

FOCUS ON EXCEPTIONAL CHILDREN

ARITHMETIC FOR THE MENTALLY HANDICAPPED

TEACHING ARITHMETIC TO MENTALLY HANDICAPPED CHILDREN

John F. Cawley¹

Arithmetic is a subject that is taught in all classes for mentally handicapped children and to all mentally handicapped children enrolled in regular classes. This suggests that nearly 700,000 children in special classes and approximately another 680,000 children in regular classes are continuously being exposed to arithmetic programs of varying degrees of quality and intensity. Yet there have never been, at least according to the literature, catalogues and reviews available to this writer, a single comprehensive arithmetical program developed, tested, and validated for use throughout the school age range of mentally handicapped children. There has not been a single attempt to start with the young handicapped child and gradually and systematically develop an effective arithmetic program. Until this is accomplished, educators will never know whether the achievement of the mentally handicapped is due to faulty instruction and curriculum or whether it is a function of developmental limitations.

The general educator has tended toward a lesser focus on the mentally handicapped because of a need to meet the instructional demands for children of average and above average abilities. The general educator relieved himself of any major responsibility for the mentally handicapped because of the impression that these youngsters were being educated in special classes. The data show, however, that approximately one-half the mentally handicapped population is enrolled in regular classes and that nearly all the youngsters in the age range five through eight are enrolled in regular elementary classes.

Special educators have not attended to any substantive action in the area of arithmetic because they tended to use regular curriculum materials at the mental age levels of the mentally handicapped. All other factors aside, the greatest limitation upon program development has resulted from the notion that the mentally handicapped are *concrete learners*. Acceptance of this notion has led to a de-emphasis of the development of arithmetical principles and understandings and to a concentration on the development of computational skills.

One study (Cawley & Goodman, 1968) demonstrated a clear tendency for the mentally handicapped to develop computational skills, while failing to show signifi-

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cant growth in problem-solving. Younger children, CA 131 months, achieved at approximately the 2-2 grade equivalent in arithmetical concepts, reasoning, and computation. Older children, CA 158 months, had grade equivalent scores of 2-8 in concepts, 3-0 in reasoning, and 3-10 in computation. Rather than using meaningful manipulation (i.e., something concrete) to facilitate understandings, educators interpreted *concreteness* to mean an inability to deal with ideas, algorithms, and principles. Hence, the tendency is to focus upon the rote development of computational skills.

In short, it is about time that educators began to challenge some of the assumptions concerning the educational achievement of the mentally handicapped. Rather than opting out in various areas, professionals should establish behavioral objectives and competencies for the youngsters and begin to discover ways to attain them. Herein, biases begin to emerge. The biases of the current writer are quite simple: either the mentally handicapped child participates in arithmetic as a problem-solving endeavor, or he continues to practice $2 + 2$. Perhaps an illustration might serve to clarify some of the ideas expressed here.

One day, this writer visited an intermediate class for mentally handicapped children. A number of youngsters were doing problems at the chalkboard. The problems were rather extended and of the following magnitude:

$$\begin{array}{r} 2638 \\ 4192 \\ 3624 \\ + 4158 \\ \hline \end{array}$$

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In discussing one youngster's problem with him, the writer asked if the number below the line had a value that was larger, smaller, or the same as the numbers above the line. The youngster looked puzzled and so I wrote $2 + 3 = 5$ on the board and asked the same question concerning the numeral 5. The child responded to the effect that the 5 was "equal" to the $2 + 3$. When presented with the vertical version of the problem

$$\begin{array}{r} 2 \\ + 3 \\ \hline \end{array}$$

and given the same option, the youngster was unable to reply. Apparently, he had not developed the idea that the single separator in the vertical problem served a function similar to the pair of lines in the horizontal problem.

The mechanistic computation of large or small problems without an understanding of the principles of addition is similar to word-calling in reading. Educators are appalled at "mechanistic" reading, yet seemingly receptive to "mechanistic" arithmetic.

The stress on meaning does not reduce the need to approach arithmetic from a functional or social point of view. The stress on meaning reduces this discrepancy between the development of an understanding of the principles of arithmetic and the utilization of this principle in social situations. The proposition has support. Holt (1963) notes the value of incorporating the psychological basis of arithmetic concepts into programs for the mentally handicapped. He suggests that this can be accomplished through the development of projects within the classroom. This is consistent with the ideas of Goodman (1967) who described the following teaching procedure:

- (1) Appraise readiness
- (2) Create a real problem
- (3) Solve a real problem
- (4) Abstract generalizations and principles
- (5) Objectify the generalizations
- (6) Relate to conventional algorism
- (7) Verify the conventional algorism
- (8) Appraise the understanding
- (9) Group children according to judgment of the need for experience to assure mastery
- (10) Practice
- (11) Evaluate children's progress
- (12) Make use of the understanding and skill developed

The model provides for the incorporation of utilitarian arithmetic within the framework of a program designed

to build ideas and understandings.

