understanding Maps: Charting the Land, Sea, and Sky.* New York: McGraw-Hill Book Company, 1957.

World Series Encyclopedia. Edited by Don Schiffer. Camden, N.J.: Thomas Nelson & Sons, 1961.

Science Books, Magazines, Maps

Beiser, Arthur, and the Editors of *Life. The Earth.* New York: Time, Inc., 1962.

Bergamini, David, and the Editors of *Life. The Universe.* New York: Time, Inc., 1962.

Branley, Franklyn M. *Reader's Digest Science Reader,* Red Book. Pleasantville, N.Y.: Reader's Digest Services, Inc., Educational Div., 1962.

Bush-Brown, Louise. *America's Garden Book* (New revised edition). New York: Charles Scribner's Sons, 1958.

De Santillana, Giorgio. *The Origins of Scientific Thought.* Chicago: University of Chicago Press, 1961.

Dryden, Hugh, "Footprints on the Moon," *National Geographic Magazine,*CXXV (March, 1964), 357-401.

Hoyle, Fred. *The Nature of the Universe.* New York: New American Library, Inc., 1962.

Oddo, Nick. *Exploring Balance.* Vol. 1, Science Kit. New York: Holt, Rinehart & Winston, Inc., 1964.

Space Launch Vehicles. No. NF 8. NASA FACTS. Washington, D. C.: U. S. National Aeronautics and Space Administration, 1967.

Turner, Dorothy. *The Book of Scientific Discovery: How Science Has Aided Human Welfare.* New York: Barnes & Noble, Inc., 1961.

Verne, Jules. *From the Earth to the Moon and Round the Moon.* New York: Dodd, Mead & Company, 1962.

What Is Science? Edited by James Newman. New York: Washington Square Press, Inc., 1961 (paperback).

Wilkins, Hugh Percival. *The Prentice-Hall Book About the Stars.* New York: Prentice-Hall, Inc., 1955.

Social Science Books

Huntington, Ellsworth. *Mainsprings of Civilization.* New York: John Wiley & Sons, Inc., 1945.

Readings in World History. Edited by Leften S. Stavrianos and Others. Boston: Allyn & Bacon, Inc., 1962.

Watson, Jane. *The Sciences of Mankind: Social Scientists at Work Today in Many Challenging Fields.* New York: Golden Press Inc., 1960.

Sound Motion Pictures

High Temperature Materials. No. HQ4. Moffett Field, Calif.: National Aeronautics and Space Administration, Ames Research Center Technical Library, 1965.

The Story of Our Money System. 11 min., color. *Fifth and Sixth Grades Audio-Visual Materials.* Publication No. EC-211 (with teacher's guide). Los Angeles: Los Angeles Unified School District, Division of Instructional Services, 1962. (Distributed by Coronet Films.)

The Story of Weights and Measures. 10 min., color and black and white. *Fifth and Sixth Grade Audio-Visual Materials.* Publication No. EC-211 (with teacher's guide). Los Angeles: Los Angeles Unified School District, Division of Instructional Services, 1962. (Distributed by Coronet Films.)

The True Story of an Election. Color and black and white. Part I, 30 min.; Part II, 26 min. Los Angeles: Churchill Films. (Kit includes teacher's handbook.)

Part Four
Program Evaluation

Chapter XV
Overview and Summary

In allocating funds for California Project Talent, the Cooperative Research Branch of the federal Office of Education stipulated that the Enrichment Demonstration Center in Los Angeles, like the other centers for the gifted funded under the California project, should stimulate improvements in educational programs for intellectually superior pupils. (8)[1] To aid in assessing the accomplishments of the Los Angeles center, approximately 3,000 questionnaires were submitted to educators, including administrators, supervisors, teachers, and college professors, and to industrialists and other lay persons. Their responses to the queries on the enrichment program indicated that the staff of the Los Angeles Demonstration Center had realized its objectives in enriching the course work of gifted pupils.

