YOUNG CHILDREN'S LEARNING, UTILIZING SELF-INSTRUCTIONAL SINGLE-CONCEPT ENTOMOLOGY FILMS

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CHAPTER I

INTRODUCTION

Forsdale (1962) has written that audio-visual materials are useful in teaching and the motion picture serves a useful purpose in training and education. Educational technology holds great potential for improving learning and teaching. Audio-visual experiences are especially valuable for enhancing conceptual development in the environment of five-year-olds during the most formative years of their lives. Robison and Spodek (1965) and Frost (1968) contend that audio-visual materials can be easily adapted to each child's individualized rate of learning.

According to Hart (1969) one of the basic concepts in American public education is that each student is an individual and should be free to develop in his own pattern, and to realize his abilities to the fullest. Torkelson (1967) emphasizes that more students are crowding into the schools than ever before and each of these children grow and learn at different rates and in different ways. The average student according to Foltz (1961) is actively engaged or interested in the classroom activity only twenty per cent of the time. Therefore, a persistent problem in the classroom is that of meeting individual learner's needs in group situations.

In the United States today educators continue to re-evaluate curricula and attempt to develop programs and techniques which will provide environments for preschool children that stimulate, challenge,

and encourage cognitive development. Limited research has been conducted to determine the extent to which audio-visual materials are used for instructional purposes. There is even less research pointing to the specific reasons audio-visual materials are used, the nature of their use, or the factors contributing to non-use in the classroom. The investigator believes that knowing how the young child responds to audio-visual materials and how he learns from these is of importance in planning for optimum learning experiences from the use of audio-visual materials.

There has been interest in the use of super 8mm films for educational purposes, but research has not been done to gather empirical evidence as to the instructional value of this type of audio-visual material. To the researcher's knowledge there have not been research studies conducted using 8mm films on instructional materials in programs for children under six.

The number of film loops suitable for elementary-science instruction is increasing rapidly because of their low cost, convenient manipulation, and inherent worth. With the 8mm films increasing in popularity Forsdale (1962) emphasized a need to gather research evidence of how such audio-visual materials affect learning. These research findings provide educators with important guidelines for proper utilization of audio-visual materials which would contribute to the learning of the children under their supervision.

Purposes of Study

The over-all purpose of this research was to investigate the learning behavior of preschool children concerning the use of

individualized instruction in an environment which stimulated their curiosity and enhanced their understanding of their environment. Specifically this study was concerned with: (1) A selective program containing single-concept entomology films produced specifically by the researcher for children four and five years of age. This individual instruction program was viewed in a helicopter booth. (2) Demonstrating one means of providing a learning environment which may stimulate children's interest and offer an opportunity for individualized experiences.

Hypotheses

The following hypotheses related to the use of the learning materials were tested:

I. Four-year-olds will obtain significantly higher scores on the PSAG Test following a learning program than they obtained before the learning program.

II. Five-year-olds will obtain significantly higher scores on the PSAG Test following a learning program than they obtained before the learning program.

III. There will be no significant differences between the four-year-old males and the four-year-old females in the amount gained on the PSAG Test.

IV. There will be no significant differences between the five-year-old males and five-year-old females who experienced the program within the classroom in the amount gained on the PSAG Test.

V. There will be no significant differences in the amount gained on the PSAG Test between all pre-tested five-year-old males and all

pre-tested five-year-old females.

VI. There will be no significant differences between the four-year-old males and females and the five-year-old males and females who received the identical experimental program.

VII. There will be no significant difference in post-test scores on the PSAG Test between the five-year-olds experiencing the program within the classroom and the five-year-olds experiencing the program outside the classroom setting.

VIII. There will be no significant differences in scores on the post PSAG Test between the five-year-olds experiencing the program within the classroom who were exposed to the initial PSAG Test and the five-year-olds not exposed to the initial PSAG Test.

IX. There will be no significant difference in post-test scores on the PSAG Test between the five-year-olds experiencing the program outside the classroom who were exposed to the initial PSAG and the five-year-olds not exposed to the initial PSAG Test.

X. There will be no significant differences in post-test scores on the PSAG Test between males and females according to age or sex.

XI. There will be no significant correlation between the time the four-year-old child spends viewing the films and his score on the post PSAG Test.

CHAPTER II

RELATED LITERATURE

The review of literature will include (1) a brief history of the development of audio-visual materials, (2) findings related to research in audio-visual materials, and (3) a summary of research findings.

Definition of Audio-Visual Materials

In the review of literature for this study, the term "audio-visual material" will be rather narrowly defined to comprise that class of instructional materials which is either projected visually or presented auditorily: namely, motion picture films, filmstrips, and tapes.

History of the Development of Audio-Visual Materials

Thomas Edison is usually credited with the invention of the first workable motion picture (Rotha, 1930). He exhibited a strange machine to the New York public in 1894. This machine Edison called the Kinetoscope. It was in competition with another instrument, the magic lantern. The Kinetoscope actually gave motion to one image projected upon an internal screen but the image could be viewed only by one individual at a time; however, the magic lantern projected a fixed image upon a screen for all the group to see (Rotha, 1930).

Stokes (1956) wrote of the invention of the film strip projector in 1920. There has been a continued increase in use of the projector

and filmstrip over the years (Tauber and Stephens, 1968).

Wittich and Fowlkes (1946) wrote that educational motion pictures have been developed only since 1925 and it was not until around 1930 that producers of educational films were certain enough of their possibilities to adapt this technique to use in the classroom.

The invention of the Vitaphone in 1925 prompted Theodore Case and Dr. Lee De Forest to adapt the bewildering properties of the photoelectric eye. They were thereby able to synchronize sound and image on a single reel (Wittich and Fowlkes, 1946).

Rossi and Biddle (1966) pointed out that the first tape recorder was manufactured in Germany in 1935. It was quickly improved upon and miniaturized for use in the home and broadcasting industry. After World War II the tape recorder found its way into the classrooms.

The progress of audio-visual materials from the silent black and white to the colored sound was rapidly adapted. Yet an even newer development in the educational media that is making its mark in education is the 8mm film. The 8mm silent films have, of course, been known in the home and school since its introduction for amateur use in 1932 according to Forsdale (1962). The technique of recording sound on a narrow magnetic strip along one edge of the film was explained by Forsdale (1962). Although this technique has been known in the 8mm field since 1947, it became a commercial reality only in 1960.

Within recent years cartridge devices have become available so that 8mm silent films can be inserted on a continuous loop cartridge and placed into the projector as easily as a slice of bread is inserted into a toaster. Tauber and Stephens (1968) write that 2,000 8mm silent cartridge films are on the market and the number is rapidly growing.

Findings Related to Research in Audio-Visual Materials

Status of Audio-Visual Materials

In a continuing survey of non-theatrical film in the audio-visual field, Hope (1964) found that the money invested in the educational audio-visual field increased 3.6 per cent in 1963 over 1962, that the production of motion pictures increased 2.6 per cent, but that the 16mm motion picture projector sales increased 10.5 per cent. The number and sale of filmstrips has climbed steeply, as has the use of 8mm film for instructional purposes.

The sound motion picture projector is gaining very little in use according to Finn (1962) and Allen (1968). Research shows that the filmstrip projector and the record player are continuing a dramatically rapid increase in use which began over 15 years ago. Allen (1968) further contends that audio-visual materials are conceived as supplementary and are outside the main focus of instruction, except in rare instances where curriculum designers have started fresh and developed an entirely new approach.

King and Bryan (1970) in a recent study of the utilization of educational media in the Oklahoma public schools revealed the following results: (1) Oklahoma schools did not appear to produce a wide variety of instructional materials; (2) the physical facilities in many classrooms were not generally equipped to utilize a wide range of media; and (3) the use of audio-visual materials to aid learning in the 460 public school districts appeared generally weak in most schools.

Teachers' Attitudes Toward Audio-Visual Materials

There has been little substantive research conducted as to attitudes and perceptions of teachers toward audio-visual materials. These few substantiate that teachers' attitudes are important and do affect the way audio-visual materials are used.

In a survey by Williams (1963) teachers in the Los Angeles city elementary schools were asked to rate the instructional value of several types of audio-visual materials. Williams (1963) reported that films were given top listing, filmstrips and study prints vied for second place.

Knowlton (1963) studied patterns of influence in the high school situation as they affect the use of audio-visual materials and found that, although most high school science teachers did not hold strong attitudes toward the motion picture film medium, those who did hold negative attitudes rationalized this attitude by criticizing films and by stating they just did not have enough time to show films. Travers (1967) and Tabuer and Stephens (1968) also concluded that teachers' attitudes are an important factor in whether teachers use films.

Project Discovery is an experimental project whereby several schools over the United States have been saturated with audio-visual materials. This program provides for everyday use of audio-visual materials in the classroom. Teachers' attitudes were positive toward audio-visual materials in research evaluating Project Discovery. Burleson (1968) concluded that sixty-two per cent of the 220 teachers reported they were able to teach subject matter previously unteachable and ninety-two per cent reported films and filmstrips increased general

subject matter information of students.

Use of Audio-Visual Materials With Different Groups

One of the important emphases of audio-visual research in recent years has been that given to the study of audio-visual applications to the instruction of learners who have special characteristics: the culturally different, mentally retarded, gifted, and blind.

The study by Nimnicht (1967) dealt with preschool children who spent 20 minutes daily in a special environment booth with an electric typewriter, Language Master and tape recorder. The booths were modeled after the "Talking Typewriter" but at 1/20 the cost. The children in this experiment were from homes where a 6th grade education was average for parents. He found children emerged from the program with I. Q. ten points higher. Additional findings Nimnicht (1967) reported were a .76 correlation between the number of times a child used the typewriter and the level of skill reached. A similar study of second grade impoverished students using the "Talking Typewriter Center" was reported by Adams and Litwen (1970). They reported they were able to increase these educationally and economically impoverished children's attention span and ability so that they were better able to follow directions.