Programmatically, there is no longer any basis for a single option strategy to be used in teaching arithmetic to the mentally handicapped. Needed are comprehensive systems of instruction that provide continuous diagnostic information within a variety of options that are immediately and efficiently acceptable. Multiple option programs will consist of diagnostic materials, laboratories for the development of linguistic, cognitive, and arithmetical traits, self-instructional materials that will reinforce new learnings, and approaches to verbal problem-solving that facilitate success by controlling the linguistic parameters of problems. The time must come when the schools will purchase and utilize a complete and coordinated system of instruction.

A serious question must be raised relative to the use of the conventional textbook or workbook with the mentally handicapped. To a considerable extent the validation data on any textbook is minimal at best. To demonstrate this, the teacher might ask a few simple questions of the publishing company's representative. First, open the book to any page and point to the sequence of problems on that page. Ask the representative to tell you how many mentally handicapped or slow-learner children in a hundred would get each problem correct. Secondly, ask why the particular sequence of problems has been arranged. Do the first few problems have some unique characteristics that the last few do not? Do children who miss the first few problems get the last few correct? The issue raised in this question is whether or not a sequence of problems is designed to facilitate acquisition of the specific behaviors.

These questions are relatively simple. Yet the implications are quite complex. If, in fact, there is no information concerning the performance of a normative sample on the problems, how will the teacher determine whether the child's failure is a function of faulty performance or poorly organized material? If the sequence is not reasonably facilitating, why send a child through it?

The single textbook or workbook approach also creates another problem. Basically, there is too much emphasis on an achievement model rather than a performance model. In the achievement model most, if not all, children do the same problems or tasks. The mechanism for evaluation is some form of *percent correct*. Children perform at varying levels of accuracy. Some get 100%, others 50%, and some 0%. Those who perform at the lower end of the scale, particularly in regular class, soon feel the

effects of failure and frustration.

There is an alternative to this. The teacher can select some reasonably determined level of success which all children must attain. It can be stated, for example, "that all children will perform at the 80% correct level." A move in this direction recognizes individual variability within the framework of an approach designed to enhance success. Programs are much more individualized because children of varying ability levels will be performing different tasks in order to attain the 80% level.

The remainder of this presentation will focus upon three areas. The first relates to problems of assessment, the second to a single illustration of one language-based component of quantity, and the third to a brief description of an individual approach to managing the group for verbal problem-solving activity.

ASSESSMENT

In a previous project (Cawley & Goodman, 1967) the authors found it necessary to develop a test of verbal problem-solving and a test of principles and understandings.

Work on the test of verbal problem-solving proceeded smoothly. This test consisted of Indirect, Direct, and Extraneous number problems. The final form was a thirty-item, untimed instrument, hereafter referred to as the IDES. Work on the test of principles and understandings was considerably more difficult. The basic problem was an interesting one, and one which emphasized the complexity of the assessment process. Identifying an arithmetical principle which the mentally handicapped could manage was difficult because the test item required reading skills which the children did not manifest. When the reading requirements were modified, the ability to assess the principle was lost. The situation became circular in nature and it was finally decided to concentrate on items in which the reading requirements were minimal. A thirty-four item test was finally devised, and it is referred to hereafter as the "PUT."

Comparisons were made within the PUT. The least difficult problems (1) required a minimum of reading, (2) are accompanied by a pictorial arrangement, and (3) are relatively simple understandings. The most difficult items were just more difficult. They included the idea of zero; the problem of place values; the role of the denominator, in the fractions $1/6$ and $1/5$, as an element in the concept of size; and the identification of the process required to solve a problem. Figure 1 con-

tains samples of the most difficult and least difficult items.

Comparisons between the most difficult and least difficult word problems (IDES) showed considerably more difficulty for mentally handicapped children than they showed for average children. The overall difficulty level was such that the ability of these items to differentiate the high and low performers was impaired. Three of the four most difficult and three of the four least difficult problems contained extraneous material. Three of the four most difficult problems required division and multiplication as the basic operations. Three of the least difficult required addition or subtraction. The occurrence of extraneous number problems at both ends of the continuum would seem to suggest that the extraneous material is not the culprit. One might conclude that the difficulty lies in the selection and utilization of the division and multiplication processes, in contrast to addition and subtraction.

A further look at the most difficult and the least difficult word problems indicates that the four most difficult problems had a mean length of 35.25 words, whereas the mean word length of the least difficult items was 21.75. No consideration was given to the linguistic complexity of the problems.

