AN EXPERIMENTAL STUDY OF ACHIEVEMENT OF INTERMEDIATE EDUCABLE MENTALLY RETARDED STUDENTS

By

CORYDON EUGENE COCHRAN

Bachelor of Arts
University of Oklahoma
Norman, Oklahoma
1954

Master of Education
University of Oklahoma
Norman, Oklahoma
1959

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Thesis Approved:

Wm P Ewens

Thesis Adviser

Lodal R. Gamble

Julia L McHale

D. D. Burham

Dean of the Graduate College

PREFACE

In the field of mental retardation the use of "watered-down academic" curriculum has often been decried, yet a limited amount of empirical study has been directed toward the curriculum which would surplant such an approach. The principle aims of this study were to determine if the development of concepts and the separating of instruction in reading from instruction in arithmetic would affect the achievement of educable mentally retarded students.

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CHAPTER I

NATURE OF THE PROBLEM

Knowledge in the field of mental retardation has increased to where there has emerged a need to study the adjustment of curriculum content for more effective development of the capabilities of the educable mentally retarded students in the public schools.

Some studies have examined the effectiveness of curricula programs for the educable mentally retarded in special classroom situations as opposed to regular classroom situations. However, there appears to be little research which examines what and in what order subjects should be taught to mentally retarded students in the special education classroom.

Observations by special education teachers tend to support the position that the teaching of arithmetic may interfere with the teaching of reading to mentally retarded students. This appears to come out of the difference in type of language used in arithmetic and reading. The content of arithmetic is inductively quantitative in nature and springs from the base of word meaning. The content of reading is more deductive and general in nature. Thus, it appears that separating the teaching of these subjects on a time continuum might improve the performance and achievement of the students involved.

The General Background and Need for the Study

Studies of the mentally retarded students suggest there may be a

gap between the vocabulary used and the vocabulary understood by these students; the literature seems to indicate a qualitative difference between the spoken and the understood vocabulary of mentally retarded students. There also seems to be a qualitative difference between the usage of arithmetic symbols and students being able to reason using these symbols.

Several studies over the past fifty-five years have been designed to investigate the differences between mentally retarded children and normal children. Quantitative differences have been established which serve in identifying the mentally retarded. More recent findings have added to the understanding of the mentally retarded by isolating qualitative differences between the two groups. Dunn (11), found evidence from his study of reading and arithmetic processes to support a position that there were both quantitative and qualitative differences between retardates and normal children in the areas of reading, arithmetic, and spelling. Shotick (33) in a larger study than Dunns', reported differences favoring normals on reading tasks, but not on performance tasks.

On studies of interference — proactive and retroactive inhibition, which seem to be directly related to the matter of curricula sequencing, Scheerenberger (32) studied 120 retarded subjects. He found retroactive inhibition (interpolated activity between learning and retention measures) to be transitory, while proactive inhibition (information already known interfering with learning new information) was found to be most severe as the time interval was lengthened. Hermelin and O'Connor (19) investigating the effects of retroactive inhibition on short term memory found that when retarded subjects were given a list of words as

an interpolation, it interfered with the relearning of digits. This may support the theory of arithmetic instruction possibly interfering with the learning of the more basic skill. . . .reading, as presently emphasized in the classroom.

The effects of mediation on retarded subjects has been discussed by Berkson and Cantor (1) who found facilitation for learning with the learning of verbal labels. Wolf (41) found that overt verbalization increased the attaining of concepts by aiding in the discrimination of verbal cues. As yet the work in the mediation area has not been extended into the classroom. But, Vergason (38), stresses that mediation does facilitate learning, that "teachers should tie all instruction to elements of materials which the individual knows."

For the purposes of this study an examination of curricular areas emphasized in the classroom reveals that reading and arithmetic are viewed (29) as subject matter areas requiring a rich background of vocabulary understanding in order to effectively establish the meaning fro written symbols, both reading and arithmetic.

Gates (16) has pointed out that his research supports the need for improvement by instruction for the learning of the meanings of words. He recommends that this teaching precede or accompany the learning of word recognition. Similarly, Serra (31) has pointed out from her review of the literature that concept development enhances both reading and arithmetic with normal children. Such might also be true with retarded children.

Educable mentally retarded students will attain at most, a reading and computational performance level comparable to regular fifth grade ability (5). Since competency in the basic skill areas is emphasized in

the educable mentally retarded classes on the basis of mental age rather than chronological age, instruction in reading and arithmetic takes place at the intermediate level (29). This being the case, most studies of regular class performance must be interpolated with an accompanying question as to the validity of such a procedure.

The ability of mentally retarded students to perform as well as other children of comparable mental ages but different intelligence quotients in the areas of reading and spelling has been noted by Merrill (25), Torgerson and Shuman (36), and by Wilson (40). These studies were concerned with testing and performance and did not include special class mentally retarded. Wilson found, in addition to the children in the lower group, intelligence quotients below 96, working more nearly to their mental age expectancy level in overall school achievement than the other children of the same mental ages but higher intelligence quotients, that in arithmetic the lower group was superior. His conclusion was that the difference might have been due to longer time in school, to more drill, and to higher grade placement which entailed exposure to arithmetic processes the younger and brighter mental age equivalent students had not encountered yet. There seems to also be room for a possible explanation that the tests might have sampled heavily of arithmetic skills weighed heavier for computational ability rather than reasoning ability, thus favoring the reasons Wilson advances.

McGehee (24) in an extensive testing of 7,986 children in regular grades four through eight of the public schools, found that in terms of academic ability the subjects of lower mental ability showed greater relative achievement than did the mentally normal and gifted. They

scored higher than could have been expected for their mental ability. Lewis reworked these data to compare the subjects in the lower 10 per cent in mental ability as matched with those in the upper 10 per cent in mental ability on mental achievement. The lower group was found to be superior and to read from one month to a year and a half above their mental age expectancy levels. This evidence tends to suggest that skills rather than reasoning and understanding have been most heavily tapped by the tests used. Other investigators concerned with reading and arithmetic processes encountered by the mentally retarded have indicated that they perform below expectancy levels in reading, arithmetic reasoning, and spelling (11, 38). Dunn (11), for example, in the first comprehensive investigation of the reading processes of the mentally retarded, found the retarded to be significantly poorer on flashed and untimed presentations of words and phrases and the comprehension of these words and phrases. They demonstrated inferior ability in the use of context clues and had little concern for content. In the area of arithmetic there was no significant difference between the mentally retarded boys and their mentally equivalent normal controls on arithmetic reasoning. This seems to point up an ability to perform but not necessarily comprehend what they are doing in the way of academics.

Dunn, in the above mentioned study, found normal subjects as rated on a teacher questionaire, to have superior home conditions, including the cultural level of the home. This aspect, the socioeconomic level, has been recognized as a possible contributor to the achievement levels attained by the mentally retarded, but exploration of this aspect would seem to lead away from the main focus of this study, academic

achievement of the educable mentally retarded in the special education classroom. Therefore, the socioeconomic level of the students used in this study will be considered and an attempt made to control this variable.

In this study, if a structured program in concept development were shown to affect academic achievement in the special education classroom this would be an indication of a need to stress the meanings of activities the mentally retarded engage in, and that being able to perform does not necessarily equate with being able to understand.

If a structured program in concept development were shown to affect achievement in reading while arithmetic instruction was held in abeyance, this would be an indication that teaching both concurrently could be affecting the more basic skill. . . .reading. This could explain, in part, the common phenomena of the student who achieves adequately in reading but displays weakness in arithmetic ability, or the reverse situation, that of the student who achieves adequately in arithmetic but has a weakness in reading capabilities. . . What could be operating is a willingness to study in the area which is understood, and an unwillingness to extend efforts to tasks that seem to be merely mechanical, that is poorly understood.

Identification of Terms

For the purposes of this study the following terms have been identified as needing clarification for purposes of analysis and treatment of the data:

In no way should academic achievement as referred to in this study be considered to sample all the different areas of the academic

curriculum for educable mentally retarded students. The use of the term "academic achievement" in this study refers to the language arts portion of the test as represented by the different sub-areas of reading skills and to Arithmetic. The sub-areas of the Stanford Achievement Test, Primary Battery are represented as: Word Reading, Paragraph Meaning, Vocabulary, Spelling, Word Study Skills, and Arithmetic. Each of the sub-areas except for Arithmetic are represented to sample part of the skills requisite in the ability to read.

Academic achievement: that which is obtained from measures in the Stanford Achievement Test. Primary Battery: Form W, 1966.

Reading: that which is obtained on the Stanford Achievement Test. Primary Battery: Form W, 1966, exclusive of the Arithmetic portion of the test.

Arithmetic: that which is obtained on the Stanford Achievement Test. Primary Battery: Form W, 1966, exclusive of the portion of the test referred to as other than Arithmetic; that portion of the test designated as tests of Arithmetic.

Concept Development: the process of acquiring an understanding and ability to use words in accordance with the accepted meaning and usage; that which is handled during the treatment phase of this study.

Summary

There appears to be need for research efforts which examine the

content and sequencing of subjects taught to mentally retarded students in special education classrooms of the public schools. Separating the teaching of reading and arithmetic on a time continuum might improve performance in each subject area. This is suggested by research studies of the mentally retarded which indicate the existence of a gap between the vocabulary used and the vocabulary understood by these students. This appears to be a qualitative difference between the spoken and understood vocabulary of mentally retarded students, which also exists between the manipulation of arithmetic symbols and the retardate's ability to reason symbollically. If it is accepted that reading and arithmetic require a different investment of thought on the part of the student, then the teaching of both during the same time period may be affecting the students ability to reason in one or the other subject matter areas.

