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Concept Formation with Select Children Who Are Severely and Profoundly Handicapped

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CONCEPT FORMATION WITH SELECT CHILDREN WHO ARE SEVERELY AND PROFOUNDLY HANDICAPPED

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by

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Chapter 1

Introduction

As educational programming becomes more available to children who are severely and profoundly handicapped, the need for reliable training methods to help enhance these children's inherently delimited conceptual disorders takes on added importance. As William Bricker (1976) stated, "One of the most crucial areas of research that needs to be moved forward is the area of concept acquisition" (p. 171).

Unfortunately, by 1981, little research had been conducted in this area with children who are severely and profoundly handicapped. Although there were some studies with populations who are mildly, moderately, or nonhandicapped, this research dealt mainly with teaching techniques that utilized verbal cues. Subsequently, these teaching techniques required the subjects being presented the verbal cues to have a high degree of receptive language (Clinton & Boyce, 1974; Forehand & Yoder, 1973, 1974; Litrownik, Franzini & Turner, 1976; Morena & Litrownik, 1974; Rosenthal & Kellogg, 1973; Ross, Ross & Downing, 1973; Strichart, 1974).

Statement of the Problem

Even though the rate of development is slower for children who are mentally handicapped, there is strong evidence that they have the same pattern of cognitive development that Piaget observed in average and above average children (Inhelder, 1968; Schmid-Kitsikis,

1973; Stephens, McLaughlin & Mahaney, 1972; Woodward, 1959, 1961, 1962). Since children who are severely and profoundly handicapped are slow to discover and cope with their environment, a reliable method of teaching concepts to these chidren would assist them in their cognitive and social development.

Mansdorf (1977) demonstrated the effectiveness of modeling in concept learning with severely handicapped institutionalized adults. In addition, Forehand and Yoder (1974) reported the use of modeling, low level verbalization, and conceptual verbalization with retarded and nonretarded subjects. Subsequently, the use of manual communication aids have been emphasized with children with severe communication disorders (Campbell, 1975; Fristoe & Lloyd, 1979). In light of the research, a question has been formulated for this study: Do the prompting procedures of modeling, verbal concept description, and verbal concept description paired with manual communication (sign/speech) affect concept formation with children who are severely and profoundly handicapped?

Hypotheses

The purpose of this study was to test the reliability of various training methods employed in teaching concept formation with students who are severely and profoundly handicapped. The hypotheses were as follows:

1. Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) when provided the model of the correct response accompanied by a verbal concept description than will students who are

severely and profoundly handicapped provided with no model of the correct response.

2. Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) when provided the model of the correct response accompanied by a verbal concept description than will students who are severely and profoundly handicapped provided with no model of the correct response.

3. Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) when provided the model of the correct response accompanied by a sign/speech concept description than will students who are severely and profoundly handicapped provided with no model of the correct response.

Significance of the Problem

The problem of training children who are severely and profoundly handicapped to acquire concepts has often been passed off because many educators did not believe these children had the necessary learning capacities. In its definition of severely handicapped children, the Bureau of Education revealed its own lack of faith in the cognitive expectations for these chidren (Federal Register, 40-35-1975); in this definition, the Bureau of Education stated that these children ". . . may possess severe language and/or perceptual-cognitive deprivations, and evidence abnormal behaviors such as: . . .failure to respond to pronounced social stimuli. . ." (p. 7412). Clearly, a population defined as possessing "severe language deficits," "perceptual-

cognitive deprivations," and failing to "respond to pronounced social stimuli" would be a poor candidate for concept instruction.

Unfortunately, special educators have often neglected children who are severely retarded as candidates for creative experimentation in cognitive learning. As Tawney (1977) pointed out, "For the most part, special educators have not expressed positive views of the learning potential of severely retarded children" (p. 237). This attitude sentenced severely and profoundly handicapped children to a more complex environment; for when concept learning is present, children not only have an easy way of categorizing their environment but also have a necessary vehicle for coping with the infinite diversity they encounter in their everyday lives. Since concepts are the expression of shared meaning, and in this sense, they are socially constructed, concepts can be used for both cognitive and social growth (Bolton, 1977).

Bandura (1969) pointed out the importance of discriminative stimuli such as number and salience of cues in directing students' attention in the formation of new responses. Although modeling alone can be used as a salient cue, the addition of meaningful verbalizations to the actual demonstration can augment the formation process. Mansdorf (1977) reported the effectiveness of modeling instruction and verbal instruction in learning concepts with adults who were severely mentally handicapped. In agreement, Bolton (1977) added:

> For subject and environment are related in such a way that conceptual development is a process of making explicit what is implicit, of constructing one's concepts the more accurately the more they faithfully reflect the reality to which they refer. There is a reciprocal relationship between the

> interpretive acts by which we construct our models of reality and the properties of reality itself. (p. 23)

Bolton's statement directs the teacher of children who are severely and profoundly handicapped to provide this population with increasingly realistic models through which concepts can be learned (e.g., number and salience of cues).

Therefore, teachers of children who are severely and profoundly handicapped should test various training techniques that employ modeling and concept descriptions. In doing so, they can determine the effectiveness of such techniques in making "the implicit, explicit," i.e., in aiding the formation of concepts in learners. The purpose of this study is to demonstrate various and significant teaching techniques that have been determined to make "the implicit, explicit" when teaching concepts to children who are severely and profoundly handicapped. Paramount to the establishment of teaching techniques will be, where possible, the opening of the door which will allow children who are severely and profoundly handicapped to enter a less restrictive conceptual environment that is more simplified, understandable and normalized.

Assumptions and Limitations

For the purpose of this study, it was assumed that the following would be valid:

1. That a single subject design would serve as a significant and reliable statistical comparison.

2. That the Preschool Language Scale (Zimmerman, Steiner & Evatt, 1969) would provide norm referenced concepts for this study.