The valid assessment of arithmetical attainment among the mentally handicapped is necessary for diagnosis, prediction, and evaluation. The diagnostic approach must be continuous because daily instructional assignments are predicated upon appropriate diagnosis. Predictive validity is essential if generalizations are go-

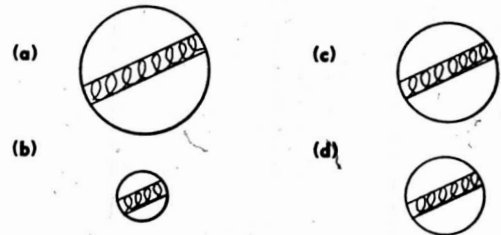
FIGURE 1 PUT: MOST DIFFICULT AND LEAST DIFFICULT ITEMS

Part 1: Most Difficult

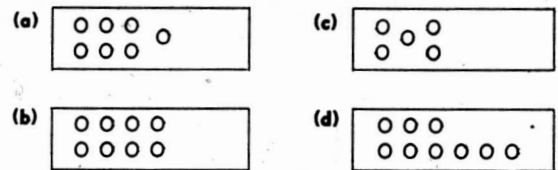
- Zero (0) + a number equals
 - 0
 - the number
 - 1
 - one more than the number
- You have two pies of equal size. If you divide one pie into 5 pieces and the other pie into 6 pieces, which piece will be bigger?
 - from the pie with 5 pieces
 - from the pie with 6 pieces
 - they will be same size
 - you can't say which will be bigger
- To find out how many groups of 2 there are in the number 10, we
 - add
 - subtract
 - divide
 - multiply
- If you take away the ones from 19, what is left?
 - 0
 - 1
 - 10
 - 9

Part 2: Least Difficult

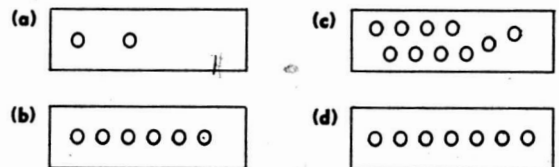
1. Which is the biggest ball?



2. Find the 9 group



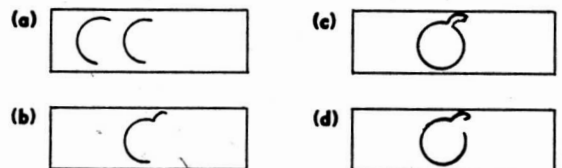
3. Find the group with 7



4. Here is one apple



Find $\frac{1}{2}$ of the apple



ing to be made and curriculum and instructional programs are going to be developed. Strategies for evaluation are necessary in order that some external assessment of pupil growth and program effectiveness can be obtained. There are too many built-in contradictions to utilize the same instruments for the different approaches to assessment.

ONE FACET OF QUANTITY

Language deficits constitute one of the more generalized and serious problems among mentally handicapped children. Language permeates all areas of instruction in varying degrees of intensity. For illustrative purposes the section will focus upon language variability within the singular/plural differentiation. Plurality has received minimal attention in arithmetic programs for the mentally handicapped. Although plurality might not be viewed as a true mathematical concept, it does function within the broad notion of quantity. And, if a child is to deal effectively with *one* and *more than one*, he should have an adequate concept of plurality.

Box 1 contains two sets of stimuli:

Box 1

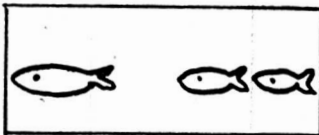


The child is given an oral direction and his response mode is to make a simple mark on the stimulus which he believes is correct.

The statement, "Mark the boats," is pluralistic and the child should mark the two boats. The statement, "Where are the boats?" should also elicit a response to plurality. However, the second statement contains two plural markers, "are" and "s," whereas the initial statement denoted plurality with a single plural marker, "s."

Box 2 contains a similar stimulus:

