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ABSTRACT

The study tested the effectiveness of Project LIFE, a programed language system, on a population of mentally retarded and/or learning disabled deaf children at Indiana State School for the Deaf. The perceptual training sequences and the thinking activities sequences of Project LIFE were implemented and evaluated. Pretest and posttest comparisons of two groups (five Ss each) of 6 to 10 year old students on the perceptual training sequence indicated significant gains in the program objectives. Pretest and posttest comparisons of a group of 9 to 11 year old students on the thinking activities sequence also showed high levels of improvement. (Author)

Language for Multiply Handicapped Deaf Children: Project LIFE

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(Abstract)

This study was undertaken to determine the effectiveness of Project LIFE, a programmed language system, on a population of mentally retarded and/or learning disabled deaf children at Indiana State School for the Deaf. The Perceptual Training and Thinking Activities sequences of Project LIFE were implemented and evaluated. Pretest and Posttest comparisons of the two groups of 6-10 year old students on the Perceptual Training sequence indicated significant gains in the stated objectives of the program. Pretest and posttest comparisons of a group of 9-11 year old students on the Thinking Activities sequence also showed high levels of improvement.

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Congenital or early adventitious deafness imposes upon the deaf child a severe language deficit. His auditory means of acquiring language is cut off, and so he must acquire language principally through visual and tactual-kinesthetic methods. If a deaf child also has a learning problem along with deafness, language acquisition becomes even more difficult for him.

Analyses of written language of the deaf child have indicated that it differs significantly from the written language of hearing children (Thompson, 1936; Templin, 1957; Walter, 1959). In comparing the writings of deaf and hearing children. Heider and Heider (1940) have reported that deaf students employ a simpler writing style, as evidenced by a less frequent use of compound and complex sentences. Fusfeld (1955) has found that deaf students fall considerably below the norm on achievement test sections involving the understanding of language; i.e. reading of text, vocabulary meaning, etc. He suggests that this basic lack of understanding of language and poverty of vocabulary manifests itself in the typical confused writings of deaf children. Simmons (1962) cites teachers' concern for syntactical correctness as a reason for this lack of diversity of vocabulary among deaf students.

In an extensive comparison of written language of deaf and hearing students, Myklebust (1964) has found that the deaf produced significantly fewer total words as well as words per sentence than their hearing counterparts. Analysis of their written work also disclosed characteristic errors. In order of frequency of occurrences these were: (1) omissions; (2) substitutions; (3) additions; (4) word order, (5) undue use of nouns and articles; (6) deficiency in the use of adjectives, conjunctions, adverbs, and interjections.

Taylor (1969) has reported that simple subject-verb, subject-verb-noun, subject-verb-adjective sentences were acquired first by deaf children. Auxiliary verbs and determiners were found to develop somewhat later in the language learning process. Deaf children could combine sentences only after they had mastered the use of phrases. Gerunds, participles, infinitives, and adverbial and relative clauses all proved to be extremely difficult for the deaf child to master.

Such evidence indicates that the process of learning language for the deaf child is far different from that for the hearing child. Streng (1964) has pointed out that the same learning principles operating in the hearing child are also operating in the deaf child. However she indicates that the process is quite different. The deaf child uses vision, not audition, for reception of language signals; and kinesthesia, not audition, serves as the feedback system for self-correction. The hearing child overlearns the spoken form of language before he is exposed to the written form.

The deaf child is expected to make almost simultaneous multiple association with the oral and written forms from the very beginning of his education.

Mendel and Vernon (1971) state that sign language itself serves as a syntactical system, and that if sign language is presented in forms paralleling the English syntactical system, it may serve to facilitate the language learning of the deaf.

Fitzgerald (1957) has suggested that "straight thinking" in the deaf child must precede "straight language," and she has put forth a hierarchy of skills to be taught in order to produce this "straight thinking." As children learn to use various classes of words, they are then taught to put these words into sentences correctly and thus are able to express thoughts grammatically.

Buckler's (1968) method differs from Fitzgerald's in that she uses linguistic principles as a basis for her system.

