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AUTHOR Golden, Emanuel
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ABSTRACT

Compared was the visual memory of 18 deaf and 18 normal hearing children (7- to 12-years-old). Ss' visual discrimination and visual memory were tested with filmstrip materials from Project LIFE (Language Improvement to Facilitate Education). Time scores and error scores were used to measure the performances of both groups. Results showing that deaf Ss scored as well or better than the hearing Ss in all tested activities indicated that the memories of deaf children for visually significant stimuli may be at least as strong and persistent as the memories of hearing children, and that attention could be focused on more and better utilization of significant visual aids in the education of the deaf. (Author/LS)

ABSTRACT

VISUAL MEMORY OF DEAF STUDENTS IN COMPARISON WITH NORMALLY HEARING STUDENTS OF SIMILAR AGES

By

Emanuel Golden

B.A., Gallaudet College, 1949

M.A., New York University, 1970

George Detmold, Ph.D., Advisor
Professor, Gallaudet College
Washington, D. C.

A Project Submitted in Partial Fulfillment of
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The investigation of visual memory was conducted with pre-lingually deaf children, who had lost their hearing before acquiring spoken American English.

Materials from Project LIFE (National Education Association) -- filmstrips, a filmstrip projector, a student response program master device, and a screen -- were used in an experiment with two separate groups of normally hearing and deaf pupils (n = 18 in each). The materials tested visual discrimination and visual memory. Time scores and error scores were used to measure the performances of both groups.

Results of the experiment indicated that the deaf pupils scored as well as or better than the hearing ones in all tested activities. The deaf were significantly superior on four filmstrips out of six, one on an error score and three on the time scores, while the normally hearing were not significantly superior on any filmstrip.

The research indicates that the memories of deaf children for visually significant stimuli may be at least as strong and persistent as the memories of hearing children, and that attention could be focussed on more and better utilization of significant visual aids in the education of the deaf. Emphasis could be placed on media technologies to impart learning in a visual manner.

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PREFACE

Thanks go to the investigator's family who made telephone calls for him and helped with the typing. Furthermore, their interpreting (reverse and translating) has been a source of relief and convenience. Thanks go also to the Project LIFE staff, especially to Dr. David A. Spidal, Associate Director, for providing impetus and assistance from time to time. His invaluable help has been enlightening during the course of the investigator's progress.

Gratitude is tendered Mr. Steve L. Mathis III, Principal of the Carver School for the Deaf, Gambrills, Maryland, for his permission to conduct an experiment with some classes. It is likewise tendered Dr. Ann C. Gross, Research Specialist, Prince George's County Public Schools, Upper Marlboro, Maryland and Mrs. Eleanor Creveling, Acting Principal, Heather Hills Elementary School, Bowie, Maryland, for their approval of the experiment with some classes of normally hearing pupils.

Mr. Alan B. Crammatte, Associate Professor of Business Administration, Gallaudet College, Washington, D. C., has given aid on statistical work. Appreciation also goes to other persons for encouragement and counsel.

Gallaudet College and the Alexander Graham Bell Association for the Deaf, both in Washington, D. C., have generously allowed the investigator to use their library services. Notice should be taken of their unique collection of books on the education of the deaf.

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CHAPTER I

General Introduction

Deafness is a term that may be applied when any organism is supposed to be able to hear yet does not hear well. Deaf human beings -- those who suffer an impaired sense of hearing -- probably number several millions among the contemporary population of the United States. The subjects of this study, however, were drawn from a much more limited population. The approximately 400,000 are pre-lingually deaf. They have suffered their loss of hearing before they have acquired a command of spoken American English. They also have suffered a loss that may be defined as "severe" (from 71-90 decibels, ISO, across the 500-2,000 cycle per second range that is called the "speech frequency"), and "profound" (a loss of 91 decibels or higher). The subjects of this study were further limited to the children in this population because the nature of their hearing loss has precluded the normal acquisition of the English language and has forced them into an educational and social situation that may properly be described as deprived -- a situation that for most of them will dominate their lives.

It is clear from the numbers involved that deaf people (as here defined), deaf children especially, are a tiny minority within the general population of the United States. There are certain parallels between their situation and that of other minorities. Blacks, Indians, Chicanos and others have been lagging behind white people in educational and economic endeavors due (it is alleged) to control of their educational destiny by the whites. This has created an educational gap for the minorities who were not consulted about what they considered to be

in their best interest. In the education of the deaf, deaf people have rarely been involved in policy-making decisions. This situation has brought disaster to the deaf. Thirty percent of the deaf population are functionally illiterate and 60 percent have about a 5th-grade reading and writing level. (1) These figures have been with us for a long time and are frequently quoted, but they have not yet aroused the kind of concern that leads to effective action.

Additionally, the educational system prescribed for the deaf has been compounded by the century-old controversy between manualism and oralism. Manualism is the usage of hand and finger movements in making symbols of language. Oralism is the attempted use of the spoken language used by the normally hearing -- except that the deaf can only pretend to hear it, can rarely attain recognizable speech, and are forced to rely on lipreading. It should be noted that only a third of the sounds of English may be discriminated on the lips of the speaker, that stress and intonation are not discriminated at all, and that a perfect score in lipreading would yield somewhat less than 30 percent of the information conveyed by the speaker. The controversy was initiated by two separate groups of hearing educators in the area of deafness. (2) No deaf person was consulted for an opinion. Even though the National Association of the Deaf with 17,000 members, of which the investigator is one, has taken a stand for "Total Communication" -- a new phenomenon on the horizon -- "the right of a deaf child to learn to use all forms of communication available to develop language competence," (3) it has been ignored in the controversy. The Oral Deaf Adults Section of the Alexander Graham Bell Association for the Deaf has approximately 300 members who promote oral communication by and among the deaf. It should

be a safe assumption that almost all deaf persons in the National Association of the Deaf have been exposed to oral training during their school years. A comparison in number between the two organizations of the deaf should reveal something about the views of an overwhelming majority of the deaf. Furthermore, the National Fraternal Society of the Deaf with 123 divisions and more than 12,000 members (an insurance firm operated and controlled by the deaf for deaf insureds) and the American Athletic Association of the Deaf with 141 member clubs have adhered to a similar mode of communication in the conduct and transaction of affairs ever since the inception of the organizations. All evidence points to a successful operation of affairs left in their own hands. Yet the educational system of the deaf on the national, state, and local levels has had little or no involvement of deaf persons in policy-making decisions. (4)

An illustration of the low number of deaf persons found in the system geared for their benefit can be found in the Silent News (5) for January, 1973: "Over 11,000 teachers and educational personnel in the U.S., only 747 are deaf." Teaching, one should remember, is often the only profession to which a member of a minority group may aspire. This could be due to inbred instincts for instruction to children within their ranks. And the deaf are not only limited to less than seven percent of the teaching positions but are almost entirely excluded from school boards and state agencies that control the education offered to deaf children. (6)

The point of the preceding observations is that no matter what remedies may be devised for the education of the deaf, they are placed in the hands of people who have, by and large, shown little concern for the educational achievement of their charges. (7) Nonetheless, this paper does propose a remedy that may be employed by any teacher of the

deaf regardless of his educational orientation -- a turn to visually significant and stimulating materials in all aspects of teaching and learning.

It is obvious that a large percentage of ordinary learning comes through the eye even to those who can hear. Since for deaf children this percentage approaches 100, it is apparent that more stress should be placed on the perfection of visual materials presented to the deaf. They should be made significant and non-ambiguous. (Lipreading is an example of ambiguous visual activity.) Ordinary visual aids are not essentially visual in nature because so many of them just show people talking or show a scene with a "Voice Over" on the soundtrack. Visual materials can be developed that are useful in imparting knowledge to children who cannot hear; they can be programmed for use in a machine; and they can assist a child in discovering that he can learn independently and that learning can be fun as well. Visual aids may be a step or so toward the power of the ear that is enjoyed by the normally hearing.

The purpose of the project reported was to assess the results in utilizing some of the materials of Project LIFE. If deaf children showed a good performance in the experiment, it would testify to the value of visual aids that are meaningful to the deaf. It could lead to a superior means of educating the deaf, whether the teachers are committed to "oralism," "total communication," or some other approach.

CHAPTER II

Review of Existing Literature

The education of the deaf has been in the throes of methodological differences since 1867 when the first two oral schools for the deaf in the United States were founded. (8) At the present time, the same controversy continues between the oralist group and those who favor some modification of oralism, a "combined system." Literature on the methods of teaching the deaf has been dominated by arguments on the strengths and weaknesses of oralism and the combined system. Considerable emotionalism has been injected into the literature.

More recent literature has gone beyond polemics into the cognitive functioning of the deaf. Much attention has been given to language acquisition and intellectual functioning. Myklebust (9) wrote: "Deafness is a significant and consequential sensory deprivation" which causes the deaf person to experience the environment differently and, therefore, to behave differently. It is "difficult for him to use his intelligence in as broad and subtle and abstract a way." Some people have followed the thinking of Benjamin Whorf (10), who felt that all higher levels of thinking are dependent upon language and that the structure of language which one uses helps to shape feelings about the environment. Doehring (11), however, stated that it is the higher levels of verbal activity which are dependent upon language, but non-verbal abilities of language handicapped children could be developed normally in spite of a language deficiency.

> True language cannot be taught by rote. It cannot be acquired by definition and mechanical drill. It cannot be divested of its social significance nor removed from its social setting. There must be reasons for using it and these must spring from the in-

dividual's deep need for making known his thoughts, ideas, needs, desires, hopes, imaginations, joys, and perplexities. (12)

Most cognitive studies of deaf children have been comparisons between them and similar groups of hearing children. Hiskey (13), in his study of the intelligence of deaf and hearing children through a comparison of performance on the separate standardizations of the Nebraska Test of Learning Aptitude, showed that the deaf rated as high as, or higher than, the hearing on 28.8 percent of the scores. He concluded that the hearing children had a decided advantage on all items where vocalization aided retention (immediate recall). The possibility that the deaf as a group could ever overcome completely the loss of efficiency resulting from deafness and loss of facility with verbal abstractions was doubtful.

Withrow (14) in his study, "Immediate Memory Span of Deaf and Normally Hearing Children," found that deaf and hearing children performed the same with simultaneous presentation of visual stimuli whereas the hearing groups showed superior recall with sequential presentation.

In his study of deaf children with superior I.Q.'s of deaf parents, Brill (15) proved that they showed superior performances in school work in comparison with deaf children of hearing parents. Other research studies by Stuckless and Birch (16), Meadow (17) and Vernon (18) were similar to Brill's study, and they have arrived at a mutual viewpoint that early manual communication is beneficial to deaf children rather than harmful. They have been supported by Bruner's (19) theory as follows:

> Cognitive growth, whether divergent or uniform across cultures, is inconceivable without participation in a culture and its linguistic community ... there are three ways in which somebody 'knows' something. These are: (1) through doing it, (2) through a picture or image of it, and (3) through some symbolic means as language.

In 1899 Mott (20) indicated that eight-year-old deaf children were superior in memory and observation to eight-year-old hearing children. Smith (21) in 1903 reported that brighter deaf subjects were superior to the slower ones in immediate and delayed visual retention. Perhaps the first study of visual retention of the deaf employing standardized psychological tests was that of Pintner and Paterson (22) wherein they produced evidence that the deaf were superior to the hearing in visual memory span. Their findings were substantially supported by other investigators. A study by Brill and Orman (23) indicated that "deaf children do not have a memory for sentences which are longer than four or five words in length that is the equivalent of the memory of hearing children for sentences." Blair (24) conducted the most recent published investigation of the deaf with reference to visual memory. The battery of visual memory tests that were employed were: the Knox Cube test; Memory-for-Designs; object location test; and four memory span tests including Digit Span Forward, Digit Span Reversed, Picture Span Forward, Picture Span Reversed, Picture Span, and a Domino, or Dot Pattern Span test. Blair found that on the four memory span tests the hearing children were able to retain spans of significantly greater length than the deaf children. However, on the Knox Cube and Memory-for-Designs tests the deaf were superior to the hearing subjects, while on the Object Location test there was no significant difference between the two groups.

Pintner and Paterson, two of the earliest and most influential psychologists who have studied the deaf, concluded in 1916 that:

1. The deaf child is about three years behind the hearing child in learning ability, as tested by the rapidity and accuracy of forming associations between members and forms.

2. The deaf boy is equal in learning ability to the deaf girl, differing in this respect from the hearing boy who falls below the hearing girl.

3. The deaf boy approximates the hearing boy more closely than the deaf girl approximates the hearing girl, in learning ability.

