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Providing for Individual Differences in the Elementary School Arithmetic Program

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PROVIDING FOR INDIVIDUAL DIFFERENCES IN THE
ELEMENTARY SCHOOL ARITHMETIC PROGRAM

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Jettye Fern Grant

FOR THE GRADUATE FACULTY

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

Undoubtedly one of the most difficult and perplexing problems faced by the arithmetic teacher is how to provide for the wide range of individual differences in the class. The children differ in mental ability, in rate of learning, in levels of mastery of number operations, in readiness for new work, and in interests.

I. THE PROBLEM

Statement of the problem. How can individual differences be provided for in the elementary school arithmetic program?

Importance of the study. It is obvious that if all pupils in the elementary schools are required to follow the same course of study, read the same books, do the same exercises, solve the same problems, and pass the same examinations, there can be little provision for individual differences. It was the purpose of this study to present practices used or usable to provide for individual differences.

II. DEFINITIONS OF TERMS USED

Individual differences. The term "individual

differences" will refer to the differences in the ages of children within a group, in their interests, rate of learning, general ability, physical and social development.

Grouping. For purposes of this study grouping will refer to the division of pupils in a classroom into instructional groups according to one or more of the grouping plans presented in this paper.

Enriched units. The term "enriched units" will refer to units of work planned to take care of individual differences so that all pupils at all levels of ability will be stimulated to do their best work.

Gifted. The term "gifted" means possessing high intellectual ability, with mental age well in advance of the norm and consequently a high I.Q.

Talented. For purposes of this study the term "talented" means capacity and ability in a special field or natural aptitude capable of high functioning under training; it does not necessarily imply a high degree of general intelligence.

Slow learner. The term "slow learner" will refer to an exceptional pupil who thinks, acts, or moves more slowly than most children and who makes slow progress in school.

Experience units. The term "experience units" will refer to a teaching or learning unit, based on real-life situations familiar to the group and demanding the functional application of the techniques of arithmetic--for example, a unit based on buying an automobile or purchasing food for the family, in which judgement is a chief consideration.

CHAPTER II

REVIEW OF THE LITERATURE

The concern about providing for individual differences is not new. About one-hundred years ago scientific studies were started dealing with individual differences. Galton was the first to make a very important contribution to society with his early work on the testing program for discovering individual differences.

I. THE NEED FOR PROVIDING FOR INDIVIDUAL DIFFERENCES

If educators are to do their best job, they must be concerned about the individual pupil. One of our most pressing problems is meeting the wide range of needs which result from individual differences in growth rates, both mentally and physically. An example of this might be the slow student who could easily become a delinquent in a school which does not meet his needs. Where his needs are met and his sense of accomplishment and worth are built up, he can become a respected citizen of the community (8:153).

To be effective, the teacher should know much about his pupils: their needs, interests, levels of mental ability, special aptitudes and talents, and social qualities. Cumulative records will provide much of this information. An inventory test can also help the teacher to know his

pupils better. Check-ups should be given at the beginning of each school year to determine how well the students have remembered the things they have studied in the previous terms. Check-ups or tests of this kind need only be a sampling of the work a student has had. Next, the teacher should give diagnostic tests in each area to determine the student's weaknesses (4:131). Adjustments of the curriculum may have to be made to deal with the problems of providing for individual differences in ability, needs, interests, and levels of development.

Today, differentiation of instruction is recognized as a regular function of the classroom teacher. The teacher must see to it that the experiences of the individual pupil are worthwhile to him and offer a challenge that he has the capacity to meet. About this subject, John R. Clark says:

It is imperative that schools challenge able pupils to discover, to invent, to prize originality and resourcefulness in thinking. The future of a technological culture and the security of our way of life demand high-level education of our superior youth (6:7).

Goodlad and Anderson say this about differentiation:

A fifth grade teacher, in spite of his designation, is not a teacher of fifth grade children. At a given time, he teaches third, fourth, fifth, sixth, seventh, eighth, and even ninth grades, as far as learner abilities are concerned (10:3).