Krug (undated) has suggested that children should begin to learn sentence patterns as early as age three because the knowledge of syntax should produce a greater efficiency in speech-reading and generally enhance communication among deaf preschoolers. He has shown that some children are able to read at three years of age and that the written word provides these children with a stable language form. Patterned Language Incorporated (1970) presents another preschool language program; however this program is especially designed for use in the home. These programs are similar in that they both view language of the deaf as a process

totally involved with life experiences and thus a possible producer of reinforcements.

Programmed learning has been described as a theoretically effective method of teaching language to the deaf (Jackson, 1965; Streng, 1964). Programming characteristics which are appropriate for teaching the deaf have been enumerated by Pfau (1968): behavioral objectives, overt responses, immediate feedback, hierarchical presentation, evaluation, reinforcement, and transfer. Extensive studies of the effectiveness of programmed learning amon g deaf children and adolescents were undertaken by Birch and Stuckless (1962, 1963). Their findings indicates that while programmed material and classroom instruction were equally successful, programmed learning was found to be the more efficient mode of presentation. Falconer (1961), Fehr (1962), Beckmeyer (1963), Brehman (1965), Karlson (1965), and Rush (1966) have reported successful use of programming in teaching various aspects of language to the deaf.

Language Programs for Deaf Children with Additional Learning Handicaps

The difficulties encountered by the deaf child with a degree of retardation or a learning disability become very complex when he attempts to acquire language. A review by Power and Quigley (1970) indicates that as many as 11% of all deaf children may be classified as educable mentally retarded.

Costello (1966) states that, when considering the deaf child with some retardation, the deafness itself should be considered the more serious problem. Thus, teaching methods ordinarily used with deaf children should be considered as the primary teaching method. These methods should then be adapted to meet the specific needs precipitated by the learning disability or the degree of retardation. The adaptation of existing materials used with deaf children becomes especially necessary, since very few specific programs for deaf retardates have been devised (Anderson & Stevens, 1969; Glovsky, 1963). Power and Quigley (1970) have recommended that special materials be prepared for these exceptional children, but until such programs are produced, it is the role of special educators to adapt existing programs and evaluate their usefulness on multiply handicapped deaf populations.

Project LIFE (Language Improvement to Facilitate Education) has as its expressed purpose the development of materials that will assist the severely hearing impaired child in acquiring a functional language system. Project LIFE is administered by the National Education Association under contract with Media Services and Captioned Films, U. S. Office of Education, Department of Health, Education, and Welfare. Materials are being produced for children at the preschool and primary grade levels. The materials are hierarchical in nature, and are especially appropriate for children with varying learning disorders, since each child can be placed at his current functional level and can then proceed at his own rate.

The materials are presented by filmstrip. The child responds to the filmstrip by pressing one of four buttons on the teaching machine marked △, ○, □, and ✚. If the child presses the correct button, the green light on the face of the program Master will light. Another button moves the filmstrip on to the next frame, but only after the child has pressed the proper response button. The machine also has a device which records the number of errors which the child has made on each unit. This serves as a reliability check for record keeping and research purposes. The machine has been extensively tested. Teachers report very few problems with the present machine. It has been observed that even very young children are able to load the filmstrips and begin the frames independently.

A Perceptual Training Program forms the first major unit in the hierarchy of the Project LIFE program. It is postulated that perceptual efficiency is a prerequisite for dealing with words. The Perceptual Training Program is divided into six sections. The first section deals with color, shape, and size discrimination. Following this is a unit dealing with additions and omissions in groups of figures. The third part of the Perceptual Training program presents inversions and reversals of figures in space. Unit four involves the spatial relationships of distance and placement. Figure ground relationships are considered in Unit five, and Unit six presents letter and word discrimination. This Perceptual Training Program is especially useful for children with learning disabilities, since it can provide both diagnosis of specific perceptual problems and expercises to remediate such problems.

The Thinking Activities Program provides the first area of specific thinking activity skills which seem necessary for entrance into formal schooling. At the present time, a large part of this program is concerned with exercises in visual memory and sequencing. The program also deals with visual closure (exercises connecting dots to form figures), object representations (matching objects to silhouettes), transformations of figures in space, and personal relationships. Exercises in classification have been created and are currently being disseminated to schools using the programs.

The present study has been undertaken to evaluate Project LIFE on a group of multiply handicapped deaf students. Pretest and posttest data will be considered both on individual children and on the groups under consideration. It is hypothesized that these children will show a significant improvement in the attainment of the program objectives when the posttest is compared to the pretest. These improvements should be reflected in both group and individual scores.