The literature indicates that mentally retarded students seem to achieve as well as other students of the same mental age, some out-achieving normal students in the areas of reading and arithmetic. This has been theorized as possibly due to the mentally retarded having been exposed to more advanced instruction. An alternate explanation posed for this study would ascribe this difference as possible due to the demands for content understanding or for mere performance.

If a program in verbal concept development were shown to affect overall academic achievement of the mentally retarded student this would indicate a need to stress the meaning aspects of activities provided for in their curriculum. If this treatment program should affect academic achievement more when arithmetic had been removed from the curriculum, the need for the present study would be implied. An exploratory study

should be made to determine if the teaching of arithmetic interferes with the teaching of reading and if provision for concept development in the special education program affects the achievement of the mentally retarded student in the public school special education classroom.

CHAPTER II

BACKGROUND OF THE PRESENT STUDY

Well documented findings are that educable mentally retarded students attain at most a reading achievement level of the third grade and an arithmetic performance level comparable to regular fifth grade ability. This presents a question of whether the achievement level could be increased or materially altered by curriculum arrangements specifically geared to the capabilities of the educable mentally retarded in the special education classroom setting. If such gains in achievement can be made, the problem becomes one of identifying areas to manipulate or alter in order to effect more appreciable gains in their achievement. Study of specific modifications would tend to isolate factors having an effect on academic achievement. Could specifically adapted curricula increase the achievement of the mentally retarded? The present study was suggested by findings that the educable mentally retarded students were being analyzed on the basis of regular curricular performance where by definition they would be inferior.

In study of the mentally retarded there are indications of a disparity between the understanding and usage of symbols both for words and numerals. It has been theorized that concept development will improve achievement in both reading and computational skills. Difficulty with concepts may be affecting both skill areas, for as brought out in this chapter, investigators (4, 8, 9, 11, 13, 17, 33) have indicated a

difference between understanding and performance in both reading and arithmetic. Other investigators have implicated concepts in the genesis of difficulties in intelligent adaptation. Attention to the development of concepts may increase reasoned performance, hence the capabilities of mentally retarded students.

Anyone doing research with concept development will recognize that concepts exist at varying levels of complexity depending on the amount of experience and the relationships which are established between objects. Concept development can be operationally defined. At present concepts have been discussed as part of the concern in learning and retention study and in problems of mediation, not as a part of the curriculum. This study would examine concept development as a specific part of the curriculum for the educable mentally retarded in the classroom.

Relationship of Concept, Concept Development And Academic Achievement

The commonly accepted definition of "Concept" has been that of Dewey (10), who defined it as "meaning sufficiently individualized to be directly grasped and readily used, and thus fixed by a word."

"Concept," according to Furth (13), is "an abstract term referring to a characteristic of thinking behavior, insofar as it lends itself to discursive verbalization." For the purposes of this inquiry the word "Concept" will be identified as verbal concept.

Serra (31) points out that research dealing with concepts as related to the reading process has been concerned with verbalized concepts. She enlarges:

> When verbal symbols are added to the stock of established

> concepts, it is essential that these initial concepts be formed on the basis of direct experience. In order to build concepts, then it is necessary to provide experience in order to establish the simple concepts that will be subsequently combined and manipulated to form the more complex concepts. Concepts that can be traced back only to verbal language or to symbols acquired through language result in mere verbalism.

She reports a study of IV and V grade pupils who were exposed to different methods of teaching word meanings in which the teacher and students discussed, gave synonyms, illustrated sentences and word definitions. This was found to be the most effective method in comparing with context, picture, and dictionary methods of teaching.

In their analysis of the academic area, Gibson, Jephcott, and Wilkins (17) state:

> Language study is made up of grammar and composition and requires considerable intellectual flexibility in its application. Similar reasoning may be applied to arithmetic, . . .once the basic symbols have been rote learned, the pupil is then required to exercise independent manipulative thinking. Writing, reading, and social studies by contrast are more dependent upon such intellectual specificities as memory function and eye-hand coordination and do not require the overall mental agility of either arithmetic or grammar, in which each problem is an unique one requiring the application and integration of prior learned principles. Even the

> acquisition of basic number skills implies some inherent ability to form closures of groups of objects so as to develop abstractions of number groupings. . .

The above quoted authors have ascribed to the various academic areas differing qualities of thought. By so doing, they became one of the few references in the literature which differentiates varying intellectual involvement for the areas of the curriculum.

Furth (13) makes reference to this differentiation. He refers to "language" as the natural verbal language of a society and separates it as not encompassing "formally taught symbols, such as mathematics of symbolic logic." He thus implies a difference in mental requirements between areas of thought.

Merrill (25), in her third study, which compared the achievement of the mentally retarded students with the more average students, reported on the correlation of several different tests. Her findings were that "correlations between reading and reasoning are higher than between reading and computation or computation and reasoning. Correlations between computation and reasoning are slightly higher than between reading and computation." Such disparities have not been empirically manipulated to see if they might affect achievement in the different academic areas.

Concept Development and the Mentally Retarded Student

As noted in Chapter I, when the mentally retarded students are compared on the basis of their mental age with normal students of corresponding chronological age, the mentally retarded's performance is quite similar. Furthermore as presented here, authorities in the field

of the mentally retarded argue that their differences are both qualitative as well as quantitative.

Cutts (9) in his evaluation of the conceptual ability as related to the academic achievement of educable mentally retarded children stresses that their difficulty in forming concepts and making generalizations differentiates them qualitatively and quantitatively from normal children.

Cruickshank (8), from his study of their knowledge of arithmetic terms, has explained that

> The unsatisfactory achievement of the mentally retarded pupils with verbal problems is closely related to their limited understanding of arithmetical terminology. It is also quite possible that lack of knowledge of vocabulary accounts for the general inferiority of the mentally retarded pupils, which has been noted in their ability to solve correctly concrete exercises in all four of the fundamental processes.

Dunn (11), in an early investigation of the reading processes of the mentally retarded, found them to achieve significantly below their mental age expectancy in reading, spelling, and arithmetic reasoning. Their reading was described as inferior in the use of context clues and they demonstrated little concern for content. Dunn supported the position of qualitative as well as quantitative differences between the mentally retarded and normal students.

Shotic (33) replicated Dunn's study, using a larger sample, finding differences supporting Dunn's results of reading tasks, but finding no significant difference for his population on the performance tasks.

As a replication of a study by Furth on concept development in deaf children, Milgram and Furth (13) used special class educable mentally retarded students, comparing their performance with normal children of chronological ages 5.8 to 9.9 years. The matched mentally retarded student had this same mental age. When compared on nonverbal tasks of sameness, symmetry, opposition, and opposition transfer, Milgram and Furth found as with the deaf, in the earlier study, that

> The retarded performed more poorly in the discovery and application of a language relevant concept that was within their realm of comprehension, but performed as well as normals in solving problems where perceptual rather than verbal modes of solution were assumed to be more suitable.

This seems to lend credence to the theory of a differential of thought content to different areas of the curriculum.

As part of a later study, in 1965, on the discovery of Similarities, Furth and Milgram (14) studied the linguistic experience of nineteen educable mentally retarded students with mental ages of 9.0, compared with 19 normals of that chronological age. They found that picture sorting was the easiest task for both groups and that the addition of verbal factors led to poorer performances, both in picture sorting and picture verbalization. Understanding what was required was relatively harder than responding in a verbal fashion to the tasks, for both groups. The retarded had less difficulty verbalizing words than with sorting their written form. In the case of pictures, sorting tasks were less difficult for the retarded than for the verbalization tasks. Since the retarded performed as well as the mental age controls on nonverbal tasks,

but were less capable on word-sorting, picture verbalization, and word verbalization tasks in proportion to their linguistic requirements, the authors concluded that the lowered performance of the retarded had to do with specific difficulty in the handling of the linguistic medium. They failed to take into account the chronological age difference in other analysis of their data, but this finding concerning the capabilities of mentally retarded students in verbal performance was a valuable contribution to the literature.

Indication of Trainability of the Mentally Retarded In Concept Development

Using an institutional population, Kirk (22) studied 63 mentally retarded children with mental ages of 5-6 to 7-5 to determine their reading aptitude and trainability in reading readiness. He took six subjects and gave them intensive reading readiness training for ten weeks. He then retested them on the Monroe Reading Aptitude Test. Where the mentally retarded were most defective (memory, articulation, and sentence length) they made the most progress. On motor functions, where they were most superior, they scored no measurable gains. Kirk demonstrated that adding to the background of experiences through an extended reading readiness program aided the mentally retarded in acquiring skills for reading.

Murdoch (27), in one of the earliest studies of gains for mentally retarded students in academic subject matter, selected twenty-one of her better students in a residential school for study. The subjects had an average chronological age of 16.4, an average mental age of 9.2, and an average intelligence quotient of 61. Using standardized achievement

tests, she studied their progress in reading, arithmetic, spelling, and composition. Initially they were slightly above expectancy in arithmetic fundamentals and below expectancy in spelling and language achievement. Restested a year later they made slight average gain in all areas, although their gains did not parallel the gain in mental age. Since she used a biased sample her findings must be viewed with caution, but her findings were used as evidence to contend that the mentally retarded could do better at some tasks because of more practice with them.