3. That children who were severely and profoundly handicapped could tolerate the testing procedure and the time element in the testing without reaching a frustration level.

Definition of Important Terms

For a clearer understanding of the concepts of this investigation, the following terms are defined:

1. Children who are severely handicapped: The AAMD reports the category of a severe handicapping condition as exhibiting an IQ of 20-35 (Grossman, 1973).

2. Children who are profoundly handicapped: The AAMD reports the category of a profound handicapping condition as exhibiting an IQ of not measurable to 20 (Grossman, 1973). Also a term which refers to a level of intellectual functioning comparable to the educational classification of severely handicapped (Kelly & Vargason, 1978).

3. Public Law 94-142: A federal law passed in 1975 which guarantees a free and public education in the least restrictive environment to all children who are handicapped (Education for All Handicapped Children Act, 1975).

4. A concept: "Whenever two or more distinguishable objects or events have been grouped or classified together and set apart from other objects or events on the basis of some common feature or property characteristic of each" (Kelly & Vargason, 1978).

5. Concept formation: The grouping of elements into categories which are already clearly understood, defined, or named (Bolton, 1977).

6. Training/teaching method: The combination of cues, prompts

and discriminative stimuli for a pedagogical purpose with a defined objective in mind.

7. Modeling: Exhibiting a response which the observer had not yet learned to make and which s/he must later produce in substantially identical form (Kelly & Vargason, 1978).

8. Sign/speech: A set of manual configurations and gestures that correspond to particular words or concepts, paralleled with the simultaneous verbalization.

9. Concept descriptor: A communicated description of the relative stimulus characteristic (Forehand & Yoder, 1974), i.e., those attributes relative to identifying a specific person, event, or object.

10. Ordinal scale of psychological development: A heirarchical organization of intelligence and motivation whereby certain behaviors manifest in an invariant progressive manner.

Chapter 2

Review of Related Research

In the area of concept acquisition with children who are mildly and moderately handicapped, considerable research has been conducted (Forehand & Yoder, 1973, 1974; Litrownik, Franzini & Turner, 1976; Rosenthal & Kellogg, 1973; Ross, Ross & Downing, 1973; Yoder & Forehand, 1974). Nevertheless, a review of the research yielded only one research study (Mansdorf, 1977) which dealt with concept formation with children who were severely mentally handicapped.

To provide an adequate theoretical background, this review of the relevant research will examine the two major theories of the nature of concept formation as reviewed by Bolton (1977): the traditional theory and the particular hypothesis theory. The traditional theory of concept formation, also referred to as the theory of abstraction, states that concepts are formed by subjects abstracting certain similarities among otherwise dissimilar stimuli. The particular hypothesis theory of concept formation credits the subjects with creating a particular hypothesis about certain features of their environments. Therefore, the subject uses an hypothesis which leads to an active test for evidence to support or reject the concept being considered. It is the particular hypothesis theory of concept formation which is most congruent to the hypotheses of this study.

There are three major assumptions in the traditional theory of concept formation. Bolton (1977) lists the assumptions as follows:

1. Concepts are formed through people recognizing resemblances among stimuli.

2. Progress in concept formation is considered to be inductive moving from the particular to the general. Subjects first observe particular events and then, noting the resemblances between some of them, develop the generalization which enables them to group these particular events as instances of a class.

3. Concrete concepts are primary only in the sense that they lay the foundation for the development of abstract concepts including logical and mathematical concepts, which are assumed to be concerned with relationships between things.

Bolton provides evidence that the traditional theory of abstraction is inadequate on each of the three assumptions discussed. First, the subject does not simply respond to similarities among stimuli in the environment. The subject's intentions and points of reference aid in the formation of a response. As subjects make a response, they are testing a hypothesis formed from these intentions and points of reference. Later, the hypothesis testing leads to the determination of a concept. Secondly, concept formation does not follow the route of development of generalization from particular experiences, since a concept is not formed from an individual, particular experience. The subject intentionally perceives things from a point of view that is already a generalization of the perception of objects, which involves a representation of what a subject already knows and expects to encounter. Finally, the traditional theory states that logico-mathematical concepts are formed later after a series of previous physical experiences. However,

these logico-mathematical concepts are more reliably formed through coordinations of the subject's actions upon the world and augment the understanding of shared physical reality.

Although inadequate, not all of the theory of abstraction should be judged fallacious. As Bolton indicated:

> For there is no doubt that the possession of a concept allows the subject to recognize resemblances among stimuli, that exposure of a variety of experiences is important in concept formation, and that the use of actual objects aids the development of logico-mathematical concepts. (p. 20)

The aforementioned discussion of the two major theories of concept formation provided a conceptual framework for reviewing studies on concept formation.

Studies on Concept Formation with Children

The review of the literature yielded studies involving concept formation with children who were nonretarded, mildly and moderately retarded. Barry Jr. and Overmann (1977) compared the effectiveness of nonretarded adults, peer models, and a no-model control condition in the learning and retention of a concept task by children who were educable mentally retarded. The Leiter International Performance Scale (Leiter, 1952), a nonverbal performance test, was employed to provide the testing items. Thirty children who were educable mentally retarded were randomly assigned to one of three treatment conditions, peer model group, adult model group, or no-model group.

The results of this experiment reveal that peer modeling may be an effective method of teaching concepts to children who were educable mentally retarded. This finding correlates with the teaching strategy that recommends peer tutors/teachers and integration

of chidren with handicaps (Sontag, Certo & Button, 1979).

Yoder and Forehand (1974) investigated the effects of modeling and verbal cues upon conceptual learning with chidren who were both nonretarded and retarded. The subjects were 40 children who were nonretarded and 40 chidren who were educable mentally retarded. Like Barry Jr. and Overmann (1977), they used test items from the Leiter International Performance Scale.