METHOD

The school chosen for the study was Indiana School for the Deaf, a residential school. The school sponsored summer programs for multiply handicapped deaf children in 1970 and 1971 with approximately twenty-five children in each group. Each child admitted to a summer program was either severely hard of hearing or deaf, and his measured intelligence quotient was between 60 and 79. The students could possess other handicaps in addition to hearing loss and mental retardation, but these handicaps were of secondary nature and did not impose great limitations on classroom procedures.

The children were between the ages of 8 and 12. An approximately equal number of boys and girls were included in the summer programs. The population included a racial and socioeconomic cross section.

Of the twenty-five children chosen for the first six-week summer enrichment program during 1970, a group of five was selected to be given Phase I (the Perceptual Training sequence) of the Project LIFE program during the school year 1970-1971 at the Indiana School for the Deaf. They were chosen on the basis of a staff prediction of their success in the program. The children chosen for this first school year program will be identified as Group A. The more severely impaired children in the six-week summer session were referred to other institutions. The higher functioning children from this group of twenty-five students were placed in the regular classes at the Indiana School for the Deaf. Those children remaining were placed in the Project LIFE program. They received special placement but were not excluded from the school. Three boys and two girls comprised Group A. All had profound hearing losses. The ages, sex, and measured intelligence of these children are presented in Table 1.

Insert Table 1 about here

A criterion test was administered by the teachers as a pretest to children in Group A before they began the actual program, and the number of errors was recorded. This pretest was prepared by Project LIFE as part of the program.

Another group of twenty-five children was chosen for a summer program in 1971. The Perceptual Training Program of Project LIFE was initiated into this six-week summer program. Five of these children were chosen to participate in Phase I of the Project LIFE program for the school year 1971-1972 on the basis of a staff prediction of their success in the program. The children chosen for this second Perceptual Training Program will be indicated as Group B. Group B was selected in the same manner as Group A. Three boys and two girls comprised Group B. Four of these children had profound hearing losses. One boy had only a severe hearing loss, measuring 75 db. in the left ear and 65 db. in the right (ISO). The ages, sex, and measured intelligence of the children in this group are presented in Table 2.

Insert Table 2 about here

The children in Group B were also given the Project LIFE criterion test by the teachers before beginning the program.

Note that the children in Group B were generally younger when they began the program than were the children in Group A.

The children in Group A who had participated in the Perceptual Training Program of Project LIFE (Phase I) during the school year 1970-1971 were placed in the Thinking Activities Program of Project LIFE (Phase II) during the school year 1971-1972. A running account was kept of the errors made on the initial attempt of each child on each Thinking Activities Unit. These scores were used as a pretest in subsequent evaluations of progress.

Group A, having participated in the Perceptual Training Program (1970-1971) and the Thinking Activities Program (1971-1972), and Group B, having participated in the Perceptual Training Program (1971-1972), were measured according to the criterion of attainment or nonattainment of the stated objectives of the Project LIFE program. The testing was done in March, 1972, after the students had completed the program frames. The Perceptual Training Program has six discrete sections. Five items were randomly chosen from each of these sections, providing a total of thirty items for each child. These thirty items were used as the posttest for Phase I. The Thinking Activities section has no discrete sections, but an index is included in the program categorizing the sections according to types of thinking skills required. A stratified random sample of thirty items was drawn including a representative number of items involving each thinking skill, and the items were used as the posttest for Phase II.

Group A was tested on the Thinking Activities and on the Perceptual Training frames. This measure of perceptual training of Group A was administered a year after the students had completed that phase and can be considered a test of retention over time. Group B was measured on perceptual training only.

The results of these tests were submitted to a repeated measures analysis of variance, using the standard computer program ANOVAR. This program provides as output both F ratios and exact levels of probability (Veldman, 1967).

RESULTS

Pretest and posttest results were compared for both Group A and Group B on the Perceptual Training Unit and for Group B on the Thinking Activities Program.

Table 3 and Figure 1 present the results of the pretest and posttests for Group B on the Perceptual Training Unit (Phase I). These results are presented in terms of error scores on thirty item tests. (The 40 item pretest scores were multiplied by a factor of .75 to provide scores comparable to the 30 item posttest).