4. The congenitally deaf and the adventitiously deaf are equal in learning ability. (25)

According to Pintner and Paterson, in all mental tests that do not involve the functioning of audition, the average deaf child is from two to three years retarded, as compared with the average hearing child of the same age. (26)

> This retardation of two or three years seems to exist all through the school career of the deaf child. It is not an initial retardation which is later overcome ... This mental retardation applies to the mental ability of the deaf child, so far as we are able to measure it at the present time. It does not apply to the language ability of the deaf child. We feel it imperative to keep language and mental tests entirely separate when dealing with the deaf children. (27)

Krippner and Easton (28) stated that a deaf child had adequate intelligence, but apathy or lack of involvement or inability to find personal meaning in his life embodied in a school setting was detrimental to his expected progress. They found out in their work with the deaf that the price of forced integration into the image of the normally hearing was high in terms of the psychological maladjustment that resulted -- "tragic." (29)

Most researchers have noted a time lag in the education of deaf children. McClure (30) in his article, "The Ostrich Syndrome and Educators of the Deaf," stated that time was of the essence in the educational life of the deaf child. The key to more adequate language mastery and achievement for him lay in making more clearly visible to him that which was desired for him to learn. All communication (31) with the deaf and all their instruction must be in some visual form. It must be borne in mind that the deaf child's progress depends wholly on the manner and amount of

visual material used for his instruction.

Although it has long been obvious that a deaf person relies primarily on his eyes in receiving information, little research (until very recent years) has been done on the vision of the deaf and on the efficacy of visual stimulation in learning. Further, not until recent years have some of the well-known applications of educational technology been applied to the deaf.

In an experiment with Project LIFE materials, J. E. and D. McCarr (32) stated that the average grade-level increment for the 1971-72 school year soared to +1.6 in comparison with +.5 in the past year. At the Oregon State School for the Deaf, Project LIFE materials and machines were placed in individual carrels in the Instructional Materials Center under the full-time direction of a teacher, a teacher's aide and a student aide. Almost 140 students from pre-school through grade 6 used the materials two or three times weekly for about 20 minutes. Their classroom teachers received copies of the objectives of each unit and also notes indicating what program the students completed as well as what supplementary work would reinforce the subject matter of the program. It could be noted that close relationships between the classroom teachers and the Project LIFE teachers were maintained, ensuring continuity of the students' progress. Apathy of the students in traditional classes was transformed into spontaneous eagerness while in the process of using the materials at the Instructional Materials Center. Besides, an approximate increase in book circulation of 150 percent could be directly related to enthusiasm in utilizing the Project LIFE materials.

D. McCarr (33) made an observation of an individualized reading program for 68 junior and senior high school students at the Oregon

State School for the Deaf. A reading center was set up at the Instructional Materials Center for their individual progress. More than 75 selections of materials were available to the students. Besides, an individual folder was kept by each student to record the materials and also progress made. At the end of the school year, the average class gain for this period was 1.3 compared with a .3 to a .5 in previous years. Above all, teachers who were in the program were reluctant to go back to the "old way" due to the success of the individualized reading program.

Spidal (34) referred to a case of an eight-year-old girl, though not hearing impaired, with a functional learning disability. Her parents were involved in application of a Project LIFE instructional system in the home. At the same time, cooperation was fostered between them and her classroom teacher to record the child's progress. A Project LIFE student response program master and three individualized learning components, namely, perceptual training, thinking activities and language development, were utilized. The child was furnished with an average of two filmstrips per day for 12 weeks whereupon a report was made to the effect that the child had steadily progressed, although the "memory skill" tasks posed the greatest difficulty to be overcome. Her interest in the materials had led to higher performance.

The investigation by Spidal has been followed by separate investigations by Bannatyne (35) and Walton (36) with hearing subjects with other learning disabilities. Spidal and Pfau (37) reported that 14 illiterate adolescent and adult deaf individuals finally could communicate with others at the simple sentence level in writing and the language of signs, although they had almost no means of communication upon entry into the

program.

Billinger (38) gave some examples of individuals working on Project LIFE machines by themselves, even after other students had left the machines. Motivation and response of the particular individuals had improved. Although not deaf, non-English speaking children in Texas made considerable increases in their vocabulary development and understanding of English language structures with the aid of Project LIFE materials, as reported by Guajardo. (39)

An interesting feature was noted in a master's thesis of Barringer (40) wherein three student population groups were matched into a home group, a school group and a control group. The home and school groups with Project LIFE materials were checked and found to accomplish more than the control groups without the materials. Besides, there was no significant difference between the home group and the school group, though those groups had undertaken different approaches in utilizing the materials. The home group was under the supervision of the parents. The school group was in the regular school routine but still with the materials.

All studies of the effectiveness of Project LIFE visual aids have reflected a surge of eagerness in the students' response to the materials. The investigator found similar reactions in the experiment with the deaf pupils.

CHAPTER III

Conceptual Framework and Methodology

The experiment was directed at the cognitive processes of deaf children; it compared an experimental group of deaf children with a control group of hearing children. One hypothesis was tested:

> that the experimental group, on six Project LIFE filmstrips that require the exercise of visual discrimination and visual memory, would perform with no more errors and in no more time than the control group.

Whether the experimental group performed with no more errors and in no more time would be determined by a .05 alpha level of significance on nondirectional (two-tailed) tests.

The materials used in the experiment were developed by Project LIFE as part of a programmed, visually-presented system for teaching language to both handicapped and non-handicapped children.

Project LIFE (Language Improvement to Facilitate Education) is a project of the National Education Association, funded by the Media Services and Captioned Films office of the Bureau of Education for the Handicapped, United States Office of Education. Plans call for the creation of more than 300 filmstrips, to be marketed by the General Electric Company, which manufactures a Student Response Program Master device that is sold with the filmstrips as a package.

The Student Response Program Master is about the size of a small radio. A student presses keys to select his choice of answers to questions presented by the filmstrips. If he selects the right key, a green light so indicates, and he is able to advance to the next frame of the filmstrip. The device operates most remote controllable filmstrip or slide projectors.

Principal features of the Student Response Program Master are as follows:

1. Four response keys, identified by a square, a cross, a circle, and a triangle, offer a multiple-choice response to the student. Since each key may or may not be depressed by the operator, a total of eight possible responses is offered by the SRPM. These four key symbols are used in all Project LIFE materials.

2. The correct answer is immediately confirmed. The student is immediately rewarded in pushing the advance button for the next frame.

3. The student learns through his need to find the correct answer in order to make the film advance.

4. Operation is simple, with little or no instruction required from the teacher.

5. The device can be used with a wide variety of projectors that operate with a remote control cord.

The six filmstrips used in the experiment were chosen in consultation with Dr. David A. Spidal, Associate Director, Project LIFE, and represent the memory programs of the Thinking Activities series. Memory tasks were selected that did not require language and presented a continuum of difficulty. Normative data not yet available will help define the approximate level of difficulty. The work undertaken as part of this study was one of many on-going studies to obtain the data needed. The six filmstrips are identified below:

Level I-1--Color Memory 30 Frames

Purpose: To develop the child's ability to remember colors.

Behavioral Objective: Given a color or colors on one frame, the student selects the item on the following frame or frames which contains the same color or colors.

Level I-2--Visual Memory 40 Frames

Purpose: To develop the child's ability to remember beyond immediate recall.

Behavioral Objective: The student must remember the components of a scene for three consecutive frames in order to choose, from two alternatives, the item which is missing.

Level I-8--Object Memory 41 Frames

Purpose: To develop the child's ability to remember the contents of a set.

Behavioral Objective: The student will select, from among several alternatives, the item which completes the pair shown on the previous frame.

Level I-12--Figural Memory 46 Frames

Purpose: To develop the child's ability of remembering beyond immediate recall.

Behavioral Objective: Given an item on one frame, the student selects from among several alternatives on the following frame, the item which is identical to, or most like, the original frame.

Level I-14--Memory of Position 40 Frames

Purpose: To develop the child's ability to remember the position of items.

Behavioral Objective: Given a three-part picture on one frame followed by only one part at a time, the student will indicate the position of that part in the original picture.

Level III-2--Memory of Position 46 Frames

Purpose: To develop the ability to remember isolated items of symbolic information, such as letters or numbers.

Behavioral Objective: Given a set of four items on a frame, the student selects the position of the item repeated on the next frame.

Children who participated in the experiment were chosen from a school for the deaf in Anne Arundel County, Maryland, approximately

six miles from an elementary public school in neighboring Prince George's County where the normally hearing children were chosen. Eighteen children from each school were selected from the first, second, and third grades; their ages ranged between seven and 12. The deaf children comprised the entire first, second, and third grade classes at the Carver School for the Deaf. Four more "special students" who fell in the same age brackets were added to make a total of 18. In the public school, the acting principal chose six students from each of three grades based on three top and three bottom academic rankings. This procedure was followed in order to correspond with the classes for the deaf, which included both bright and slow students. There were 11 boys and seven girls in each group, with three black pupils in each group.

There were indications that the deaf children of Anne Arundel County and the hearing children of Prince George's County came from families that on the average are not far apart in socio-economic status. In the spring of 1974 the Maryland State Department of Education conducted a statewide testing and data-gathering program, the results of which were widely reported in the local newspapers. The Baltimore Sun, on January 30, 1975, reported the rankings of the 24 Maryland school districts in family income, teachers' salaries, per-pupil expenditures, and scores of the reading and mathematics portions of the 1970 Iowa Tests of Basic Skills. The rankings of Prince George's County and Anne Arundel County, among the 24 districts, are given in the table below:

TABLE III-1--Ranking in Socio-Economic Factors, Prince George's County and Anne Arundel County

	Prince George's County ranking	Anne Arundel County ranking
Median family income (1970)	3rd	5th
Teachers' salaries	2nd	4th
Per-pupil expenses	3rd	11th
Fifth grade language, raw scores	14th	10th
Seventh grade mathematics, raw scores	8th	13th

The Washington Post of the same date reported additional data: I.Q. scores as determined by the non-verbal portion of the Cognitive Abilities Test published by Houghton Mifflin; actual per-pupil costs; and percentage of disadvantaged children in the school district. The following table summarizes this data:

TABLE III-2--Socio-Economic Factors (Additional Data), Prince George's County and Anne Arundel County

	Prince George's County	Anne Arundel County
I.Q., Fifth Grade	99	100
Per-pupil costs	$1,215	$1,082
Percent disadvantaged	11%	16%

In addition to a comparable socio-economic environment in the Washington, D. C. suburbs, the children of both the experimental and control groups were matched in age and grade level. A more detailed description of the children is given in Appendix A, pp. 29-31.

At the beginning of the experiment, the deaf children were met by

the investigator, who showed them by mime the action they were expected to perform with the Student Response Program Master in conjunction with the Project LIFE filmstrips projected on a screen. The normally hearing children were introduced to the machine by the acting principal of the school, with the investigator in attendance. Because the investigator is deaf and has the deaf person's normal difficulties in communicating with the hearing, he felt that the school principal would provide an easy transition to the environment of the experiment. His expectations were rewarded. After a brief introduction, the hearing children showed no embarrassment with him or difficulty in understanding the requirements of the experiment.

The six filmstrips used in the experiment were shown once or twice weekly until all were completed. Children in each group came separately to a room set aside for the experiment after a preceding child had completed his task and returned to his class. If a child was absent on a day that the experiment was in process, he completed his task on another date.

In the room devoted to the experiment, the child sat at a desk on which was placed the Student Response Program Master that controlled the filmstrip projector. The investigator sat behind the child, with a stop watch, making time tallies and observing the child's movement of keys on the SPRM. Whenever the child pressed a worng key, and the green light failed to flash, the investigator marked the error on the child's chart. He continued to mark mistakenly pressed keys until the light went on and the child proceeded to the next frame of the filmstrip.

On the investigator's chart, digits (1, 2, 3, 4) were used to mark errors on the four keys. On the back of the SPRM there is an error

counter that tabulated the cumulative errors made by the operator; this total corresponded with the total on the investigator's chart, which was employed not only to total the errors but to indicate precisely which errors had been made.

No variations of this procedure were noted except with all 18 deaf children on the second filmstrip. The projector malfunctioned and was advanced manually by the investigator, upon the flashing of the green light, not affecting the time and error scores. However, during this process, the error breakdown for these subjects was foregone, and the investigator decided, at the end of the experiment, that an item analysis (except for total errors and time) would yield little additional useful information.