Box 2

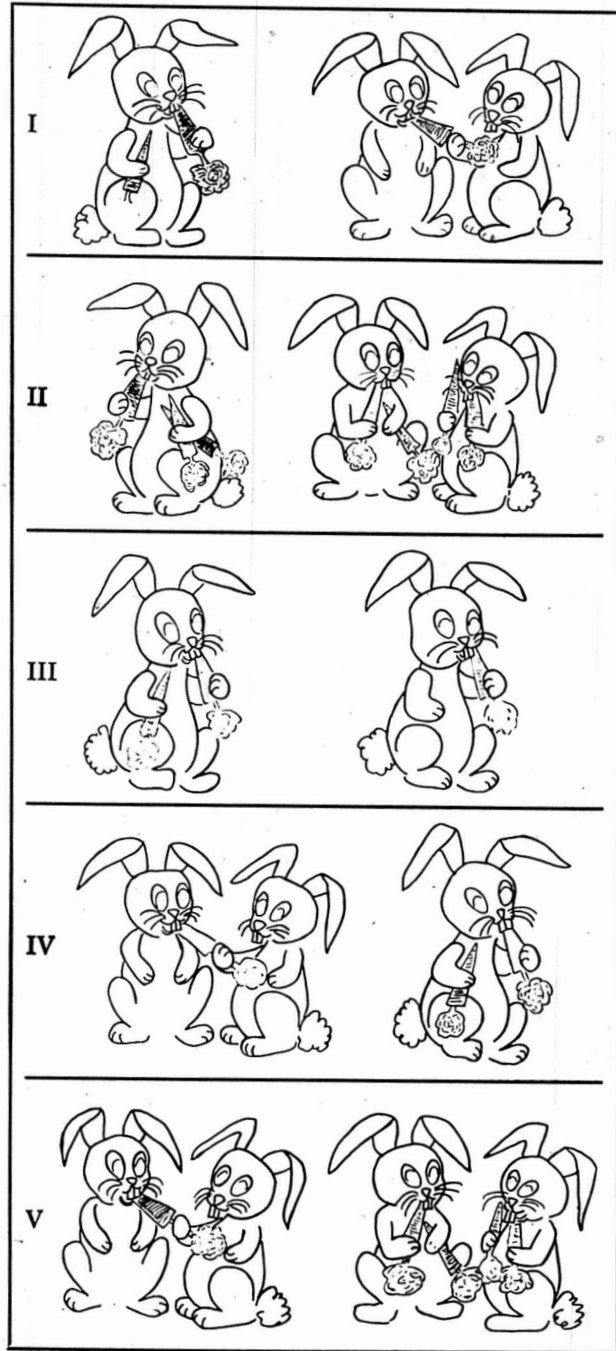


Here there is a problem with the mechanics of plurality. In this instance the noun "fish" is both singular and plural. The statement "Mark the fish" is ambiguous and fails to provide the child with an adequate basis for a decision. "Where are the fish?" does contain a satisfactory plural marker. The teacher can judge the nature of the child's development of plurality, his overgeneralization of selected plural markers (i.e., Is he waiting for fishes to denote plurality?), and his ability to respond

discriminately to specific stimuli.

A third illustration, Box 3 expands upon the language involvement in plurality:

Box 3



Observe the seemingly simple variation in the use of plural markers within the sequence of tasks.

- I 1. Where are the rabbits eating the carrot?
 $\overline{\text{P.}}$ $\overline{\text{P.}}$ $\overline{\text{S.}}$
- II 2. Where are the rabbits eating the carrots?
 $\overline{\text{P.}}$ $\overline{\text{P.}}$ $\overline{\text{P.}}$
- III 3. Where is the rabbit eating the carrot?
 $\overline{\text{S.}}$ $\overline{\text{S.}}$ $\overline{\text{S.}}$
- IV 4. Where is the rabbit eating the carrots?
 $\overline{\text{S.}}$ $\overline{\text{S.}}$ $\overline{\text{P.}}$
- V 5. Where are the rabbits eating the carrot?
 $\overline{\text{P.}}$ $\overline{\text{P.}}$ $\overline{\text{S.}}$

The five statements referring to each of the illustrations contained in Box 3 demonstrate a number of ways that language can be controlled in order to assess development. The statements contain various contradictions and arrangements which the child must heed. Statements 1 and 5 have the same plural/plural/singular arrangement. The stimuli differ in order to assess five discriminations. Statements 2 and 3 are consistent (2 is plural/plural/plural; 3 is singular/singular/singular). Statement 4 is arranged in singular/singular/plural fashion. The child must often make careful and distinct choices. The organization and assessment of these choices and the language requirements that accompany them need proper attention.

VERBAL PROBLEM SOLVING

Continuous diagnosis is fundamental to successful teaching. Without it, meaningful instructional adaptations will not materialize and continuous progress will not develop within a success-oriented program. It was suggested earlier that the constraints of textbook teachings are such that the adaptations required in the diagnostic model are impaired by the arrangement of many texts. Because individual variability exists as much in the class for the mentally handicapped as it does in the regular elementary classroom, the approaches to the teaching of arithmetic must allow for considerable flexibility. Accordingly, it is suggested that teachers go beyond the constraints of the workbook and more toward a

system of multiple options. One option within this system utilizes a teaching/learning matrix as the basic system of interaction between teacher and pupil.