Bradway (3) reported on the selected records of fifty-three older mentally retarded subjects at the Devereau Residential School in Pennsylvania. She found on the Stanford Achievement Tests that mean reading comprehension exceeded mean mental age by one year, and mean spelling age exceeded the mean expectancy level by two years. The arithmetic age was approximately that of mental age. These subjects made a one-half year improvement in one year in spelling, in reading comprehension, and in arithmetic reasoning. On word meaning and arithmetic comprehension they improved two-thirds of a year in one year. Since this was a selected group of subjects, the results would have to be viewed as biased, but they do create a suspicion that verbalism was being demonstrated by the disparity of performance versus mental ages.

Using 326 special class mentally retarded pupils in the Detroit public schools, Nemzek and Meixner (28) studied their progress over a four year period. They gained approximately two-fifths of a grade yearly in reading and exceeded the reading scores at each grade level on arithmetic fundamentals. Engle (12), in another study in the Detroit school special classes, reported the gains in achievement for 3,169 mentally retarded pupils on the Stanford Achievement Tests. Average

gain in paragraph reading was 0.44 of a grade; in vocabulary reading 0.45 of a grade; and in spelling 0.40 of a grade. The overall gain was two-fifths of a year, the same as Nemzek and Meixner reported.

Janes (21) reported the results of a program of special reading instruction in special classes in Camden, New Jersey. During the first year the subjects made nine months progress, the second year ten months, the third year, six months, and the fourth year a gain of 4 months. He concluded that within the range of their ability, special reading instruction was effective with the mentally retarded.

Chipman (7), in her study used a state residential school population of 135 mentally retarded subjects with mental ages of 8-2 and up. They were reading at the third grade level. She had the subjects supply words to fill in the blanks of a series of 22 sentences written on the blackboard. The sentences were read aloud and the subjects would write down as many words as they could that would complete the sentences. They were helped with their spelling. The findings were that the mentally retarded had a poverty of ideas: few of the words had mental age values over six years. She found that the older mentally retarded pupils did make more correct responses and that this was more important than the reading level.

Gallagher (15) studies 42 brain-injured mentally retarded students residing at the Dixon State School of Illinois. They had chronological ages of 7-4 to 13-9 years, intelligence quotients of 33 to 63. Matched on the basis of mental ages, he studied their achievement over a three year period of time. One group received 21 months of individual tutoring for a fifty minute period each day. He compared for gains in performance during the third year when tutoring had been stopped.

Additionally, he compared the control group on their development during the third year when they received the special tutoring. There was an average gain in verbal intelligence of six points during the first year of tutoring and a loss of 1.6 points during the second year for the experimental group. The most extensive losses occurred with those children who made the most progress during the initial year. During the third year the experimental group lost an average of 2.5 intelligence points, while the control group, with tutoring gained 1.2 points. In the language area, both groups made similar progress in verbal labeling and in making simple associations. Both groups showed similar gains in quantitative skills. Both groups showed a significant difference in attention as a result of the tutoring experience, which was maintained after tutoring was removed.

Even though he was concerned with tutorial arrangements and results, rather than classroom methodology and curriculum modification, Gallagher did demonstrate that even with a low ability population, verbal ability performance could be increased. This was one of the first studies demonstrating that educational methods with the mentally retarded could be subjected to rigid research control.

Smith (34) lays claim to the earliest attempt to demonstrate significant effects of a language development program with special education educable mentally retarded children with use of controls and standardized measures. He matched sixteen pairs of educable mentally retarded children (IQ 50-80; CA 7-10) on the basis of chronological age and language age as obtained on the Illinois Test of Psycholinguistic Abilities. The experimental children were taken from their special classes in groups of eight, three times a week for forty-five minutes

over a three month treatment time. They were administered a stimulating and enriching series of lessons which were high in conceptual content, as well as linguistic emphasis. Results demonstrated a more than 7 month gain for the experimental over the control group. He demonstrated that a program geared to special education educable mentally retarded children in the public schools can be profitably accomplished. Smith further stressed that this type of program needed to be studied rather than the institutionalized population programs which had been the source of most previous studies.

Mueller and Smith (26) followed up the previous study a year later. They found the groups to still differ significantly in favor of the experimental group: one-half the experimental group continued to show language growth acceleration while the other half held the gains they had made. The control group made slow but steady increases in language development during this period.

Blackman and Capobianco (2) evaluated the effects of programed instruction in comparison with "traditional" special class instruction. They used mentally retarded adolescents with mean chronological ages of 14 and IQ of 54, reading grade of 1.4, and arithmetic grade of 1.7. Their objective was to teach beginning reading and arithmetic to these children. They found that arithmetic achievement gains were greater than the gains made in reading. Both methods produced significant gains in reading though neither method was superior to the other in mean gain scores. In this study the teachers were in charge of both the experimental and control groups for half of each day. This was not controlled as to the possible contaminating influence each migh have on the different groups. The inadvertent instruction by "traditional" methods of a content area

being stressed during the programmed portion of the study could have affected the results obtained. Nevertheless, this study indicates a difference between the understanding and learning of reading and arithmetic.

Vergason (37) investigated the effects of using traditional methods of teaching a high vocabulary as opposed to an auto-insturctional method of teaching educable mentally retarded children in special education classes. He used sixteen subjects (IQ 55-74; CA 7.0-14.6; MA 5.9-10.0) who did not know twenty words in common. For treatment, a paired-associate method using automatic slide projectors to pair words with pictures was used with half the words, while the other half were taught by traditional methods using the teacher's customary methods. Good retention rates were produced by both methods after one day, but significant differences were found for retention after 1, 24, and 14 months in favor of auto-instruction.

Such studies as these serve to emphasize that methodological variation in instructional approaches to educate the mentally retarded in special education classes should be studied. Achievement gains have been made but wide application of methods successful with small samples may be ineffective when applied to a full classroom situation. These studies further demonstrate that the actual achievement potential of the mentally retarded student has yet to be ascertained. Such potential not even being approached until the academic program has been fitted to serve their capabilities.

Achievement Studies of Public School Special Education Classes For Educable Mentally Retarded Students

Study of educable mentally retarded students have been centered

around comparisons between academic achievement in special classes as opposed to achievement in regular classes. In the first study of its kind, Goldstein, Moss, and Jordan (18) examined 1938 children in first grade classes of twenty schools and districts. Those children with Intelligence Quotients of less than 85 on the Primary Abilities Test were individually tested on the Stanford-Binet (1937, Form L). Those with Intelligence Quotients of less than 85 on both tests were then assigned randomly to treatment conditions. The experimental group (special class) consisted of 57 subjects (Mean IQ 78.20; Mean CA 77.29) while the control group (regular class) included 69 subjects (Mean IQ 78.48; Mean CA 79.08). Ninety-six subjects completed the study. Using a special curriculum which made heavy, deliberate use of previous experience and exploring the meanings of words and ideas toward developing understandable concepts in each area, the authors demonstrated significant differences in achievement for reading, language, arithmetic (computation and problem-solving) and for social information favoring the special education group. They also found that children with IQs above 80 should not be placed in special classes. For those children with IQs below 80, they found that with a specifically designed curriculum the educable mentally retarded could be most effectively taught in a special class program.

Two other studies were found which involved the achievement of special education educable mentally retarded students in public schools. The dearth of such studies was surprising since the majority of the mentally retarded population has been taught in this type of situation.

Cartwright (5) conducted a descriptive study of eighty adolescent educable mentally retarded students. He studied twenty students at each

age level, twelve through fifteen, with IQs of 55-75. They were compared with eighty pupils whose chronological age was controlled: twenty at each age level twelve through fifteen (IQ 90-110). There was also a mental age level eight through eleven (IQ 90-110). All three groups had written compositions of 50 or more words. Each group was selected by stratified random sampling from approximately 1,500 pupils in grades 2 through 10 or in special education classes for educable mentally retarded in junior high schools. Cartwright compared the written language abilities of these groups. He found the normal children to exhibit more diversity in their use of words. Thus the mentally retarded were characterized as having smaller vocabularies. From this study it was felt that more stress was being placed on writing skills in regular classes than in special classes for educable mentally retarded students.

In the other achievement study, Rouse (30) sought to enhance the abilities of educable mentally retarded students in productive thinking. She administered a training program in productive thinking to 47 educable mentally retarded students (IQ 58-78; CA 7-7 to 17-2) from five special education classrooms. She compared their performance for mean gain in productive thinking as measured by verbal and nonverbal subtests of the Minnesota Tests of Creative Thinking. The students received thirty consecutive lessons designed to increase their productive thinking. Five teachers of the experimental classes administered the training program which was designed, through individual daily lesson plans, to be rigidly structured. Brainstorming sessions, limited to fifteen minutes each session, were used to stimulate a flowing of ideas and to form the core of the treatment. In addition, reading charts and cumulative graphs were prepared from the ideas generated during the

brainstorming sessions. Pictures, poems, and stories were shared, thus giving added opportunity for verbal expression. With analysis of pretest and post-test mean gain scores, compared with five control classes who were taught by traditional methods (N.31), the results clearly demonstrated a significant superiority for the experimental group in terms of the training improving their test performance. Rouse, by this study, demonstrated that educational treatments in the special education classroom could have positive effects on the cognitive abilities of educable mentally retarded students.

Summary

Much has been written in the past years about the capabilities of the mentally retarded in comparison with the more average student. Little has been attempted in the way of curriculum adjustment to effect a more adequate achievement on the part of the mentally retarded. Recent efforts have demonstrated that more adequate performances could be accomplished through tutoring arrangements and special instructional provisions. The indications are present that curricular modifications and special instructional emphasis might be an appropriate part of the special class curriculum for educable mentally retarded students.