CHAPTER IV

Analysis of the Data

Statistical computations were made to define the relationships between the hypothesis and results. In both error scores and time scores there were differences between the groups. Though the school systems did not have or issue intelligence quotient scores on students, it is likely that hearing students would have scored above their counterparts on I.Q. due to the spoken language assimilated ever since their infancies; yet the experimental group (deaf) performed with fewer errors as well as in less time. The total error score of the experimental group was 1,125 in comparison with a count of 1,291 in the control group -- 166 fewer errors than in the control group. The total time count in the experimental group score was 476 minutes whereas that of the control group was 497 minutes. The experiment was finished by the experimental group in 21 fewer minutes. In summary, the experimental group finished with 166 fewer errors in 21 fewer minutes.

An analysis of performance on each of the filmstrips is given in the following tables:

TABLE IV-1--Comparison of Performance on Six Filmstrips; Error Scores and Mean Difference

Error Scores						
Filmstrips	f/s 1	f/s 2	f/s 3	f/s 4	f/s 5	f/s 6
Experimental	182	135	163	134	203	308
Control	123	159	149	159	326	375
Mean Difference						
Filmstrips	f/s 1	f/s 2	f/s 3	f/s 4	f/s 5	f/s 6
Experimental	10.111	7.500	9.055	7.444	11.277	17.111
Control	6.833	8.833	8.277	8.333	18.111	20.833
Difference	3.278	-1.333	0.778	-1.389	-6.834	-3.722

TABLE IV-2--Comparison of Performance on Six Filmstrips; Time Scores and Mean Difference

Time Scores						
Filmstrips	f/s 1	f/s 2	f/s 3	f/s 4	f/s 5	f/s 6
Experimental	77.0'	102.25'	64.78'	65.1'	81.21'	83.36'
Control	96.1'	89.9'	76.97'	76.48'	73.97'	80.75'
Mean Difference						
Filmstrips	f/s 1	f/s 2	f/s 3	f/s 4	f/s 5	f/s 6
Experimental	4.278	5.6806	3.6	3.617	4.512	4.631
Control	5.34	4.99	4.276	4.249	4.109	4.4861
Difference	-1.062	0.6906	-0.676	-0.632	0.403	0.1449

Filmstrip Number	1		2		3		4		5		6	
	E	T	E	T	E	T	E	T	E	T	E	T
Experimental	#		+		#		#		#		+	
Control	+		+		+		+		+		+	

E = Error score
T = Time score
+ = superior performance
# = significantly superior performance

The t-tests for each filmstrip on error scores indicated that the obtained t was smaller than 2.110 at the .05 level of significance for 17 df in all except the fifth one. On the fifth filmstrip, the experimental group scored significantly better with 203 errors against 326 ones on memory of position.

The t-tests for each filmstrip on time scores showed that the obtained t was smaller than 2.110 at the .05 level of significance for 17 df in all except the first, third and fourth ones. On the first, third and fourth filmstrips, the experimental group finished in significantly less time with 77 minutes against 96 minutes and 15 seconds; 64 minutes and 48 seconds against 77 minutes; 65 minutes and 10 seconds against 72 minutes and 30 seconds, in respective order.

CHAPTER V

General Conclusions

The experiment tested one hypothesis: that deaf children, on six Project LIFE filmstrips that require the exercise of visual discrimination and visual memory, would perform with no more errors and in no more time than hearing children. Analysis of the data produced in the course of the experiment tends to support the hypothesis. On the fifth filmstrip, the deaf children performed significantly higher than the normally hearing children on the error scores and also on the time scores for the first, third and fourth filmstrips.

At this point, one might well ask what practical significance the experiment showed. How could it help us to understand deaf children better and provide them with a better education? It is comforting, of course, to learn that deaf people can perform as well as hearing people in certain activities, in view of the age-old attitude that deaf people are inherently inferior to those who have the full use of all their senses. Every bit of evidence that contradicts this attitude helps us to view deaf people as essentially and fully human; and the experiment here reported adds a little to that evidence. But more important is the nature of the evidence itself. The experiment tested memory, in its various aspects: memory for color, memory for shape, for spatial and temporal relationships. True, memory may not be the highest of all cognitive processes, but it is certainly essential. Can a human being learn a language without memory, perform any symbolic process such as solving an algebraic equation without memory, perform even a kinetic activity such as playing tennis without some use of memory?

The data seems not only to support the hypothesis, but also to indicate that the experimental group never performed in a manner significantly inferior to the control group. In four of the six filmstrips, on either time or error scores, the former group performed in a superior manner. The experiment yields no data to explain why this might be so. However, in the observation of the investigator, the deaf children continually approached their tasks on the machines with greater enthusiasm than the hearing children; it is possible that this enthusiasm alone could account for the difference in scores.

If the observable enthusiasm of the deaf children is not disregarded, it adds greatly to the significance of the experiment because it shows that deaf children may respond strongly to visual stimuli that have meaning for them, and that their education can be reinforced by the creation of significant visual aids.

One can speculate that the creation and use of such aids could be attractive to both the oralist and the non-oralist divisions in the education of the deaf. The education of deaf children might proceed apart from the arguments between these two divisions. There is some indication that educators of the deaf are ready to take advantage of new practices in educational technology, and to utilize them for the creation of visually significant stimuli.

Reference may be made to the annual symposium sponsored by University of Nebraska and the Midwest Regional Media Center for the Deaf on research and utilization of educational media for teaching the deaf. The annual symposium has been conducted since 1965. Of special significance in connection with the school layout, materials could be found in the November, 1968 issue of the American Annals of

the Deaf (41) as the symposium was entirely devoted to designing instructional facilities for teaching the deaf, such as the learning module for the utilization of visual materials.

Access to and utilization of visual resources like Project LIFE should probably be an integral part of a school curriculum for the deaf. Visual resources in education are probably more necessary with the deaf than they are with the hearing.

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APPENDIX A

Summary of Subjects in Control Group

Subjects	Age (month)(day)(year)
A	07-02-66
B	06-07-66
C	05-17-66
D	04-18-66
E	02-20-66
F	11-19-65
G	11-18-65
H	10-25-65
I	05-08-65
J	04-28-65
K	03-21-65
L	01-19-65
M	10-30-64
N	10-22-64
O	05-24-64
P	02-22-64
Q	05-31-63
R	02-17-63

Summary of Subjects in Experimental Group

Subjects	Age (month)(day)(year)	Hearing Loss
A	01-08-66	Profound
B	10-27-65	Severe
C	02-18-65	Profound
D	02-16-65	Profound
E	01-13-65	Severe
F	10-26-64	Profound
G	10-06-64	Severe
H	12-16-64	Moderate
I	11-26-64	Profound
J	11-21-64	Profound
K	11-20-64	Moderate
L	09-28-64	Moderate
M	09-17-64	Profound
N	12-14-64	Profound
O	12-16-63	Moderate to Severe
P	08-29-63	Severe
Q	11-22-62	Profound
R	12-08-61	Profound

Summary of Subjects in Experimental Group

Subjects	Hearing Loss in Better Ear*	Age at Onset
A	95 dB	Birth
B	90 dB	2 years
C	90 dB	Birth
D	80 dB	"
E	60 dB	"
F	80 dB	14 months
G	75 dB	Unknown
H	45 dB	Birth
I	75 dB	"
J	86 dB	"
K	70 dB	"
L	72 dB	"
M	93 dB	"
N	85 dB	"
O	57 dB	"
P	86 dB	"
Q	110 dB	"
R	110 dB	8 months

* Hearing loss, ISO, in the better ear for the average of the frequencies 500, 1,000 and 2,000 Hz (cycles per second).

APPENDIX B

Time Score on All Six Filmstrips

Matched Pair	Experimental	Control
A	25 min.	32 min.
B	24 "	30 "
C	25 "	30 "
D	24 "	33 "
E	32 "	26 "
F	34 "	29 "
G	27 "	25 "
H	37 "	24 "
I	26 "	29 "
J	21 "	28 "
K	28 "	28 "
L	27 "	22 "
M	23 "	26 "
N	30 "	28 "
O	25 "	24 "
P	16 "	27 "
Q	24 "	24 "
R	28 "	32 "
18	Total time = 476 min.	Total time = 497 min.
	Mean = 26.44	Mean = 27.61
	S. D. = 2	S. D. = 4.31

Error Score on All Six Filmstrips		
Matched Pair	Experimental	Control
A	57	42
B	57	110
C	64	73
D	57	86
E	80	100
F	88	99
G	108	72
H	108	93
I	63	51
J	101	50
K	29	62
L	31	81
M	12	29
N	90	79
O	77	12
P	24	79
Q	38	90
R	41	83
18	Total errors = 1125	Total errors = 1291
	Mean = 62.5	Mean = 71.72
	S. D. = 27.61	S. D. = 23.92

FILMSTRIP #1--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
7	49	4	16
20	400	29	841
9	81	0	0
15	225	9	81
17	289	13	169
20	400	10	100
19	361	4	16
15	225	5	25
5	25	3	9
4	16	10	100
10	100	2	4
6	36	2	4
1	1	5	25
12	144	5	25
14	196	2	4
3	9	8	64
5	25	11	121
0	0	1	1
Σ 182	2582	Σ 123	1605

$n_1 = 18$

$\bar{X}_1 = 10.111$

$n_2 = 18$

$\bar{X}_2 = 6.833$

FILMSTRIP #2--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
9	81	11	121
2	4	1	1
12	144	7	49
6	36	11	121
9	81	14	196
10	100	14	196
6	36	6	36
15	225	15	225
8	64	8	64
9	81	5	25
8	64	4	16
2	4	13	169
4	16	4	16
8	64	10	100
7	49	3	9
3	9	9	81
5	25	13	169
12	144	11	121
Σ 135	1227	Σ 159	1715

$n_1 = 18$

$\bar{X}_1 = 7.500$

$n_2 = 18$

$\bar{X}_2 = 8.833$

FILMSTRIP #3--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
6	36	3	9
4	16	5	25
13	169	7	49
5	25	12	144
12	144	12	144
8	64	11	121
19	361	6	36
19	361	17	289
9	81	5	25
15	225	6	36
6	36	6	36
3	9	7	49
1	1	5	25
12	144	11	121
12	144	1	1
7	49	12	144
8	64	14	196
4	16	9	81
Σ 163	1945	Σ 149	1531

$n_1 = 18$

$\bar{X}_1 = 9.055$

$n_2 = 18$

$\bar{X}_2 = 8.277$

FILMSTRIP #4--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
3	9	3	9
2	4	7	49
1	1	3	9
3	9	6	36
3	9	20	400
10	100	13	169
17	289	18	324
14	196	16	256
12	144	1	1
23	529	6	36
1	1	3	9
2	4	13	169
1	1	3	9
15	225	10	100
11	121	1	1
4	16	7	49
2	4	16	256
10	100	13	169
Σ 134	1762	Σ 159	2051

$n_1 = 18$

$\bar{X}_1 = 7.444$

$n_2 = 18$

$\bar{X}_2 = 8.833$

FILMSTRIP #5--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
16	256	12	144
14	196	26	676
11	121	27	729
9	81	21	441
18	324	26	676
15	225	22	484
21	441	28	784
18	324	16	256
5	25	19	361
30	900	8	64
0	0	20	400
3	9	15	225
0	0	7	49
16	256	20	400
16	256	3	9
3	9	18	324
4	16	20	400
14	16	18	324
Σ 203	3455	Σ 326	6746

$n_1 = 18$

$\bar{X}_1 = 11.277$

$n_2 = 18$

$\bar{X}_2 = 18.111$

FILMSTRIP #6--Error Scores of Experimental and Control Groups

Experimental		Control	
X_1	X_1^2	X_2	X_2^2
16	256	9	81
15	225	42	1764
18	324	29	841
19	361	27	729
21	441	15	225
25	625	29	841
26	676	10	100
27	729	24	576
24	576	15	225
20	400	15	225
4	16	27	729
15	225	31	961
5	25	5	25
27	729	23	529
17	289	2	4
4	16	25	625
14	196	16	256
11	121	31	961
Σ 308	6230	Σ 375	9697

$n_1 = 18$

$\bar{X}_1 = 17.111$

$n_2 = 18$

$\bar{X}_2 = 20.833$

t-Test: Related Measures — Time Score (Filmstrip #1)

Matched Pair	Experimental	Control	Difference
A	5.0 min.	7.5 min.	-2.5 min.
B	4.0 "	4.25 "	-0.25 "
C	3.0 "	5.75 "	-2.75 "
D	5.0 "	6.0 "	-1.0 "
E	5.0 "	7.58 "	-2.58 "
F	6.0 "	5.08 "	+0.92 "
G	5.0 "	5.58 "	-0.58 "
H	6.5 "	6.0 "	+0.5 "
I	4.0 "	4.0 "	0
J	2.5 "	5.58 "	-3.08 "
K	6.0 "	4.8 "	+1.2 "
L	4.0 "	2.92 "	+1.08 "
M	3.0 "	5.66 "	-2.66 "
N	4.0 "	5.75 "	-1.75 "
O	3.5 "	3.25 "	+0.25 "
P	2.5 "	5.8 "	-3.3 "
Q	5.0 "	4.8 "	+0.2 "
R	3.0 "	5.8 "	-2.8 "