The classroom teacher must be prepared to provide effective motivation and instruction at all these different levels of learning (10:3). Unfortunately some teachers seem still to be in the "Dark Ages" of teaching and follow

a single course of study or a textbook which is uniformly required for all (17:6-7).

In the book Curriculum in the Modern Elementary School, Beck says, "Whenever a school purports to accept all the children of all the people and to meet their individual needs, the curriculum must be developed according to the policies that recognize individual and trait differences" (1:365). This problem can be partially corrected by a more realistic, practical, and life-centered learning program. The facts of child development and a program geared to the needs and nature of the school's community should be considered (8:153).

II. ENRICHED UNITS

A device commonly used to provide for individual differences is the "enriched unit." This is a supplementary unit of work specially designed to increase or extend a concept or skill which is being developed as a part of the regular instructional sequence. The fact that many authors still favor the enriched unit plan is evident when one looks at new arithmetic textbooks. Most of the new books contain some provisions for individual differences, and many of them contain provisions for enriched units. For example, The New Understanding of Numbers, a textbook by Brueckner, Merton, and Grossnickle, has extra enrichment in all units. In the introduction the authors

say, "To enrich instruction many units include starred problems that require discussion, independent study or research" (5:1).

The following plan to provide enriched units seems to be a typical sampling of this school of thought:

1. The use of enriched units provide a wide variety of activities.
2. Problem-solving research, and experimentation should be included.
3. An important part of this plan is to provide constructive activities resulting in intellectual or material products.
4. Appreciation experiences enjoyed by the individual should be provided.
5. Creative activities resulting in original thinking, acting and producing need to be included.
6. Excursions, field trips, and participation in community enterprises are to be encouraged.
7. Opportunities for learning through use and direct experience are desirable (2:82).

Another suggested way to enrich units is to bring in individuals from the community as resource people. A banker, merchant, or bus driver are examples of possible resource people. They could all demonstrate actual situations dealing with their jobs that would help the children to understand some of the practical applications of arithmetic skills and concepts in the business life of the community. The school's problems are the community's problems as well. Human resources can be quite valuable. These experiences

are very meaningful because they involve real people doing real things.

In dealing with enriched units, Cronbach says:

The most enduring and most useful learnings are general understandings, attitudes, and methods of work. These are the responses most likely to be transferred to the new situation, and so they receive continual trial and confirmation which refreshes the knowledge. These sorts of learning endure and, according to some studies, grow even further after instruction has ended (7:403).

Experience units. Experience units are based on real-life experiences. They might include problems related to the purchasing of clothing, food, or other items, keeping a record of income and expenditures for a paper route, learning to manage a small checking account, or perhaps keeping a record on the cost of feeding a pet for a definite length of time. The use of experience units provide an excellent means of enrichment. They enable the teacher to organize the work in any class in such a way that tasks range in the degree of difficulty from those easy enough for the slower pupils to others that challenge the most gifted. These tasks can either be individual or group tasks. An important factor is that the tasks, on the achievement level of the pupil, do provide for individual differences (3:463).

Provisions for slow learners. Teachers know through observation, experience, and research that the spread of

arithmetic skills and concepts learned are very wide within any given class. Some children have learned many concepts, others very few. Readiness is a very important factor to consider when trying to teach arithmetic skills. If a child is not ready, he will have a great deal of difficulty in learning a new skill (14:310).

In many cases special adjustments for slow learning pupils have been adopted. The following list of recommendations has been made to help the learner mathematically as well as socially:

1. Make greater use of concrete social experiences to give meanings and to enrich background.
2. Provide more extensive opportunity to manipulate concrete materials in the development of number facts and in the demonstration of the meaning of a process.
3. Use of more varied visual aids so as to enable the learner to visualize the situations involved and to grasp the meanings of the operations.
4. Be sure to use well graded development of new work so that only one new difficulty is introduced at one time.
5. Spread the presentation over a longer interval of time. Do not bunch the development.
6. Allow more time for practice exercises and vary them to avoid monotony of repetition by using games and similar interesting devices.
7. Provide a larger amount of practice, such as in workbooks.
8. Give considerable guidance of directed reading activities to develop reading connected with the use of the textbook and supplementary materials.
9. Delay the introduction of new work until it is

clear that the pupil has mastered the underlying skills and concepts.