The subjects wre randomly assigned to four experimental conditions: model only, model plus low-meaning verbalizations, model plus conceptual verbalizations, and no model. Number of errors and time required to complete each of eight test items were the two dependent measures.

The results indicated that all modeling conditions produced fewer errors than no-modeling conditions. The model only and model plus low-meaning verbalizations groups did not differ; yet each had significantly more errors than the model plus concept group. Therefore, these results showed that modeling and verbal cues can facilitate the learning of a conceptual task (especially if what is to be learned is a difficult concept). Furthermore, Forehand and Yoder suggested that children who are retarded use behavioral modeling and verbal conceptual cues in the same manner as do children who are nonretarded, and that children use external cues to solve problems only when they cannot provide their own solutions. Both the Forehand and Yoder (1974) and the Barry Jr. and Overmann (1977) studies revealed that the more difficult the task, the more that children who are retarded rely on models.

Bellamy and Bellamy (1974) employed a procedure for teaching

descriptive concepts with four preschool boys who were educable mentally retarded. Methods of testing and teaching sessions were organized into trials in which the teacher presented object pairs which differed in the concepts of (a) big-little, (b) hot-cold, (c) long-short, and (d) straight-curved. Once students had reached criterion performance on the teaching sets, probe sets (or concept members not used during teaching) were used to test concept learning.

The data revealed that the teaching procedures used were quite adequate in helping the children reach the established criterion in the teaching sets. Concepts were considered learned when the children then could perform with 85% accuracy on the probe sets. The data showed that this goal was far exceeded.

The same teaching program was replicated with three boys with Down's Syndrome, who were even younger in age, with similar results, thus indicating that concept acquisition can be taught and could prevent future academic deficits so common to retarded children.

Concept Formation with Adults

The review of literature yielded only one study dealing with concept acquisition and adults who were severely retarded. Mansdorf (1977) exposed 45 adults who were institutionalized and severely retarded to three different instructional procedures. The teaching methods were as follows: "imaginal instruction conditions" (Mansdorf, 1977) which included a model of the concept match, followed by a statement of the concept rule and an actual demonstration of the rule (e.g., glove goes with hand because. . ., and then place an actual glove on hand); verbal instruction conditions which

included stating the verbal concept rule after modeling the conceptual match; and the no-instruction condition which consisted of only the model demonstration of the concept match.

Results revealed imaginal instruction to be superior to verbal instruction, which was superior to no instruction. Mansdorf inferred that imagery "functions well with the retarded population because specific verbal coding strategies by these individuals are impaired while imaginal-coding strategies are not" (p. 290).

Concept Formation and Acquisition--A Developmental Perspective

Most of the research studies on concept acquisition deal with concrete and abstract conceptual stages of development which are generally considered unattainable by children who are severely and profoundly handicapped (Inhelder, 1968; Kahn, 1980). Therefore, the research literature will be reviewed as it relates to children who are severely and profoundly handicapped and primarily as it discusses the sensorimotor and pre-operational stages.

Some researchers have presumed that the processes of concept acquisition have an invariant order (Inhelder and Piaget, 1964). From this perspective, the child is seen as progressing from identifying objects to discerning them from other objects. The child also has to perceive the object as existing independently from him/herself, and as having permanence and properties which distinguish it from other objects. Therefore, although children learn about the differences among objects, they also perceive their similarities. The dichotomy of learning the sameness and difference is, perhaps, the most important facet of concept acquisition. The ability to deal

with this dichotomy of learning develops gradually with age, and is greatly enhanced with the advent of language in identification and labeling. Younger children rely on the criteria of functional use of objects; as they get older they employ the criteria of conceptual understanding. Personality may be another criterion and has been studied under the concept of cognitive style (Kagan and Kagan, 1970).

Although the utilization of language is a crucial influence in identification (Sigel, 1975), a controversy exists concerning the role of language (McNeil, 1970; Piaget & Inhelder, 1973). Mussen (1970) extensively surveyed the learning processes involved in concept acquisition and determined the process involved discrimination, perception, memory, transposition, and generalization, with language involved throughout the processes.

Schema development was emphasized by Piaget and Inhelder (1964) as an evolution of learning that affects classification of items for conceptual purposes. Sigel (1975) revealed that individuals learn at least three characteristics of a schema or a class of items. First, children learn the most common aspects of an object, or its most central tendency. Second, children learn how items within the class differ from one another. Third, children learn how members within the class differ from one another, as well as how items have multiple class membership. These three characteristics paralleled the finding of Piaget & Inhelder (1964).

Paramount to all the above characteristics is that the subjects remember the objects. Memory has its own developmental sequence, which is connected to the general cognitive status of the child

(Olson, 1973; Piaget and Inhelder, 1973). Thus, the developmental changes scan from a failure to organize, plan, monitor, and integrate information to a capability of recalling rules by which to organize information. This information is then organized for adaptation to daily living (Sigel, 1975).

Sigel (1975) stated that Piaget provided the most meaningful and comprehensive system dealing with cognitive development. The significance of Piaget's theory, for the purpose of this study lies in his descriptions of the sensorimotor period which lasts from birth to two years in normal child development, and the preoperational period which lasts from two to seven years in normal child development. In these stages, individuals who are severely handicapped generally do not achieve a more advanced level of cognitive functioning (Inhelder, 1943, 1968; Kahn, 1979). Therefore, Piaget's work as it relates to the sensorimotor and preoperational periods is most frequently utilized with children who are severely and profoundly handicapped (Kahn, 1975, 1976, 1978, 1979).