Since the obtained t is larger than 2.110 at the .05 level of significance for 17 df, the experimental group finished in significantly less time than the control group.

t-Test: Related Measures Time Score (Filmstrip #2)

Matched Pair	Experimental	Control	Difference
A	7.0 min.	5.0 min.	+2.0 min.
B	5.0 "	6.92 "	-1.92 "
C	6.0 "	5.58 "	+0.42 "
D	5.0 "	6.25 "	-1.25 "
E	7.0 "	3.25 "	+3.75 "
F	6.0 "	4.42 "	+1.58 "
G	6.0 "	4.42 "	+1.58 "
H	8.0 "	3.66 "	+4.34 "
I	5.0 "	5.66 "	-0.66 "
J	6.0 "	4.58 "	+1.42 "
K	5.5 "	5.25 "	+0.25 "
L	7.0 "	3.66 "	+3.34 "
M	4.0 "	5.17 "	-1.17 "
N	6.0 "	5.0 "	+1.0 "
O	3.5 "	5.33 "	-1.83 "
P	2.75 "	4.75 "	-2.0 "
Q	5.5 "	4.42 "	+1.08 "
R	7.0 "	6.58 "	+0.42 "

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures Time Score (Filmstrip #3)

Matched Pair	Experimental	Control	Difference
A	3.0 min.	4.5 min.	-1.5 min.
B	3.0 "	4.75 "	-1.75 "
C	4.25 "	4.42 "	-0.17 "
D	3.17 "	4.17 "	-1.0 "
E	5.09 "	3.8 "	+1.29 "
F	3.58 "	4.33 "	-0.75 "
G	3.75 "	4.33 "	-0.58 "
H	4.92 "	3.42 "	+1.5 "
I	4.25 "	5.17 "	-0.92 "
J	3.8 "	4.5 "	-0.7 "
K	3.58 "	5.33 "	-1.75 "
L	3.17 "	3.66 "	-0.49 "
M	3.8 "	4.0 "	-0.2 "
N	2.75 "	4.75 "	-2.0 "
O	4.17 "	3.92 "	+0.25 "
P	2.0 "	4.17 "	-2.17 "
Q	2.92 "	3.5 "	-0.58 "
R	3.58 "	4.25 "	-0.67 "

Since the obtained t is larger than 2.110 at the .05 level of significance for 17 df, the experimental group finished in significantly less time than the control group.

t-Test: Related Measures — Time Score (Filmstrip #4)

Matched Pair	Experimental	Control	Difference
A	3.0 min.	4.17 min.	-1.17 min.
B	2.92 "	4.75 "	-1.83 "
C	2.92 "	4.0 "	-1.08 "
D	2.8 "	4.75 "	-1.95 "
E	3.5 "	3.8 "	-0.3 "
F	5.42 "	5.0 "	+0.42 "
G	4.0 "	3.92 "	+0.08 "
H	4.33 "	4.0 "	+0.33 "
I	3.17 "	4.33 "	-1.16 "
J	2.58 "	4.33 "	-1.75 "
K	3.58 "	3.8 "	-0.22 "
L	3.25 "	3.58 "	-0.33 "
M	3.75 "	3.8 "	-0.05 "
N	5.33 "	4.58 "	+0.75 "
O	4.25 "	4.25 "	0
P	1.8 "	4.17 "	-2.37 "
Q	3.17 "	4.17 "	-1.0 "
R	5.33 "	5.08 "	+0.25 "

Since the obtained t is larger than 2.110 at the .05 level of significance for 17 df, the experimental group finished in significantly less time than the control group.

t-Test: Related Measures — Time Score (Filmstrip #5)

Matched Pair	Experimental	Control	Difference
A	3.33 min.	4.8 min.	-1.47 min.
B	5.08 "	4.42 "	+0.66 "
C	5.66 "	4.8 "	+0.86 "
D	3.75 "	5.42 "	-1.67 "
E	5.8 "	3.5 "	+2.3 "
F	7.75 "	4.92 "	+2.83 "
G	4.17 "	3.17 "	+1.0 "
H	6.0 "	3.08 "	+2.92 "
I	4.5 "	5.25 "	-0.75 "
J	2.17 "	4.17 "	-2.0 "
K	4.33 "	4.5 "	-0.17 "
L	4.17 "	3.25 "	+0.92 "
M	3.58 "	3.25 "	+0.33 "
N	6.25 "	3.42 "	+2.83 "
O	4.17 "	3.8 "	+0.37 "
P	3.92 "	3.8 "	+0.12 "
Q	2.08 "	3.5 "	-1.42 "
R	4.5 "	4.92 "	-0.42 "

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Time Score (Filmstrip #6)

Matched Pair	Experimental	Control	Difference
A	3.5 min.	5.8 min.	-2.3 min.
B	3.8 "	4.75 "	-0.95 "
C	2.75 "	4.92 "	-2.17 "
D	4.33 "	6.08 "	-1.75 "
E	5.17 "	4.17 "	+1.0 "
F	5.58 "	5.08 "	+0.5 "
G	4.42 "	3.58 "	+0.84 "
H	7.25 "	3.58 "	+3.67 "
I	5.25 "	4.8 "	+0.45 "
J	3.8 "	4.75 "	-0.95 "
K	5.0 "	4.66 "	+0.34 "
L	5.0 "	4.5 "	+0.5 "
M	4.8 "	3.75 "	+1.05 "
N	5.8 "	4.0 "	+1.8 "
O	5.08 "	3.17 "	+1.91 "
P	2.58 "	3.92 "	-1.34 "
Q	4.92 "	3.58 "	+1.34 "
R	4.33 "	5.66 "	-1.33 "

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Time Score (All Filmstrips)

Matched Pair	Experimental	Control	Difference
A	25 min.	32 min.	- 7 min.
B	24 "	30 "	- 6 "
C	25 "	30 "	- 5 "
D	24 "	33 "	- 9 "
E	32 "	26 "	+ 6 "
F	34 "	29 "	+ 5 "
G	27 "	25 "	+ 2 "
H	37 "	24 "	+13 "
I	26 "	29 "	- 3 "
J	21 "	28 "	- 7 "
K	28 "	28 "	0
L	27 "	22 "	+ 5 "
M	23 "	26 "	- 3 "
N	30 "	28 "	+ 2 "
O	25 "	24 "	+ 1 "
P	16 "	27 "	- 9 "
Q	24 "	24 "	0
R	28 "	32 "	- 4 "

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measure Error Score (Filmstrip #1)

Matched Pair	Experimental	Control	Difference
A	7	4	+ 3
B	20	29	- 9
C	9	0	+ 9
D	15	9	+ 6
E	17	13	+ 4
F	20	10	+10
G	19	4	+15
H	15	5	+10
I	5	3	+ 2
J	4	10	- 6
K	10	2	+ 8
L	6	2	+ 4
M	1	5	- 4
N	12	5	+ 7
O	14	2	+12
P	3	8	- 5
Q	5	11	- 6
R	0	1	- 1

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Error Score (Filmstrip #2)

Matched Pair	Experimental	Control	Difference
A	9	11	- 2
B	2	1	+ 1
C	12	7	+ 5
D	6	11	- 5
E	9	14	- 5
F	10	14	- 4
G	6	6	0
H	15	15	0
I	8	8	0
J	9	5	+ 4
K	8	4	+ 4
L	2	13	-11
M	4	4	0
N	8	10	- 2
O	7	3	+ 4
P	3	9	- 6
Q	5	13	- 8
R	12	11	+ 1

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Error Score (Filmstrip #3)

Matched Pair	Experimental	Control	Difference
A	6	3	+ 3
B	4	5	- 1
C	13	7	+ 6
D	5	12	- 7
E	12	12	0
F	8	11	- 3
G	19	6	+13
H	19	17	+ 2
I	9	5	+ 4
J	15	6	+ 9
K	6	6	0
L	3	7	- 4
M	1	5	- 4
N	12	11	+ 1
O	12	1	+11
P	7	12	- 5
Q	8	14	- 6
R	4	9	- 5

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Error Score (Filmstrip #4)

Matched Pair	Experimental	Control	Difference
A	3	3	0
B	2	7	- 5
C	1	3	- 2
D	3	6	- 3
E	3	20	-17
F	10	13	- 3
G	17	18	- 1
H	14	16	- 2
I	12	1	+11
J	23	6	+17
K	1	3	- 2
L	2	13	-11
M	1	3	- 2
N	15	10	+ 5
O	11	1	+10
P	4	7	- 3
Q	2	16	-14
R	10	13	- 3

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Error Score (Filmstrip #5)

Matched Pair	Experimental	Control	Difference
A	16	12	+ 4
B	14	26	-12
C	11	27	-16
D	9	21	-12
E	18	26	- 8
F	15	22	- 7
G	21	28	- 7
H	18	16	+ 2
I	5	19	-14
J	30	8	+22
K	0	20	-20
L	3	15	-12
M	0	7	- 7
N	16	20	- 4
O	16	3	+13
P	3	18	-15
Q	4	20	-16
R	4	18	-14

Since the obtained t is larger than 2.110 at the .05 level of significance for 17 df, it establishes that the experimental group has performed in a significantly superior manner.

t-Test: Related Measures — Error Score (Filmstrip #6)

Matched Pair	Experimental	Control	Difference
A	16	9	+ 7
B	15	42	-27
C	18	29	-11
D	19	27	- 8
E	21	15	+ 6
F	25	29	- 4
G	26	10	+16
H	27	24	+ 3
I	24	15	+ 9
J	20	15	+ 5
K	4	27	-23
L	15	31	-16
M	5	5	0
N	27	23	+ 4
O	17	2	+15
P	4	25	-21
Q	14	16	- 2
R	11	31	-20

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

t-Test: Related Measures — Error Score (All Filmstrips)

Matched Pair	Experimental	Control	Difference
A	57	42	+15
B	57	110	-53
C	64	73	- 9
D	57	86	-29
E	80	100	-20
F	88	99	-11
G	108	72	+36
H	108	93	+15
I	63	51	+12
J	101	50	+51
K	29	62	-33
L	31	81	-50
M	12	29	-17
N	90	79	+11
O	77	12	+65
P	24	79	-55
Q	38	90	-52
R	41	83	-42

Since the obtained t is smaller than 2.110 at the .05 level of significance for 17 df, there is no significant difference between the two groups.