PROJECT TALENT CONTRACT SPECIFICATIONS

The contract for California Project Talent specified that an enrichment program for gifted children should be (a) developed at the Los Angeles Demonstration Center; (b) presented at teacher training sessions; (c) reported in a publication; (d) demonstrated in the classroom; and (e) disseminated through meetings, workshops, a filmstrip, and a film series. (7) Itself a requirement in fulfilling that contract, the present volume describes how those specifications were met at the Los Angeles center in the main content of its enrichment program as well as in its companion program for teacher training. The demonstration center staff arranged for 125 different observation periods for about 3,000 visitors to view classes in progress. Innumerable other persons attended conferences and workshops where the enrichment activities of the Los Angeles center were described and illustrated with a color filmstrip accompanied by a phonograph record and guide (4), or with filmed observation lessons. (3)

CITY AND STATE CRITERIA

The enrichment standards established at the California State Department of Education follow: (a) extra educational activities to meet special interests and abilities of the gifted in addition to the regular courses of study; (b) use of advanced materials accessible within the school building or classroom to generate ideas and hypotheses; and (c) provision of special help to pupils directly and indirectly from resource persons. (2) Specialists working in the classroom rendered pupils direct assistance as needed; other specialists worked regularly, albeit indirectly, with classes through the inservice training program.

This publication delineates the enrichment program superimposed on the regular curriculum and indicates the instructional materials used in the Los Angeles center. The document begins with an operational definition of enrichment prepared by committee members working on programs for the gifted in the Los Angeles Unified School District. (See Chapter I.) In accordance with that definition, the demonstration center staff provided classroom environments conducive to original pupil explorations. Together with the Project Talent filmstrip and guide, the descriptions, photographs, and other elements contained herein graphically portray the provisions for individual differences afforded in the classrooms. Curricular materials were illustrated in the filmed observation lessons and have been listed in the course outlines presented in the preceding three chapters of this report. Those chapters and the film series indicate the depth and scope of learning opportunities provided in the study units for developing the gifted pupils' abilities to solve problems and to think creatively, logically, and reflectively.

RATIONALE OF CURRICULUM DEVELOPMENT

Underlying the enriched curriculums were the following factors: (a) subject content; (b) data sources; (c) objectives regarding levels of content and desired behavior; (d) cumulative information procured on the pupils; (e) levels of difficulty and logical sequence of learning opportunities; and (f) evaluation of the program in terms of a general diagnosis of strengths and weaknesses in groups of pupils, analyses of individual learners, clarification and redefinition of objectives, pupil achievement, learning stimuli, growth of teachers, morale of staff, and assessment of educational hypotheses.

[1] Numbers in parentheses refer to entries in the list of "Selected References" at the end of this chapter.

QUERIES TO EDUCATORS AND TO PARENTS

The evaluation of the work performed at the enrichment center also included the appraisals, both solicited and unsolicited, from educators who participated in the enrichment program and from parents of gifted pupils enrolled at the center.

School administrators and supervisors were asked the following questions:

- Has participation in Project Talent stimulated the adoption of enrichment in the local school?
- Have pupils evinced an increase in educational achievement?
- Has the elementary school adopted any of the lessons and guides produced for the enrichment project?
- Has the local staff increased its awareness of the educational needs of gifted pupils?
- Would you recommend continuing the project?

Teachers answered the following questions:

- Have you improved your instructional techniques as a result of participating in the inservice workshops?
- Have you engaged in more reading or studying about the gifted as a result of your experiences in Project Talent?
- Have other teachers sought your advice about teaching gifted pupils effectively?
- Did this project help you to discover and develop pupils' abilities?
- Would you recommend continuing the project?
- What comments and suggestions do you have?

Parents responded to three questions:

- Have personal contacts with the Project Talent staff contributed to your understanding?
- Has your child been more enthusiastic about his school work since attending enriched classes?
- Would you recommend continuing the project?

Nearly all the responses to the various questionnaires were positive and enthusiastic. Some parents expressed concern regarding the possibility implied by one of the questions that the program might terminate in their schools after the grant from the Cooperative Research Branch had been expended. Administrators and supervisors wished to continue the inservice training program and stressed the need for further preparation of teachers in the content areas related to enrichment. Teachers requested continuance of their training classes to consolidate the gains they had realized in their professional skills.

Many unsolicited letters indicated interest in obtaining information about the program and the techniques and materials used in enrichment. Other correspondence pertained to classroom observations at the center, to presentations by the project staff, and to the proven effectiveness of the program.