Figure 2 contains one possible matrix, the focus of which is addition. A child might encounter as many as forty, fifty, or more matrices in an arithmetic program. There might be matrices for each of the operations in arithmetic, matrices within a given operation that are linguistically constructed in order to adapt to differences in language development, and matrices that focus upon different areas of arithmetical knowledge such as integers, fractions, and decimals. Within a given array, specific components of verbal problem-solving abilities might be stressed. This might include problems in which the position of the numerals are controlled or varied. The number of permutations and combinations that exist among arithmetical skills and language abilities have yet to be determined. As part of a comprehensive research and demonstration activity sponsored by the Bureau of Education for the Handicapped, the present author and his colleagues, Professors Vincent Glennon, John Goodman, and Henry Goodstein, are investigating selected aspects of a comprehensive approach to arithmetic.

This study includes the search for answers to questions inferred herein. For this reason, the composition of the sample matrix is tentative and exploratory.

As can readily be seen, the matrix consists of an array of rows and columns. Each row is labeled as to the arithmetical skill contained therein. Row 1-A includes only problems that add 1 to a number to yield sums less than 10. The teacher and the pupil are continuously aware of the arithmetical requirements of a given row.

The problems, for purposes of illustration only, are sequenced 1 through 10. The reading level and linguistic complexity of problem 1 is of a lesser difficulty than problem 10. Ultimately each row will be sequenced and provide a progression that will be as hierarchical as knowledge permits. Thus, the teacher is simultaneously aware of the arithmetical and language requirements of a given problem. The teacher can move across a row to control arithmetical complexity while varying the language requirements. The teacher can have the child move down a column, thereby controlling the language requirements and varying the arithmetical involvement. A child need not complete all the problems in a row, column, or matrix. Supplementary manipulative exercises and a host of other strategies may be interjected at any given point.

Figure 2
Diagnostic Teaching Matrix: Addition

PART	PROBLEM NUMBERS										PROCESS: Addition
I-A	1	2	3	4	5	6	7	8	9	10	1 digit number + 1, sum less than 10. (like $8 + 1 = 9$)
I-B	1	2	3	4	5	6	7	8	9	10	1 digit number + 1 digit number, sum less than 20. (like $7 + 8 = 15$)
I-C	1	2	3	4	5	6	7	8	9	10	1 digit number + 2 digit number, sum less than 20, no carrying. (like $6 + 12 = 18$)
I-D	1	2	3	4	5	6	7	8	9	10	2 digit number + 2 digit number, no carrying. (like $12 + 14 = 26$)
I-E	1	2	3	4	5	6	7	8	9	10	1 digit number + 1 digit number + 1 digit number, sum less than 10. (like $4 + 2 + 3 = 9$)
I-F	1	2	3	4	5	6	7	8	9	10	3 digit number + 3 digit number, no carrying. (like $113 + 136 = 249$)
I-G	1	2	3	4	5	6	7	8	9	10	2 digit number + 2 digit number, or 2 digit number + 1 digit number, sum less than 40, with carrying. (like $17 + 14 = 31$)
I-H	1	2	3	4	5	6	7	8	9	10	1 digit number + 1 digit number + 2 digit number, or 2 digit number + 2 digit number + 1 digit number, with carrying. (like $3 + 6 + 12 = 21$)
I-I	1	2	3	4	5	6	7	8	9	10	2 digit number + 2 digit number, carrying in units. (like $12 + 19 = 31$)
I-J	1	2	3	4	5	6	7	8	9	10	2 digit number + 2 digit number, carrying in tens. (like $42 + 71 = 113$)
I-K	1	2	3	4	5	6	7	8	9	10	2 digit number + 2 digit number, carrying in both columns. (like $96 + 28 = 124$)

Each child has his own matrix. The proper matrix is a function of previous activities and diagnosis by the teacher. The daily assignment is given to the child by having him complete those problems that have been circled by the teacher. All problems are contained in a card file. The child picks up his matrix, selects the cards from a file (one child might be assigned the job of librarian), and completes the problems at his seat. Each

card contains at least one correct algorithm on the reverse side. Thus, the child is immediately aware of his results. If in difficulty, he can go to the teacher and request assistance.

Each child in the class can be doing a different combination of problems and a different number of problems from every other child.

When the assignment is complete, the child returns to

the teacher who reviews his work. A series of problems is kept in the teacher's desk and she can, at any point, have a youngster do a problem or more while she is observing him. The teacher checks those problems that are correct (✓) and those that are incorrect (✗). The child can be referred to other tasks—manipulative, drill, etc.—based upon his performance.

In the illustration, the child has completed problems 1 through 5 in Row A, and 1 and 2 in Row B. His next assignment might be 6, 7, 8, 9, in Row B, or he might go to Row C. The options are as varied as the teacher desires, enabling him to stay alert to the performance of the child and to intervene systematically on the basis of continuous diagnosis.