In addition, Kahn (1979) claimed that individuals who are mentally retarded develop cognitively in the same order and manner as individuals who are not retarded only at a slower rate. Kahn continued to assert that the Uzgiris-Hunt scales (1975) measure normal sensorimotor development, and are probably reliable as an indicator of readiness skills for the forming of concepts. In an earlier study, Kahn (1975) reported that severely handicapped children who function at stage 6 of Piaget's sensorimotor period, as tested by the Uzgiris-Hunt scales (1975) were ready for the acquisition of meaningful, expressive language. The attainment of stage 6 would place the

children on the threshold of concept formation. Moreover, those children functioning below stage 6 were not expected to learn meaningful, expressive language with any degree of proficiency. The subjects in Kahn's study (1979) were eight children who were profoundly retarded. Since the concrete operational period from age seven to age eleven and the formal operational period from age eleven to age sixteen (or adult thinking) are not considered within the purview of children who are severely and profoundly handicapped, these periods will not be discussed in the literature review for this study. For the reasons mentioned above, the Uzgiris and Hunt (1975) scales were used in the study to determine the presence of cognitive skills which would lead to concept formation in all the subjects. The various scales and sub-scales tested in the Uzgiris and Hunt (1975) assessment will be explained in Chapter 3.

Chapter 3

Method

Subjects

The subjects in this study were four children who were diagnosed as severely mentally handicapped. All four subjects were enrolled in a primary self-contained classroom housed in an elementary public school. Three of the children lived in their natural homes while one subject (the oldest) lived in a community based residential group home. The child in the group home was taken home by his natural parents for weekends and short vacations.

Subject A was a male who had a chronological age of 11 years 10 months and a mental age of 2 years 6 months as determined by a Stanford Binet. He was diagnosed as having Cornelia DeLang Syndrome, was nonverbal, with a receptive language of 3 years, and used approximately 18 signs for expressive language.

Subject B was a male with a chronological age of 7 years 7 months and a mental age of 2 years, also determined by a Stanford Binet. He was diagnosed as severely mentally handicapped with mild cerebral palsey, a developmental language delay, and severe behavioral disorders. Behavioral deficits included pinching and hitting, pulling his hair, and noncompliance to tasks. Subject B had a receptive language of 30 months, used six words verbally, and had recently learned four signs to communicate his basic needs.

Subject C was a female with a chronological age of 8 years 10 months and a mental age of 2 years 3 months as determined by the

Stanford Binet. She was diagnosed as having cerebral palsey due to RH encephalopathy and also as having microcephaly due to a breech delivery during birth. She was nonverbal, had a receptive language of 30 months, and had learned to use three signs expressively to communicate her basic needs. Behavioral problems included autistic-like behaviors such as perseveration on objects and events, lack of eye contact, and noncompliance to tasks.

Subject D was a male 7 years 8 months old with a mental age of 2 years as determined by the Stanford Binet. He was nonverbal with a receptive language of 24 months, and had recently learned to use five signs expressively to communicate his basic needs. He had been diagnosed as having seizure disorders and duo-denojejunostomied (a stomach disorder), and had a bracheocephalic type skull. Behavior deficits included pinching and hitting others, lack of eye contact, and noncompliance to tasks.

The instrument used to test all subjects for compatible cognitive skills was the "Assessment in infancy: Ordinal scales of psychological development" (Uzgiris and Hunt, 1975). Developed over a nine year period, the Uzgiris and Hunt scales are the most frequently used sensorimotor instrument with children who are severely and profoundly handicapped (Kahn, 1979). The six scales of the assessment are as follows:

1. Visual pursuit and the permanence of objects.
2. Development of means for obtaining events.
3. a) Development of vocal imitation.
   b) Development of gestural imitation.
4. Development of operational causality.

5. Construction of object relations in space.

6. Development of schemes for relating to objects.

These scales provided evidence that all the subjects in the study had obtained object permanence, gestural imitation, operational causality, relations of objects in space, and the development of schemes for relating to objects. All subjects were functioning within Scale VI of the assessment, which demonstrated an emergence from the sensorimotor stage into the preoperational stage (Piaget, 1952). This emergence into the preoperational stage placed the subjects at the threshhold of concrete thinking, and thus concept formation. Concrete thought is characterized by learning that structures reality in its raw form and uses most efficiently objects and tangible items (Kelly & Vergason, 1978).

The mental age of all four subjects was determined by the administration of the Stanford Binet IQ test which was administered in the last five months prior to this study. The students were using American Sign Language in both the receptive and expressive modes. All subjects met the following selection criteria for this study: (a) there was no evidence of visual or auditory impairment; (b) there was established mobility in the upper torso and limbs, such that the subjects could easily grasp and manipulate objects; and (c) all students were ambulatory.

The Task

An instrument constructed to measure comprehension and verbal ability as a basis for testing, the Preschool Language Scale (Zimmerman, Steiner & Evatt, 1974) provided the norm-referenced concepts

chosen in this study. The Preschool Language Picture Book presented pictures on page 28, picture number 14, item 4 of concepts norm-referenced at chronological age 4 years (see Appendix A for complete representation).

The trainer presented each student a specified item and provided a conceptual match and a distractor. From this presentation the student was asked to find the conceptual match for the item. The conceptual matches and distractor were as follows:

1. The item knife (w) was to be conceptually matched with the scissors (they are both used to cut), and was presented with the distractor item toy ball.

2. The item pencil (x) was to be conceptually matched with crayon (they are both used for writing), and was presented with the distractor item toothbrush.

3. The item clock (y) was to be conceptually matched with watch (they are both used to tell time), and was presented with the distractor item paint kit.

4. The item book (z) was to be conceptually matched with newspaper (they are both used when reading), and was presented with the distractor item cup.

The teacher rotated the conceptual match and the distractor, which were placed 18 inches apart in front of the subject, from right to left. Each subject was rotated through the four concept items and through the four methods (independent variables). The concept items and methods were assigned through randomization on a week to week basis.

Dependent Variable

Criteria for learning the concept was 80% correct responses for two successive training sessions under the application of a specific method (independent variable). The dependent variable in this experiment was the number of correct conceptual matches made during a ten trial session.