APPRAISALS OF BEHAVIORAL CHANGES

The evaluation of the enrichment program involved assessing changes in the pupils' intellectual behavior and in the teachers' ability to stimulate the children to think. Evaluators of performance at the center used checklists of data to measure pupil growth in creative writing, critical appreciation, and application of the scientific approach. Teachers also evaluated their own participation with the aid of a check sheet. Copies of these check sheets are included in this chapter.

Use of Films in Evaluating Behavior

Teacher and pupil behavior as evinced in demonstration lessons and in the three series of 14 films also served as a basis for evaluation. (3) Prepared in black and white, the films each portray a separate lesson featuring a discussion of the seminar type, together with a commentary by Mary P. Broderick. Each of the six films comprising Series 1 is devoted to a major class of goals drawn from the *Taxonomy of Educational Objectives* handbook on cognition, edited by Benjamin S. Bloom. (9) Named for those classes of objectives, the film titles in Series 1 are: *Knowledge, Comprehension, Application, Analysis, Synthesis,* and *Evaluation.*

Each of the five films in Series 2 presents a different type of intellectual operation, based on J. P. Guilford's "Structure of Intellect" model as portrayed and discussed in Chapter II of this work. (5) The film titles, corresponding to the type of operation illustrated by the respective film, are the following: *Cognition, Memory, Convergent Thinking, Divergent Thinking,* and *Evaluation.*

Jerome Bruner's discription of learning stages served as the basis for the third series of films focusing on enriched

classes at the center. (1) Named for each of the learning stages represented, the films in Series 3 are called *Acquisition, Transformation,* and *Evaluation.*

Entitled "Development of Scientific Discovery, Methodology, and Investigation Through a Study of Graphic Representation of Statistical Information," the first film series on cognitive goals aided teachers both in specifying learning opportunities and in measuring their effects. The six lessons pictured in that series are founded on the course outlines contained in Chapter XIV of this publication.

The second series of films, "Development of Creative Expression Through a Study of the Literary Element of Characterization," illustrates five lessons applying Guilford's theories to the classroom as presented in Chapter XII of the present work.

Chapter XIII provides the course outline used as a basis for the three films in the third series, entitled "Development of Critical Appreciation Through a Study of the Fundamental Forms of Music," as based on Bruner's educational philosophy.

Each of the 14 films comprising the three series is approximately 28 minutes long; they all record actual classes in session and feature comments by the project consultant; and all are discussed in separate film guides. The three film series are also available on videotape for reproduction on television. The California State Department of Education appointed the Acme Film and Videotape Laboratories (1161 North Highland Avenue, Hollywood, California 90028) to process and distribute the films and videotapes on enrichment. Only mailing charges are made by that firm for preview prints of the films, which may also be rented or purchased.

In collaboration with the Hollywood concern, the Great Plains Instructional Television Library of the University of Nebraska at Lincoln, Nebraska 68508, also distributes the filmed series, together with the *Viewer's Guide.* The Nebraska library will send interested persons a representative filmed lesson and a copy of the *Viewer's Guide* for previewing for one week; the library also sells the films either individually or as a series.

Besides their evaluative functions, the film series also serve to train leaders for subsequent programs; to provide audio-visual aids in university education courses or inservice teacher training; and to acquaint educators and parents with the philosophy, objectives, methodology, and materials of enrichment.

The teacher's level of intellectual behavior in interacting with pupils, guiding discussions, and asking questions determined the pupils' levels of intellectual functioning. The course outlines in chapters XII, XIII, and XIV illustrate the manner in which teachers phrased their queries to correspond to specific levels of intellectual behavior. Lesson plans and course outlines give examples of these leading questions, which are also portrayed in the guides accompanying the filmed observation lessons. The filmed lessons illustrate the use of a seminar type of discussion in assessing the intellectual growth of pupils at the center. The teachers also used written questions to evaluate pupil progress in course content.

The Consultant as an Evaluator

The project consultant evaluated the growth of teachers as well as that of pupils. The consultant assessed the teachers' subjective and objective measurements of the pupils' intellectual development, recorded the intellectual behavior of teachers and pupils, and charted the dimensions of their growth.

EVALUATIVE INSTRUMENTS

The following pages present five evaluative instruments that were used by teachers in the Los Angeles enrichment program.

The first of these, "Diagnostic Information About Cluster Groups," was a work sheet which was used to discover the composition of cluster groups within the classes in the program. The information provided by this sheet aided teachers in promoting their pupils' abilities.