APPENDIX C

MATERIALS

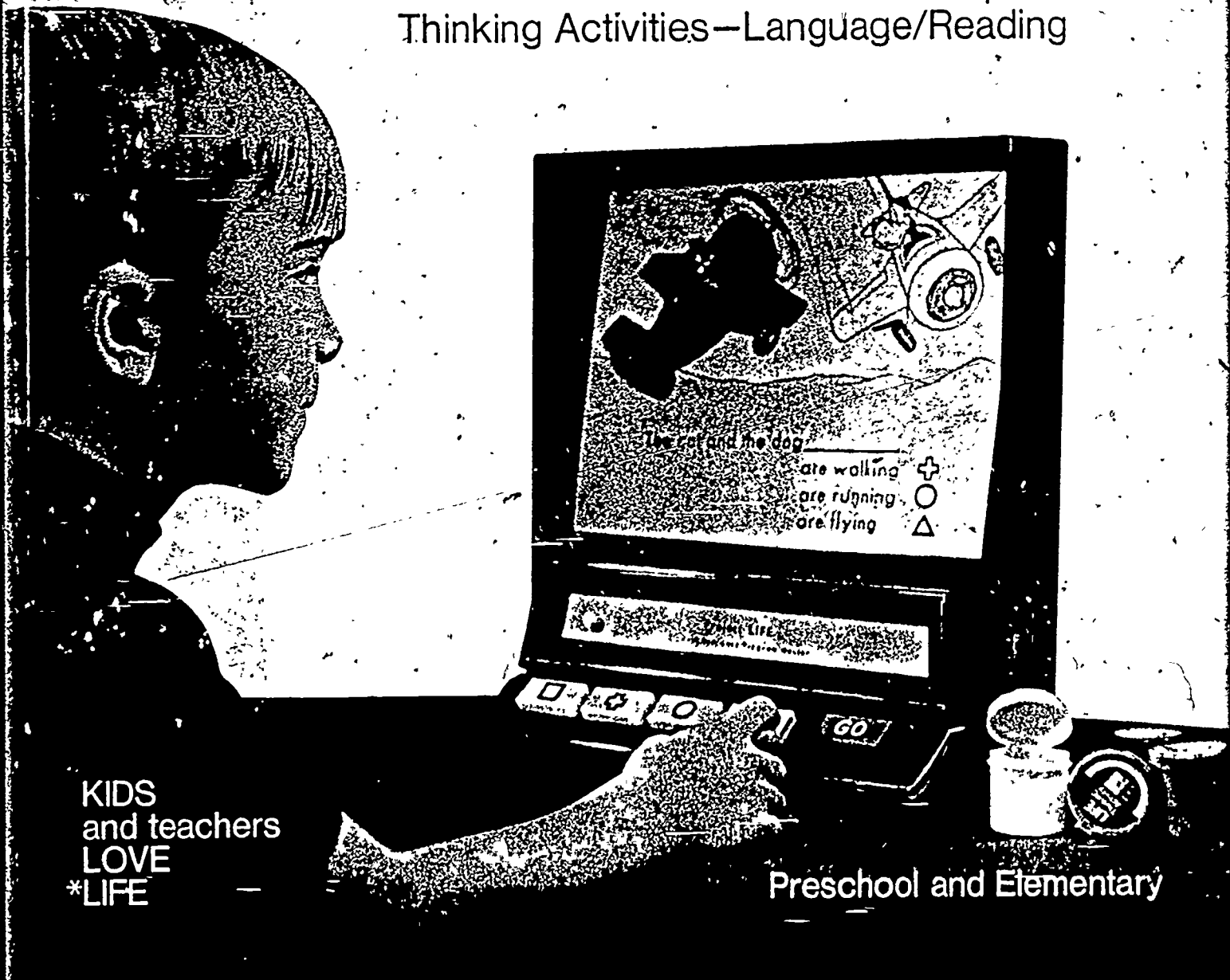
From Project LIFE

The General Electric/Project Life Program

PROJECT LIFE

Language improvement to facilitate education

Visual Perception
Thinking Activities—Language/Reading



KIDS and teachers LOVE *LIFE

Preschool and Elementary

- Provides for Individualized Instruction
- Specified-Behavioral Objectives
- Built-In Diagnostic Tests
- Student Self-Pacing
- Intrinsically Motivating
- Child Centered
- Visually Oriented
- Functional and Meaningful
- Immediate Feedback to Learner
- Error Accountability
- Carefully Tested
- Small, Sequential Learning Steps

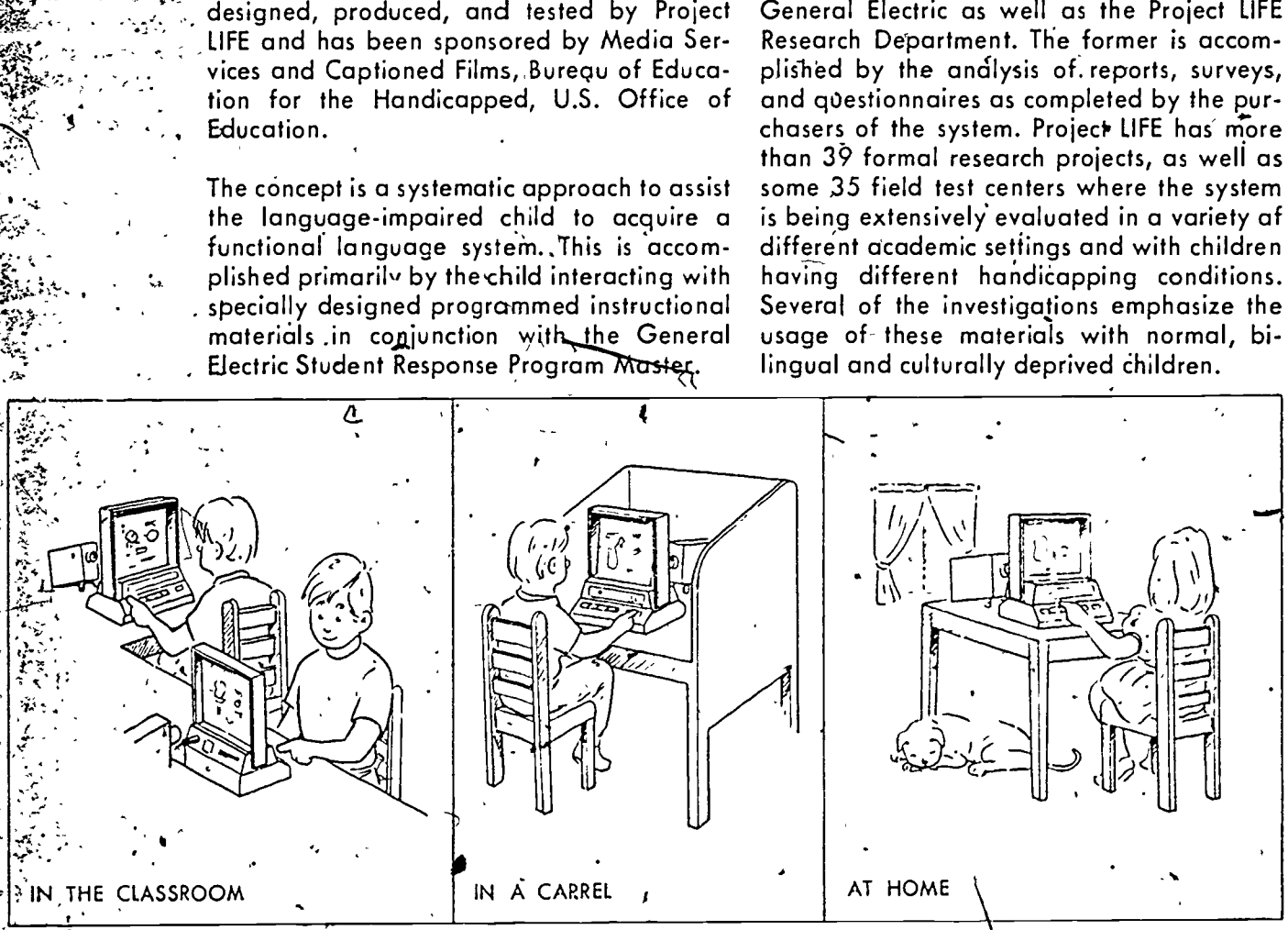
GENERAL ELECTRIC

The Instructional System

Project LIFE, the National Education Association, The U.S. Office of Education, and the General Electric Company have joined forces to provide a programmed instructional system for teaching handicapped and non-handicapped children. The systems concept was designed, produced, and tested by Project LIFE and has been sponsored by Media Services and Captioned Films, Bureau of Education for the Handicapped, U.S. Office of Education.

The concept is a systematic approach to assist the language-impaired child to acquire a functional language system. This is accomplished primarily by the child interacting with specially designed programmed instructional materials in conjunction with the General Electric Student Response Program Master.

Under the present program arrangement Project LIFE has created more than 300 filmstrips, storybooks, transparencies, workbooks, flash cards, etc., with an ever expanding system under development. The effectiveness of the system is being evaluated by General Electric as well as the Project LIFE Research Department. The former is accomplished by the analysis of reports, surveys, and questionnaires as completed by the purchasers of the system. Project LIFE has more than 39 formal research projects, as well as some 35 field test centers where the system is being extensively evaluated in a variety af different academic settings and with children having different handicapping conditions. Several of the investigations emphasize the usage of these materials with normal, bilingual and culturally deprived children.



IN THE CLASSROOM

IN A CARREL

AT HOME

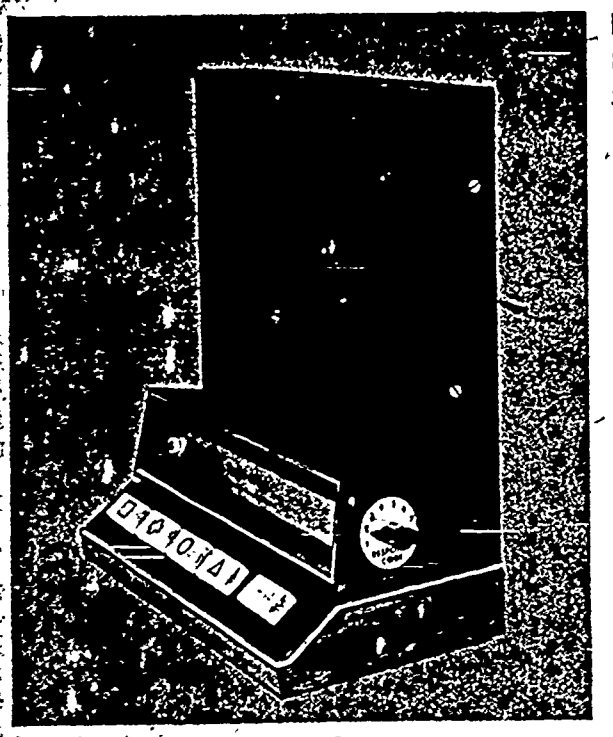
Student Response Program

The system consists of the programmed instruction filmstrips and a "response" device called a "Student Response Program Master" on which the student presses keys to select his choice of answers to the questions presented to him. If the student selects the correct key, the green key marked "GO" lights up, and he is able to advance to the next frame in the filmstrip. It will operate most remote controllable filmstrips or slide projectors.

Features of the Program Master

Features of the Student Response Program Master include:

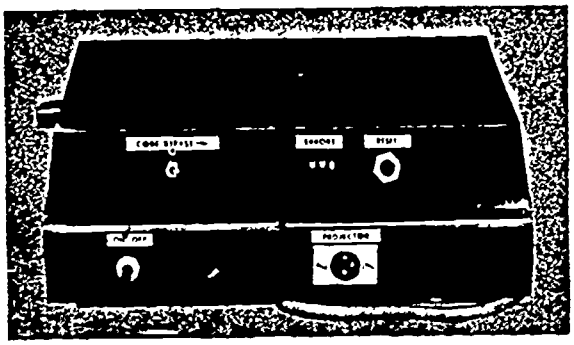
- Ability to provide a multiple-choice response available to the student.
- Confirmation of the correct answer selection.
- Student learning by the need to find the correct answer to advance.
- Ease of operation for the student.
- Versatility, with a wide variety of remote control projectors (slide, filmstrip, and movie).
- Variety of eight response patterns, eliminating the memorizing of answers.
- Record of the number of errors made by the student, to determine progress and areas needing attention.
- Low cost achieved by the ability to use existing projection equipment.



Easy to operate

Figure 1. Project LIFE Student Response Program Master MOD II
The Response Code Selector allows you to dial any one of 8 different codes used in the filmstrips.

Figure. 2. Project LIFE Student Response Program Master MOD II (Rear View)
Figure 2 shows connector cord, which plugs into the projector to carry the signal that advances the film. The RESET pushbutton sets up a new sequence for each filmstrip, the error counter records each button pushed incorrectly by the student in answer to multiple-choice questions, and the Bypass switch allows advance without the response code.



Your chance to join the program

Each purchaser of the Project LIFE material and Student Response Program Master will have the opportunity to join our Evaluation Team. By sharing the knowledge gained by one another we can improve our ability to help children with learning disabilities. Therefore, we will establish a communication network consisting of:

- Quarterly Newsletters
- Student Progress Records
- Program Evaluation Surveys
- A Forum for Discussion of Problems

FILMSTRIP LIBRARY

The Project LIFE Perceptual Training materials consist of 30 programmed filmstrips developed to assist in the child's development of specific visual perceptual skills. The filmstrips are designed for pre-language instruction; therefore, the primary population is the four-to-six-year-old child. The series can also be advantageously used for remediation of identified visual perceptual problems in older children.

The Project LIFE Thinking Activity materials provide a series of 102 teaching and testing filmstrips divided into six levels of difficulty. The lower levels, primarily visuals, concentrate on those specific thinking activity skills that should be acquired during the preschool years. The intermediate levels, a picture and language mixture, concentrate on those skills essential for success in the lower grades. The higher levels, primarily language, extend the earlier skills and introduce additional tasks that lead toward academic success.

The Project LIFE Language series consists of 178 filmstrip lessons which provide a visual input of receptive language wherein the child is progressively introduced to language principles, concepts, and basic sentence patterns. Each set has a theme or general topical area such as self, animals, food, clothing, and shelter.

A test section is provided for each language set. The test can be used for diagnostic purposes to determine the child's needs, for post test purposes to evaluate his level of mastery of the materials, or for periodic review of previously learned language concepts.

The Level I filmstrips (55) present singular and plural nouns, verbs in present progressive form and past tense, agreement of subject and verb, pronouns and their antecedents, prepositions, possessives, and simple sentence patterns in both statements and question forms.