Bosco (1970) investigated the relationships between social class and visual information processing rates of advantaged and disadvantaged children. The results indicated that disadvantaged children do process visual information more slowly than advantaged children.

According to Wade (1969) in a summation of literature regarding media and the disadvantaged certain general conclusions can be indicated:

> (1) Media are useful in extending frames of reference and providing models and motivation for the disadvantaged; (2) media can emphasize each individual's approach to learning; (3) can teach basic skills, but seems to be inadequate to teach assimilation skills to the disadvantaged; (4) projects that focus on older disadvantaged children or adults will have greater difficulty in achieving noticeable success in a short period of time. (Wade, 1969, p. 11)

Cline (1962) asserted he was able to significantly improve the arts performance of bilingual Spanish-speaking children by the use of films, filmstrips, recordings, slides and pictures.

The findings by Gordon (n.d.) differed from Cline (1962) in that a remedial speech improvement course presented over television to third grade multiracial children in Hawaii had no significant effect on learning.

Wittich and Fowlkes (1946) studied fourth, fifth, and sixth graders' factual knowledge and social understanding using sound films. The children with a low I. Q. and those with a high I. Q. seemed to be equally motivated to learn and both groups learned a comparable amount from educational sound films.

Research done by Hovland (1949) pointed out that ninth graders with higher general ability or intelligence tended to learn more from films than those of lesser ability. McTavish (1949) asserted that for less intelligent students, the repetition of the film increases learning. Working with 100 seventh and 101 eighth grade English students Tabka (1963) agreed with Burleson (1968) that audio-visual materials offer a unique opportunity to reach students assumed to have low native intelligence. In a study conducted by Devitt (1961), using telephone televised instruction, he was able to successfully provide intellectual stimulation to gifted students attending rural secondary schools. Gordon, Engar, and Shupe (1963) have also been successful in challenging

superior elementary grade students in the process of teaching them the Russian language.

Research done by Hale, Miller, and Stevenson (1968) involved 444 children enrolled in grades three through seven and 167 college students who viewed an 8-minute dramatic skit, filmed in sound and color. They found girls had higher scores than boys at all grades, however, the sex difference disappeared by college years. The study conducted by Dwyer (1970) was made to determine (1) whether males and females in the same grade level learned equally well from the same types of illustrations, and (2) whether identical illustrations are equally effective for boys and girls in the same grade level. Boys and girls who were in the ninth through twelfth grades showed no significant differences on tests designed to measure student achievement of different educational objectives with regard to learning from visual illustrations.

The literature revealed few research studies concerned with young children's use of audio-visual materials, although they were often recommended as appropriate teaching aids by Robinson and Spodek (1965), Leeper et al. (1968), and Kuslan and Stone (1968). According to Schramm (1962), Marlin (1965), and Pines (1966) O. K. Moore used the electric typewriter in a carefully controlled responsive environment and was successful in teaching reading and writing to preschool children.

Forsdale (1962) reports that informal observational studies which have been made by members of the Project in Educational Communication at Teachers College, Columbia University, show that the cartridge projectors can be used and are being used, without difficulty by

children as young as four years of age, and by adult teachers who have professed fear, or distaste, for the complexities of standard projectors. Hymes (1968) avers that the best films for classes of young children usually are amateur films, parent-made or teacher-made.

Teaching the Higher Mental Processes

Hoban (1950), Kishler (1950), Meierhenry (1952), Allen (1960), and Eastman Kodak (1962) in recent research have indicated that learning from films is not confined to details, but may include concepts and attitudes. Allen (1960) also supported the same findings when he reported that films may be used effectively to teach factual information over a wide range of subject matter, content, ages, abilities, and conditions of use; and that they may be used to modify motivations, attitudes, interests, opinions; and that it is possible to teach concepts.

According to Liston (1965), with motion and vision teachers are able to teach more science and social studies in greater depth than ever before and to develop concepts more rapidly. He further contends that films help with vocabulary and spelling.

Wittich and Fowlkes (1946) and Liston (1965) asserted that children not only like to learn via motion pictures but that learning is more lasting. The self-produced single concept film is growing in importance as a supplementary teaching tool emphasizes Steen (1967). The results proved effective in Lansing's 50 elementary schools where numerous single concept films were used.

Torrance and Gupta (1964) worked with fourth grade pupils following a series of 12 planned learning experiences in creative thinking

presented by specially prepared audio tapes and teacher guides. The findings showed an increase in the students' creative thinking abilities.

A study was completed by Hicks (1968) and a similar study by Marsden (1968), reporting that a colored film influenced preschool children. They further demonstrated that a symbolic model who rejects and derrogates a particular toy influences subsequent play of children with the same toy.

Rowlett (n.d.) and Suchman (1962) cited that the "discovery" method of teaching, using audio-visual materials, was found to be effective in developing transfer of principles and skills that were learned. Students in the study also improved in their question-asking ability. In a more recent study Dietmeier, Sheehan, and Decker (1963) found no advantage for a problem-solving method over an information-giving method in teaching elementary science concepts when presented by television.

Experiences With Audio-Visual Materials Increases Learning

The study conducted by VanderMeer (1950) pointed out that students learn how to learn from films. He found students with previous experience with instructional films learn more than those without previous experience. Working with students in the Brigham Young University Laboratory School, Edling (1964) reached a similar conclusion. He found students accomplished a great deal more the second year in a program using audio-visual aids.

Characteristics of Audio-Visual Materials

Northrop (1952) reported that outline materials, such as titles and commentary, increase learning if a film is not well organized. Studying aspects of directed attention to parts of a film Lumsdaine (1958) found that learning of these parts could be increased by oral or written instructions, by giving a pre-film test, or by pointing out the hardest questions before a second showing.

In a study of 244 ninth graders viewing algebra instruction Westley and Severin (1965) found there was a positive relationship between increased distance from the screen and better scores. The Tolliver (1970) study examined the extent to which college students were affected by and remembered color information from two 16mm motion picture films. Results indicated that higher scores were achieved with high codable colored stimuli than with low. One of the most recent studies by Bretz (1970) involved the comparison of color television instruction to black-and-white television instruction. His research did not support that students learned more from the colored instruction but that elementary and high school children do prefer color films. Bretz (1970) suggested that it is well to remember that the motivation of the learner and the proper sequencing of learning objectives is more important than any aspect of the instructional media used.

Audio-Video

Nelson (1950), Kopstein (1954), May and Lumsdaine (1958), Foltz (1961), Galfo (1967), and Maccoby (1969) investigated audio and video elements of instructional films.

Nelson (1950) cited the following results using a sample of 430 R.O.T.C. trainees: (1) Significant learning accrues from the presentation of the film as a whole, and from the presentation of either the audio or video channel alone. (2) Neither channel is consistently better than the other. (3) Both channels together are consistently better than either one alone. (4) In general, hearing the sound track in the dark appears to be slightly superior to hearing it in the light.

Kopstein (1954) and May and Lumsdaine (1958) found that presenting pictures is more effective than presenting words as stimuli in rote association tasks such as learning a foreign language. May and Lumsdaine (1958) also reported that the parts of the "Seasons" film that were best learned by fifth and sixth graders were both verbalized and acted out.

Stevenson and Siegel (1969) in an extensive study using 472 elementary and junior high boys and girls attempted to evaluate the audio and visual learning from an 8-minute skit presentation. The results indicated children in the primary grades, at least in formal learning situations, are more responsive to materials presented auditorily than to materials presented visually.

Zuckerman (1949) described an experiment of 1,787 naval trainees who viewed several different motion pictures each teaching basic information about knot tying. The experiment showed that a moderate amount of verbal description of the task aided learning while too much talk hindered it. This conclusion was also supported by Lumsdaine and Gladstone (1958). An additional finding Zuckerman (1949) reported was that a "leading" commentary helped trainees more than a lagging commentary.

Student Participation

The technique of student participation during audio-visual presentation has received considerable attention in investigations by Howland, Lumsdaine, Sheffield (1949) and Michael and Maccoby (1953). Their conclusions supported the almost universal confirmation that student participation during audio-visual presentations is a means of facilitating learning.

Ash and Carlton (1951) reported that for 216 freshman college students note taking during a film was not effective when a test was administered immediately after the film. They suggested that active participation needs to be planned in the production of a film, rather than being interjected as an additional task for the student. The final conclusion of the study stated that notetaking actually may have interferred with learning from films.

The research done by Michael and Maccoby (1953), Kanner and Sulzer (1961), and DeCecco (1964) indicated no significant differences between overt and covert responding. Lumsdaine and Gladstone (1958) replicated one of their earlier studies and their findings indicated superiority for active response procedure over passive review.

Studying the "feedback" of knowledge of results during the presentation of a filmstrip, Smith (n.d.) found that the groups receiving immediate knowledge of test results made significant post-test gains over those receiving knowledge of results at the end of the filmstrip. In addition he found those who received the knowledge of results at the end of each logical sequence retained the information best when tested three weeks later.

Class Follow-Up

Research done by the Australian Office of Education Study (1950) indicated that the most effective learning may be gained from a film by introducing it to the class, projecting the film, discussing it immediately, and viewing the film again the next day.

Intensive Use of Audio-Visual Materials

Popham (1961, 1962) reported that the tape recorder was effective in providing the major part of classroom instruction. The study dealt with students who were presented with all tape recorded lecture material in a semester-long college teacher education course and in a summer session educational research course.

Wendt and Butts (1962) reviewed the research on the saturated use of motion pictures. They concluded that motion pictures, at least under certain circumstances, could assume the total teaching load.