Insert Table 3 and Figure 1 about here.

Table 3 and Figure 2 present the results of the pretests and posttests for Group A on the Perceptual Training Unit (Phase I). These results are also in terms of error scores on thirty item tests.

Insert Figure 2 about here

Table 4 and Figure 3 present the results of the pretests and posttests for Group A on the Thinking Activities Unit (Phase II). These results are presented in terms of error rates per 100 items rather than error scores. (The pretest contained 450 frames, whereas the posttest contained only 30 frames. In addition, only incomplete data was available on one subject on the pretest. Thus a conversion to error rates was necessary to provide a basis for comparison).

Insert Table 4 and Figure 3 about here

Ta. ... and 6 present the pretest and posttest scores of each individual subject. It may be noted that every student improved his performance; no student failed to make progress or regressed. Note that pretest scores indicate that children in Group A were functioning at a generally higher level than children in Group B when they began the Perceptual Training Unit.

Insert Tables 5 and 6 about here

Results indicate that posttest scores were significantly higher than pretest scores in all cases. Posttest scores for Group B on the Perceptual Training Unit were significantly higher than the pretest scores at the .02 level. This posttest was administered about six months after the pretest. The posttest for Group A was administered approximately eighteen months after the pretest. The posttest for Group A was significantly higher than the pretest at the .008 level on this same Perceptual training Unit. Posttest scores for Group A on the Thinking Activities Unit were significantly higher than the pretest at the .0007 level.

DISCUSSION AND CONCLUSIONS

The results of this study indicate that two groups of multiply handicapped deaf students were highly successful in attaining the stated objectives concerned with perceptual and thinking efficiency in the Project LIFE Program. Success on these objectives was

evident both a few months and a full year after the completion of the Perceptual Training Program. All subjects showed progress between the pretest and the posttest; no one regressed.

Because of the absence of a control group and/or randomization, the generalizability of these findings is somewhat limited. When dealing with very exceptional children such as those in the study, it becomes very difficult to obtain a large enough population to obtain a proper control group. Thus, it was impossible to control such factors as maturation (as could well be operating in the highly significant results obtained with Group A on the Perceptual Training posttest after the eighteen month interval.). It also becomes impossible to control for teacher variables. Additional research on Project LIFE should be addressed to these issues.

However, despite these limitations, significant positive conclusions may be drawn from the present study. The handicaps of these children were diverse, extending from general retardation to specific learning disabilities. These various handicaps added to the heterogeneity within the groups as well as to unique differences between the two groups. The fact that all the children in both groups, even with such a diversity of handicaps, succeeded in achieving the objectives of the program adds to the generalizability of the findings.

Thus educational decision makers should use the success of these children as an indication that such a program would have a

high probability of success with deaf children who have varying degrees of retardation and learning disabilities.

Children who have deafness compounded with other learning disorders need language. Language is a uniquely human attribute which enables children to communicate, to understand their world, and to begin to understand the meaning of the spoken and written words of others. Without language there is profound isolation. Without language children cannot communicate their affective needs and their changes of emotional disturbance are increased. Project LIFE and other learning programs like it represent major attempts to break this isolation.

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TABLE 1

AGE, SEX, AND IQ OF Ss IN GROUP A

	Sex	Age in Sept. '70	IQ
S_1	M	9 yr. 3 mo.	70 (Leiter)
S_2	M	8 yr. 11 mo.	78 (Leiter)
S_3	F	8 yr. 6 mo.	68 (Leiter)
S_4	F	8 yr. 7 mo.	68 (Leiter)
S_5	F	10 yr. 3 mo.	61 (Wechsler Performance Scale)

TABLE 2

AGE, SEX, AND IQ OF Ss IN GROUP B

	Sex	Age in Sept. '71	IQ
S_6	F	8 yr. 7 mo.	70 (Wechsler Performance)
S_7	M	6 yr. 11 mo.	76 (Columbia Scale of Ment. Mat.)
S_8	F	6 yr. 8 mo.	80 (Wechsler Performance)
S_9	M	8 yr. 0 mo.	71 (Wechsler Performance)
S_{10}	M	6 yr. 9 mo.	72 (Wechsler Performance--pro-rated)