Some caution should be taken when introducing new content into the curriculum, for until adequately studied, the new content may be no more effective than the content which has been excluded. Presently, the studies of curriculum have indicated gains in achievement for the mentally retarded. Investigations need to be made of specific areas to ascertain their relative contribution, for the different investigations have used different methods and have not sought to study the method's

effect on academic achievement of subject matter affected.

CHAPTER III

DESIGN OF THE PRESENT STUDY

The present study is an exploration designed to gather data to determine the effect of an administered treatment program in verbalized concept development upon the achievement level of educable mentally retarded students when the teaching of reading and of arithmetic is varied.

Statement of the Problem

Evidence has been presented in support of a theory that the teaching of reading and the teaching of arithmetic should be attempted at different intervals of the school experience. That because they require different types of thought, the teaching of both subjects during the same time continum creates a situation where one interferes with learning of the other.

Investigators (16, 31) have indicated that more experience with the meaning of words will improve the achievement both in reading and arithmetic. Evidence has been gathered as reported in the previous chapter that links concept development to the academic achievement of educable mentally retarded children. If this is the case, then concept development as it affects academic achievement should be investigated.

By emphasizing the content and skills of reading, to the exclusion of any arithmetic instruction until later in the school year, and by

emphasizing the meanings of words through a controlled treatment program in concept development the student should develop more competency in reading than students who have their thought energies expended attempting to master two variegated symbolic skills at the same time.

Measuring the achievement of educable mentally retarded students who were taught the usual curricula of reading and arithmetic at the same time for six weeks, and comparing their achievment scores with students who are taught reading with an emphasis on developing verbal concepts, separated from instruction in arithmetic for six weeks. Then, a reverse of the procedure will be made, having the reading and the concept development treated group study reading and arithmetic in the usual manner for six weeks while the original reading-arithmetic group follow the reading-concept development program for six weeks. The comparing of the treatment group achievement scores with the opposite group and with another group that had received no treatment, should yield some evidence of the soundness of current curricular emphasis and sequencing with educable mentally retarded students.

Hypotheses

After a review of the reports which have been made and a consideration of the theory that has been developed the following general hypotheses were established for the present study:

1. There will be no significant difference in academic achievement between:
   - (a.) educable mentally retarded students taught reading and arithmetic in the usual manner, and
   - (b.) educable mentally retarded students who are taught

reading accompanied by a training program in concept development but not given instruction in arithmetic computation.

2. There will be no significant difference in the academic achievement of the following two groups:

   (a.) educable mentally retarded students taught reading and arithmetic in the usual manner for six weeks, then taught reading accompanied by a training program in concept development but not taught arithmetic;

   (b.) educable mentally retarded students who, for six weeks, are taught reading accompanied by a training program in concept development but not given instruction in arithmetic computation, and then taught reading and arithmetic for six weeks in the usual manner.

3. There will be no significant difference in academic achievement between:

   (a.) educable mentally retarded students who are taught reading and arithmetic in the usual manner, and

   (b.) educable mentally retarded students who are taught reading and arithmetic in the usual manner for six weeks: and then for six weeks are taught reading and a program in concept development, excluding computational arithmetic insturction.

4. There will be no significant difference between the academic achievement of educable mentally retarded students who are taught reading accompanied by a training program in concept

development separate from instruction in arithmetic computation when such a program is taught during a different phase of the school year.

5. There will be no significant difference between the reading achievement of educable mentally retarded students taught reading in the usual manner during different phases of the school year.

Subjects

The Oklahoma City Public Schools had thirty-four intermediate special education classes. Only the fifteen classes and teachers used in this study seemed to meet the criteria. A review of the central office records indicated only fifteen teachers met the requirements of having at least one year of previous experience in teaching such classes and having met State requirements of a Standard Teaching Certificate in Special Education, and their classes containing students from the lower middle socioeconomic level.

The criteria established for this study were that the students used in the analyses of achievement have chronological ages from 8.5 to 13.0 years; have intelligence quotients on either the Wechsler Intelligence Scale for Children or the Stanford-Binet Intelligence Scale: Form L-M, recorded from a certified examiner on an individual psychological evaluation, such scores being from 50 to 80 points; they had to have mental ages between 3.5 and 10.5 years; have been one or more years in a special education class for the educable mentally retarded; and, they had to have similar lower middle class socioeconomic status.

An additional requirement for being included in this study was that

the student had to have been present during each subtest administration of the achievement testing. When this requirement and the other criteria were applied in isolating the students to be included in this study, 134 students remained.

Table I indicates the classes, and students from these classes, used in the different groups and in the study as a whole.

Of the 158 students who received the full experimental treatment 69 students' data could not be used due to attrition. This left a total of 89 students in the treatment groups from which useable tests were obtained: 51 students in Group I and 38 students in Group II. Of the control group, Group III, 60 students received both pre-testing and final testing. Of these, 15 students' data could not be used for the reasons of attrition as with the experimental groups. Forty-five students were in Group III. Data for 134 students were used in analyses of overall effect of the study.

Table II presents the basic information on the intelligence quotient (IQ), chronological age (CA), and mental age (MA) for each group included in the study. As shown, the IQ scores ranged from 50 to 80 and when tested for Mean difference, the t values obtained were found to not be significantly different. The standard deviations of the IQ scores were obtained and by use of the Fisher F formula, found to not be significantly different. Thus, intelligence quotients were accepted as equivalent for the three groups.

On chronological age the range of ages was from 8.5 to 13.0, with Means only .4 of a year apart. When the Means of the separate groups were compared there was not found a significant difference, but when the treatment Groups I and II data were combined and compared for Mean difference with the control Group III a significant t-value was found at the .05 level of confidence. Looking at the data for the groups, Group

TABLE I

CLASSES AND GROUPING OF THE EXPERIMENTAL STUDENTS

Teacher	Group I	Group II	Group III
1	14		
2		7	
3	13		
4		6	
5	8		
6		11	
7	10		
8		7	
9	6		
10		7	
11			9
12			10
13			9
14			12
15			5
TOTAL	51	38	45

TABLE II

IQ, CA, AND MA CHARACTERISTICS OF GROUPS I, II, AND III

	Measures	Group I (N=51)	Group II (N=38)	Group III (N=45)	F	Combined F	t*	Pooled t
IQ	Mean	70.96	70.5	68.6			.028	1.09*
	Range	53-80	50-80	51-78				
	SD	6.4	7.2	6.7	1.129*	1.015*		
CA	Mean	10.3	10.5	10.7			.8	4.621**
	Range	8.5-13.0	8.7-12.9	8.5-12.8				
	SD	1.27	.01	1.4	127.0***	10.573**		
MA	Mean	6.7	6.7	6.5			.0	.262*
	Range	4.0-10.1	3.8-9.8	3.9-9.9				
	SD	1.46	1.56	.26	1.068*	5.769**		

*Not significant at the .05 level of confidence

**Significant at the .05 level of confidence

***Significant at the .02 level of confidence

III was chronologically older than Groups I and II. Examination of the Standard Deviations of the separate Groups, indicates significantly different t values, significant at the .02 level of confidence, between the three groups. When the treatment groups data were again combined and compared with the control Group III a significant difference at the .05 level of confidence was found between the Standard Deviations. Further examination indicates that, on the basis of the Range, Standard Deviation and Mean data, the control group contained students more near the same chronological age than the treatment groups and to be older by an average of .2 of a year. Also, that Group II is more near the same chronological age than Group I.

Concerning Mental Age, only when the treatment group's data were combined and compared with the control group was there a significant difference. The Means were not found to be significantly different, but the Standard Deviations were found to differ at a significant level, at the .05 level of confidence. This would indicate that the control group III was more near the same mental age than the other two groups.

Thus, any advantage from measuring the Mean raw score gains in achievement between the Groups would seem to favor the control Group III, and should be taken into account when analyzing the results of this study.

To determine the socioeconomic level of students included in the study the Hollingshead Index of Social Position was administered and a chi square analysis made of the data obtained.

Hollingshead (20) developed a multiple equation index for estimating a family's social class position based on the residence, education and occupation of the parents which when weighted, 6, 5, and 9

respectively for the different areas, yielded a criterion prediction of .942 by means of multiple correlation. The range of scores for each class was on the basis of heterogeneity in scale score patterns determined by the formula: X_1 (Estimated class position) = $6X_2$ (Residence) + $5X_3$ (Education) + $9X_4$ (Occupation).

TABLE III

INDEX OF SOCIAL POSITION*

Class	Range of Scores	Percentage of Total Number of Families
I	20 - 31	2.7
II	32 - 55	9.8
III	56 - 86	18.9
IV	87 - 115	48.4
V	116 - 134	20.2

*From Hollingshead, A. B. & Redlich, F. C., Social Class and Mental Illness, John Wiley and Sons, New York, 1958. p. 395.

The residence scale was based on a six point basis ranging from the finest homes down to the lowest tenements. The education scale was a seven point scale, ranging from graduate professional training down to less than seven years of school. The occupational scale was also of seven points, ranging from executives and proprietors and major professionals, down to unskilled workers. It was anticipated that the population for this study would fall in the Class IV range of this index (Table III). This class containing the midpoint of the percentages, was

felt to reflect a more unbiased sampling criteria besides being the lower-middle class area of the Index.

Each of the 134 students included in this study was scored for social class position. Each school's score was combined for purposes of analysis. All fell within the range established for this study. Table IV indicates the scoring obtained on this index. While the actual and expected scores do not fully meet the criteria for chi-square, the largest variation was only .008 which was thought to be accounted for in the use of approximate weighting suggested for use on this index. Wert, Neidt and Ahmann (39, p. 150) list as "the only restriction placed on the computation of chi-square has been that the expected frequency total equal the actual frequency total." Therefore, the conditions for using chi-square were assumed to have been met. The resulting values obtained from the table of chi-square were found to be well away from the .10 value of 4.605 listed. The students used as the population sample for this study met the criteria for being from the same socioeconomic level. Hollingshead and Redlich (20) suggest that the place of residence, occupation of the head of the household, and the parent's occupation, the factors used in their index, are adequate reflections of the social and cultural position in our society.