Purdue University (1965) described a unique program of providing students with audio-materials for their individual use, or for group use. In 1964, 65,000 audio-visual materials were borrowed by the students: 80 per cent tapes, 14 per cent motion picture films, and 6 per cent other. The number of loans is significant indicating students do choose to use audio-visual materials.

Van Deusen (1968) in a discussion of Project Discovery wrote that higher and better utilization of motion pictures is possible. She also wrote that a class involved in the project uses approximately 60 films and 29 filmstrips in a year. Another striking example of the impact which Project Discovery has had is in evidence at Scott Montgomery, one of the 29 model schools of the inner-city in Washington, D. C., where a

research study including all 29 schools is being conducted. At the beginning of the study two years earlier, Scott Montgomery ranked 29th in achievement scoring. All 29 schools used the same instructional materials with the exception of Scott Montgomery. It was provided with Project Discovery's film materials. Van Deusen (1968) cited that in two years Scott Montgomery's achievement ranking rose from 29th to 7th.

Leeper et al. (1968) and Kuslan and Stone (1968) contend that motion pictures in elementary science are not entertainment; they are tools for learning, to be used to accomplish a specific purpose. One of the most recent studies involving intensive use of films in the classroom was conducted by Thoren (1970). She found a kindergarten class very successful in producing a 50-foot, 8mm cartridge movie of Apollo 8 Moon Flight.

Miscellaneous Types of Use

Schramm, Coombs, Kahmert, and Lyle (1967) described audio-visual media as being helpful when working with people of all ages in developing foreign countries and in areas with scattered populations that are difficult to reach. Within the Appalachian Mountain area in the United States and in northern Alabama Wade (1969) discussed a project known as Operation-Gap-Stop. In Alabama during 1960, 600 adults all over forty years of age, who had a reading level at the 2nd grade, were exposed to audio-visual materials. Results showed they benefited from the experience.

Recent interest has been shown in the use of speeded speech, up to two and three times normal speech, for the more rapid presentation of recorded material. According to Orr and Friedman (1964) media

presentation can be speeded up to twice normal speeds without comprehension loss. Bixler and others (1961) and Foulke (1964) were successful in applying the above technique to teaching of the blind.

Burkhart (1960) was able to successfully enrich college courses by telephone interviews of significant national figures or authorities amplified into the classroom. In another study working with college students, Smith and Clifton (1961) studied perceptions of students toward their performance of several athletic motor skills before and after viewing repetitive loop films of themselves and others performing the skills, resulted in a significantly more positive self-concept about their performance.

Cook (1964) described the effectiveness of equipping college students with small transistor radios through which they received broadcasts of Spanish drill exercises in out-of-classroom time as a supplement to their regular Spanish language instruction. The results of research done by Schueler, Gold, and Mitzel (1962) and Johnson and others (1960) failed to find measurable gains in improvement of teaching training skills when teachers in training viewed sound motion pictures of their own classroom performance.

In another study that dealt with pre-service training of elementary teachers Kersh (1963) simulated 20 sixth grade classroom problems by means of films, slides, and sound. He concluded that the less realistic simulation modes produced the superior performances by the subjects. The opposite conclusion was reached by Hayes and others (n.d.) as they pointed out that a driver training simulator using coordinated motion pictures improved the driving skills of high school students and could substitute for actual behind-the-wheel instruction.

A more recent study by Pensinger (1967) investigated a technique known as "micro teaching" that has been developed by Stanford University's School of Education. This technique employs video tape as an evaluation aid in a teach-critique-immediately-reteach procedure employing five- to ten-minute lessons with small groups of pupils. They found that the technique has produced statistically significant improvement in the student teachers' teaching performance.

A review of the research studies seems to indicate that the greatest amount of research in classroom utilization of audio-visual materials has been conducted with the motion picture. Many of the studies have been conducted on a civilian level; however, the United States Navy is responsible for financing a large proportion of research reports on the utilization of motion pictures for instructional purposes. In addition the Education Resources Information Centers have contributed significantly to this area of research.

Summary From Review of Literature

Findings of research reviewed in this study seem to indicate that:

1. Audio-visual materials have improved over the past 60 years.

2. Considerable diversification of audio-visual equipment is taking place, as might be expected, the newer devices are the ones receiving the most attention.

3. The attitude of teachers toward the use of audio-visual materials and the perceptions teachers hold about these materials is an important factor whether teachers use films or not.

4. Audio-visual instruction is helpful in instructing learners with special characteristics: the disadvantaged, the mentally

retarded, and gifted.

5. Recent research has indicated that the practice of such high mental processes as concept development, creative thinking, and problem solving may be encouraged through the use of audio-visual materials.

6. Preparing the class in advance for audio-visual material that will follow, and establishing an active set to learn, results in significant learning gains.

7. Student participation during audio-visual presentation has received almost universal confirmation as a means of facilitating learning.

8. Follow-up class discussion of audio-visual material will add significantly to the learning of the factual content of the material.

9. A second showing of educational films results in increased learning. It may make the same contribution to learning as student participation.

10. Audio-visual materials, at least under certain circumstances, could assume the total teaching load.

From these statements it is apparent that audio-visual materials are widely employed in teaching and are a vicarious means of instruction. No single audio-visual aid is appropriate for all conditions or for all purposes. At the present, most audio-visual materials seem to be used as an adjunct to supplement instruction. With continuous advances in technological improvements, the growth and development of classroom uses of these media seems assured.

CHAPTER III

PROCEDURE

Subjects

The subjects who participated in this study were 13 preschool children, 6 girls and 7 boys, ranging in age from three years eleven months to four years seven months, and 52 children from the public kindergarten from two elementary schools in Stillwater, Oklahoma. The preschool children were in attendance at one of Oklahoma State University's Child Development Laboratories. In Table I, the description of the subjects by age and sex is presented. PSAG Test scores of individual children are presented in Appendix F.

TABLE I

DESCRIPTION OF SUBJECTS BY AGE AND SEX
(N=65)

Age Group	Boys	Girls	Total
Four-year-olds (3:11 - 4:7)	7	6	13
Five-year-olds (5:2 - 5:11)	26	26	52
Total	33	32	65

Selection of Sample

The subjects used in this investigation were selected from one Child Development Laboratory school at Oklahoma State University during the spring semester 1971. These children attended the school five half-days a week. The subjects from the Child Development Laboratory will be referred to as four-year-olds.

The 52 kindergarten subjects were selected from two different public elementary kindergarten classes in Stillwater, Oklahoma. They will hereafter be referred to as five-year-olds within the classroom and five-year-olds outside the classroom. Of these 52 children, 26 were boys and 26 were girls. Twelve children of the total 64 kindergarten enrollment were eliminated prior to the study due to various reasons. Five children were eliminated on the recommendation of the teachers as children who would not profit from the study due to learning or emotional difficulties. Another child was eliminated due to illness, and one child exceeded the age criteria for this thesis study of five years two months to five years eleven months. Five girls were randomly omitted from this study to obtain an equal number of kindergarten girls and boys.

Collection of Data by Administering the PSAG Test

The investigator was introduced to each subject by the nursery school or kindergarten teacher in charge. The investigator then asked the child if he would like to come with her to play some special games. If any child had not wished to play the games, he would not have been required to do so; however, none of the subjects refused. Each child

was then taken individually by the investigator to a room near or a part of the nursery school or kindergarten. The investigator talked to each child a few minutes to establish rapport before beginning the test.

The physical setting included an appropriate size desk or table and two small chairs, one for the subject and the other for the investigator. The child was asked by the investigator to sit to the diagonal left of the investigator. In addition hid from view of the child was a Wollensak 3M Cassette portable tape recorder which was turned on as the child entered the test area and off at the end of the test session. The tapes containing the children's responses were later played and analyzed for preselected vocabulary words. Preselected vocabulary words are in Appendix C. Various items used as test materials were placed within reach of the investigator, but out of sight to the child.

The PSAG Test questions were than administered in numerical sequence. The entire test procedure was practiced on fourteen children prior to the investigation reported so the same procedure and verbal dialogue were followed for each subject. The initial PSAG Test was administered to half the five-year-old subjects and to all the four-year-olds one week prior to the program and the identical PSAG Test again was administered by the researcher to all subjects within one week after the program. The names of the five-year-old children were drawn randomly to determine the subjects who were given the initial test. The names remaining in the hat did not receive the initial test; however, they did take the post-test. Tables II and III list the subjects by age for the initial and post-test.

TABLE II

DESCRIPTION OF SUBJECTS RANDOMLY SELECTED FOR INITIAL TESTING (N=39)

Four-Year-Olds (Classroom)		Five-Year-Olds (Classroom)		Five-Year-Olds (Outside Classroom)	
Girls (6)	Boys (7)	Girls (7)	Boys (7)	Girls (6)	Boys (6)
*3:11	4:0	5:3	5:3	5:3	5:2
4:3	4:1	5:4	5:3	5:4	5:3
4:5	4:2	5:5	5:3	5:6	5:4
4:5	5:5	5:6	5:4	5:7	5:6
4:5	4:5	5:6	5:4	5:7	5:6
4:7	4:5	5:7	5:5	5:7	5:7
	4:7	5:11	5:6		

*Three years and eleven months.

TABLE III

DESCRIPTION OF SUBJECTS BY AGE
FOR THE POST-TEST
(N=65)

Four-Year-Olds (Classroom)		Five-Year-Olds (Classroom)		Five-Year-Olds (Outside Classroom)	
Girls (6)	Boys (7)	Girls (14)	Boys (14)	Girls (12)	Boys (12)
*3:11	4:0	5:2	5:2	5:3	5:2
4:3	4:1	5:3	5:2	5:3	5:3
4:5	4:2	5:3	5:3	5:4	5:3
4:5	4:5	5:4	5:3	5:4	5:4
4:5	4:5	5:5	5:3	5:5	5:4
4:7	4:5	5:6	5:3	5:6	5:5
	4:7	5:6	5:4	5:7	5:6
		5:6	5:4	5:7	5:6
		5:6	5:5	5:7	5:6
		5:6	5:5	5:7	5:7
		5:7	5:5	5:7	5:7
		5:7	5:6	5:7	5:7
		5:7	5:7		
		5:11	5:10		

*Three years and eleven months.