TABLE 3

MEAN ERROR SCORES ON 30 ITEM PERCEPTUAL

TRAINING PRETESTS AND POSTTESTS

	Pretest	Posttest	F	d.f.	Probability
Group A	13.2	1.4	25.134	1, 4	.008
Group B	24.0	1.6	13.992	1, 4	.02

TABLE 4

MEAN ERROR RATES PER 100 ITEMS ON THINKING

ACTIVITIES PRETESTS AND POSTTESTS

	Pretest	Posttest	F	d.f.	Probability
Group A	21.4	11.2	236.455	1, 4	.0007

TABLE 5

INDIVIDUAL RESULTS OF PRETESTS AND POSTTESTS

ON PERCEPTUAL TRAINING UNIT

S	Pretest Error Score on 30 Item Test	Posttest Error Score on 30 Item Test
	GROUP A	
1	11	3
2	19	1
3	9	0
4	8	1
5	19	2
	GROUP B	
6	9	0
7	33*	2
8	38*	0
9	27	1
10	13	5

*Subjects were asked to continue responding until they gave the correct answer for each frame. Thus it was possible for a student to make more than one error per frame.

TABLE 6

INDIVIDUAL RESULTS OF PRETESTS AND POSTTESTS

ON THINKING ACTIVITIES UNIT

GROUP A		
S	Pretest Error Rate per 100	Posttest Error Rate per 100
1	14	3
2	25	13
3	23	13
4	15	7
5	30	20