Materials

A specificly developed, uniform teaching unit was supplied each teacher in the ten treatment classes (Appendix A). In addition a commercially obtained record, Teaching Children Values (4), consisting of a series of recorded stories was given to these teachers.

TABLE IV

CHI-SQUARE ANALYSIS OF STUDENT'S STANDING ON
THE HOLLINGSHEAD INDEX OF SOCIAL POSITION

	Factor	Expected Index Position	Expected Scale Value	Actual Scale Value	Weight*	Actual Score	Expected Score	Mean
Group I (N=51)	Residence	5	255	285	6	1548	1530	
	Occupation	5	255	263	9	2367	2295	
	Education	5	255	245	5	1225	1275	
	Total					5140	5100	101
Social Index Position: Class IV Chi-square (2 df) = .314 P>.10								
Group II (N=38)	Residence	5	190	194	6	1164	1140	
	Occupation	5	190	176	9	1584	1710	
	Education	5	190	214	5	1070	950	
	Total					3818	3800	100
Social Index Position: Class IV Chi-square (2 df) = .085 P>.10								
Group III	Residence	5	225	214	6	1284	1350	
	Occupation	5	225	234	9	2106	2025	
	Education	5	225	227	5	1135	1125	
	Total					4525	4500	101
Social Index Position: Class IV Chi-square (2 df) = .139 P>.10								

*an approximate weight

Research Design

The research design was developed to test the stated hypotheses. It was postulated that instruction in both reading and arithmetic during the same time periods affected academic achievement. It was also postulated that instruction in concept development would enhance academic achievement. Therefore, the study was designed to determine if educable mentally retarded students receiving instruction in concept development instead of arithmetic computation had different achievement academically when measured with educable mentally retarded students who received the usual academic instruction. Figure 1 illustrates the design of the present study in diagram form as illustrated there were three groups of unequal size: Group I had 51 students, Group II 38 students, and Group III 45 students. After being pretested they received six weeks of study, were retested, then received six weeks more of study, followed by another testing for achievement gain. The control group, Group III, received only initial and final testing.

Group I and Group II data were combined and compared with Group III data. The groups were measured and compared for Mean achievement gain at the conclusion of Post-test $_2$, that is at the conclusion of the second phase of treatment. Further analysis of the gains in achievement were made. Mean raw gain scores for Groups I and II during Phase I were compared with each other; then, the Phase II Groups I and II were compared. In addition, Phase I, Group I were compared with Phase II, Group II for differences in treatment effects on achievement. Each Group and Phase was then compared with every other Group and Phase for possible differences resulting from the curriculum modifications.

Procedures Used in the Study

This study required the special education teachers to administer the Stanford Achievement Test. Primary Battery: Form W. as a pretest, at the conclusion of Phase I, and at the conclusion of Phase II. In addition, except for Group III, the teachers presented a controlled series of lessons in concept development (Appendix A) while refraining from teaching arithmetic computation during one of the phases of the study, either Phase I or Phase II. They would present their usual instructional program, without the concept development unit, during alternate phases as called for in the experimental design. Teachers in Group III of the study would administer only pretests and the tests at the conclusion of Phase II. They would thus serve as an overall control of the experimental procedures.

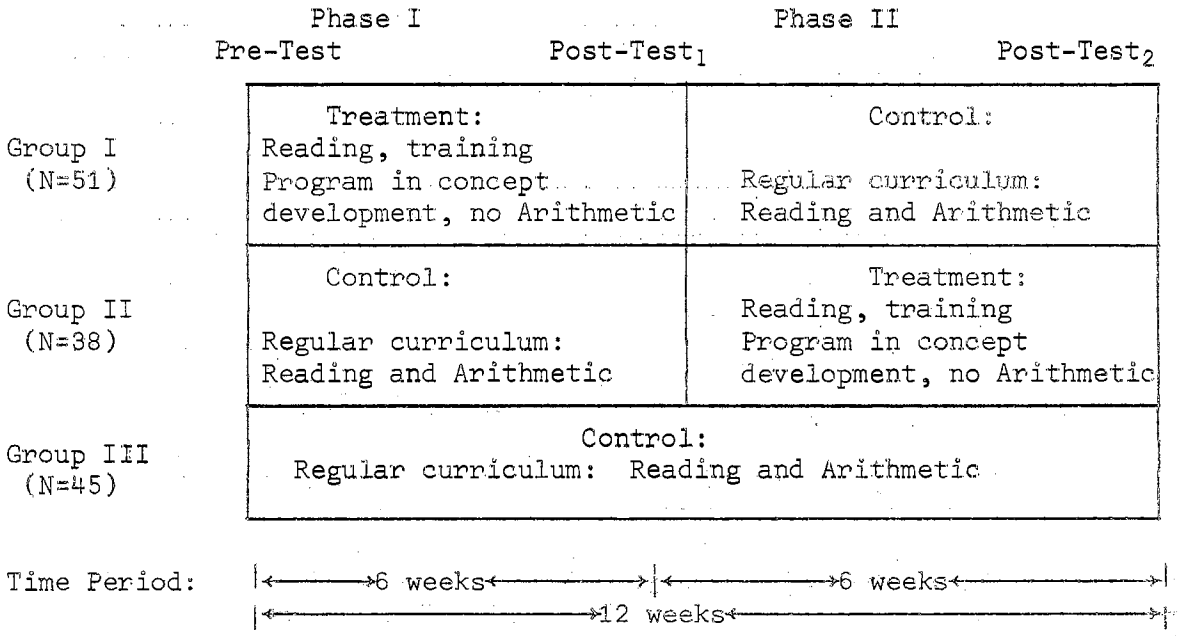

Figure 1. Design of the Present Study.

The teachers were arbitrarily numbered off from one to ten, with the odd-numbered teachers being designated the treatment classes for Phase I of the experiment while the even-numbered teachers automatically were assigned as control classes for Phase I. After determining when during the day the treatment was to occur (because arithmetic instruction was given in the morning, before recess, this was the period of time selected for presentation of the treatment lessons to all of the classes), the teachers who were to give the treatment during Phase II were excused, to meet for their orientation the Friday just preceeding the start of their treatment lessons. The treatment teachers for Phase I were then instructed and oriented to the teaching unit of the experimental treatment. A copy of the teaching unit was supplied to each teacher, together with the recorded stories around which the unit centered (Appendix A). This was given to the Phase II teachers at their orientation meeting.

It was felt to be impossible to completely eliminate variation between teaching procedures and influence, but it was felt that the teacher variable could be partially controlled by the uniform teaching unit, instruction in its presentation, the uniform recorded stories, and weekly contact with the teachers by the experimenter.

Basically, the experimental treatment consisted of a recorded series of stories which were played individually throughout the treatment program. This, together with a wide assortment of activities designed to clarify and fix the conceptual meanings of words contained in the recorded stories. For the entire class as a group an introduction was given to each story as it was presented. A single story was heard on a single day. The story was played, followed by a

discussion of the entire story, then an analysis of certain preselected words was made as to their meaning. Experience charts were written using and enlarging on the words being emphasized. These were dictated by the students to the teacher. Each student was encouraged and allowed to read these charts. Original drawings were made depicting the stories as ideated by the students. In addition to the teaching unit, any use of words under study during other parts of the day were noted and brought to the attention of the class as being a word they were studying: attention to the context in which the word was used was cited to the class. Each teacher in the experimental group was required to refrain from teaching arithmetic or handling any direct arithmetic content. They were to treat numbers as words only and not to stress them, even as words.

All of the tests were individually scored by the experimenter and two assistants, trained by the experimenter, to insure accuracy and consistency of scoring.

The Mean, Range and Standard Deviation of each Group used in this study were obtained. All tests used were formulated as presented by Wert, Neidt, and Ahman (39). A t-test for unequal groups was applied to the Mean data and an F-test was applied to the standard deviation data.

CHAPTER IV

RESULTS OF THE STUDY

The purpose of this study was to determine the effect of a curriculum variation on the academic achievement of educable mentally retarded students. A treatment program in concept development was taught instead of instruction in arithmetic computation to two different groups of students. One group received the treatment program while the other group was taught the usual curriculum. After six weeks the order was reversed: the second group received the treatment program with no arithmetic instruction while the first group followed the regular curriculum. A third group received the regular curriculum throughout the study, serving as an overall control group.

The Stanford Achievement Test was administered to Groups I and II as a pretest, after the first six weeks of treatment, and at the conclusion of the second six weeks of treatment. The third group received only the pretest and final test. The achievement differences of Mean raw score gains between the treatment groups, Groups I and II, the control group, Group III, were measured and analyzed by use of t-test statistics for sample groups of unequal size. In addition the differences between the two phases of the treatment program were measured, as well as, the probability of differences between Means for the different sub-areas of the Language Arts portion of the test. As a further analysis, the Language Arts portion of the test was compared

with the Arithmetic portion of the test for Mean raw score gains.

Findings of the Study

In the first instance the raw score data were analyzed using a combined Mean for Groups I and II which was then measured for Mean difference with Group III (see Table V). The resulting t of .048 for Language Arts and 1.051 for Arithmetic were not found to be significantly different at the .05 level of confidence. A t-value of 2.000 with 88 degrees of freedom was necessary to achieve significance. Only in arithmetic was this value approached, and it failed to attain the necessary level, nevertheless, the tabled scores indicate a disparity between Language Arts and Arithmetic performance. Thus, the overall achievement effects of the treatment program are subject to question as to value.