The Helicopter Booth

It is not this researcher's intention to incorporate an elaborate detailed explanation of the construction of the booth, but only a brief overview. This study was done in cooperation with Mrs. Shelba Branscum, whose thesis research was coordinated with the research reported in this study, and the specific detailed description of the development of the booth was reported by Branscum (1971).

The helicopter booth was designed for use by an individual child. The fiberglass helicopter booth had a seating capacity of one and thus established the individual program environment.

The booth was fitted with a Technicolor, Model Number 810 Super-8-Loop movie projector and synchronized Wollensak 3M Cassette portable tape recorder. The child controlled the movie and audio portion of the program by the use of a lever projecting from the instrument panel inside the helicopter. The projector, located behind the child in the helicopter, projected the film onto the front of the booth which served as a screen.

On the inside, the single seat was built of plywood, padded with foam, and covered with black vinyl upholstery fabric. Also upholstered was the instrument panel located on the side opposite the door; this provided space for the recorder and electrical connections. The control lever, which provided the child complete control of the operation of the program, projected up through a slot in this instrument panel.

The exterior of the booth was painted by brush with two coats of non-toxic lead-free enamel in fire engine red. The interior surface was painted with a non-toxic black enamel; however, the front which

served as a screen was painted white. A picture of the helicopter booth is presented in Figure 2, Appendix B.

The helicopter booth was constructed during the summer of 1970 by the researchers. The dimensions of the rectangular booth are 30 x 28 x 44 inches. A fiberglass material was laid over a reinforced cardboard carton that had first been covered with chicken wire and plaster to obtain a smooth cab-shaped rectangular mold. A door opening was cut and removed from one side of the finished fiberglass cab; this would later permit a preschool child entry. A smaller cardboard carton was covered with fiberglass and the resulting form was attached to the outside, on the upper back of the booth. This fiberglass form served as a projector box. A Technicolor, Model Number 810 Super-8-Loop Projector projected the picture through an aperture three inches in diameter that had been cut into the back wall. This aperture permitted the picture to be projected onto the front of the booth which served as a screen.

In addition, a tail section was constructed of a frame of pine 1 x 2 material which was covered with masonite and finally fiberglassed. The wood and masonite were not removed and remain as reinforcement under the fiberglass. This section, with the attached movable propeller, served no specific purpose other than when attached to the rectangular cab it created a more realistic helicopter image and contributed to the stability of the structure.

The floor was made of three-fourths inch plywood. It was secured to the rectangular booth and tail section to connect the two sections and thus serve as a stabilizer for the booth. Two four-inch wagon wheels mounted to the cab floor aided in moving the helicopter. Four

furniture legs were placed on the four corners of the floor board to stabilize and make the booth safe from tipping. These could easily be unscrewed for ease of transporting it from place to place.

Use of Booth With Groups of Children

The booth was first used with the four-year-old children, within the classroom, in an unstructured setting. These subjects were attending Oklahoma State University's Child Development Laboratory preschool. For the unstructured setting the helicopter booth was placed in the nursery school playroom with the first film and tape assembled. The children were instructed that they could use the booth and the program films in any way they desired, except that only one child could enter the booth and view the film at a time. Verbal directions for how the booth operated were given to each child on his first approach to the booth.

One group of five-year-olds was composed of five-year-old kindergarten children who experienced the identical experimental environment as the four-year-olds, in that it was an unstructured setting. The booth was placed in one corner of the classroom. During the free selected activity period the subjects were free to make use of the booth and film program in any manner they chose. Again the children were told that they could use the materials in any manner they wished, the exception being that only one child could be in the booth at a time.

A structured experimental setting, removed from the immediate kindergarten classroom, was provided for the other five-year-olds. The booth was placed in a room adjoining the regular classroom. For eight

days, one hour daily, children arrived and departed after viewing the film once according to a certain predetermined schedule. Twelve children were scheduled randomly to use the booth daily for individualized self-instruction.

For all three experimental groups a different movie with a synchronized tape was scheduled every two days, thus creating an eight-day entomology program. The program, which consisted of four single concept loop eight movies with audio cassette tapes, was presented in the following order: butterfly, grasshopper, cicada, and dragonfly.

While the child watched the program, the experimenter was positioned behind and to one side of the door opening. She observed and recorded a brief comment about the child's use of the booth and program. For the four-year-old nursery school children a timed record was kept for the amount of time each child spent viewing the films. In addition she made sure the experimental equipment was functioning properly and that the oral directions for use of the booth were understood.

Planning and Producing Materials

Development of Entomology Concepts

In the development of the program of entomology concepts that would be incorporated into the program the following procedure was followed: (1) in cooperation with Branscum the investigator examined elementary science books, early childhood education tests, and articles from scientific journals for guides in selecting concepts appropriate for the kindergarten and nursery school age level; (2) professionals in early childhood education were consulted as to the reasonableness of the concepts for use with children of this age; (3) two specialists in

the Department of Entomology were asked to evaluate the accuracy of the concepts that would be presented; (4) the following five entomology concepts were then selected to be used in producing the movies and audio tapes by the investigators for this research.

Main Entomology Concepts

1. All insects have six legs.
2. All insects have three main body parts.
3. There are many kinds of insects.
4. Some insects change form.
5. Insects move in different ways.

The four insects to be included in the study which illustrated the five entomology concepts were selected by the following criteria: (1) some of the insects should be familiar to the children and some insects should be unfamiliar to the children; (2) the insects should be available for filming; the insects should clearly illustrate the five concepts; (3) the insects should be large enough to film; and (4) the insects should be a variety of different colors and shapes. From a general listing of possible insects the following four insects were selected for the entomology program: butterfly, grasshopper, cicada, and dragonfly. Additional subconcepts were selected to enhance children's understanding of the four selected insects for the entomology program. The concepts were as follows.

Sub Concepts

I. Monarch Butterfly

1. The butterfly is an insect.

2. The butterfly has six legs and two feelers.
3. The butterfly has three main body parts.
4. There are different kinds of butterflies.
5. There are different sizes of butterflies.
6. Butterflies have four wings to fly with.
7. Mother butterflies lay tiny round eggs on leaves.
8. The caterpillar is the young butterfly.
9. Butterflies are helpful because they are pretty to look at.

II. Grasshopper

1. Grasshoppers are insects.
2. Grasshoppers have three main body parts.
3. Grasshoppers have strong, long back legs to hop with.
4. Young grasshoppers are called nymphs.
5. Young grasshoppers have no wings.
6. There are different kinds of grasshoppers.
7. There are different sizes of grasshoppers.
8. Grasshoppers are harmful because they eat leaves.
9. Grasshoppers have six legs.
10. Grasshoppers grow from eggs to adults.

III. Cicada or Locust

1. Cicadas are insects.
2. Cicadas have six legs.
3. Cicadas have four wings to fly.
4. Cicadas have three main body parts.
5. The cicada is a noisy insect.
6. Cicadas are harmful because they ruin trees.
7. Young cicadas are called nymphs.

8. Cicadas lay tiny eggs on branches of trees.
9. Cicadas shed their skins to become adults.
10. Young cicadas come out of the ground.

IV. Dragonfly

1. Dragonflies are insects.
2. There are many kinds of dragonflies.
3. Dragonflies have four wings to fly with.
4. Dragonflies have six legs.
5. Dragonflies have three main body parts.
6. Dragonflies are helpful because they eat mosquitoes.
7. Young dragonflies are called nymphs.
8. Young dragonflies live under the water.
9. The dragonflies lay their eggs near the water.

Producing Films

In the development and production of the four loop eight cartridge movies the researcher recognized the need to develop appropriate material to assist learning by four- and five-year-olds. The researcher hoped to convey to those concerned with the education of children that it is not necessary to rely on commercial planning for materials suitable in certain learning situations at a particular level. Hymes (1968) supports the idea that the best films for classes of young children usually are amateur films, parent-made or teacher-made, that re-enforce real-life adventures.

The four films produced dealt with the butterfly, grasshopper, cicada and dragonfly. The use of flannel board illustrations, puppets, and live specimens obtained from the entomology museum were incorporated

into each of the films to increase understanding of the entomology concepts. Each loop eight cartridge film was constructed to run four minutes. For details concerning the preparation of the audio-visual materials, photography and editing of film sequences see Branscum (1971).

Producing Audio Tapes

Synchronized sound tapes were produced on sixty minute, thirty minutes a side, Sony cassette tapes. The script was repeated each time the film completed the four minute cycle, thus the audio and visual position of the program were synchronized for a thirty minute time period. At the end of thirty minutes the cassette tape was rewound and again would play for a thirty minute duration. This made it necessary to rewind the tape only once a day during the entomology program. The foregoing procedure was repeated in producing each of the four sound tapes: one for the butterfly, grasshopper, cicada, and the dragonfly.

Placement of Sound Tapes

The Wollensak 3M portable cassette recorder containing the sound tape was placed in the booth instrument panel. The instrument panel was along the wall of the booth opposite the door. Access to the electrical connections and recorder was made possible through a hinged door on the top of the panel. This could be locked in place to assure safety for the child using the booth.

With the use of a double electric socket for the cassette tape adapter and the projector plug-in, it enabled the child to control the movie and sound as a synchronized program unit. The child could push

the control lever forward to start the program and backward to stop it.