Materials/Setting

As stated in the task section, four concepts were chosen for the training tasks. Each item was assigned a concept match item and a distractor item. All items used were real objects chosen to replicate as much as possible these objects as they are found in the subjects' everyday environments. The training area for all testing procedures for this study was an established training area in the students' regular classroom setting.

The teacher was a certified special education teacher and had worked with the students throughout the school year for a period of eight months. The special education teacher was provided data sheets that included the behavioral objectives, listing of materials, training procedures, and an area for coding responses and collecting the data. All training sessions throughout the experiment were on a one-to-one basis.

Procedure

There was a three-part procedure used in this experiment which included baseline, treatment, and post-treatment baseline. Sulzer-Azaroff and Mayer (1977) recommended that the "ABA" design be used

for implementing observational systems on selected treatment phases. In this design, A is the baseline and B is the treatment. Thus, the "ABA" design was implemented to measure the effect of the treatment methods, which represent the independent variable in this study.

Baseline. An initial baseline was taken to test what conceptual knowledge the subjects had towards the concept items prior to the application of the treatment methods. Table 1 illustrates the data received from the first baseline. It is clear that the subjects scored well below the 80% criteria set for the measurement of the dependent variables for all the concept items. In fact, the percentage average baseline score across the subjects was 22.5%

The procedure used for establishing the baseline was:

1. The subjects were taken one at a time to the testing area (see the materials/setting section).

2. Both the trainer and the subject sat opposite each other at a table.

3. The trainer held up the concept item and instructed the subject that they were going to play a matching game and told them, "I want you to get the object that goes with the _____ (concept item)."

4. The trainer placed two objects (the concept match and the distractor) on the table 18 inches apart and 18 inches in front of the student.

5. The trainer, still holding up either concept item w, x, y, or z, asked the subject, "What goes with _____(concept item)?" Each concept item was presented five times, alternating concept match and distractor left to right. Concepts were presented alternatively,

Table 1

Raw Scores and Percentage Scores of Performance

For All Experiment Participants and Methods

Subject	Baseline Percentages	Method/ Procedure	Raw Score	Designated Concept Item	Post-treatment Percentages
A	20%	Baseline	4/20	Alternated	N.A.
B	20%	Baseline	4/20	Alternated	N.A.
C	25%	Baseline	5/20	Alternated	N.A.
D	25%	Baseline	5/20	Alternated	N.A.
A		1	1/50	Knife	0/5 (0%)
B		1	5/50	Pencil	1/5 (20%)
C		1	7/50	Clock	1/5 (20%)
D		1	4/50	Pencil	1/5 (20%)
A		2	29/50	Pencil	3/5 (60%)
B		2	39/50	Book	4/5 (80%)
C		2	0/50	Knife	0/5 (0%)
D		2	1/50	Knife	0/5 (0%)
A		3	15/50	Book	2/5 (40%)
B		3	6/50	Knife	1/5 (20%)
C		3	7/50	Book	1/5 (20%
D		3	46/50	Clock	5/5 (100%)
A		4	35/50	Clock	4/5 (80%)
B		4	37/50	Clock	5/5 (100%)
C		4	32/50	Pencil	4/5 (80%)
D		4	33/50	Book	4/5 (80%)

i.e., w, x, y, z, w, x, y, z, etc.

No reinforcement was given for correct responses, nor were incorrect responses consequenced in any specified manner. All responses were treated neutrally, after which the trainer would say, "Try the next one." The subjects were reinforced intermittently with verbal praise (e.g., "good sitting") for sitting, looking, and listening to maintain attention level and reinforce on-task behavior.

Treatment. After the baseline data determined the need for training methods, the subjects were assigned a schedule which included a designated concept item labeled w, x, y, or z and a training method (see Table 1) on a week to week basis.

There were four training methods used: (1) no model, (2) model only, (3) model with verbal concept descriptor, (4) model with sign/speech concept descriptor. The procedure used for the first method, no model, was as follows:

1. Same as baseline.
2. Same as baseline.
3. Same as baseline
4. Same as baseline
5. The trainer held up the assigned concept item w, x, y, or z, but this time continued for ten trials with the same concept item. The trainer then asked, "What goes with_____ (concept item)?" Again, the trainer alternated the concept match and distractor left to right. For example, the trainer, holding up the pencil, tells the student, "We are going to play a matching game. I want you go get the object that goes with the pencil." Placing the concept match and the distractor in front of the child, the trainer asks, "What

goes with the pencil?"

After the response, the trainer lowered the concept item, recorded the data, and alternated the concept match and the distractor item from left to right. Holding up the same concept item, the trainer again asked, "What goes with the pencil?" This procedure continued until ten trials were run. No response was recorded as an incorrect response. As in the baseline and throughout the treatment, all responses were treated neutrally, with good sitting, looking, and listening reinforced with verbal praise.

Method 1 was similar to the baseline procedure, but was not a duplication. In Method 1 the trainer used the same concept item throughout and ran ten consecutive trials for five separate sessions.

Method 2: The procedure used for the second training method, model only, was as follows:

1. Same as Method 1
2. Same as Method 1
3. Same as Method 1
4. Same as Method 1
5. The trainer held up the assigned concept item which was used for ten trials, modeled the correct response, restored the concept match and the distractor to its original place on the table, and then asked, "What goes with _____ (concept item)?" For example, the trainer held up the clock and told the student, "We are going to play a matching game. I want you to get the object that goes with the clock." Having placed the concept match and the distractor in front of the student, the trainer modeled the correct response, in this case picked up the watch and paired it with the

clock. Then, having restored the concept match, the trainer asked the subject, "What goes with clock?" The same alternating of objects, data collection, and reinforcement procedures employed in Method 1 (no model) were used throughout Method 2 (model only).