10. Make considerable use of manipulative materials and visual aids in the initial presentation of work.
11. If possible, assign the slow pupils only those activities and problems in textbooks which are not likely to frustrate them.
12. Make use of experience units in which there are a wide variety of activities.
13. Check by observation of their work habits and by questioning, for evidences of difficulty and lack of comprehension.
14. Give diagnostic tests systematically to locate weak spots at an early stage of learning.
15. Prevent the practicing of errors and faulty procedures by insisting on mastery of each step in the work before others are attempted.
16. Reduce the requirements in the curriculum for slow learners by eliminating the more difficult computational skills, such as unlike fractions and multiplication and division of fractions and decimals. Emphasize mastery of the skills of general value in life (3:464-465).

III. GROUPING

There are many opinions on which method of grouping is best. There seems to be no final word as to the best type of grouping, but some methods are generally preferred over others. Studies of American children have consistently revealed a wide range of learning ability in both age groups and grade groups. Studies of children in other countries have revealed similar findings (16:565).

About the different types of grouping, Goodlad and

Anderson say:

The argument for homogeneous grouping is rejected by others who feel that a wide spread in abilities and reading problems within the same class is not necessarily as problematical as the implications of homogeneous grouping. Many schools therefore assign children to class groups on a relatively random or chance basis (10:65).

An article in the National Education Association Journal, September, 1959, pointed out that the ungraded primary plan is being used by an increasing number of school systems to group children in the primary years. This article also brings forth the idea that in the elementary grades, some ability grouping appears to be growing in popularity (15:17). The ungraded plan makes it easier to adjust to individual differences. Children, in most cases, neither skip nor repeat any part of the program. This plan takes advantage of the fact that learning does not proceed at a uniform rate even with an individual.

Sub-grouping according to achievement is a good plan in arithmetic as well as other subjects. Occasionally three groups are formed, but more often just two. The abler of the two groups does more difficult work; the less able group does a minimum course, uses more visual aids, and progress somewhat more slowly (6:7). This is a step in the right direction, but much more must be accomplished.

Main types of groups.

1. Homogeneous - Grouping together those children

who are alike in a particular characteristic such as general ability or achievement.

2. Heterogeneous - No division within the classroom according to a single criterion. A mixing of abilities, achievements and social adjustments.
3. Ability - The gifted and the slow pupils are segregated into homogeneous groups within the classroom.
4. Achievement - Grouping in the classroom according to level of work attained. To place children in groups according to scores on achievement tests or other measuring devices.
5. Interest - Grouping according to the interests of the children within the classroom.
6. Reading achievement - To group within a classroom according to achievement level in reading.
7. Social relationships - Grouping those in the classroom, whose interests, personalities, and backgrounds enable them to get along well together.
8. Study-work skills - Classroom grouping according to the degree of independence, self-propulsion, study skills, or other work habits already developed in individual pupils.
9. Combination - Various combinations of the previously stated grouping methods can be used.

In using any of the grouping methods, the first consideration is for the needs of the individual child. It is necessary to see that the proper relationships, desirable personal traits, and social adjustments as well as academic achievements are accomplished (13:91). It must be remembered that formal grouping according to need of help and guidance alone should be avoided (18:6).

Julia W. Gordon says this about grouping:

When all the arguments about grouping are over, and the pupils have been grouped in one way or another, it is, in the end, the day-to-day influence of the teacher that matters. The accumulation of the countless little things the teacher does gives meaning to a child's school experience and has a far more powerful impact on what a child learns and becomes than we sometimes recognize. Instead of our present preoccupation with separating, classifying, and categorizing human beings, we need to examine what we believe about children growing up in our society (11:27).