Script for the Sound Tapes

The experimenter planned the script keeping in mind the needs of young children and the concepts that were to be emphasized in this study. The goal was to keep the script brief and simple, yet interesting to young children. Kuslan and Stone (1968) wrote that often commercial narration is ineffective and inappropriate for the age level of the film. They further contend that music and too much narration is distracting to the young child. The scripts were produced on cassette tapes, in conjunction with the four films, to help convey the entomology concepts presented in the films. A different script and movie combination was introduced every two days. Hence, this thesis study made use of visual as well as audio techniques. The program was presented in the following sequence: butterfly, grasshopper, cicada and dragonfly. See Appendix E for the complete sound script.

Development of Evaluative Instrument

An evaluative instrument was developed in order to measure children's knowledge of the entomology concepts which were presented in this project. The Programmed Sequence Achievement Gain Test, hereafter referred to as the PSAGT, is an achievement test based on the completion of a series of short simple tasks in the field of entomology. This instrument consisted of seven game type questions which involved the use of multi-media test materials. The instrument is presented in Appendix C.

Behavioral objectives were devised to be used as a guide in the construction of the evaluative instrument. These objectives were based on a review of the literature, research on the learning processes of young children, and assistance from specialists in the field of Early Childhood Education. One over-all objective was to develop materials related to the key concepts of science.

Over-all Objective

To present patterns of the universe, specifically those dealing with the Animal Kingdom--Insects.

1. Life is adapted to the environment--Adaptation.
2. There are great variations in the universe--Variety.
3. The universe is constantly changing--Change.
4. The interdependence of living things--Interrelationship.

Behavioral Objectives of the PSAG Test

The behavioral objectives for the instrument are listed sequentially.

A. To have the children identify and categorize different insects.

B. To have the children associate the insect with its appropriate environment.

C. To have the children verbally identify the three body parts of an insect.

D. To have the children illustrate the movement of the grasshopper, dragonfly, cicada, and the butterfly.

E. To have the children assemble styrofoam body parts of an insect correctly.

F. To have the children associate the adult stages of an insect with the same insect at an earlier stage of development.

G. To have the children transfer their knowledge of metamorphosis of a familiar insect to metamorphosis of an unfamiliar insect.

H. To have the children recall information presented in their past experience and in the programmed materials by drawing on a blank sheet of paper an insect.

I. To have the children identify harmful and helpful insects in our environment.

J. To have the children categorize the insects by placing the insects in the correct metamorphical stage of growth from an egg to adult.

K. To have the children associate the earlier stages of the same adult insect.

L. To have the children use the appropriate vocabulary when discussing insects and their growth during the test procedure.

An Overview of the PSAG Test Questions

A variety of multi-media materials were used in the development of the test questions. A brief overview of the PSAG Test which consists of seven game-type questions that were used to measure young children's knowledge of entomology concepts is presented:

1. The first question consisted of having children identify and categorize fourteen colored 9 x 12 plastic coated pictures. See Appendix C for the complete PSAG Test.

2. For the second question the children associated the insect with its appropriate environment, using four felt insects and three small flannel boards.
3. Next the children were to assemble styrofoam body parts of an insect and verbally identify the body parts. For the second part of this question the children were to illustrate the movement of four plastic insects.
4. The objective of this question was to associate the adult stages of eight insects with the same insect at an earlier stage. Two magnetic boards provided the child a place to match his choice.
5. The fifth question required the children to draw an insect on a blank sheet of paper using a pencil.
6. Question number six required the child to identify helpful, harmful, or both helpful and harmful insects in our environment from six live plastic-coated specimens.
7. For this question children categorized four insects by placing the square puzzle picture pieces in the correct metamorphic sequence. Six square puzzle pieces each with a picture of a metamorphic state of an insect were laid before the child along with two poster sequence boards. Three square holes were removed from each of the poster boards to allow the child to place the three metamorphic stages of two insects in order in these holes. The procedure was repeated with the two other insects.
8. A Wollensak 3M Cassette portable tape recorder was used to record the children's vocabulary associated with insects

during the test procedure. The tapes were later evaluated for preselected vocabulary words and were given two points for each word spoken. For a list of vocabulary words that were given points see Appendix C.

Administration of the PSAG Test to Children

The PSAG Test which consists of seven game type questions was developed specifically to evaluate children's knowledge of certain entomology concepts. It was designed for a one-to-one, child-to-administrator testing condition. Half of the kindergarten subjects and all of the four-year-olds were given the PSAG Test before the research program sequence was presented. All subjects were given the PSAG Test after the research entomology program had been completed to determine the amount of learning gained from the entomology program. Each child was taken individually by the investigator to a room near or a part of the nursery school or kindergarten. A tape recorder was used to record the children's responses to the questions in order to obtain a vocabulary score for question number eight.

The investigator talked to each child a few minutes to establish rapport before beginning the test. Each child was told by the investigator that she had some special games for them to play. The test questions were then presented in numerical order with the following specific verbal directions and questions being asked by the investigator. See Appendix C for the complete verbal directions.

Scoring of the PSAG Test

The score sheet of Child F-16 is presented in Figure 1, and is used to illustrate the method of scoring. The vertical marks indicate the correct responses the child made in completing each question according to the specific behavior evaluated score chart. This specific behavior score chart may be found in Appendix A. For question number eight a tape recording was made during the administration of the test session and later evaluated. Two points were given for every preselected vocabulary word used by the child. A list of preselected vocabulary words may be found in Appendix C.

The scoring consists of a simple numerical count of the correct responses. In the illustration, Child F-16 made 14 correct responses in question number one, 8 for two, 7 for three, 1 for four, 5 for five, and 2 for six, 2 for seven, and 20 for number eight. The total correct responses were added together to determine the total PSAG Test Raw Score of 59.

Validity, Reliability, and Pilot Study

A pilot study using the PSAG Test was conducted with 13 four-year-old and 14 five-year-old kindergarten children. The children used in the pilot study were not used in the study proper. Acceptable measures of validity and reliability were obtained. The positive correlation of .88, significant at the .01 level indicated by the Spearman Rank Correlation Test shows that the test was consistent over a seven-day time period. The Kuder-Richardson Formula 21 indicated a .76 correlation of the items with the test as a whole on the initial test and a .73 correlation of the items with the test as a whole on the retest. Internal

PROGRAMMED SEQUENCE ACHIEVEMENT GAIN TEST-ENTOMOLOGY
SCORE SHEET

Name: Child F-16 (First / Last) PRE or POST Testing Date: 1-20-71

School: Five-year-old Outside the Classroom Score: 59 Examiner: Schmidt (last)

1a 5	1. Identity Group: (18 pts)	a. insect	b. animal	c. identity	
1b 7		|||||	||||| ||	||	
1c 2		(7)	(7)	(4)	
1T 14					
2a 2	2. Flannel Board: (9)	a. B	b. D	c. C	d. G
2b 2		||	||	||	||
2c 2		(2)	(2)	(3)	(2)
2d 2	3. Insect Replica: (12)	a. styrofoam	b. name	c. movement	
2T 8		|	|	|| || |	
3a 1		(3)	(3)	(6)	
3b 1					
3c 5	4. Match-Stages: (8)	a. stages			
3T 7		|			
4a 1		(8)			
4T 1	5. Drawing: (11)	a. legs	b. attachment	c. wing-an	
5a 4		||||	0	|	
5b 0		(6)	(3)	(2)	
5c 1					
5T 5	6. Environment (12)	a. harmful	b. helpful	c. both	
6a 1		|	|	0	
6b 1		(3)	(3)	(6)	
6c 0					
6T 2	7. Puzzles: (16)	a. similarity	b. sequence		
7a 2		||	0		
7b 0		(4)	(12)		
7T 2	8. Tapes: (40)	a. responses			
8a 20		||||| ||||| x2			
8T 20					

Total 59 126

Comments:

Figure 1

consistency within the two tests indicates that the test is composed of items related to the objectives they were designed to measure. The Wilcoxon Matched-Pairs Signed-Ranks Test indicated that the PSAG Test was a consistent measure of children's knowledge. It is not this researcher's intention to incorporate an explanation of the above steps in this study. For details of the information and for criteria used in establishing validity for the PSAGT during the fall of 1970 see Branscum (1971).

Analysis of Data

Non-parametric statistical tests were used to analyze the eleven hypotheses of this study. The Wilcoxon Matched-Pairs Signed-Ranks Test was used to examine the first two hypotheses. The Mann-Whitney U Test was used to test hypotheses three through ten. In analyzing the last hypothesis, number twelve, the Spearman Rank Correlation Test was used.

CHAPTER IV

ANALYSIS OF DATA

The over-all purpose of this research was to investigate the learning behavior of preschool children concerning the use of individualized instruction in an environment which stimulated their curiosity and enhanced their understanding of their environment. Specifically this study was concerned with: (1) a selective program containing single-concept entomology films produced specifically by the researcher for children four and five years of age; this individual instruction program was viewed in a helicopter booth. (2) demonstrating one means of providing a learning environment which may stimulate children's interest and offer an opportunity for individualized experiences.

The initial PSAG Test was administered to all of the four-year-old children attending one of the Child Development Laboratories at Oklahoma State University, and to half of the five-year-old children attending two public school kindergartens in Stillwater, Oklahoma. The PSAG Test was administered to all subjects subsequent to participation in the program of individualized instruction. Individual test scores are presented in Appendix F. In the following paragraphs the results are presented with direct reference to each hypothesis.

Examination of Major Hypotheses

Hypothesis I: Four-year-olds will obtain significantly higher scores on the PSAG Test following a learning program than they obtained before the learning program. The Wilcoxon Matched-Pairs Signed-Ranks Test was used to compare scores on the initial test and the retest of the PSAGT for four-year-old subjects. The results of this analysis are presented in Table IV. A T score of 9.0 was obtained, significant at the .025 level using a one-tailed test; therefore, Hypothesis I was retained. This data suggests that there is a difference between the initial test and the retest scores. In this study the data show that only two of the four-year-old subject's scores were less than their initial test scores.