Method 3: The procedure used for the third training method, model plus concept descriptor, was as follows:

1. Same as Methods 1 and 2
2. Same as Methods 1 and 2
3. Same as Methods 1 and 2
4. Same as Methods 1 and 2
5. The trainer held up the assigned concept item which was used for ten trials, modeled the correct response and provided a verbal concept descriptor while modeling the correct response. As in Method 2 (model only), the concept match was restored to its original place on the table by the trainer who then asked the subject, "What goes with _____ (concept item)?" A list of the concept descriptors can be found in Table 2. For example, the trainer held up the book and told the student, "We are going to play a matching game; I want you to get the object that goes with book." Having placed the concept match and the distractor in front of the child on the table, the trainer modeled the correct response, in this case picked up the newspaper, and told the student the concept descriptor, which in this case was, "The book and the newspaper are both used for reading." Then, having restored the concept match, the trainer asked the subject, "What goes with book?" The same alternating of objects, data collection, and reinforced procedures employed in Methods 1 (no model) and 2 (model only) were used throughout Method 3

Table 2

List of Concept Descriptors

Concept Item	Concept Description
(w) knife	"The knife and the scissors are both used for cutting."
(x) pencil	"The pencil and the crayon are both used for writing."
(y) clock	"The clock and the watch are both used for telling time."
(z) book	"The book and the newspaper are both used for reading."

(model and verbal concept descriptor).

Method 4: The procedure used for the fourth training method, model with sign/speech concept descriptor, was as follows:

1. Same as Methods 1, 2, and 3
2. Same as Methods 1, 2, and 3
3. Same as Methods 1, 2, and 3
4. Same as Methods 1, 2, and 3
5. The trainer held up the assigned concept item (same for ten trials), modeled the correct response and provided a sign/speech concept descriptor while modeling the correct response. As in Methods 2 (with model) and 3 (with model and concept descriptor), the concept match was restored to its original place on the table by the trainer who then asked the subject, "What goes with _____(concept item)?" The list of concept descriptors found in Table 2 was converted to a manual communication system based on American sign language. For example, the trainer held up the knife and told the student, while employing sign/speech, "We are going to play a matching game; I want you to get the object that goes with knife." Having placed the concept match and the distractor in front of the child on the table, the trainer modeled the correct response, in this case picked up the scissors and used sign/speech to tell the student the concept descriptor, which in this case would be, "The knife and the scissors are both used for cutting." Then having restored the concept match, the trainer asked the subject using sign/speech, "What goes with knife?" The same alternating of objects, data collection, and reinforcement procedures employed in Methods 1 (no model), 2 (model only), and 3 (model and verbal concept descriptor) were used throughout

Method 4 (model and sign/speech concept descriptor).

Post-treatment baseline. As described above, the completion of the "ABA" design required a post-treatment baseline. Since the baseline procedure greatly resembled Method 1 (without model), the data for both were similar. However, post-treatment baseline data needed to be collected.

Therefore, after each training method, the trainer was required to run five trials with the assigned concepts (i.e., w, x, y, or z). The procedure used to collect the post-treatment baseline was as follows:

1. Same as baseline
2. Same as baseline
3. Same as baseline
4. Same as baseline
5. Same as baseline, except the concept item used for the five trials was either w, x, y, or z as assigned for the specific method. Nevertheless, the training method, whether Method 1 (without model), 2 (with model), 3 (with model and concept descriptor), or 4 (with model and sign/speech concept descriptor), was abandoned. More specifically, the trainer would follow the fifty trials, with five trials using the training method described in the baseline. The only exception was that the concept items were not rotated, but five trials were run with the assigned concept item for each method respectively.

Chapter 4

Results

Introduction

The purpose of this study was to answer the question: Do the prompting procedures of modeling, verbal concept descriptor, and verbal concept descriptor with manual communication (sign/speech) effect concept formation with children who are severely and profoundly handicapped?

The hypotheses in this study were to be tested to determine the statistical significance at the .05 level of confidence. A *t* test for each hypothesis was used to test the raw score data against the raw score of Method 1 (without model). It is important to point out that in this study hypothesis 1 tested Method 2 (with model) against Method 1 (without model); hypothesis 2 tested Method 3 (with model and concept descriptor) against Method 1 (without model); and hypothesis 3 tested Method 4 (with model and sign/speech concept descriptor) against Method 1 (without model).

Hypothesis 1

Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) when provided the model of the correct response than will students who are severely and profoundly handicapped provided with no model of the correct response.

Table 3

t Test Scores for Hypothesis 1

Sources of variation	N	MS	SS	d_f	t
Without model	4	4.25	6.25	$\frac{(N_1+N_2)^{-2}}{6}$	2.26 (NS)
With model	4	17.25	390.91		

Discussion

Table 3 illustrates that the t test for hypothesis 1 determined that this hypothesis was rejected as not statistically significant. However, the t test did compute to be 2.26. Since the t test score would have been significant at the 2.44 level, hypothesis 1 fell short of significance by .2 of a point. Inasmuch as the margin of difference was statistically low, Method 2 (with model) which hypothesis 1 represents, should be considered for future experimentation as a potentially viable teaching method. The treatment with a model while not statistically significant was approaching significance.

Hypothesis 2

Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) when provided the model of the correct response accompanied by a verbal concept description than will students who are severely and profoundly handicapped provided with no model of the correct response.

Table 4

t Test Scores for Hypothesis 2

Sources of variation	N	MS	SS	d_f	*t*
Without model	4	4.25	6.25	$\frac{(N_1+N_2)^{-2}}{6}$	2.63*
With model and verbal concept descriptor	4	18.50	352.33		

* p .05

Discussion

Table 4 illustrates that the *t* test for hypothesis 2 determined that this hypothesis was accepted as statistically significant. The acceptance of the hypothesis was based on the *t* score of 2.63 which placed it at the .05 level of confidence. Therefore, hypothesis 2 indicated that the treatment method with model and concept description was significantly different than the treatment method using no model.