The Level II filmstrips (59) present additional function words, possessive and object pronouns stressing antecedents, adjectives that describe feelings, imperative mood (request) and future tense of verbs, and additional question forms.

The Level III filmstrips (59) present the use of the infinitive, the past progressive form of verbs, "going" meaning intention and additional question forms, verbs, and adjectives.

Student Response Program Master Mod II

Characteristics	Specification
Power requirement	120 volts, 60 hertz, 200 watts maximum
Dimensions	
Height	4½ inches
Width	10⅞ inches
Depth	7 inches
Weight	5½ pounds
Color	Brown wood grain, with black and chrome trim
Programming	Dial having 8 positions is provided to set the eight correct answer patterns for 20 student responses. After 20 responses, the correct answer pattern repeats.
Projector control	Six-foot cords are provided to connect the Student Response Program Master to the projectors. The projector being used must be identified in ordering to receive customized connector cord. An adjusting device is provided to insure correct pulse width match with the projector.

Prices:				
Student Response Program Master	$224.00 each	Mounted SRPM Rear Projection Screen	$10.50 each

The pricing for Connector Cords are as follows for the various Remote Controllable Projectors:

Eastman Kodak-MFS 8, Standard Projector-750 Auto, Viewlex V85, V27R, V83R		$5.25
Bell and Howell	745C rd. plug/rect. plug, 960M	9.75
Dukane	All remote units	9.75
Eastman Kodak	All Ektagraphic & Carousel	9.75
Graflex	SM400 RC, SM1000RC, Schoolmaster, Compact, SM750 RC	9.75
Kalart Victor	All remote units	9.75
Standard Projector	333RC, 666RC, 1001 RP	9.75
Viewlex	All remote units not listed above	9.75

(when ordering underline specific projector if it is listed)
All prices F.O.B. Shipping Point.

The Student Response Program Master provided by General Electric will be warranted against factory defects in material and workmanship for a period of 180 days from date of purchase. General Electric will either repair the unit or replace it with a new or factory-serviced unit at no cost to the customer for labor, materials, or return transportation, if it is delivered prepaid to Instructional Industries, Inc., Executive Park, Ballston Lake, New York 12019. In addition, a one-year guarantee from the date of purchase on all parts will prevail, with the purchaser paying for labor.

For further information, contact:

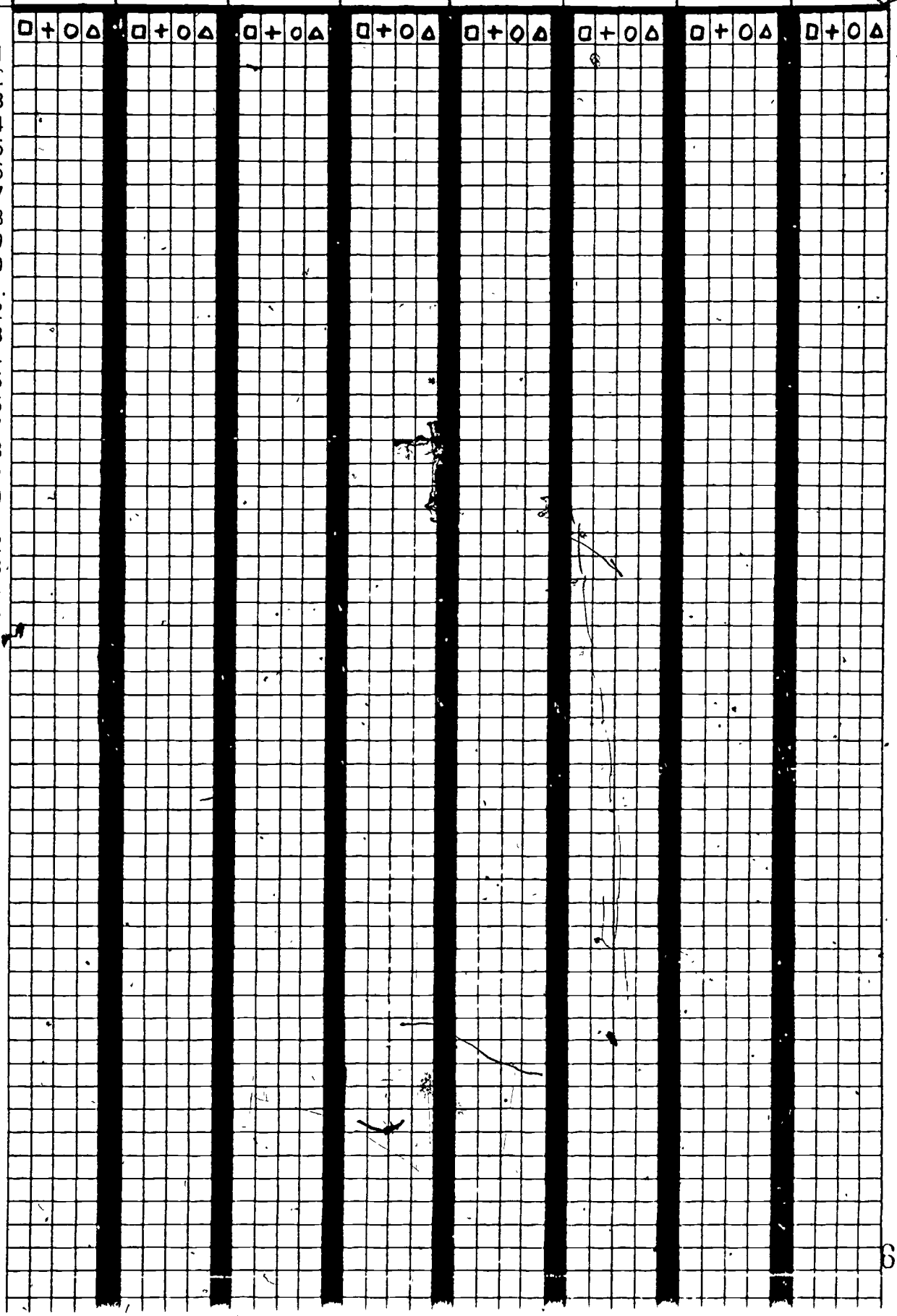
Mr. H. E. Tately, Manager
General Electric/Project LIFE Program
Instructional Industries, Inc.
Executive Park
Ballston Lake, New York 12019
(518) 877-7466

GENERAL ELECTRIC

Instructional Industries Inc., is an independent affiliate of the General Electric Co.
GP-72-0101

UNIT _____ SECTION _____ SCHOOL XXXXXXX _____

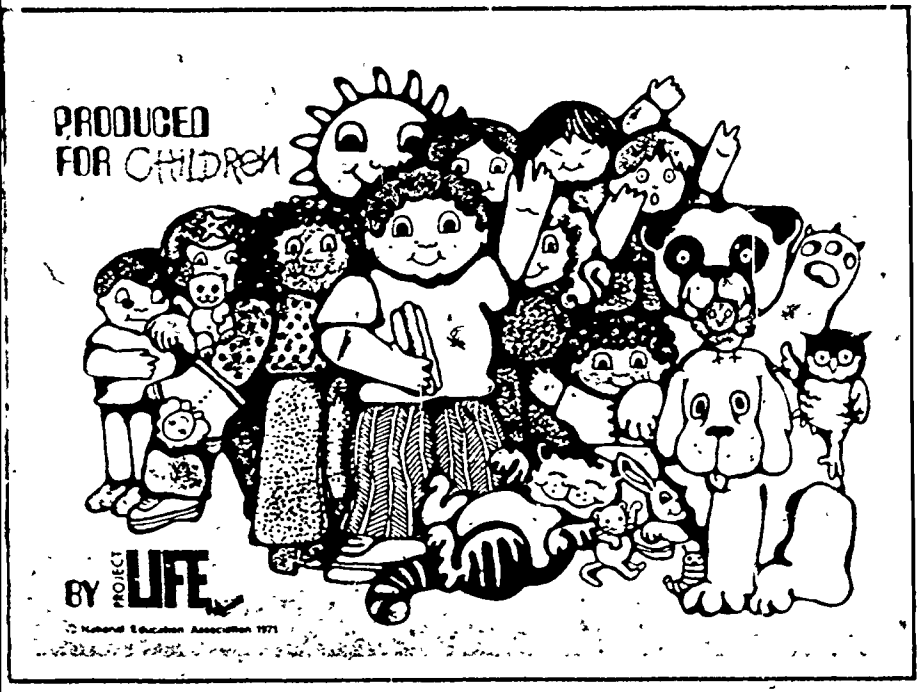
TIME							
NAME							
DATE TESTED							



Handbook for Teachers

LIFE

Language Improvement to Facilitate Education



GENERAL ELECTRIC

The Project LIFE / General Electric Program

Project Life, of the National Education Association, the U.S. Office of Education, and the General Electric Company have joined in this program, which is intended to provide a programmed language system to teach handicapped and non-handicapped children. Under this program arrangement, more than 300 filmstrips are being created by Project LIFE; and General Electric is providing the filmstrips as well as manufacturing the Student Response Program Master. The effectiveness of the system will be evaluated and developped by obtaining and analyzing reports from the users of the filmstrips and the Student Response Program Master.

All Project LIFE materials are tested prior to distribution, and an evaluation of the materials is continually in progress. The results of all evaluations are sent to all recipients of the material in reports prepared and published by Project LIFE. These reports include technical data, teacher evaluations, and teacher and student utilization information and recommendations for presenting, supplementing, and reinforcing of the material content.

These reports will also allow teachers and administrators to share their ideas with other teachers and administrators to enhance the language achievement of the child.

The Project LIFE Program is a new programmed-language system designed to teach handicapped and non-handicapped children.

The concept designed and produced by the NEA's Project LIFE is a systematic approach to assist the language-impaired child to acquire a functional language system. This is accomplished primarily by the child interacting with specially designed programmed instructional materials in conjunction with the Student Response Program Master.

The programmed materials deal with the areas of perception-cognition, thinking skills, and basic vocabulary and language skills. The majority of materials are produced in a filmstrip format to be used in a remote-control filmstrip projector. The programs in each area are carefully sequenced so that the child can make satisfactory progress through the individual subsystems in each area, working in an independent manner but in close conjunction with the teacher and classroom curriculum.

In language, the child is provided with thousands of meaningful language contacts that will increase his vocabulary level as well as his language structure competency. Thus, by successfully interacting with each frame in a program geared to his specific language needs, the child gradually and sequentially increases his ability to comprehend printed language and later to express his feelings, thoughts, and emotions.

Suggested Use

To the extent possible, the Project LIFE materials should be an *intrinsic part of the regular curriculum* (rather than periodic assignments that are given to children when they have nothing else to do). The concepts and principles presented in the materials should be reinforced in classroom activities.

A regular schedule should be followed for each child. The children who can move ahead rapidly should be allowed to do so. The slower children might require some periodic supplemental materials and assistance in order to experience continued success with the LIFE system.

Keep records of each child's progress, including an error count on each filmstrip for the teacher's record, and a graph of progress and errors for visual display to the children.

If a child makes more than two errors on the pretest (the pretests are 10 frames or less within the test filmstrip), the teacher may wish to give the teaching section. Omit the pretest and begin with the teaching section for children who have a low probability of success on the pretest.

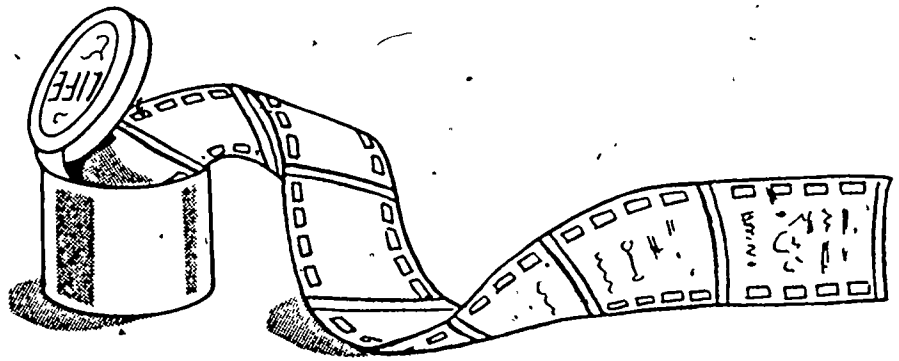
A general guideline is: *if a child makes more than 10 errors on the teaching* section he should repeat the filmstrip under the teacher's supervision (at his next scheduled period). It is recommended that the teacher carefully analyze the child's errors and the probable reasons for them, and subsequently provide additional work on the principles and concepts as needed.

The school or institution may wish to consider strategies for extending the number of hours of formal learning in the child's day. This may include *additional time with the LIFE system during the "after school" hours*, evenings, weekends, holiday periods, and summers. The setting might vary from the classroom to the dormitory or home.