Hypothesis II: Five-year-olds will obtain significantly higher scores on the PSAG Test following a learning program than they obtained before the learning program. In order to examine this hypothesis, the Wilcoxon Matched-Pairs Signed-Ranks Test was computed to determine the relationship between five-year-olds' scores on the initial and retest of the PSAG Test. As Table IV shows a T score of 14.0 was obtained, which was significant beyond the .01 level. One could conclude that there is a difference between initial and retest scores for the five-year-olds. Only three of the twenty-six children's retest scores were less than their initial test score. The largest percentage of the five-year-olds gained from the films as reflected by their retest PSAGT scores. Hypothesis II was retained.

TABLE IV

WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST
ANALYSIS OF SCORES BEFORE AND
AFTER THE PROGRAM

Groups	T Value	Level of Significance
Four-Year-Old Children *(N=13)	9.0	.05
Five-Year-Old Children (N=26)	14.0	.01

*N = Total subjects.

Hypothesis III: There will be no significant differences between the four-year-old males and the four-year-old females in the amount gained on the PSAG Test. The Mann-Whitney U analysis of differences was used to analyze the data for this hypothesis. A U of 13.5 indicated that there are no significant differences in the amount gained on the PSAG Test for the four-year-olds. The results of this analysis are presented in Table V.

Hypothesis IV: There will be no significant differences between the five-year-old males and five-year-old females who experienced the program within the classroom in the amount gained on the PSAG Test. The Mann-Whitney U Test was also used to examine the differences between classroom five-year-old males and five-year-old females in the amount gained on the PSAG Test. Table V shows a U of 19.0 indicating no significant differences between five-year-old classroom males and females in the amount gained on the PSAGT.

TABLE V

MANN-WHITNEY U ANALYSIS OF COMPARISON OF DIFFERENCE SCORES RELATED TO SEX AND AGE

Groups	U	Level of Significance
Four-Year-Olds (Males - Females) *(N = 7 - 6)	13.5	n.s.
Five-Year-Olds (Males - Females) (N = 7 - 7)	19.0	n.s.
All Pre-Tested Five-Year-Old Males - All Pre-Tested Five-Year Old Females (N = 13 - 13)	68.5	n.s.

*N = Total males and females.

Hypothesis V: There will be no significant differences in the amount gained on the PSAG Test between all pre-tested five-year-old males and all pre-tested five-year-old females. The Mann-Whitney U analysis of differences was used to analyze the data. The results of this analysis are presented in Table V. These data indicate that there are no significant differences in the amount gained on the PSAG Test between all pre-tested five-year-old males and all five-year-old females.

Hypothesis VI: There will be no significant differences on the post PSAGT scores between the four-year-old males and females and the five-year-old males and females who received the identical experimental program. In order to examine Hypothesis VI the Mann-Whitney U analysis

of differences was applied. As Table VI shows, a U value of 27 was obtained, showing that a significant difference exists at the .002 level. Therefore Hypothesis VI was rejected. The finding indicates that five-year-olds who experienced the program within the classroom who were subjected to the identical experimental program as the four-year-olds had higher post-test scores on the PSAGT. Five-year-old children did know more about entomology than four-year-old children.

TABLE VI

MANN-WHITNEY U ANALYSIS OF POST-TEST SCORES ON PSAG TEST BETWEEN FOUR-YEAR-OLDS AND FIVE-YEAR-OLDS IN THE CLASSROOM

Group	U	Level of Significance
Four-Year-Olds Compared With Five-Year Olds Pre-Tested Within the Classroom *(N=27)	27	.002

*N = Total subjects.

Hypothesis VII: There will be no significant difference in scores on the post PSAG Test between the five-year-olds experiencing the program within the classroom and the five-year-olds experiencing the program outside the classroom setting. A significant difference was found at the .001 level, when the Mann-Whitney U Test was utilized to compare the post scores between those who saw the films within the

classroom and those who experienced the program outside the classroom setting. The U score obtained was -3.57, and P = .001; therefore Hypothesis VII was rejected. The children who viewed the films on a predetermined schedule outside the classroom had higher post PSAG Test scores.

Hypothesis VIII: There will be no significant differences in scores on the post PSAG Test between the five-year-olds experiencing the program within the classroom who were exposed to the initial PSAG Test and the five-year-olds not exposed to the initial PSAG Test. The Mann-Whitney U Test was also used to examine post scores on the PSAG Test between those five-year-olds within the classroom who were exposed to the initial test and those not exposed to the initial test. Table VII shows that a U score of 92 was obtained for these five-year-olds. The hypothesis that there will be no significant differences in scores on the post PSAG Test between the five-year-olds experiencing the program within the classroom who were exposed to the initial PSAG Test and the five-year-olds not exposed to the initial PSAG Test was retained.

Hypothesis IX: There will be no significant difference in post test scores on the PSAG Test between the five-year-olds experiencing the program outside the classroom who were exposed to the initial PSAG and the five-year-olds not exposed to the initial PSAG Test. The Mann-Whitney U Test indicated that there was no significant difference between the five-year-olds exposed to the pre-test outside the classroom setting and those not exposed to the initial PSAG Test. The null hypothesis that there will be no significant difference in post-test scores on the PSAG Test between the five-year-olds experiencing the

program outside the classroom who were exposed to the initial PSAG and the five-year-olds not exposed to the initial PSAG Test was retained with a U score of 45, Table VII.

TABLE VII

MANN-WHITNEY U ANALYSIS OF FINAL PSAG TEST SCORES BETWEEN FIVE-YEAR-OLDS EXPOSED TO THE INITIAL TEST AND FIVE-YEAR-OLDS NOT EXPOSED TO THE INITIAL TEST

Groups	U	Level of Significance
Five-Year-Olds Within Classroom *(N=28)	92	n.s.
Five-Year-Olds Outside Classroom (N=24)	45	n.s.

*N = Total subjects.

Hypothesis X: There will be no significant differences in post-test scores on the PSAG Test between males and females according to age or sex. This hypothesis was examined by use of the Mann-Whitney U Test. The results are presented in Table VIII, indicating that there was no significant difference in scores on the post PSAG Test between males and females for any of the groups according to age or sex. The null hypothesis that there will be no significant differences in post-test scores on the PSAG Test between males and females according to age or sex was retained.

TABLE VIII

MANN-WHITNEY U ANALYSIS OF POST PSAG TEST SCORES ACCORDING TO SEX AND AGE

Groups	U	Level of Significance
Four-Year-Olds *(N=13)	20.0	n.s.
Five-Year-Olds Within Classroom (N=28)	93.5	n.s.
Five-Year-Olds Outside Classroom (N=24)	58.5	n.s.
Total Subjects (N=65)	526.0	n.s.

*N = Total subjects.

Hypothesis XI: There will be no significant correlation between the time the four-year-olds child spends viewing the films and his score on the post PSAG Test. A Spearman rank correlation coefficient was computed to determine the relationship between the time the four-year-old child spends viewing the films and his score on the PSAG Test. The Spearman rank correlation coefficient was found to be 0.56, significant at the .05 level. This suggests that there is a relationship between the time the child spends viewing the films and his score on the post PSAG Test; therefore Hypothesis XII was rejected. The child who spent the most time viewing the films had the highest score while the child who spent the least time had the lowest score on the post PSAG Test.

Summary of Findings

(1) Both four-year-old and five-year-old children learned from the program as indicated by their PSAG Test scores.

(2) There were no significant sex and/or age differences in any group in the amount gained on the PSAG Test or the final PSAGT score.

(3) A significant difference in final scores was found between the group of five-year-old kindergarten children who viewed the films within the classroom and the five-year-old kindergarten children who viewed the films outside the classroom setting. This indicates the children who viewed the films on a predetermined schedule outside the classroom had higher post PSAG Test scores.

(4) No significant differences were found on the PSAG post-test scores between the five-year-old kindergarten group experiencing the pre-test and the five-year-old kindergarten group not responding to a pre-test.

(5) There was a significant correlation at the .002 level of significance between the post-test scores of four-year-olds and five-year-olds who experienced the identical experimental program. The five-year-olds had higher post test scores than four-year-olds.

(6) There was a significant correlation between the time the four-year-old child spent watching the films and his score on the post PSAG Test.

CHAPTER V

SUMMARY AND DISCUSSION

Some educators and psychologists believe that in the traditional school environment many children are not being sufficiently stimulated in the area of cognitive development to promote growth toward learning potential. The over-all purpose of this research was to investigate the learning behavior of young children concerning the use of individualized instruction in an environment which stimulated their scientific curiosity and enhanced their environmental understanding. A secondary goal was to demonstrate that teachers may develop their own materials to support plans for learning experiences. Specifically this study was concerned with: (1) a selective program containing single-concept entomology films produced specifically by the researcher for children four and five years of age; this individual instruction program was viewed in a helicopter booth. (2) demonstrating one means of providing a learning environment which may stimulte children's interest and offer an opportunity for individualized experiences. The effectiveness of the learning environment was measured by the administration of the Programmed Sequence Achievement Gain Test. (Branscum, 1971)

The sample of children was composed of 13 four-year-old children attending the Child Development Laboratories at Oklahoma State University and 52 five-year-old kindergarten children attending morning kindergarten classes from two public elementary schools in Stillwater,

Oklahoma. The 8-day program of four single-concept films with synchronized audio tapes developed by the researcher on basic concepts in entomology were presented and the subjects were tested using the PSAG Test during January and February, 1971. The data provide scores for each child on the PSAG Test indicating the amount of knowledge the child had about specified entomology concepts. These data were analyzed for each of the hypotheses using the Wilcoxon Matched-Pairs Signed-Ranks, Mann-Whitney U, and Spearman Rank Correlation Coefficient tests. The findings of this research were as follows: The four-year-old and five-year old children did choose to use the self-instructional program. Boys and girls learned equally well in this study. A significant difference in final scores was found between the group of five-year-old children who viewed the films within the classroom and the five-year-old children who viewed the films outside the classroom setting. Children viewing the films outside the classroom had higher post PSAG Test scores. The effects of a pre-test did not aid learning. The five-year-olds had higher post test scores than four-year-olds. There was a significant correlation between the time the four-year-old child spent watching the films and his score on the post PSAG Test.