Hypothesis 3

Students who are severely and profoundly handicapped will form norm-referenced concepts more significantly (at the .05 level of confidence) than will students who are severely and profoundly handicapped provided with no model of the correct response.

Table 5

t Test Scores for Hypothesis 3

Sources of variation	N	MS	SS	d_f	*t*
Without model	4	4.25	6.25		
With model and sign/speech concept descriptor	4	34.25	4.91	$\frac{(N_1+N_2)^{-2}}{6}$	33.33*

* p .001

Discussion

Table 5 illustrates that the *t* test for hypothesis 3 determined that this hypothesis was accepted as statistically significant. The acceptance of the hypothesis was based on the *t* score of 33.33 which placed it at the .001 level of confidence. Therefore, hypothesis 3 indicated that the treatment method with model and sign/speech concept description was significantly different than the treatment method using no model.

Chapter 5

Summary

> A new degree of the intellectual power seems cheap at any price. The use of the world is that man may learn its laws. And the human race have wisely signified their sense of this, by calling wealth, means--Man being the end. ...The child shall be taken up by the State, and taught, at the public cost, the rudiments of knowledge, and, at last, the ripest results of art and science.
>
> Humanly speaking, the school, the college, society, make the difference between men. ...When a man stupid becomes a man inspired, when one and the same passes out of the torpid into the perceiving state, leaves the din of trifles, the stupor of the senses, to enter into the quasiomniscience of high thought--up and down, around, all limits disappear. No horizon shuts down. (p. 249)

Introduction

In his essay, "On Education," Ralph Waldo Emerson expressed the power of education, which provides a salient precursor to the implications of this study. As educators and trainers in both educational and residential environments strive to improve the quality of life for persons who are severely and profoundly handicapped, they should consider how the quality of life and the quality of intellect depend upon each other. Environment should not stand alone as a standard for quality of life, for a greater victory is achieved when individuals can appreciate their environments both intellectually and functionally.

The results of this study indicated that, starting with Method 2 (with model), the subjects advanced in conceptual matches in subsequent treatment methods respectively. The objective of teaching

is to equip the child with concepts that can lead to environmental understanding and appreciation. Until this environmental understanding and appreciation is realized, quality of life for the severely and profoundly handicapped will be only a mandate and not a reality.

Discussion

Any discussion of research findings must represent a transition with the above introduction. This study's resultant data confirmed absolute and proportional increases in frequency of conceptual matches by the subjects. As expected, one purpose of this study was to test the stated hypotheses; however, another purpose was to demonstrate and confirm training methods that could be replicated to increase the conceptual understanding of the environment by learners who are severely and profoundly handicapped. If this study were to accomplish this increase, a victory would be achieved to enable these individuals to appreciate their environment both intellectually and functionally.

The data in Tables 3, 4, and 5 showed that when teaching methods employed modeling, concept descriptions, and sign/speech concept descriptions respectively, concept formation of select children who are severely and profoundly handicapped was significantly improved. Since the subjects had a different norm-referenced concept presented for each method, historical learning was controlled. Since none of the subjects had the same concept item twice during the treatment methods, the treatment methods were the presumed independent variables.

Additionally, this study demonstrated the following:

1. The employment of modeling, although not statistically significant, increased the number of correct responses in relation to the use of no model.

2. The provision of modeling plus a concept description is statistically significant in relation to the use of no model.

3. The provision of modeling plus a sign/speech concept description is statistically significant in relation to the use of no model.

Improvements in the Experimental Design

In random sampling, carefully controlled conditions are created to ensure that each unit in the population has an equal or known chance of being included in the sample. Unfortunately, in this study there was a randomization error. Although no subject had the same concept item twice, concept items were repeated within the same method. Due to a randomization error, the concept item pencil appeared twice in Method 1 (without model); concept item knife appeared twice in Method 2 (with model); concept item book appeared twice in Method 3 (with model and concept descriptor); and concept item clock appeared twice in Method 4 (with model and sign/speech concept descriptor). If this experiment were to be replicated, randomization for the whole study should occur prior to the study rather than on a weekly basis as indicated in Chapter 3.

Nevertheless, this error in randomization showed a consistent pattern. This consistency came into view with the concept item knife. Regardless of method, the correct response scores were poorest when

the knife was presented as the concept item (see Table 1). Certainly, the concern for these low scores would have been minimized if the knife appeared only once in each method. Yet, it is important to note that although formal data could not be reasonably collected after the experiment, informally the significant people in the subjects' environments admitted to the deliberate inaccessibility of the concept item knife. Obviously, making knives inaccessible occurred for safety reasons, but this inaccessibility may have fostered the belief that children who are severely and profoundly handicapped would be endangered if they were encouraged to use, or gain access to, knives or other cutting instruments.

In this study, the lowest correct response percentage for any concept was the concept item knife which was only 4.0%. This score would support the tentative conclusion that children who are deprived of functional interaction with a given item, even though this item may be age appropriate will not readily form a conceptual understanding of the item. The removal of certain concept items which are considered dangerous is a frequent experience for children who are severely and profoundly handicapped.

From the data and the conclusion I have drawn from them, teachers, trainers, and parents of children who are severely and profoundly handicapped should be encouraged to examine a new approach to resist controlling the training milieu for these children. Age appropriate, functional environments should be considered in designing curricula for all children with handicaps. Surely, children with severe learning deficits would have their learning potential enhanced if careful consideration was given to exposure, and not removal, of age appropriate,

functional concept items. Teachers, trainers, and parents should discontinue the practice of exerting unnecessary control of these children's environment, and should study the provision of the "dignity of risk" into the training and living environment of these children.