SUMMARY

The development of comprehensive systems of arithmetical instruction for mentally handicapped children will require extensive support and assistance. A complete system will consist of laboratory experiences which focus upon problem solving, through manipulation, for children who do not read. For the mentally handicapped, this includes children up to about nine years of age. A system will include multi-media, programmed instruction, original learning and overlearning activities, multiple option approaches to verbal problem solving, and a host of other tactics. The system will have to be validated so that the teacher can feel comfortable with the variability that exists within it. It will have to be fluid in order that individual adaptation can be made efficiently. It must consider the developmental nature of the mentally handicapped child and his relative strengths and weaknesses. Minute phases of such a system have been presented herein.

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MATHEMATICS FOR THE HANDICAPPED: PROGRAMMING CONCEPTS

Conwell Higgins¹

Bruner's (1960) provocative dictum that any concept may be "taught effectively in some intellectually honest form to any child at any stage of development" may be extreme, but it reflects the hopes underlying the development of the IDI Instructive System.

Instructive Devices, Inc., of Pawtucket, Rhode Island, has begun the production and marketing of a multi-media manipulative auto-instructive desk with programs in mathematics for the educable mentally handicapped. The strategies and tactics incorporated in the system were developed in a project jointly sponsored by the Office of Education, Bureau for Handicapped Children and Youth, H.E.W., and the Albany Public Schools. Higgins and Rusch (1969) reported on the classroom use of the system in teaching basic quantitative concepts to mentally handicapped children.

CONCEPTS PROGRAMMED IN MATHEMATICS

We are indebted to Piaget (1952) and Stern (1949) for insights relating to the growth of mathematic concepts, insights which stress the importance of sensory motor experience in the early development of mathematical concepts. We also acknowledge the influence of Osgood (1953, 1957) for understanding the rationales of intervening variables. Like all programmers, our debt to Skinner (1953) is tremendous. The tactics for eliciting the orienting reflex enhances the effectiveness of the total system (Boguslovsky, 1955, 1967).

The sequence of our programs reflects consideration and study of the curricular guides prepared by Goldstein and Seigel (1958), Lynch (1949), the Sisters of St. Francis of Assisi (1960) and the staff of the Educational Research Council of Greater Cleveland (1961).

TEACHING THE CONCEPTS

After a concept has been selected to be taught, the crucial initial step is to specify the criterion behavior which signals that the concept has been learned. When the objectives of a program have been written and the criterion behavior specified, the next step is the outlining of the paradigm in terms of cycles or subcycles.

The information necessary to learn a mathematical

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concept is coded in terms of objects, pictures, and words. The information is stored in manipulative materials, graphics, and tapes, all in a programmed sequence of instruction. The programs are communication tools which enable the child to initially decode, then internally code, store, and retrieve the concepts.

The sequence of instruction begins with the physical representation of the numerical properties of things and builds progressively to symbolic representation. The mathematical concept is developed first with objects, then pictures, and finally numerals. Widely differing stimuli are presented to the child without presuming any ability on his part to read. The sequence links together the concrete manipulative behavior in which the EMH child has some facility with the symbolic behavior with which he has difficulty. In a sense, it is a means of connecting doing, seeing, and saying into a highly organized multi-sensory learning experience.

CUE AND CONFIRMATION FRAMES

The frames and associated graphics fall into one or two operational categories: cue frames or confirmation frames. The cue frames are sequenced to heighten the probability of correct responses. However, a very definite tactic is to provide an instructional matrix in which each correct response is dependent upon discrimination. We feel that unless a cue frame elicits discrimination, the frame is ineffective with respect to learning. Not all cue frames are teaching frames since certain ones are used for proper placement of objects or artifacts to or from the interface.

Cue frames are used to elicit verbal behavior or motor behavior. Motor responses are emitted on the opaque glass interface or screen and are a combination of object placement, drawing, and/or writing. Visual confirmation is provided directly following motor behavior and auditory confirmation immediately follows verbal behavior.

ORIENTING BEHAVIOR

We have used Boguslovsky's (1967) techniques of selectively reducing or increasing the prominence of instructional graphic materials to sharpen the focus on the verbal and visual input. We feel that when the child fails to pay attention to the confirmation frames, feedback as well as learning are precluded. In certain instances, judicious use of sound effects as well as embellishment of verbal input are employed to arouse the orienting reflex.

OBJECTIVES

It should be noted that the mathematics programs are not designed to reach computational skills. Nor do the programs teach competency in the use of algorithms. We feel that skill in computation can only be justified for a particular child if the specific skill taught advances the social or economic adjustment of the child. In this day of calculators, sophisticated cash registers, and even computers, many of the computational skills now taught are actually irrelevant to the child's needs. When a child asks, "Do I add or subtract?" he is really telling us he lacks mathematical concepts, even though he may have the skills of the addition and subtraction operations.

The pre-post test for each unit provides an opportunity to the child to emit the criterion behavior under standard conditions.