The second instrument, "Checklist for Evaluating the Creative Writing of Pupils," contained criteria suggested by E. Paul Torrance. (10) These were used in evaluating creative expresssion to improve the children's ability to write creatively. The factors in this checklist were evaluated on a continuum, with 0 representing no evidence, 1 indicating a limited degree, 2 designating a considerable degree, and 3 indicating a marked degree of creativity in writing.

The third evaluation tool, "Checklist for Evaluating Critical Appreciation," was based on objectives prepared by David Krathwohl and others in their handbook on the affective domain. (6) The teachers used this check sheet as a guide for measuring pupil progress in the critical appreciation of music, painting, and sculpture. The ratings were made on a continuum, with 0 representing a negligible degree, 1 indicating some, 2 designating considerable, and 3 indicating a marked degree of such appreciation.

The fourth device, "Checklist for Evaluating Application of the Scientific Approach," helped teachers of enriched

classes to evaluate pupil application of the scientific approach. Here again, the factors were rated on a continuum; 0 represented no evidence, 1 indicated some, 2 designated considerable, and 3 indicated a marked degree of ability to apply the scientific attitude.

The fifth instrument, entitled "Checklist for Teachers' Self-Evaluation," was found to be most useful, inasmuch as the teachers in the Enrichment Demonstration Center were continually evaluating their own implementation of enrichment objectives. The factors in this checklist were grouped under headings that indicated three major program areas: lesson planning, classroom environment, and application of theories. In the third area, theoretical knowledge pertained to characteristics of gifted children, levels of intellectual functioning, and levels of subject matter content. As in the evaluative aids described in the foregoing, the factors in this checklist were weighted along a continuum; 0 represented no evidence, 1 indicated some, 2 designated considerable, and 3 indicated a marked degree of implementation.

DIAGNOSTIC INFORMATION ABOUT CLUSTER GROUPS

Room number _____

Teacher _____

Entire class

Age levels _____

Grade levels _____

Cluster group

Number in cluster group _____

Number of pupils verified as gifted _____

Number of pupils to be tested _____

Range of IQ: low _____ high _____

	Stanines	
	Low	High
Achievement scores		
Range of reading comprehension	_____	_____
Range of reading vocabulary	_____	_____
Range of arithmetic fundamentals	_____	_____
Range of arithmetic reasoning	_____	_____
English	_____	_____

Levels of thinking (number of pupils at following levels according to the teacher's observations):

	Understanding of knowledge	Application	Analysis	Synthesis	Divergent Thinking	Evaluation
Reading comprehension	_____	_____	_____	_____	_____	_____
Reading vocabulary	_____	_____	_____	_____	_____	_____
Arithmetic fundamentals	_____	_____	_____	_____	_____	_____
Arithmetic reasoning	_____	_____	_____	_____	_____	_____
Language	_____	_____	_____	_____	_____	_____
Problem solving	_____	_____	_____	_____	_____	_____
Discussion	_____	_____	_____	_____	_____	_____

Number of pupils considered capable of *higher achievement*:

General _____ Specific area _____

Number of pupils having the following *special talents*:

Leadership qualities _____ Music _____

Written expression _____ Sculpture _____

Painting _____ Dance _____

Literature _____ _____

Comments:

CHECKLIST FOR EVALUATING THE CREATIVE WRITING OF PUPILS

	0	1	2	3
Organization				
Balance				
Arrangement				
Consistency				
Conciseness				
Clarity				
Sensitivity				
Stimulus perception				
Association				
Relevancy of idea				
Specificity				
Empathy				
Psychological Insight				
Causal explanation				
Perspective				
Meaningfulness				
Ego-involvement				
Understanding				
Richness				
Expression				
Ideas				
Emotion				
Curiosity				
Fluency				
Originality				
Choice of topic or idea				
Organization				
Style of writing				
Sense of humor				
Picturesqueness				
Vividness and flavor				
Personal element				
Original setting, plot, solution, or ending				
Invented words, names, and so forth				
Conversational tone				
Use of quotations				
Variety in sentence type, length				
Personal touch and naturalness				
Questions and answers				
Feelings of characters				