Furthermore, the training methods represented different results when the knife was removed from the scores of the responses. Respectively, with the knife eliminated from the experiment, Method 1 (without model) had a percentage of correct responses of 10.7%, Method 2 (with model) and Method 3 (with model and concept descriptor) both had a percentage of 68%, and Method 4 (with model and sign/speech concept descriptor) had a percentage of 68.5%. Although for this experiment it would be inappropriate to delete any concept item from the data, it is important to point out the similarities in the scores of Methods 2, 3, and 4. The difference was only .5% between Methods 2 and 3, which both had a score of 68% correct responses, and Method 4 which had a score of 68.5%. Still, one can speculate that with the knife removed from the data, Methods 2 (with model), 3 (with model and concept descriptor), and 4 (with model and sign/speech concept descriptor) would appear to reflect the same level of training efficacy. However, if this experiment were to be replicated, the randomization of the concept items should be correctly distributed to test the hypotheses of this study more accurately.

Another concern of this study was that the distractor item toothbrush, used with the pencil and crayon concept match, may have been too similar in shape to the concept match items. This similarity of the toothbrush could be corrected easily by substituting the toothbrush with an item such as a plate or any other dissimilar item.

Again, if this experiment were to be replicated, this distractor consideration might be corrected.

The improvements in this study reflected the importance of expert consideration when designing teaching methods for children who are severely and profoundly handicapped. The experiment demonstrated that these children possess unique and varied learning styles which can be identified and incorporated into teaching and training methods.

Implications for Future Research

The following are implications for future research:

1. All single subject design or small group studies, although common in research with children who are severely and profoundly handicapped, need to be replicated to test significance of the findings. It would be helpful if both the school and residential programs would duplicate this study to determine if the results are consistent. This study would not be difficult to replicate, nor would it be obtrusive to most teaching and training environments.

2. The instructional component of this experiment was done in a contrived, sit-down format. For purposes of future research, the teaching method could be applied in a more functional rather than clinical environment. That is, the instruction component for "pencil" could be presented immediately after another teaching component that required the use of a writing instrument; the concept "book" could be tested after the subject's story time or when s/he has observed a parent or significant adult reading a book, magazine, or newspaper.

3. Different concept items could be employed for instructional

methods in future experiments if they were based on a team decision of significant people in the child's environment. In this way, instructional time would benefit subjects wherever possible to learn concepts ultimately functional in their lives.

4. Parents and/or residential caretakers could be trained in the methods of this experiment to implement a study of concept learning in the home. This training could help researchers to determine (a) the generalization of the training methods to significant others and (b) significant differences, if any, in concept formation between the home and school environments.

5. As in the case of the knife, researchers should explore the benefit of a functional and a normalized environment as an important factor in the learning behavior of children who are severely and profoundly handicapped.

6. Different educational environments including the regular classroom should be researched for children with severe and profound handicaps. If, as in the case of the knife, removal of environmental stimuli is detrimental to these children and their learning potential, technology should be sought to avoid their exclusion from any age appropriate, functional environment.

Summary/Conclusion

This study reveals that children who are severely and profoundly handicapped can attain improved concept formation when various teaching methods were employed. The salience of cues through modeling, concept description, and sign/speech concept description increased correct responses respectively. More importantly, this study points

out the careful deliberation that must be applied to the instruction of children who are severely and profoundly handicapped. The cues in the teaching techniques in Methods 2 (with model), 3 (with model and concept descriptor), and 4 (with model and sign/speech concept descriptor) exhibit the thought and deliberation that often needs to be given instructional programming.

Additionally, this study illustrates the need for highly skilled teachers when providing school programs for children who are severely and profoundly handicapped. These teachers need intensive training in such areas as developmental psychology, applied behavior analysis, learning theory, teaching methods, language development including sign language, and legal and ethical considerations. As one examines the expertise needed to teach children with severe and profound handicaps effectively, one can see how much intensive training and effort must go into the development of effective teachers. Certainly, for this study, the teacher implementing the experimental design had to possess many pedagogical skills and much theoretical understanding.

The implications for the quality of life discussed in the introduction of this chapter were an obvious concern in this study. The ethics of public school programs for children who are severely and profoundly handicapped should examine social, political, and economic issues in a programming context. Socially, curricula should include a commitment to assist these children to be functional members of their society. The technology of the field should strive to create new training methods, new prosthetic devices, an ethical philosophy dedicated to enabling these children to function as healthy participants

in society, and an establishment of integrated locus for educational programming.

Politically and economically resources are drying up for programs which provide services to these children. Advocates for children with handicaps have loudly protested against the return to warehousing these children in custodial institutions. This traditional method of care must be resisted; all programs for these children should demonstrate an excellence that addresses both the political and economic realities of the day. The term "special" should be examined for its worth, as it tends to encourage legislators and taxpayers to view programs for children with handicaps as exclusionary and exceptional to the everyday operation of the public school system. To date researchers and public school officials have yet to compare the costs of programming these children with severe and profound handicaps in the regular classroom with that of programming them in self-contained classrooms.

Surely, research that examines the teaching of concepts and is undertaken from a commitment to ensure a quality of life and intellect will point the way for programs seeking excellence. The commitment to teaching and training these children cannot be diminished by current political and economical conditions. Teachers, other professionals, and parents who instruct children who are severely and profoundly handicapped must become activists, I believe, for the quality of life and the quality of intellect for these children.

Nevertheless, developing a philosophy and an adequate technology for children who are severely and profoundly handicapped

cannot wait for future research to be completed. Each individual in the field must move on with innovative techniques and commitments on a day-to-day basis. If at every level those who work with these children are dedicated to the development of appropriate, functional programs in normalized environments, the field will survive current political and economic constraints and advance the cause of integrating children who are severely and profoundly handicapped into society.

In conclusion, this study and future studies of concept formation will best serve children who are severely and profoundly handicapped if they lead to devising more effective teaching methods. Since the central goal, I believe, should be integrating these children into society, these teaching methods should create for these students ways in which they can cope more appropriately with the daily demands of ordinary living.

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APPENDIX A

PICTURE BOOK PAGE OF CONCEPT ITEMS