THE INSTRUCTIVE SYSTEM

The effective instructive system mirrors the happy wedding of hardware and software. The Higgins TELE-DESK represents the hardware; the visuals, audio information with control signals, and the artifacts constitute the programmed and instructive software.

The advanced IDI System provides for the following:

1. Pupil pacing of verbal as well as motor responses.
2. Rapid and efficient monitoring of the verbal responses after the child has completed a program.
3. Reliable synchronization of sound and the visuals.
4. Easy loading of the program.
5. Predetermined variable time intervals prior to automated presentation of confirmation, should the child fail to pace the program.

EFFECTIVENESS OF INSTRUCTIVE SYSTEM

Higgins and Rusch (1967) report on four evaluative studies. The first study is summarized in the following paragraphs.

Purpose: The purpose of this study was to determine the effectiveness of the multi-media programmed instructional system in teaching selected mathematical concepts to handicapped children.

Sample: The sample consisted of classes of educable mentally handicapped children in the Albany Public Schools. The chronological ages ranged from eight to twelve years. The mean SB IQ's of the classes ranged from 66 to 71.

Procedure: Pupils in the experimental group were instructed in the behavioral objectives through the multi-media system. The behavioral objectives were taught directly to the control groups by their teachers. Instruction continued four months. Pre-post data were collected. To determine retention, post-post data were collected one month after the conclusion of the experiment proper.

Results: The results are presented in the table.

Group	Mean Scores		
	Initial	Final	Retention
Experimental	55.9	92.2	103.7
Control	47.8	56.4	64.5

The differences favoring the experimental group over the control group at the conclusion of instruction and one month following instruction were significant beyond the .01 level of confidence.

LEARNING RESEARCH CENTER AND INSTRUCTIVE DEVICES, INC.

Instructive Devices, Inc., is manufacturing, producing, and marketing the complete auto-instructive system developed at the LEARNING RESEARCH CENTER of the Albany Public Schools.

The Albany Public Schools receives royalty payments directly from IDI. The Board of Education earmarks these funds for the preparation and evaluation of additional curricular materials for the handicapped through its LEARNING RESEARCH CENTER.

Rather than recruiting a large staff of curriculum and other specialists to program and prepare instructional materials, the CENTER will contract with special education and educational communication field personnel to write scripts and specify materials. The CENTER will also contract for the field evaluation of the materials. Hopefully, a continuing stream of instructional materials of demonstrated effectiveness will then be available for wide distribution.

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WASHINGTON REPORT

Dr. Edwin Martin, a thirty-eight-year-old Special Educator who has been serving as Acting Associate Commissioner of the Bureau of Education for the Handicapped in the United States Office of Education, was recently appointed Associate Commissioner.

In articulating his philosophy of education for the handicapped, Martin explained that he believed his views were consistent with the general approach of educators in the 70's: that education is "... an inalienable right and not a gift to be bestowed upon the handicapped by those of us who are not handicapped. . . ." The new Associate Commissioner said he thought too many people still see education for the handicapped as a

charitable enterprise.

Martin also expressed concern that more and more minority group children are being classified as handicapped and are being included in the special education program when they should in fact be served by the general education system, and that this practice is unrealistic in many ways. He posed a fundamental question, "How do we assert that the basic responsibility for the education of the children lies with the general education program and not with special education?"

Dr. Martin would like to see the Special Educator take the initiative in clarifying to other educators that many children now being referred to special education programs should be more appropriately served in the general education system, by that system's becoming more responsive to the individual.

RESOURCE MATERIALS

CEREAL INSTITUTE

The *Cereal Institute* was founded in 1942 to encourage research and distribute research findings emphasizing the nutritional value of a cereal breakfast. Relevant teaching units in home economics, health education, social studies, and science are facilitated by transparencies, filmstrips, source books, and wall charts. Teacher's guides for primary and intermediate grades developing basic nutritional concepts include related problems, study questions, and follow-up learning activities. A brochure listing the Institute's educational materials can be requested from: Cereal Institute, Inc.; 135 La Salle Street; Chicago, Illinois 60603.

AMERICAN CHIROPRACTIC ASSOCIATION

Intent on promoting good health habits in children, the *American Chiropractic Association* furnishes materials stimulating concern for physical fitness and the attainment of proper posture. Several materials utilize cartoon-like formats and workbook activities enhancing their appeal to elementary level children. *Physical Fitness Around the World* is an audio-visual presentation for grades three through six which highlights a record featuring the children of United Nations representatives. Individual items are priced from 3¢ and the complete

kit is \$5.00. Further information may be obtained from: The American Chiropractic Association; P.O. Box 1535; Des Moines, Iowa 50306.