CHECKLIST FOR EVALUATING CRITICAL APRECIATION

	0	1	2	3
Receiving (attending)				
Awareness				
Willingness to receive				
Controlled or selected attention				
Responding				
Acquiescence in responding				
Willingness to respond				
Satisfaction in response				
Valuing				
Acceptance of a value				
Preference for a value				
Commitment to a value				
Organization				
Conceptualization of a value				
Organization of value system				
Characterization by a value or a value complex				
Generalized				
Characterization				

CHECKLIST FOR EVALUATING APPLICATION OF THE SCIENTIFIC APPROACH

	0	1	2	3
Exploration of existing knowledge				
Identification of the problem				
Definition of the problem				
Statements of hypotheses				
Collection of data				
Organization of data				
Analyses of data				
Elimination of some hypotheses				
Modification of some hypotheses				
Extension of some hypotheses				
Formulation of conclusions				
Rejection, modification, or acceptance of hypotheses by testing				
Communication of results				

CHECKLIST FOR TEACHERS' SELF-EVALUATION

	0	1	2	3
Lesson Planning				
Clear knowledge of purposes, including level of content and intellectual behavior to be observed				
Many experiences with pupils so that they feel free to verbalize and utilize background (example: "When we read . . ., I thought that . . .")				
Provision for each child in the enrichment group to work on one or more individual projects related to the enrichment units				
Use of guiding questions at identified intellectual levels				
Opportunities for children to summarize and generalize				
Follow-up work (independent study) regularly offered				
Introduction of new, related opportunities for work at the learning centers				
Classroom Environment				
Social science center				
Informational pictures (on a bulletin board, in a file box, on a book rack, in a folder)				
Periodical file in upper grades				
Globe				
Long-range, problem-solving question				
Manipulative materials with assignment for independent work				
Realia (objects authentic to unit)				
Textbooks				
Single-copy books				
Construction work and organized materials				
System for independent work storage (folders in file, one large folder, card-file record)				
Science center				
Experimental materials and equipment				
Reports on science experiments				
Single-copy science materials (books, magazines, folders of information)				
Independent work in question form				
Science diagram				
System for organizing children's independent work (folders, files, and the like)				
Music center				
Collection of phonograph records				
Music books				
Music notation (on charts or posters)				
Musical instruments				
Long-range, problem-solving question				
Follow-up for independent study				
Art center				
File of artists' biographies for children who can read them				
Art prints for appreciation				

CHECKLIST FOR TEACHERS' SELF-EVALUATION–Continued

	0	1	2	3
Art center (Continued)				
Manipulative materials				
Organization of art work materials (paints, crayons, clay, brushes, paper, and the like)				
Question related to area of study				
Art books if children can read them				
Independent study questions with system for organizing children's work				
Mathematics center				
Textbooks and single-copy enrichment books				
Problems for independent study				
Manipulative materials (equipment for experimentation or measurement)				
Long-range, problem-solving question				
Language center				
Spelling materials				
Dictionaries and other appropriate reference books				
Typewriter				
Word drill materials				
Independent work on reading skills				
Collections of children's stories				
Environment reminders for teachers:				
Correlate one subject to another.				
Put all captions on the bottom of bulletin board area.				
Block all bulletin boards neatly, using strips of tagboard at ends of captions or pictures.				
Don't paste or tape anything on painted wall area.				
Any mobiles should be arranged in *one* uncrowded area.				
If bulletin board is large, use large picture or diagram.				
Have a variety of bulletin boards: children's work; diagrams (mathematics, science); informational pictures (social sciences); art prints; time lines; maps.				
Use cursive writing consistently (depending on grade level); show signs, labels, captions, writing examples of excellent quality.				
Use envelopes, file cards, or folders for organizing independent work in centers.				
Application of Theories				
Knowledge of specific theoretical structures				
Knowledge of how you have fulfilled the definition of enrichment:				
Learning environment (conducive to exploration and originality)				
Provision for individual differences				
Depth and scope of enrichment experiences				

CHECKLIST FOR TEACHERS' SELF-EVALUATION--Concluded

	0	1	2	3
Knowledge of how you have fulfilled the definition of enrichment: (Continued)				
Opportunities for children to do reflective thinking, problem solving, and critical thinking				
Opportunities for children to be creative				
Knowledge of how you have provided for attributes of the gifted, particularly for the following abilities:				
To work with abstract concepts				
To summarize and generalize				
To learn independently				
To work for an extended time span				
To interrelate learnings				
Appreciation of the fact that although the course of study is basic, "the ceiling is off" for children who are gifted				

SUMMARY

The basic approach to enrichment at the Los Angeles Demonstration Center was to set realistic goals, to take well-researched advice, and to allow sufficient time for results. In implementing the program, the center's faculty emphasized the following factors: (a) a sense of perspective, with alertness to new developments; (b) a regard for human growth; (c) a respect for scholarship and academic learning; and (d) cooperative efforts to meet the pupils' needs.