The teacher might designate on a rotational basis *different children to keep all progress and error records*. She might also wish to designate different pupils to set up the filmstrip projectors and Student Response Program Masters, and later return the materials to their designated areas.

What:

Programmed Filmstrips:



- Individualized
- Child Oriented
- Purposeful
- Sequential
- Measurable

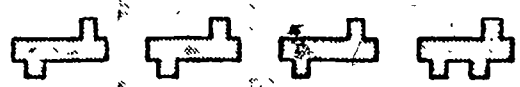
The Child:

- Interprets
- Reasons
- Discriminates
- Builds self-confidence
- Develops perceptual, thinking, and language skills

Perceptual Training

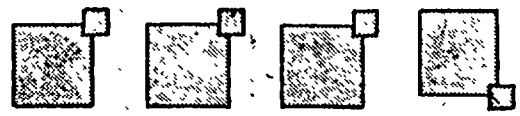
using discrimination and matching of

Visual Properties

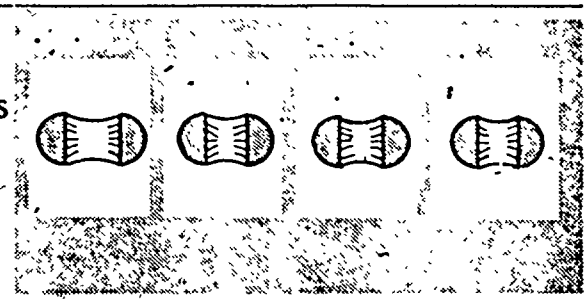


Additions-Omissions

Position in Space



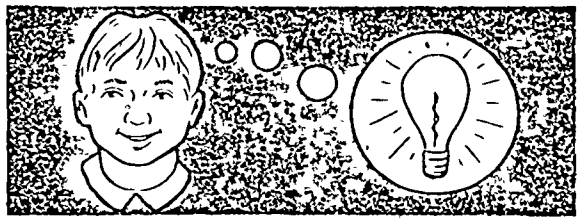
Spatial Relationships



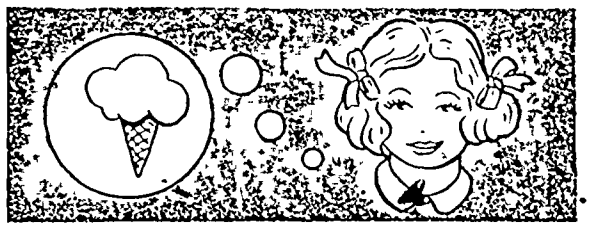
...inking Activities

to develop

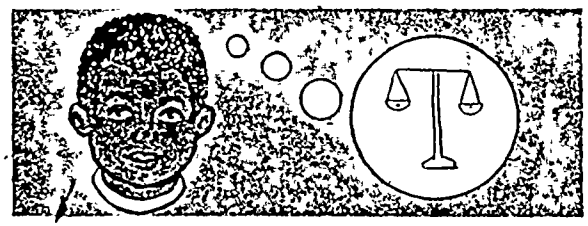
Cognition



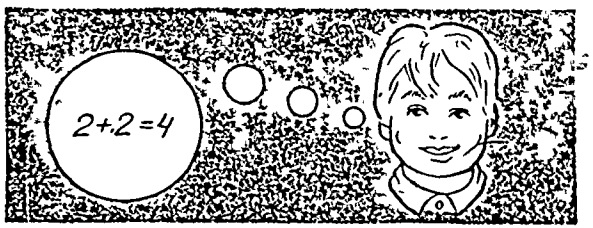
Memory



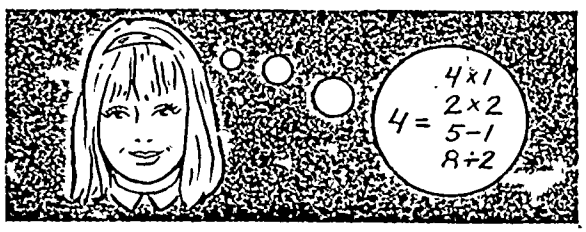
Evaluation



Convergent Thinking



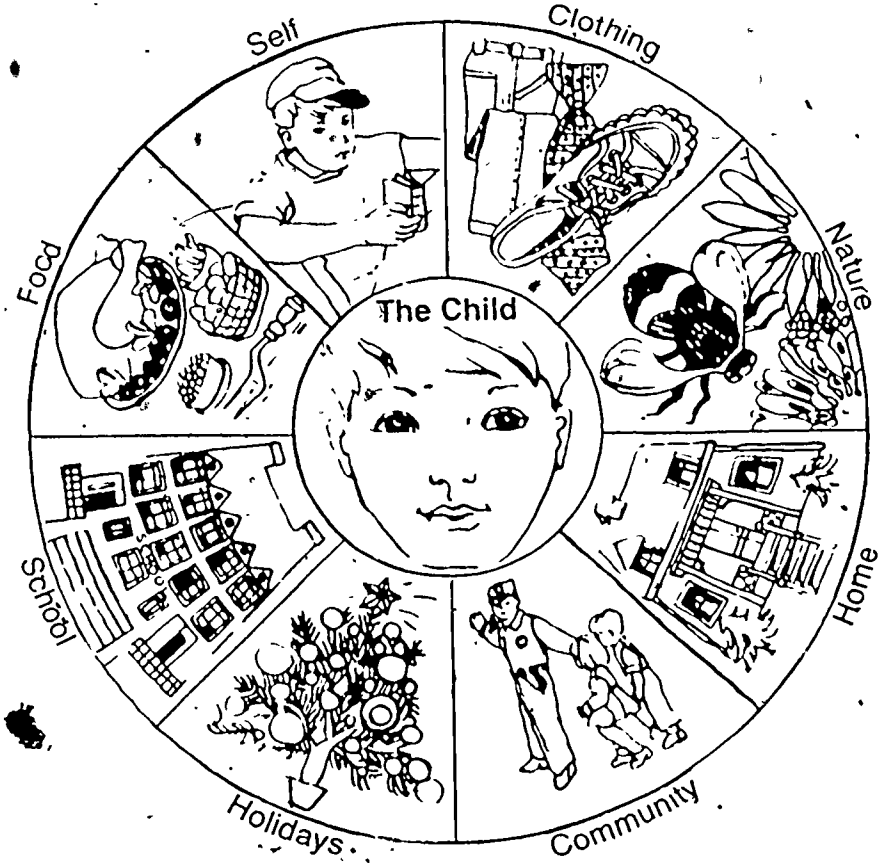
Divergent Thinking



Language

Teaching Sections

focusing on eight areas



Arranged in numbered sets

Subdivided in lettered sections

First year level

Second year level

Test Sections

serving these purposes

Diagnosis: To discover needs of child

Evaluation: To measure child's accomplishment

Review: To review previously taught units

Fun Sections

used

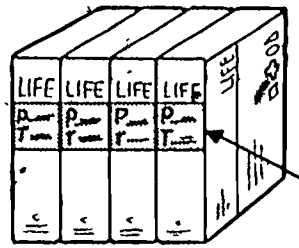
to entertain

to extend concepts

to reinforce language

Your Filmstrip Library

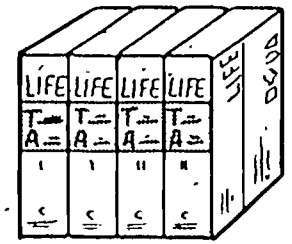
Easily Kept in Order



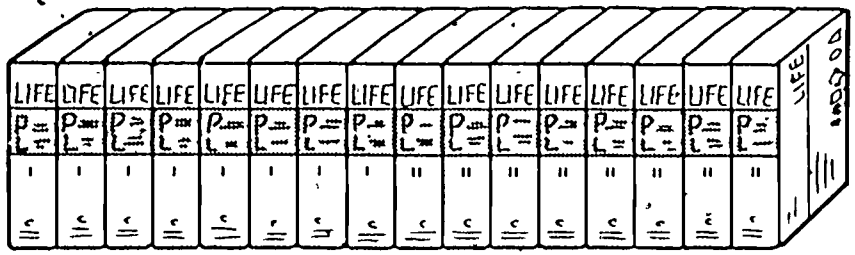
Perceptual Training
(Yellow label)

Label color matches filmstrip can label

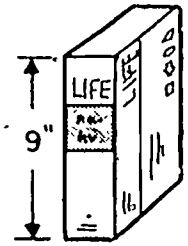
Thinking Activities
(Green label)



Programmed Language (Red label)