DAVID C. COOK PUBLISHING COMPANY

The David C. Cook Publishing Company produces teaching aids featuring picture packets, teacher resource books, flannelgraph sets, and puppets designed to be utilized for preschool and primary grades. The available materials may be categorized in the content areas of music, social studies, science, arithmetic readiness, and history. The publishers suggest that the simplicity and attractiveness of their teaching pictures make them especially amenable to use with the mentally retarded and emotionally disturbed through focusing attention and encouraging verbal response. In addition, the pictures may be used repeatedly to accomplish the repetition often necessary for retarded and disturbed children. The flannelgraph kits, containing activity records, combine songs with motions and figures, utilizing a teaching technique maximizing sight, audition, touch, motion, and voice participation.

Prices range from \$1.50 per set of miniature take-home pictures to \$2.25 for the regular teaching picture packets. Flannelgraph kits are \$2.98. Cook Publishing will distribute their catalogue to teachers and supply examination copies of materials to Special Education Supervisors and Curriculum Directors for adoption or regular use consideration. Catalogue requests and material orders should be directed to: David C. Cook Publishing Company; 850 N. Grove; Elgin, Illinois 60120.

DIRECTORY FOR LEARNING DISABLED

A directory of facilities for children and adolescents who are intellectually capable but academically under-achieving has been compiled, and is available free of charge by writing to: Directory, Academic Therapy Publications, 1539 Fourth Street, San Rafael, California 94901.

ISSUES & TRENDS

Special education teachers working with retarded children have frequently been critical of the research carried out within the broad spectrum of educating the

mentally retarded. For the most part, their position has been that the research has not been relevant and has typically been reported in such technical terms that the implications for the classroom were sufficiently disguised. Their perspective has been fairly accurate. This was due partly to the lack of applied interest on the part of researchers and partly to the difficulty in obtaining support for classroom-type research. Funds were more readily available for experimental and basic research. Also, schools were reluctant to tolerate some of the inconvenience necessary in order for research to be conducted.

The situation is changing. More individuals are interested in classroom-type research and the subsequent implications for materials development. Applied research is also receiving more attention from funding sources.

Cawley's article reflects the types of research that teachers are interested in. In view of the criteria currently being leveled at the curriculum employed in special classes and the movement toward a non-categorical model, the need for research aimed at answering specific questions regarding what particular skills should be taught and the manner in which they can best be taught to the mentally retarded becomes essential.

Researchers interested in the practical aspects of developing curriculum and materials should be encouraged. Such encouragement should be in the form of financial support as well as a more open-door policy for research in the public school setting.

CLASSROOM FORUM

Edited by Austin J. Connolly, University of Missouri

PROBLEM 1

You have a boy in your intermediate class for the educable mentally retarded who seems to read silently with comprehension. When reading orally, he makes omissions, has many reversals, and demonstrates other perceptual motor disturbances. He is twelve. Should you have him read silently and ignore his perceptual motor problems, or should you attempt to cope with them? If so, how?

Readers have suggested that oral reading is a particular problem for many youngsters. The boy in question is already reading silently with comprehension—the goal of reading instruction. Thus, most readers responded to his plight by taking the heat off.

Omissions, reversals, and similar problems the boy is currently exhibiting during oral reading are probably the result of his anxiety over oral reading and should not merit teacher concern unless they appear in other situations. If the teacher feels compelled to enhance the child's oral reading ability it should be done without focusing undue attention on the child. This might be accomplished by the teacher reading to the group, by choral reading, and by providing a headset and listening tape which coincide with what the child is reading. Lastly, the child may be sent to a private area where he can read the story orally and record his reading on the tape recorder. Then let him hear his reading of the story as he follows the story in a book, finding his mistakes on the recording. Let him retape his reading, correcting his mistakes. The teacher must be willing to accept approximations of success and improvement.

The contribution of Mrs. Juanita Haywood, Education Director, Parson's State Hospital and Training Center, Parsons, Kansas, earns her a tip of the hat and a year's subscription to *Focus on Exceptional Children*.

PROBLEM 3

Our school makes a practice of having parent-teacher conferences each fall. Generally, the parents I need to see most are the least likely to attend. I am particularly anxious to see the parents of a nine-year-old educable retarded girl who comes from a large family in a very deprived neighborhood. This family has not participated in other types of school functions. What can I do to gain their cooperation?

All readers are invited to send their solution and tell how they would handle problem 3. The November, 1970 issue will summarize contributions by readers. *Focus on Exceptional Children* will award complimentary subscriptions each month for the best solutions. Send your response to the Editorial Offices, *Focus on Exceptional Children*, 6635 East Villanova Place, Denver, Colorado 80222.

FOCUS ON EXCEPTIONAL CHILDREN back issues are available. Single copies 80¢, 2-9 copies 70¢, and 10 or more copies 50¢ each.