TABLE V

COMPARISON OF GROUPS I, II, III FOR MEAN RAW SCORE GAINS

		Mean	P_t GROUP I	P_t GROUP II	P_t GROUP III
GROUP I:	LANGUAGE ARTS	15.216		.180	.144
	ARITHMETIC	3.255		.704	.436
GROUP II:	LANGUAGE ARTS	14.052	.180		.069
	ARITHMETIC	6.263	.704		1.168
GROUP III:	LANGUAGE ARTS	14.488			
	ARITHMETIC	2.044			
GROUP I AND II COMBINED	LANGUAGE ARTS	14.719			.048
	ARITHMETIC	4.539			1.051

No significant difference at the .05 level of confidence.

Separate t-tests were made of the Mean raw score gains in achievement of the different groups during Phases I and II of the study. In addition, comparisons were made between the different Phases of the treatment program. These data are presented in Table VI.

TABLE VI

SIGNIFICANCE OF DIFFERENCES BETWEEN MEANS OF ALTERNATELY COMPARED PHASES AND GROUPS FOR LANGUAGE ARTS AND ARITHMETIC

	PHASE I		PHASE II		P_t
	GROUP I	GROUP II	GROUP I	GROUP II	
Language Arts Arithmetic	109.610 3.333	9.026 6.842			19.607* .920
Language Arts Arithmetic	109.610 3.333		4.686 .052		28.542* 1.290
Language Arts Arithmetic	109.681 3.333			5.026 .579	33.671* 1.417
Language Arts Arithmetic		9.026 6.842		5.026 .579	.075 1.824
Language Arts Arithmetic			4.686 .052	5.026 .579	.071 .274

*Significant at the .001 level of confidence.

The t-value obtained on comparison of Phase I: Groups I and II Language Arts Means, when measured with the t-table value of t with 50 and 37 degrees of freedom, indicates that 19.607 is beyond the t-value of 3.646 or 3.551 at the .001 level of significance. Therefore, the difference between these scores may be considered as highly significant. Likewise, the difference between the t-value scores for Phase I: Group I and Phase II, Group I, and between Phase I: Group I and Phase II: Group II.

All other t-values failed to approach a level of significance. It is interesting to note that in actual Mean arithmetic gain scores there were greater gains made during the treatment phases when arithmetic was not formally taught than when it was taught, even though the difference was not significant.

These results gave indication that the effects of Phase I Group I were unique to that Group and Phase.

The probability of a difference between the Means of different sub-areas of the Language Arts portion of the study was investigated. Table VII summarizes these data. Analysis of the t-values obtained indicates that in only one area was there a significant difference in Means. An obtained t-value of 2.042 with 37 degrees of freedom and 2.021 with 50 degrees of freedom at the .05 level of significance was necessary. Spelling was the only sub-area of the study which approached this level, obtaining a t = 2.248 value. Thus there was a significant difference between the Means of Phase II, Group I and II Means favoring Group I. Analysis shows the Group I Mean to be larger than the Group II Mean for spelling. The Phase I, Group II Arithmetic Mean scores approached the significance level. All other probabilities failed to reach a level of significance.

To establish the significance of difference between the Mean raw score gains in achievement for Language Arts and for Arithmetic a different analysis was made. Table VIII indicates the differences in scores between the two portions of the study. All comparisons failed to approach the .05 significance levels of 2.042 with 37 degrees of freedom or 2.021 with 50 degrees of freedom, except in comparison of Phase I: Group I values favoring the Language Arts area. The obtained value of

TABLE VII

SIGNIFICANCE OF DIFFERENCES BETWEEN MEAN RAW GAIN SCORES FOR GROUPS I AND II, PHASES I AND II

	GROUP I SCORES	GROUP I MEAN	GROUP II SCORES	GROUP II MEAN	P_t
PHASE I					
LANGUAGE ARTS					
WORD READING	55	1.078	62	1.632	.313
PARAGRAPH MEANING	181	3.549	64	1.684	.743
VOCABULARY	132	2.588	38	1.000	.962
SPELLING	28	.549	104	2.737	.775
WORD STUDY SKILLS	163	3.196	75	1.974	.483
ARITHMETIC	170	3.333	260	6.842	1.824
PHASE II					
LANGUAGE ARTS					
WORD READING	85	1.667	41	1.079	.536
PARAGRAPH MEANING	36	.706	31	.816	1.058
VOCABULARY	98	1.922	50	1.316	.359
SPELLING	70	1.373	-28	-.737	2.248*
WORD STUDY SKILLS	-72	-1.412	97	2.553	.416
ARITHMETIC	-4	-.052	-22	-.579	.274

*Significant difference at the .05 level of confidence

TABLE VIII

SIGNIFICANCE OF DIFFERENCES BETWEEN THE MEANS OF LANGUAGE ARTS AND ARITHMETIC

	LANGUAGE ARTS MEAN	ARITHMETIC MEAN	Pt
PHASE I			
GROUP I	109.610	3.333	30.012*
GROUP II	9.026	6.842	.410
PHASE II			
GROUP I	4.686	.052	1.700
GROUP II	5.026	.579	1.289
GROUP III	14.88	2.044	3.428*
COMBINED GROUPS I & II	14.719	4.516	2.612**
COMBINED GROUPS I, II, & III	14.642	3.701	5.79 *

*Significant at the .001 level of confidence.

**Significant at the .05 level of confidence.

30.012, far exceeds 3.646, the t-table value at the .001 level of significance. Thus, indicating an advantage to the initial stage of the treatment program.

Combining the Language Arts scores and Arithmetic scores, then comparing for a significant difference between Means of Language Arts and Arithmetic produced a t-value of 5.790 which was found to be significant at the .001 level of significance. The t-table value was converted to the mid-point value of 44 and 88 degrees of freedom, yielding a value of 2.407 which was exceeded in this analysis. There was a significant difference in Mean raw gain scores when the Language Arts Mean was compared with the Arithmetic Mean. In this case, the indications were that achievement in the Language Arts area was greater than the achievement in the arithmetic area.

To establish the significance of the difference of Mean raw score gains in achievement of Language Arts for the treatment Group I and II as compared with Arithmetic, Groups I and II, a t-test was made. A comparison was made between the combined Mean Language Arts scores of Groups I and II and the Mean Arithmetic scores of Groups I and II. As indicated in Table VIII, a t = 2.612 value was obtained when the t-table was entered for the value at 88 degrees of freedom. The minimum t-value of at least 2.000 at the .05 level was necessary to obtain a significant difference. Therefore, it was concluded that the difference in Language Arts achievement was significantly greater than the Mean achievement in Arithmetic by Groups I and II, exceeding the t-tabled value for .001 level of significance.

An analysis was made of the sub-area scores of the Language Arts portion of the study, comparing each sub-area score with the respective

Arithmetic scores of the Group and Phase where the scores were appropriate. Table IX shows the probabilities for each comparison. Only in the area of Word Reading for Group III was there a significant difference at the .05 level of confidence, between Arithmetic and the different sub-areas. It was concluded that this reflected a gain in word reading as compared with Arithmetic for Group III students. All other sub-area scores failed to approach a significant level. It is interesting that Phase I, Group II Probability scores reflected a rather consistent level for each of the sub-areas, this consistency of difference being unmatched by any other and being superior to Group I in all but the Spelling sub-area. During Phase II, Group I's level of difference in all areas was consistently greater than the probabilities of Group II.

The significance of these findings will be reported in the next chapter.

TABLE IX

SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS FOR SUB-AREAS OF LANGUAGE ARTS AND ARITHMETIC

SUB-AREAS	PHASE I		PHASE II		P_t GROUP III	TOTAL
	P_t GROUP I	P_t GROUP II	P_t GROUP I	P_t GROUP II	P_t GROUP III	
Word Reading	1.063	1.436	.913	.321	2.473*	.911
Paragraph Meaning	.079	1.416	.337	.181	.907	1.342
Vocabulary	.310	1.722	1.000	.425	.585	.193
Spelling	1.350	.968	.745	.117	.206	1.577
Word Study Skills	.050	1.283	.736	.707	.513	.511

*Significant at .05 level of confidence.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND SUGGESTIONS FOR FURTHER STUDY

Review of the Purpose and Design

Research evidence was presented in an effort to establish the value of emphasizing concepts when teaching educable mentally retarded students. Some evidence has indicated that emphasizing of concepts before or accompanying the teaching of the academics has a positive effect on the student's ability to achieve in these areas, especially in reading and arithmetic. Other evidence supported a position that the teaching of arithmetic, an inductive thought process, during the same time interval as reading, a deductive thought process, may interfere with the acquisition of the more basic skill — reading.

This study was suggested by the finding of a gap in the literature of any empirical study concerning curriculum adjustments in the classroom which were aimed toward effecting a more adequate achievement on the part of the mentally retarded. Recent studies had demonstrated that more adequate performances could be accomplished through tutoring arrangements and special instructional provisions, giving indications that curricular modifications and special instructional emphasis might be an appropriate part of the special class curriculum for educable mentally retarded students.

Some caution was expressed relative to the introduction of new

content into the curriculum, for until adequately studied, the new content may be no more effective than the content which has been replaced.

A few investigators have demonstrated (through curricular modification) gains in achievement by the mentally retarded. Specific areas of the curriculum need exploring to ascertain their relative contribution to achievement. The studies that have been made have employed different methods and have not sought to study their effects on academic achievement of subject matter.