How grouping provides for the gifted or talented.

Grouping is considered most important by those who are deeply concerned about providing for our gifted youth. Concern for the education of the gifted is not new. Almost from their beginning, the public schools have tried to provide adequately for youngsters with outstanding abilities (19:1). The present need for more discovery and development of our talented youth emphasizes the fact that because of our national goal, to provide an education for all the children of all the people, a problem has been created concerning the gifted learner.

Grouping and the slow learner. Whether the child of less than normal I.Q., who is still educable, will thrive best in a group of the same ability or in a heterogeneous group would seem to depend upon a number of things. First of all it would depend on how retarded the child was, then how the parent and the child felt about segregation. Other important factors to consider are how wide the differences in ability are in the proposed group and the degree of acceptance by the teacher (9:238).

Many authorities presently favor the heterogeneous grouping because it appears to be more beneficial to the slow learner. The slow learner is like his faster learning classmate in so many ways that he will do better if all are left together. Using this method, good teaching must take place to provide for individual differences.

Two admitted difficulties in ability grouping are that many of the children and their parents do not like the idea of being assigned to a slow group; many teachers are reluctant to accept assignment to a slow group. Also, teachers sometimes have not had special preparation in handling a slow group.

An article in the National Education Association Journal by Fred T. Wilhelms says:

It's probably a good thing to do a limited amount of grouping along the ability lines, perhaps especially in arithmetic and reading. Don't forget your room as a whole is a group also. Don't get so preoccupied with handling it in bits that it loses its force and unity.

Remember that grouping isn't a way of teaching. It is simply a technique of classroom management. Don't worry about the technical refinements of grouping (21:19-20).

A special system of ability grouping is now being used in some schools. The grades are divided into slow-average groups and fast-average groups. Advocates of this plan report many advantages: the slower children are stimulated, placement is easier, and movement between groups is easier (15:18).

IV. OTHER WAYS OF PROVIDING FOR INDIVIDUAL DIFFERENCES

Many other methods can be used to provide for individual differences. Some of the most commonly used methods are mentioned in the following paragraphs.

Special guidance services can be offered for those pupils who need them. Quite often, slow learners or mal-adjusted pupils would learn more effectively if given counselling or psychiatric help.

Adding motivational experiences to the arithmetic program often will lead to better learning. When a class has a wide spread in individual differences, there often will be a wide spread in interests also. Different types of teaching aids, materials, and equipment (such as counting sticks, peg boards, flannel boards, pocket charts, and number cards) will help to stimulate these varied

interests. Motion pictures, flat pictures, and film strips all help pupils to become more interested in arithmetic.

Opportunities to apply skills and abilities in problem-solving situations help to reinforce learning in arithmetic. Arithmetic skills can be used in all subject matter areas. Some examples of using arithmetic in science are reading a barometer, making charts and graphs, comparing sizes of planets, and measuring the growth of plants. In health, arithmetic skills could be used to measure and weigh children, record heart beats, and estimate daily needs for calories.

For the children who are too retarded or maladjusted to be taught effectively in the regular school program, special classes or special schools should be provided. Such classes or schools should have specially trained teachers, a special curriculum, special materials, and equipment fitted to the instructional requirements of these children.

CHAPTER III

SUMMARY

The purpose of this study was to show the need for providing for individual differences in the elementary arithmetic program and to suggest some ways in which this may be done.

Citizens of our democracy believe in educating all the children of all the people; therefore, the spread of individual differences is great. This wide spread in differences of children must be taken into consideration if a good job of educating our youth is to be accomplished. No teacher can be successful unless a conscientious effort has been made to provide adequately for the needs of all the children.

Many different methods can be used to provide for individual differences in the elementary arithmetic program. The techniques used will depend upon the needs of the children, the community, the administration, and the skill and background of the teacher.

The important thing to remember is that provision for individual differences must be made if all the children of all the people are to be educated to their fullest potential.

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