Discussion

This study demonstrated that certain entomology concepts can be learned from viewing super 8-mm cartridge films. The nursery school and kindergarten children did choose to use the self-instructional program and found it a pleasurable learning experience. Boys and girls seemed to learn equally well, in this study. A significant difference existed at the .001 level between the kindergarten children who viewed

the films within the classroom and those who experienced the program outside the classroom setting. This suggests that the children who viewed the films on a predetermined schedule outside the classroom had higher post PSAG Test scores. A limitation of this study seemed to be that the self-selected activity period was often restricted by the teacher. The children were often limited in their self-selected activity by having a choice of three things from which to choose. Competition for a turn to view the films perhaps was restricted to only the very aggressive, persistent children. The helicopter viewing booth and entomology films were attractive to the young children. In this study, audio-visual instruction seemed to increase learning, as was evidenced by higher scores on the retest by the majority of the children. In the area of audio-visual materials in particular, research is important to facilitate educational improvements. Current media research gives the teachers of today insights into effective methods of presentation and techniques which will provide the most learning. The findings from this research are important for those working with children for it is only with such knowledge that one is able to make the most effective use of audio-visual materials in the classroom. A general conclusion held by the investigator is that educational technology seems to hold great potential for improving the instructional process as well as providing for individualized self-instruction.

Recommendations for Further Research

Considerations of the findings in this study and the findings of other investigators as noted in the review of literature suggest certain interpretations and implications for understanding how audio-visual

materials are used for instructional purposes. In order to further verify the findings and provide additional information, the investigator proposes the following recommendations for additional research.

1. Repeat the study with a larger group of children in order to obtain a more representative sample of the population.

2. Repeat the study to investigate the influence of race and socio-economic status on learning from films.

3. Repeat the study using groups with special characteristics such as gifted or mentally retarded since the literature indicates films are appropriate for use with such groups.

4. Study learning from films in terms of how long the child views the films and the amount learned.

5. Repeat the study to investigate the learning from films in an entirely free self-selected vs. scheduled viewing environment.

6. Study young children's use of individualized instruction and their learning from films in terms of comparisons to the child's development in various areas.

7. Repeat the study using single concept films in other areas appropriate for preschool children.

8. Repeat the study with children of grade-school age to see if learning from films takes on a different value for the child in the later developmental stages of childhood.

9. Repeat the study using only two films for a longer period of time so every child would have the opportunity to view films as many times as he desired.

10. Study young children's interest in entomology material in relationship to learning from that audio-visual material.

11. Findings seem to point toward the need to study media used in combinations, in meeting different kinds of educational objectives, in application to broad educational problems and total segments of the curriculum, and in relation to the education of different kinds of learners.

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APPENDIX A

CORRESPONDENCE

OKLAHOMA STATE UNIVERSITY • STILLWATER

Department of Family Relations & Child Development 74074
372-6211, Ext. 6084

COPY

September 15, 1970

Mrs. Edna Jungers
Director of Elementary Education
Stillwater Public Schools
Stillwater, Oklahoma 74074

Dear Mrs. Jungers:

The purpose of this letter is to request permission to use one class of kindergarten children at Highland Park School as subjects for my thesis. In addition I would like permission to use a group of kindergarten children from Skyline School as a control group. The control group will only be interrupted to administer the Pre-Test and Post-Test that has been developed to test children's understanding of insects.

A booth in the shape of a helicopter was constructed to view programmed materials. Single concept films are being developed with synchronized audio tapes. From frames of the film a Pre-Test and Post-Test are being constructed to test children's understanding of insects.

I would like to secure permission to carry out the above research the latter part of first semester.

I would be most willing to give my full co-operation in working with the principal at Highland Park and at Skyline as well as the kindergarten teachers.

Presently, I am a graduate student in the department of Family Relations and Child Development at Oklahoma State University.

Your co-operation in this thesis study would be greatly appreciated.

Sincerely,

Carolee Schmidt (Mrs.)

Dr. Frances Stromberg (Thesis Advisor)
Department of Family Relations
and Child Development

Stillwater Public Schools
316 West Eighth Avenue
Stillwater, Oklahoma 74074
October 2, 1970

Mrs. Carolee Schmidt
1209 E. 4th
Stillwater, Oklahoma 74074

Dear Mrs. Schmidt:

Your letter of September 15 addressed to Mrs. Edna Jungers has been referred to me for response. Every year we have several requests to do research in our system and unfortunately we have to turn down many. However, if you will send me six (6) copies of a one page abstract of your thesis describing in detail exactly how many students you will be working with, the number of teachers or classes, how often and when you will be in our school, I will be happy to discuss your request with Mr. Ward and Mr. Roubinek at the next principal's meeting. Include in your abstract what you hope to accomplish and how it might be of some value to our system.

Sincerely,

Wesley Beck, Jr.

Wesley Beck, Jr.
Assistant Superintendent

WWBJr.:pw

PROSPECTUS OF STUDY
to be submitted
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE

By Carolee Schmidt

YOUNG CHILDREN'S LEARNING, UTILIZING SELF-INSTRUCTIONAL SINGLE-CONCEPT ENTOMOLOGY FILMS

Although the scientific attitude stems from interaction of a young child with his environment. Torkelson (1967) maintains that because children grow and learn at different rates and in different ways there is a persistent problem in the classroom of meeting individual learner needs in group situations. Foltz concludes (1961) that the average student is actively engaged or interested in classroom activity only twenty per cent of the time. Robison and Spodek (1965) suggest that not only is there a need for research and advanced conceptual development in programs for five year olds but also programs that are both significant and elementary.

The purposes of the proposed study are: (1) To develop a helicopter booth; (2) To develop a multi-media programmed instruction sequence on entomology for young children; (3) To devise and administer a programmed sequence test to be given before and after the programmed sequence to measure the effect of programming; (4) Non-parametric statistical measures will be used to analyze data.

The sample of children (N=52) to be used in the proposed study will be selected from Skyline and Highland Park Elementary Schools, in Payne County during the spring of 1971. Criteria for selection will be (1) enrolled and attending kindergarten in Payne County; (2) between the age of 5.0 and 6.0.

A booth constructed in the form of a helicopter with the seating capacity of one will be placed approximately Jan. 11th in the Highland Park Elementary, and Jan. 25th in the Skyline School Kindergarten. The child will control the programmed instruction and view the entomology films as many times as he wishes for a two-week period.

At the Skyline School I would like to use Mrs. June Black's younger class of kindergarten children (N=26) as a control group. In addition I would like to use Mrs. Jana Releford's younger class of kindergarten children (N-26) for the experimental group. For two weeks, 1 hour daily during the free selected activity period the booth would be placed in the kindergarten room and the child would be free to view the films. The teacher's help will not be needed and I will be the only person to work on the project. There will be no follow up. Approximately ten minutes per child will be required to administer a pre test and again after the program for the post test. Only one-half (N-13) children at Highland Park and (N-13) at Skyline will be given the

pre test. All (N=52) would be given the post test to determine the amount of learning from the programmed entomology films. During the time of the Program, I would need to be present the one hour daily for the two weeks for the purpose of seeing that the experimental equipment was functioning properly.

TO WHOM IT MAY CONCERN:

I am concerned for young children and assure no harm will come to the child from this project. I feel the programmed insect films will be a profitable and pleasant experience. Having taught for seven years I fully understand the importance of the on-going program. I will be most willing to co-operate in working with the teachers to insure as little disturbance to the regular schedule. The Stillwater School System is of particular interest to me, due to the fact my husband is an employee and my daughter is a student in the Highland Park Elementary School.

I believe the Stillwater School System would benefit from this study in a number of ways. This study would emphasize the importance of research to contribute to the development of effective learning situations in our public schools. Elementary school children and children of preschool age need increased opportunities for learning. Particularly in day care centers and places where the ratio of adults to children is not desirable to afford individualized instruction. Children would benefit from the research by having the opportunity for learning which would not be otherwise available. The study would increase awareness of the need to develop materials in many areas for the child four to six years of age. There would be a definite practical value to teachers of having the opportunity to share new ideas. I believe every effort must be exerted for a continuing relationship between higher education and public schools to foster continuing program development. A later goal is to develop material and eventually a manual to not only outline the procedure of the program for this research but so other teachers might be inspired to develop some of their own teaching materials.

Again, may I say your co-operation in this thesis study would be greatly appreciated.

Sincerely,

Carolee Schmidt (Mrs.)

Dr. Frances Stromberg (Thesis Advisor)

Stillwater Public Schools
315 West Eighth Avenue
Stillwater, Oklahoma 74074
November 2, 1970

Mrs. Carolee Schmidt
1209 E. 4th
Stillwater, Oklahoma

Dear Mrs. Schmidt:

Following the Principal's meeting last Wednesday, I met with Mr. Darrell Roubinek and Mr. Lee Ward, about your project proposal. I gave each of them a copy and answered a few questions. They approved your study and I told them that you would be contacting them about the details.

Please let me know if there is any other way this office can be of help.