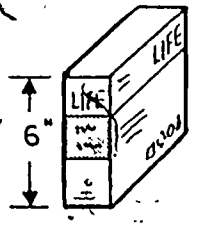


Put on shelf

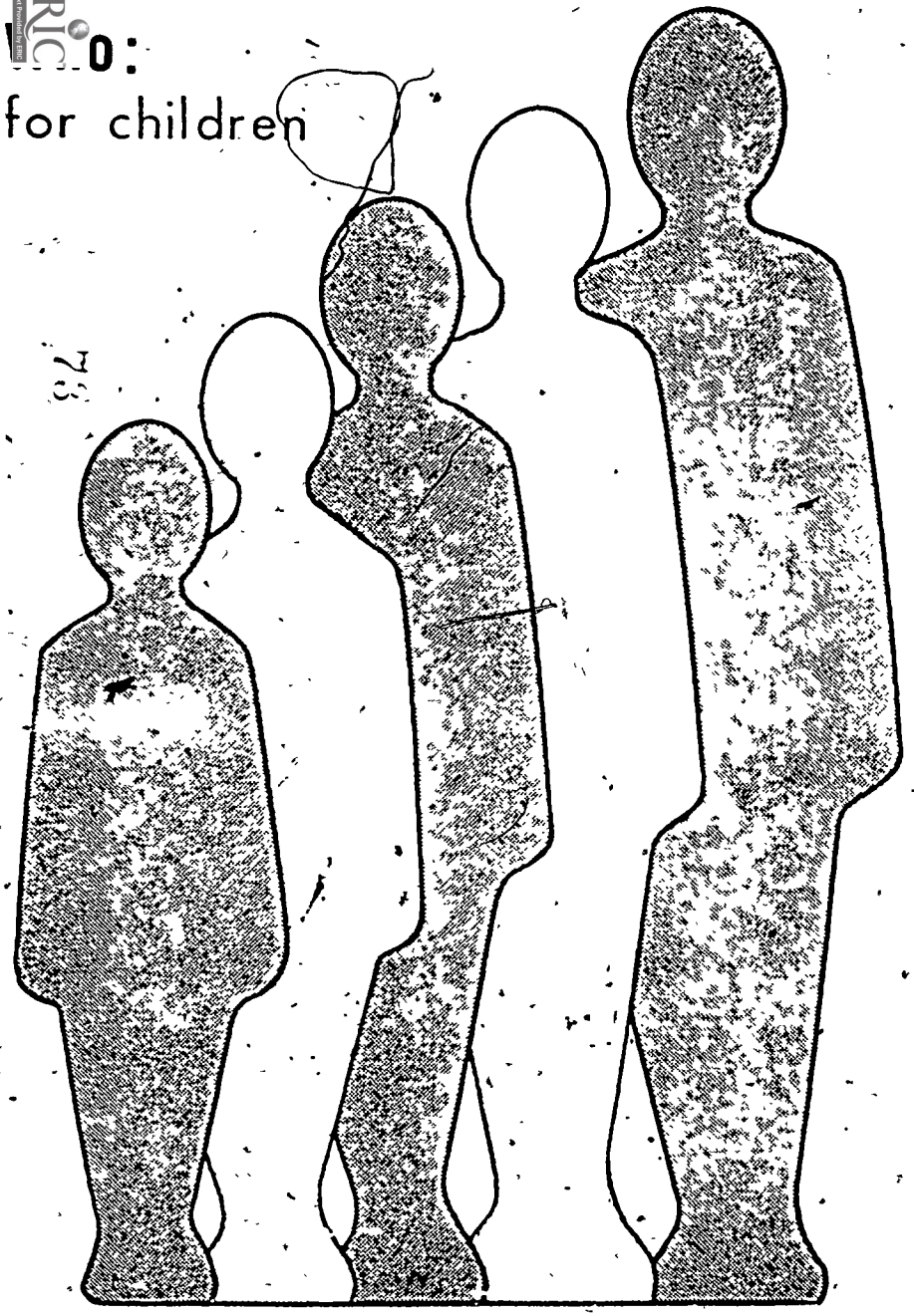


this way

or this way

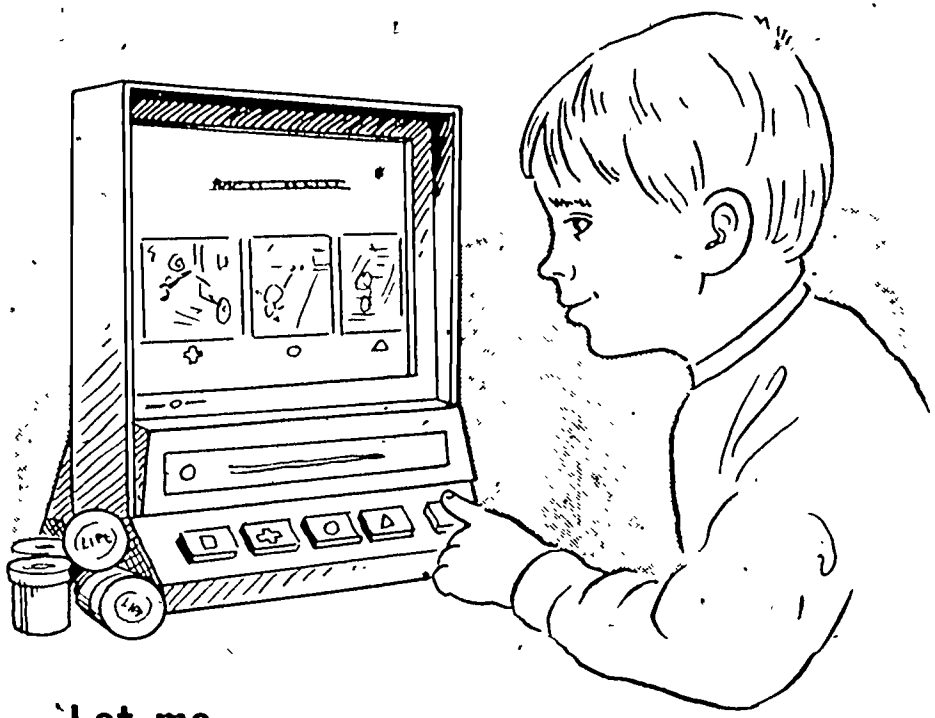


...o:
for children



4 5 6 7 8 or older

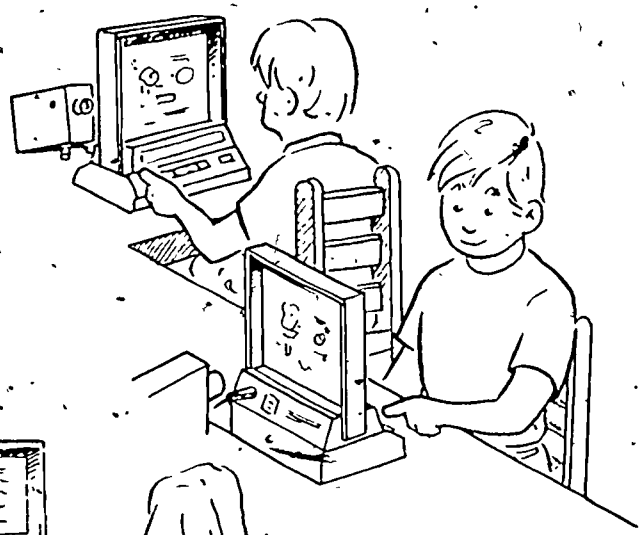
Let me do it myself !



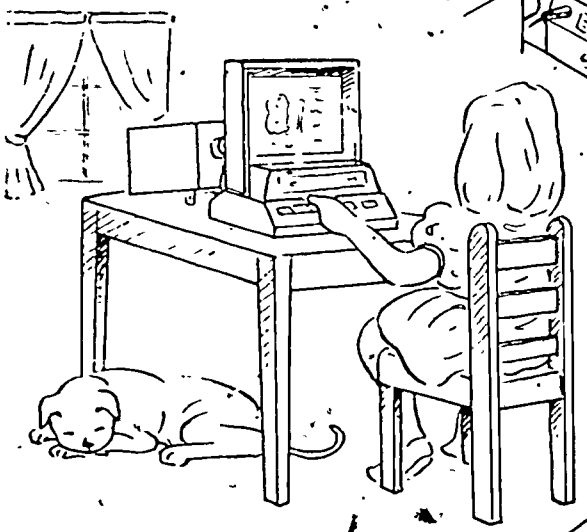
Let me

- Read (Interpret)
- Think (Build concepts)
- Take my time (Self-pace)
- Choose (Discriminate)
- Answer (Respond)

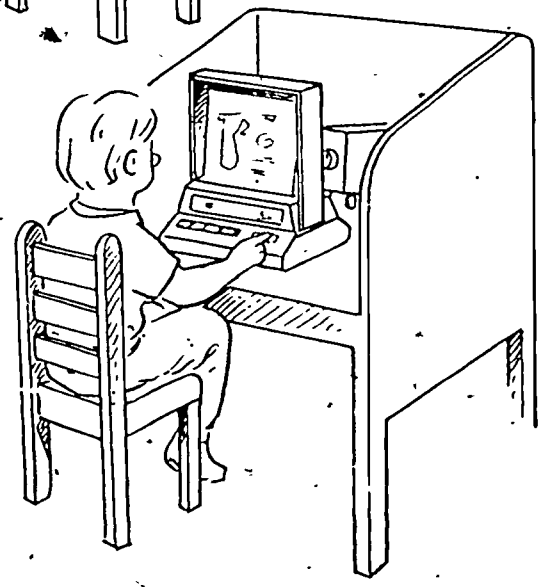
Where:



In the classroom



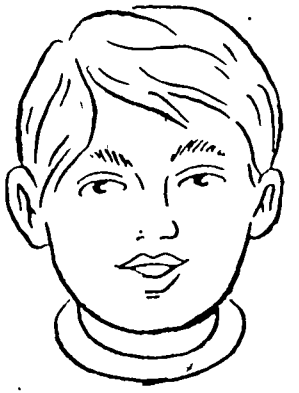
In the home



In a carrel

When:

Two or more times a week
Only one filmstrip at a sitting
Allow 20-25 minutes for each filmstrip
Don't repeat a filmstrip over and over

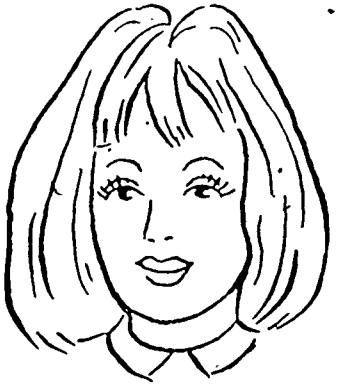


It's fun but,
three times is a lot.

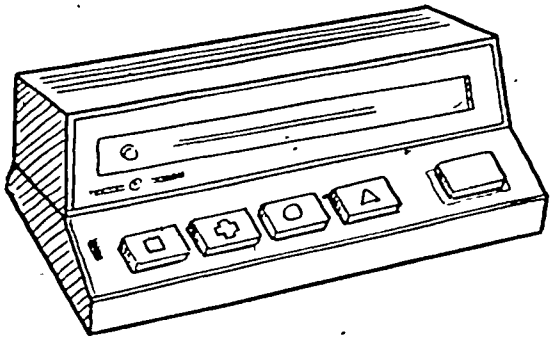
Give the child a chance

I'm tired and
get mixed up.

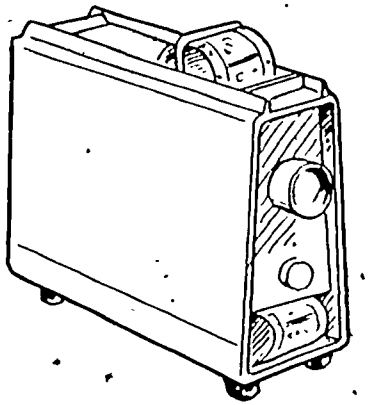
Let me do a
different one.



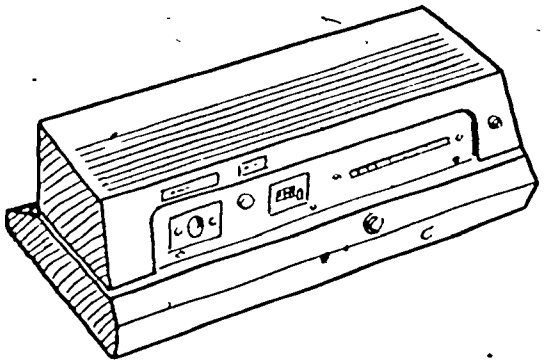
How:



I'm the
Student Response
Program Master



Plug adapter cord
in my remote control
outlet and put a
filmstrip in me.



Connect me
to your
filmstrip
projector
with an
adapter cord.

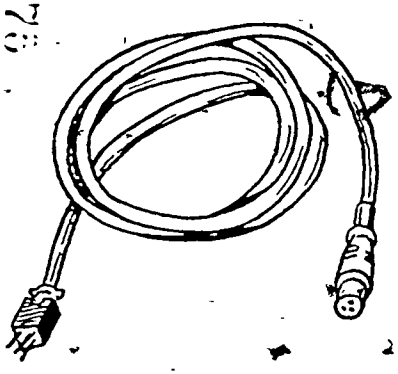
I am the
title page.
Advance the
filmstrip
to me.
I am just
for the
teacher.

PROJECT LIFE PROGRAMMED LANGUAGE

UNIT 12 SECTION C

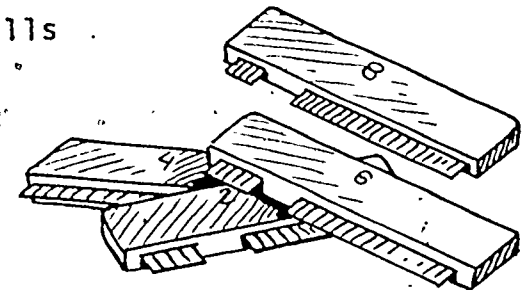
54 FRAMES RESPONSE PATTERN 6

Advance Manually
to next frame.

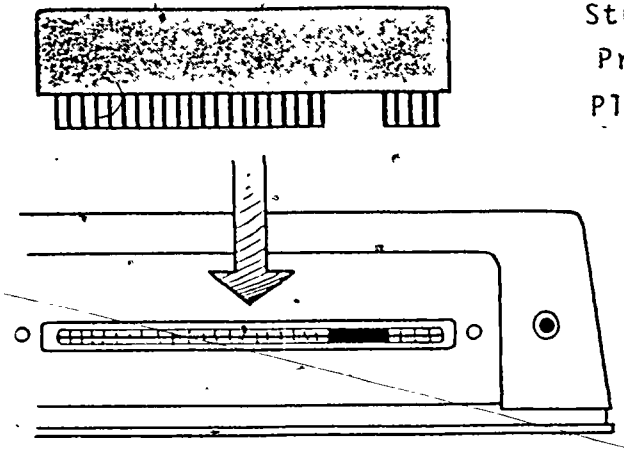


I'm the adapter cord.
Put this end in
the Student Response
Program Master.
I can only go
one way!

We are the
response patterns.
The title page tells
which one of
us to use.



I'm the response plug. I go in the back of the Student Response Program Master. Plug me in here.



I am also just for the teacher.

PURPOSE: To introduce words relating to traffic and to develop the concept of traffic safety

PROGRAMMED WORDS: stop street stopped go light policeman wait

BEHAVIORAL OBJECTIVES: The student

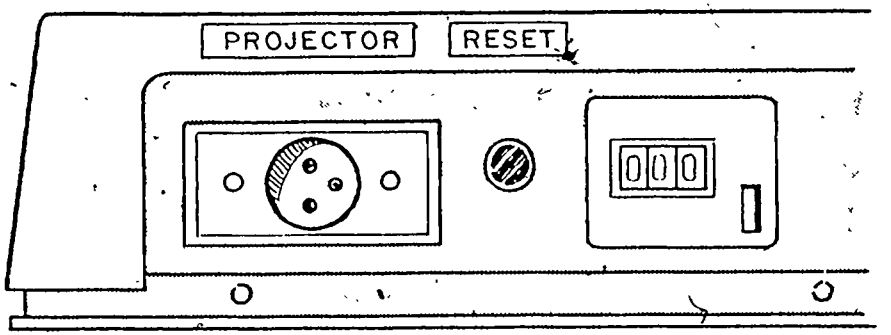
a Associates the colors of traffic lights or the policeman's signals with the words go, wait, or stop with or without visual clues

b Selects the verbal options to complete sentences describing the pictured traffic situations

(Clear the error counter. Synchronize the machine by depressing the reset button and manually advance to frame 1.)

I'm the reset button. Synchronize by pressing me.

I'm the error counter. Clear me.



Turn me to frame 1.

You are ready to go!