To promote the maximum development of the gifted children's potentials, the enrichment program afforded wide opportunities for interaction among its faculty and staff members, the pupils, the parents, and other persons of the community. A heightened awareness of the impact of those interactions on classroom learning gave teachers a more meaningful construct of the teaching-learning process – a construct at once more complicated and more helpful than previous models.

The Education Research Consultant to the center focused her attention on establishing the teacher training program; implementing the operational program in the schools; producing filmed observation lessons and a filmstrip with guides; publishing the *Viewer's Guide*; disseminating information on the enrichment center through meetings, workshops, and demonstrations; and preparing this publication. Inherent in the program were continual evaluative procedures, which served to verify the soundness of the many facets of the program and their effectiveness in enabling gifted children to realize their intellectual potentials in selected elementary schools.

Selected References

1. Bruner, Jerome S. *The Process of Education.* Cambridge, Mass.: Harvard University Press, 1960. Also, paperback – New York: Vintage Books, 1963.

2. *Education of Educationally Gifted Pupils in Los Angeles City Schools.* Prepared by the Committee on Education of Intellectually Gifted Pupils. Los Angeles: Los Angeles Unified School District, 1962.

3. ENRICHMENT PROGRAMS FOR INTELLECTUALLY GIFTED STUDENTS. Presented by California Project Talent. Includes 14 films contained in three series. Sound, 28 min. each film. Series 1, "Development of Scientific Discovery, Methodology and Investigation Through a Study of Graphic Representation of Statistical Information," consists of six films based on the work edited by Benjamin Bloom: (1) *Knowledge*; (2) *Comprehension*; (3) *Application*; (4) *Analysis*; (5) *Synthesis*; and (6) *Evaluation*. Series 2, "Development of Creative Expression Through a Study of the Literary Element of Characterization," consists of five films based on the work of J. P. Guilford: (7) *Cognition*; (8) *Memory*; (9) *Convergent Thinking*; (10) *Divergent Thinking*; and (11) *Evaluation*. Series 3, "Development of Critical Appreciation Through a Study of the Fundamental Forms of Music," consists of three films based on the work of Jerome Bruner: (12) *Acquisition*; (13) *Transformation*; and (14) *Evaluation*. Hollywood, Calif.: Acme Film and Videotape Laboratories, 1964. (Also videotaped for use on television.)

4. *Enrichment Programs for Intellectually Gifted Students.* Prepared in cooperation with the U.S. Department of Health, Education, and Welfare, Office of Education, and the California State Department of Education. Presented by California Project Talent. Los Angeles: Los Angeles Unified School District [n.d.]. Filmstrip, color, 73 frames; sound on phonograph record, two sides, 33⅓ rpm LP; and filmstrip guide.

5. Guilford, J.P. "Three Faces of Intellect," *American Psychologist,* XIV (August, 1959), 469-79.

6. Krathwohl, David, and Others. *Taxonomy of Educational Objectives – Handbook II: Affective Domain.* New York: David McKay Co., Inc., 1964.

7. Plowman, Paul D., and Joseph P. Rice, Jr. "Revised Guidelines for Establishing and Evaluating Programs for Mentally Gifted Minors." California Project Talent, Program Administration 1. Prepared in cooperation with the Office of Education, U.S. Department of Health, Education, and Welfare. Sacramento: California State Department of Education, 1964.

8. *Talent: A State's Resource, a State's Responsibility.* Edited by J. Ned Bryan. Washington, D. C.: U. S. Department of Health, Education, and Welfare, 1963.

9. *Taxonomy of Educational Objectives – Handbook I: Cognitive Domain.* Edited by Benjamin S. Bloom. New York: David McKay Co., Inc., 1956.

10. Torrance, E. Paul. *Guiding Creative Talent.* Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1962.

St6-32 (1087) 75138–300 1-69 4,500