The present study was an exploration designed to gather data to determine the effect of an administered treatment program in verbalized concept development upon the achievements of educable mentally retarded students when the teaching of reading and of arithmetic was varied by separating instructional emphasis.

Investigators have indicated that more experience with the meaning of words would improve achievement in reading and in arithmetic. Some studies would seem to indicate a link between concept development and academic achievement. Others seem to lend support to the view that the teaching of reading and arithmetic during the same time period could cause interference: one subject interfering with the acquiring of the other.

Measuring the achievement of intermediate educable mentally retarded students in special education classrooms, of relatively the same mental age level and socioeconomic level, and whose teachers have had experience as special education teachers, who have received reading instruction and a treatment program in concept development for six weeks, the usual instruction in both reading and arithmetic for six weeks;

measuring their achievement gain with a group of students who received the alternate series: reading and arithmetic for six weeks first, then reading and the treatment program in concept development for six weeks, should yield some evidence if the teaching of reading or arithmetic interferes with achievement of the other and if emphasizing concepts increases achievement of educable mentally retarded.

Five hypotheses were established for this study and a research design developed to test the hypotheses of difference in achievement as follows:

Educable mentally retarded students taught reading and arithmetic in the usual manner and educable mentally retarded students who are taught reading and a treatment program but no arithmetic computation.

Educable mentally retarded students taught reading and arithmetic in the usual manner for six weeks, then taught reading for six weeks together with a treatment program but not taught arithmetic computation and educable mentally retarded students who, for six weeks are taught reading accompanied by a training program but no instruction in arithmetic computation and educable mentally retarded students who are taught reading and arithmetic in the usual manner for six weeks and then for six weeks are taught reading and concept development excluding computational instruction.

Educable mentally retarded students taught reading and the training program separate from instruction in computation during a different phase of the school year.

The Stanford Achievement Test. Primary Battery: Form W. was used as a measuring instrument. The procedure was to pretest, retest at the end of the first six week training program, and retest again at the end

of the second six week training program. The overall control group was only administered the pretest and the final retest. On the basis of the test criteria the students were scored for academic achievement and their Mean raw score gains in achievement were analyzed.

Two hundred and eighteen students participated in the program of which one hundred and thirty-four were used in the study. A Mean and Standard Deviation scores were obtained on these 134 students' Chronological Ages, Intelligence Quotients, and their Mental Ages. A t-test statistic was applied to the Means to establish equivalent groups. In all but chronological age there was no significant difference. The overall control group was found to be significantly older chronologically than the two treatment groups. This was not thought to seriously affect the results of the study since achievement with mentally retarded students was established as more closely associated with mental age than chronological age.

A Fisher F-test was used to examine the homogeneity of variance between the treatment groups I and II for chronological ages was established, indicating that Group II students were more near the same chronological age than Group I students. The same rationale as previously mentioned seems to apply in this instance. There were significant differences found between the overall control group and the treatment groups for both chronological and mental ages. On examination of the data this was interpreted as meaning the control group contained students more mear the same chronological and mental age than the treatment groups. This latter finding must be kept in mind when analyzing the data included in the study for an advantage, in terms of achievement has been shown which would tend to favor the control group

of students in this study.

A chi-square analysis was made of the data obtained from the Hollingshead Index of Social Position. The socioeconomic eligibility of the students for inclusion in the study was established with this instrument. The resulting values indicated that the students used were from the same approximate socioeconomic level.

The population from which the study was drawn were intermediate level educable mentally retarded students in special education classes in the Oklahoma City, Oklahoma, Public Schools. Of the thirty-four intermediate special education classes in the Oklahoma City Public Schools, the fifteen classes and teachers used in this study met the criteria of the teachers having had at least one year of previous experience in teaching such special education classes and having met State requirements of a Standard Teaching Certificate in Special Education.

The tests were administered by the teachers to each class as a group. All tests were scored by the experimenter and two assistants, trained by the experimenter to insure accuracy and consistency of scoring.

The effects on achievement in terms of Mean raw score gain due to the treatment program in concept development and the varying of the arithmetic instruction were measured by use of t-test statistics. Achievement differences of Mean raw score gains between the treatment groups and the control group were analyzed. Differences between the two phases of the treatment program were measured. The probability of differences between Means for the different sub-areas of the Language Arts portion of the study were investigated.

A comparison was made of achievement in the Language Arts area as opposed to the Arithmetic area for differences in Mean achievement gains of Language Arts and Arithmetic for the treatment groups as compared to the control group. Individual analysis of each sub-area score of the Language Arts program were compared with the Arithmetic score for the different groups. As a further analysis all Language Arts Mean raw score gains were compared for differences with the combined Arithmetic Mean raw score gains.

The ten teachers for the treatment portion of the study met with the experimenter the week preceeding the start of initial testing for achievement. The teachers were arbitrarily numbered from one to ten, with the odd numbered teachers being designated the treatment classes for Phase I of the study. The even numbered teachers were then excused from this session, to meet for their orientation the week just preceeding the start of their treatment series. The treatment teachers of Phase I were then oriented to the teaching unit materials and instructed in the procedures of treatment.

In an effort to reduce variation between teaching procedures and influence, which was felt to be impossible to completely eliminate, a partial controlling effort was attempted through use of a uniform, commercially obtained series of recorded stories and through weekly contacts with the teachers by the experimenter.

The series of stories were played individually throughout the treatment program. A single story was heard on a single day. The story was played followed by a discussion of the entire story, then certain preselected words were analyzed as to their meanings as used in the stories. A wide assortment of activities were used, designed to clarify

and fix the conceptual meanings of words contained in the stories. Experience chart stories were developed using and enlarging on the words being emphasized. Each student was encouraged and allowed to read these charts. Original drawings were made depicting the stories as ideated by the students. In addition, words under study which were encountered during other parts of the school day were noted and brought to the attention of the class as to their usage and meaning. The teachers in the experimental treatment groups were required to refrain from teaching arithmetic or handling any direct arithmetic content. They were to treat numbers as words only and not stress them even as words.

Of the students who received the experimental treatment, eighty-four students could not be used due to not meeting the criteria of the study or being absent for part of the testing on some sub-testing. In all, a total of one hundred and thirty-four students were used: eighty-nine in the treatment portion and forty-five in the overall control.

The first week was set aside for testing the, six weeks of treatment were scheduled, followed by another week of testing; six weeks for the second treatment portion, and a final week of testing. In all the study covered the time period from the first week in October to the first week in February: a total of fifteen weeks of actual school.

Due to a conflict in scheduling it was not possible to meet with the teachers of the Phase II treatment group. Therefore, the experimenter delivered the materials and individually oriented these teachers as to their procedural and teaching arrangements.

It was found that weekly visits to the classrooms seemed to be affecting the students away from the content of the lessons. So this visiting was discontinued and weekly contact with the teachers outside

of the class hours was substituted. The coordinators of special education for the mentally retarded in the school system assisted in the liaison with the teachers.

Summary of Major Findings

The five hypotheses were tested to investigate the effect of an administered program in concept development upon educable mentally retarded students when the teaching of reading and arithmetic were varied.

General null hypotheses were established for the present study and were measured by use of t-test statistics in comparisons of Mean raw score gain differences in academic achievement of intermediate level, public school, educable mentally retarded students. The findings were:

Hypothesis 1: There were no significant differences in the achievement on Language Arts or Arithmetic between the combined scores of Groups I and II when compared with the respective scores of Group III. The level of significant difference was not found at less than the .05 level of confidence. Therefore, the available evidence indicates a failure to reject the hypothesis.

Hypothesis 2: There were no significant differences found between the achievement of the different groups, when overall achievement Mean raw score gains were compared, either for Language Arts or for Arithmetic. Therefore, the available evidence indicates a failure to reject the hypothesis.

Hypothesis 3: Significant differences were found between the different treatment groups: treatment Group I during Phase I was found to achieve at less than the .001 level of confidence in the Language Arts area when compared with any other Group or Phase of the study. The evidence indicates that the hypothesis should be rejected for the Language Arts area of Phase I, Group I of the study.

Hypothesis 4: Significant differences were found between the different treatment groups in the area of Language Arts according to the phase of the school year that the reading and treatment program in concept development and no computational instruction was attempted. The significance of the difference was found to be at less than the .001 level. Therefore, the evidence indicates that this hypothesis should be rejected for the Language Arts area of Phase I of the study.

Hypothesis 5: No significant differences were found between the reading and arithmetic achievement of students taught in the usual manner during different phases of the school year. The level of significant difference was not found at less than the .05 level of confidence. Therefore, the available evidence indicates a failure to

reject the hypothesis.

When a comparison was made between the overall Mean achievement in Language Arts for the three groups as opposed to the overall Mean achievement in Arithmetic there was a significant difference favoring the overall Mean achievement in Language Arts. The significance was at less than the .001 level. A further comparison of Groups indicated a significant difference between the combined scores of Groups I and II for Language Arts as against the combined Arithmetic scores of Groups I and II. This significance was at less than the .01 level of confidence favoring the Language Arts Groups. Comparisons of Language Arts for each Group with Arithmetic for each respective Group found a highly significant difference, at less than the .001 level of confidence for Group I Phase I, but no significant difference for Group I and Phase II; there was no significant difference though there was a trend toward significance (significant at the .1 level); Group III was found to also be moderately significant at less than the .02 level. All significances were found to favor the Language Arts Area.

Examination of comparison of sub-areas of Language Arts with Arithmetic indicates only one area that reaches the level of significance. This was at the .02 level of confidence for Word Reading in Group III.