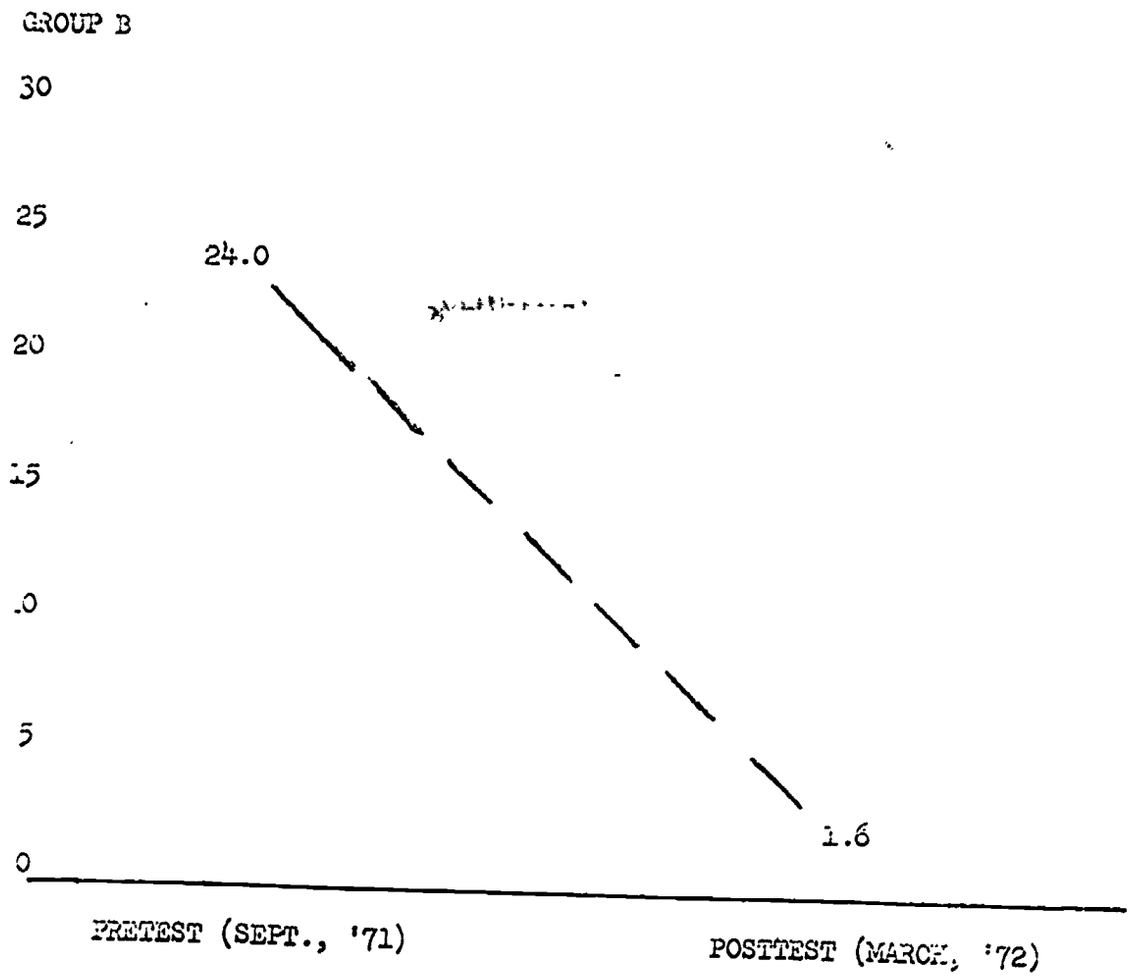

FIGURE 1

PROJECT LIFE PERCEPTUAL TRAINING UNIT

MEAN ERROR SCORES ON 30 ITEM TESTS - GROUP B

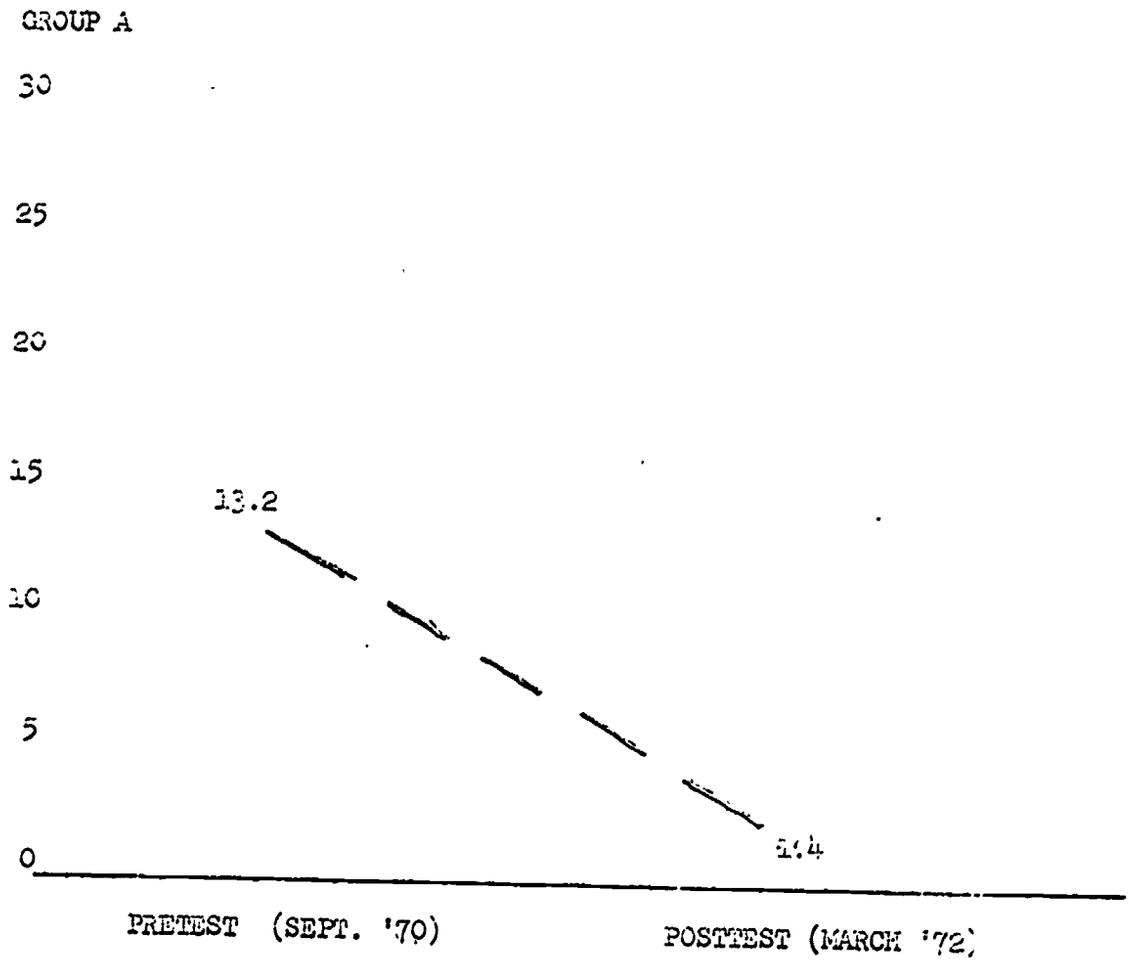

FIGURE 2

PROJECT LIFE PERCEPTUAL TRAINING UNIT

MEAN ERROR SCORES ON 30 ITEM TESTS - GROUP A

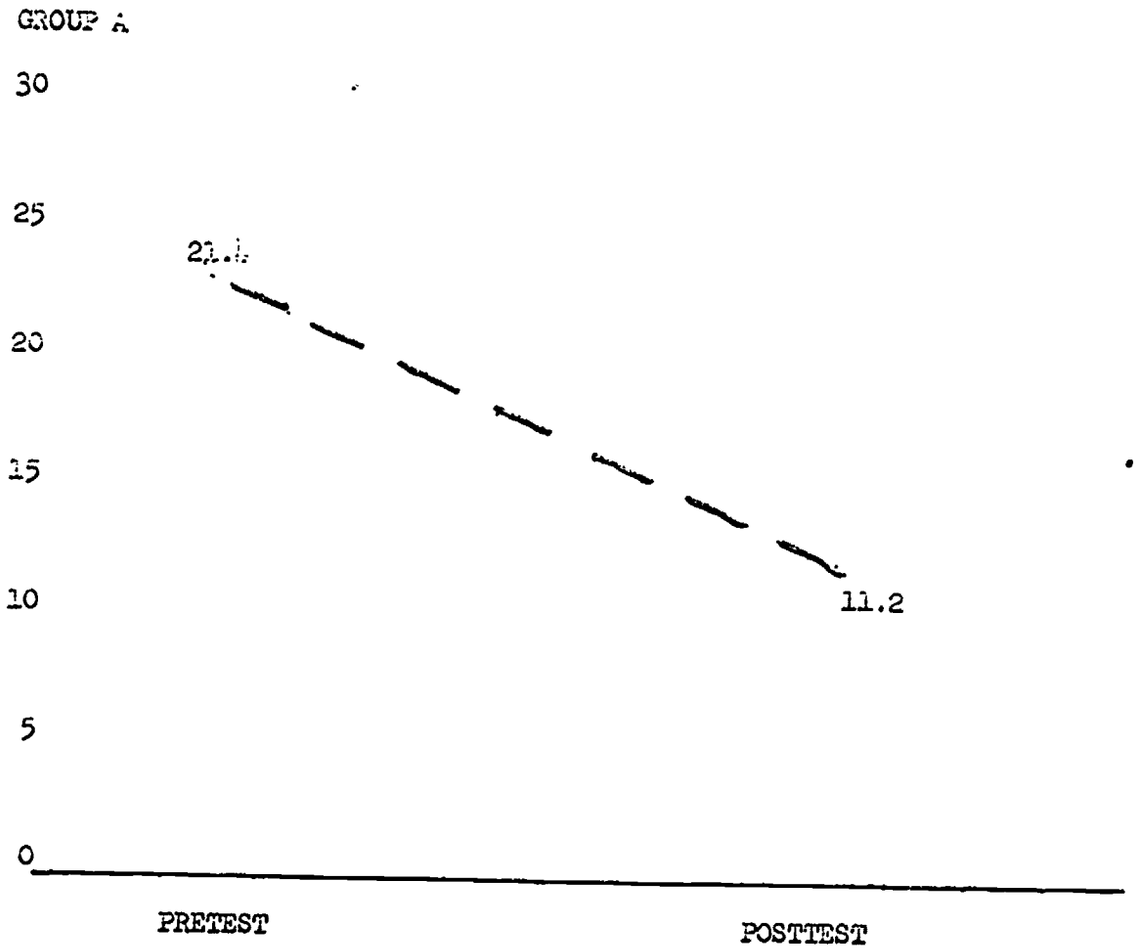

FIGURE 3

PROJECT LIFE THINKING ACTIVITIES UNIT

MEAN ERROR RATE PER 100 TRIALS

GROUP A

Footnote

[1]Appreciation is expressed to Alfred Hirshoren and Donald Felker for their helpful comments on an earlier version of this paper.