Conclusions

This study was designed as an exploration to find out whether a treatment program in concept development would affect the achievement of educable mentally retarded students when the reading and arithmetic were varied in their presentation. What has been found is some indication as

to direction for further investigation. The analysis appears to justify the following statements:

1. There does seem to be a measurable difference in the reading performance of educable mentally retarded students, using the present instrument, when reading and arithmetic are separated and a program in concept development is presented in place of instruction in arithmetic computation. This seems to be indicated if the students are presented with such a program of study during the first weeks of the year. This does not seem to be indicated if such a program is started later in the school year.
2. There does not seem to be a measurable, sustained difference in the achievement of educable mentally retarded students using the present instrument, when variations in curriculum are six weeks or less in duration.
3. There does not seem to be a measurable difference in the arithmetic achievement of educable mentally retarded students when instruction in arithmetic computation is omitted for six weeks using the present instrument. This would appear to be indicated, at least if a program in concept development is presented instead of the arithmetic computation.
4. There does not seem to be a measurable difference in achievement, using the present instrument, when reading and arithmetic are taught in the usual manner during

different phases of the school year.

5. There does seem to be a measurable difference in reading and arithmetic achievement of educable mentally retarded students, using the present instrument.

6. There does not seem to be any measurable difference in arithmetic achievement of educable mentally retarded students using the present instrument, when instruction is not given in arithmetic computation for at least six weeks and a program in concept development is taught instead.

7. There does seem to be a measurable difference in the reading achievement as opposed to the arithmetic achievement of educable mentally retarded students, using the present instrument, when reading and arithmetic are taught in the usual manner.

It must be emphasized that the findings of this study should be regarded as preliminary. Accordingly, the results suggest that this area should be investigated further. The instrument used in collecting this data was not designed for the population to which it was applied. An instrument to measure the achievement of intermedicate level educable mentally retarded students would give more valid indications of actual achievement of this population. The present instrument employed is only indicative of achievement as it is recognized in the regular classroom. Such findings of gains must be generalized as valid for educable mentally retarded students.

Implications

From the analysis of differences in achievement for the three

groups it would appear that a difference in reading performance can be effected if arithmetic computation is not taught at the same time as reading and a program in concept development is employed, if such a program and arrangement were started early in the school year. On the basis of the highly significant difference for Group I in Language Arts during the first phase of the study and the tapering off if this achievement gain to a non-significant level during the second phase, it appears that a more longitudional study should be made to determine if these gains in achievement can be sustained.

It would appear from this study on the basis of the analysis of overall achievement gains, that educable mentally retarded students do achieve, but the variations in curriculum were inconclusive in establishing a differential in achievement rate.

The differences in achievement between Language Arts and Arithmetic throughout the analysis indicates that educable mentally retarded students are better able to achieve reading oriented subject matter than to achieve in the arithmetic area.

There are several possibilities implied in this study. First, when a subject is presented during the school year to educable mentally retarded students seems to be important in terms of academic achievement. Second, curriculum variations, to be effective in terms of sustained achievement, must be continued for more than a six weeks period, using the present study's procedures. Third, the Stanford Achievement Test. Primary Battery: Form W, does record achievement gain for intermediate educable mentally retarded students. Fourth, reading gains in achievement are greater than arithmetic gains with this population. Fifth, a training program in concept development can affect the

achievement of educable mentally retarded students at least on a short term basis. Sixth, studies using special education classroom students can profitably be accomplished. Seventh, the curriculum of special education programs are in need of extensive study, too little is known of the present achievement capabilities and achievement areas of special classroom educable mentally retarded students.

Suggestions for Further Study

The conclusions and implications of this study suggest more intensive and extensive investigations should consider the recommendations of:

(1) Use of an achievement instrument specifically developed for educable mentally retarded students, though the present instrument seems appropriate in lieu of such an instrument.

(2) Reading and Arithmetic computation should be separated for a longer period of time to establish a clearer effect of such a variation.

(3) Other treatment programs should be incorporated into such investigations to establish whether the present program in concept development was responsible for the short term gains in achievement.

(4) Studies should be made that attempt to find the causes of difference between the reading achievement and arithmetic achievement of educable mentally retarded students.

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APPENDIX A

Six Weeks of Concept Development

Purpose: To increase the conceptual capabilities of the students, as demonstrated through a more effective choice of terms and a more explicit understanding of words and their meanings.

Rationale: A more precise and challenging understanding of the terminology in use will increase the effectiveness of reading instruction and have positive effects on other curriculum areas. It is obvious that students use many words, but for this unit it is assumed they have a poor grasp of the many meanings each word may have in different contexts.

Restriction: Arithmetic terms are to be treated casually: with no special emphasis. Instead, they should be treated as words only. They should not be isolated or ignored.

Procedure:

1. During that part of the day which would otherwise be devoted to instruction in computational skills (30 - 45 minutes), the teacher will involve the students in this unit.
2. There are twelve stories; two stories for each week for the six weeks duration of the unit. The teacher must decide which of the two stories to develop three days and which to develop for two days. This decision

is to be based on the capabilities and interests of the students.

3. Each story should be played in its entirety, both at the start and conclusion of each session. Portions may be played to maintain interest or orientation.
4. The story question should be attended to only during the final portion of work with a story, unless the students volunteer to treat it at an earlier time.
5. Exploration should be made of every possible term in the story: each sentence in the story will have several concepts to be developed, i.e., the first story: "Boys and girls,do you like to run races? Dennie (student), what does "like" mean? The story started with, 'Boys and girls. . .' What does "like" mean? Greta (another student), is Dennie's "like," what you think "like" means?", and so forth.
6. Each student should be involved in isolating a concept as often as time will allow, yet managing for each student to be involved in each session, at least once. Some terms are more familiar and should be directed so as to encourage the more backward students.
7. Using and enlarging on the concepts during other activities of the day should be fully exploited.

Materials: Tape recorder

Extension cord (if necessary)

Record: Teaching Children Values. Educational Activities, Inc., Freeport, L. I., New York.

APPENDIX B

WORK SCHEDULE

Testing—	October 2 - 6

Treatment I

1 week	October 9 - 13
2 week	October 16 - 20
3-a week	October 25 - 27
4 week	October 30 - November 3
5 week	November 6 - 10
6 week	November 13 - 17
3-b week	November 20 - 22
total	31 days
Testing—	November 27 - December 1

Treatment II

1 week	December 4 - 8
2 week	December 11 - 15
3 week	December 18, 19, January 2 - 5
4 week	January 8 - 12
5 week	January 15 - 19
6 week	January 22 - 26
total	31 days
Testing—	January 29 - February 2

APPENDIX C

ROSTER _____

School

_____ _____

Teacher's Name Years Teaching in Special Education

_____

Group

NAME	M-F	PARENT Occupation	PARENT Address	IQ WISC	IQ Binet	Date of Test	MA	CA	Years in Special Education

DATA COMPILATION SHEET

Group _____ School _____

Name	Word Reading			Paragraph Meaning			Vocabulary			Spelling			Word Study Skills			Arithmetic		
	Pre Test	T_1	T_2	Pre Test	T_1	T_2	Pre Test	T_1	T_2	Pre Test	T_1	T_2	Pre Test	T_1	T_2	Pre Test	T_1	T_2

VITA

Corydon Eugene Cochran

Candidate for the Degree of

Doctor of Education

Thesis: AN EXPERIMENTAL STUDY OF ACHIEVEMENT OF INTERMEDIATE EDUCABLE MENTALLY RETARDED STUDENTS

Major Field: Educational Psychology

Biographical:

Personal Data: Born at Saint Louis, Missouri, June 3, 1926, the son of Corydon D. and Mary S. Cochran.

Education: Attended grade school at Oklahoma City, Oklahoma; secondary schools at Fort Worth, Texas and San Diego, California; graduated from San Diego High School in 1946; attended San Diego, California Junior College from 1940 to 1949; attended Oklahoma City University from 1950 to 1952; received the Bachelor of Arts Degree from the University of Oklahoma in May, 1954; attended Phillips University, Enid, Oklahoma, from 1955 to 1957; received the Master of Education Degree from the University of Oklahoma with a major in Special Education in August, 1959; attended Wichita State University, Wichita, Kansas, from 1960 to 1962; attended George Peabody College for Teachers, Nashville, Tennessee, from 1965 to 1966; completed the requirements for the Doctor of Education Degree in May, 1969.

Professional Experience: Appointed speech therapist for the Enid Public School System, Enid, Oklahoma in 1954; appointed speech therapist in Wichita Public School System, Wichita, Kansas in 1959; appointed coordinator of special education, Wichita Public School System, Wichita, Kansas in 1963; appointed graduate fellow at George Peabody College for Teachers College, Nashville, Tennessee, in 1965; appointed Visiting Lecturer at the Oklahoma State University during the summers of 1963 to 1968; appointed instructor and graduate associate at the Oklahoma State University in 1966.

Professional Organizations: Life member of National Education Association; Advanced clinical certification in American Speech and Hearing Association, Phi Delta Kappa; Council for

Exceptional Children; Division on Mental Retardation, Council for Exceptional Children; American Association of Mental Deficiency.

Professional Offices: State Secretary of Kansas Federation of Council for Exceptional Children in 1963; Treasurer, Kansas Speech and Hearing Association in 1964; President of South Central Kansas Chapter #76, Council for Exceptional Children in 1964.

Publications: "Carry-Over Aspects of Speech Therapy." Kansas Journal of Speech and Hearing, Vol. 2, 1963.