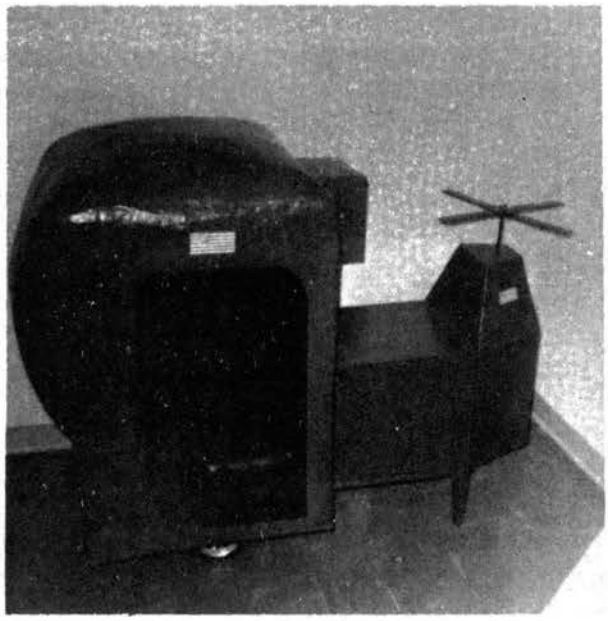
Sincerely,

Wesley W. Beck, Jr.
Assistant Superintendent

WWBJr.:pw

APPENDIX B

HELICOPTER BOOTH



Side View of Helicopter

Figure 2. Helicopter Booth

Figure 1. Picture of Publicity From Study. KEEP 'EM INTERESTED--Mrs. Carolee Schmidt, standing right, and Mrs. Shelba Branscum are working toward Master's Degrees in Family Relations and Child Development. The thesis study has the important and unique feature of establishing an enticing and fun environment for preschool children to develop scientific concepts of entomology. They feel that with the information from behavior of pre-school children in a learning environment it may be possible to understand better how children can indeed develop scientific attitudes and comprehend basic scientific concepts. This past summer the women constructed this helicopter, designed for a child's individual use and operation. They then produced four films dealing with the butterfly, grasshopper, cicada and dragonfly. The projector, located behind the student in the helicopter, projects the film onto the front of the booth which serves as a screen. This helicopter establishes the individual programmed environment and makes use of the single concept films. Mrs. Schmidt worked with Mrs. Jana Releford's kindergarten and is presently working with Mrs. June Black's kindergarten class. Becky Dowlen waits her turn as Lynn McQuiston leaves the booth.

APPENDIX C

PROGRAMMED SEQUENCE ACHIEVEMENT GAIN TEST

OR THE EVALUATIVE INSTRUMENT

PROGRAMMED SEQUENCE ACHIEVEMENT GAIN TEST--ENTOMOLOGY

Test Description and Procedure Booklet

I. Identity Grouping:

A. Objective: To have the children identify and categorize different insects.

B. Material Description: Fourteen 9 x 12 inch colored pictures of the following seven insects (cicada, dragonfly, ants, firefly, bees, grasshoppers, and butterfly and the following seven animals (giraffe, fish, squirrel, turtle, rabbit, birds and a hippopotamus).

C. Procedure:
1. Mix the cards randomly by shuffling.
2. Hold the cards in hand so that child can see the first card only.
3. Tell child: "I'll show you the cards one at a time and when you see an insect tell me."
4. When the child responds place the card at the back of the pile.
5. Ask the child to identify the grasshopper, dragonfly, cicada, and butterfly pictures by naming the insect.

D. Scoring: For each insect correctly categorized give one point; for every animal correctly categorized give one point; for every correct identification of the four insects preselected, butterfly, cicada, dragonfly, and grasshopper, give one point.

E. Points: Insects-7 points, animals-7 points, identity-4 points, Total-18

II. Flannel Board:

A. Objective: To have the children associate an insect with its appropriate environment.

B. Material Description: Four felt insects (grasshopper, dragonfly, cicada and butterfly) and three small flannel covered boxes with scenes of water, flowers, and tree with sky background.

C. Procedure:
1. Set all three of the boxes on the table in front of the child.
2. Set the four felt insects in a miscellaneous pile in front of the boxes.
3. Ask the child to put the insect on the box where the insect lives.

D. Scoring: Give one point for having the insect in a correct environmental scene.

E. Points: Total points-9, butterfly-2, grasshopper-2, cicada-3, dragonfly-2
(See the point distribution chart for specific details)

III. Insect Replica:

A. Objectives: To have the children verbally identify the three body parts of the insect, to have the child demonstrate the movement of the grasshopper, dragonfly, cicada and butterfly, and to have the children assemble styrofoam body parts of an insect correctly.

B. Material Description: Three styrofoam oval-shaped parts of an insect body; a plastic cicada, grasshopper, dragonfly and butterfly.

C. Procedure:
1. Dump the three body parts onto the table.
2. Tell the child to make an insect.
3. Ask the child- "Do you know the name of this part of the insect?" (point to the part)
4. Put the insect parts away and take one of the plastic insects out and lay it on the table.
5. Tell child- "Show me how the insect moves."
6. Repeat the procedure for each of the insects.

D. Scoring: For every correct arrangement of a body part give one point; for every correct identification of a body part give one point; and for every correct demonstration of an insect's movement give one point.

E. Points: Body parts-3, names-3, movement-6, Total points-12

IV. Match-Stages:

A. Objectives: To have the children associate the adult stage of an insect with the same insect at an earlier stage of development, and to have the children transfer their knowledge of metamorphical stages of familiar insects to unfamiliar insects.

B. Material Description: One magnetic board containing four adult insect pictures on both sides. Eight small pictures of young stages of the same insects. The insects are grasshopper, butterfly, dragonfly, cicada, bee, beetle, ladybug, and fly.

C. Procedure:
1. Put the magnetic board on the table in front of the child and place the four matching cards randomly in front of the magnetic board.
2. Tell the child-"These are the parent insects on the board and I want you to put the baby insect card next to its mother."
3. Follow same procedure for second side of the magnetic board.

D. Scoring: For every correct matching of a baby insect with its parent give one point for each.

E. Points: Total-8

V. Drawing:

A. Objective: To have the children recall information presented in the program by drawing an insect on a blank paper.

B. Material Description: Back of score sheet and a pencil.

C. Procedure:
1. Put the back of the score sheet in front of the child along with a pencil.
2. Tell child- "I want you to draw an insect. It can be any insect you want to draw."

D. Scoring: For every leg drawn give one point; for one set of three legs on each side give one point; for drawing wings give one point; antennae on head one point; legs attached to thorax give one point.

E. Points: Legs-6, set of legs-2, wings-1, thorax-1, antennae-1, Total points-11

VI. Environment:

A. Objective: To have the children identify harmful and helpful insects in our environment.

B. Material Description: Six plastic coated insects (grasshopper, dragonfly, cicada, butterfly, ladybug, and a housefly).

C. Procedure:
1. Set the insects on the table in front of the child.
2. Tell child to point to the insects that are harmful and the insects that are helpful.

D. Scoring: For every correct identification of harmful insects give one point and for every correct identification of the helpful insects five one point, for those insects given both traits give one point each.

E. Points: Harmful-3, helpful-3, both-6, Total points-12

VII. Puzzles or Sequence Boards:

A. Objectives: To have the children categorize the insects by placing the insects in the correct metamorphical stage of growth, to have the children associate the earlier stage of growth of an insect with that insect at a later stage of growth.

B. Material Description: Four three-piece puzzles of the stages of growth of the dragonfly, butterfly, cicada, and grasshopper.

C. Procedure:
1. Take two of the puzzles and dump the pieces out onto the table placing picture side up where they lay.
2. Tell child: "These are puzzles of two insects. I want you to put them together the way the insect grows from baby to parent."
3. Do same for the two remaining puzzles.

D. Scoring: Give one point for putting all three pieces of the right puzzle together; give one point for putting a piece in sequence.

E. Points: Similarity-4 points, sequence-12 points, Total-16

VIII. Tape Recording:

A. Objective: To have the children use the appropriate vocabulary when discussing insects and their growth during the test procedure.

B. Material Description: One portable cassette tape recorder and blank tape.

C. Procedure: Turn the tape recorder on at the beginning of the test session and turn off at the end. Identify each child by name at beginning.

D. Scoring: Give two points for every preselected vocabulary word used by the child. Do not give a point for repetition of a word used by the child more than two times consecutively.

E. Total Points-40

F. Preselected Vocabulary Words:

abdomen	helpful
antennae	insect
butterfly	legs
caterpillar	locust
cicada	monarch
dragonfly	nymph
egg	pupa
grasshopper	shell
harmful	thorax
head	wings

PROGRAMMED SEQUENCE ACHIEVEMENT GAIN TEST--ENTOMOLOGY
Point Distribution Chart

Test Item	Specific Behavior Evaluated	Points	Sub-Total	Total
Identity Grouping	Sort insect cards into insect pile	1	7	
	Sort animal cards into animal pile	1	7	
	Naming the four insects in study	1	4	18
Flannel Board	Putting butterfly in sky	1	1	
	Putting butterfly on ground	1	1	
	Putting dragonfly on water	1	1	
	Putting dragonfly in sky	1	1	
	Putting cicada in underground	1	1	
	Putting cicada in sky	1	1	
	Putting cicada on the ground	1	1	
	Putting grasshopper on ground	1	1	
	Putting grasshopper in grass	1	1	9
Insect Replica	Placing head at one end of body	1	1	
	Placing thorax in middle of body	1	1	
	Placing the abdomen at one end	1	1	
	Naming each body part	1	3	
	Grasshopper flying	1	1	
	Grasshopper jumping	1	1	
	Butterfly flying	1	1	
	Dragonfly flying	1	1	
	Cicada flying	1	1	
	Cicada sitting on table, trees	1	1	12
Match-Stage	Match butterfly with caterpillar	1	1	
	Match dragonfly with larvae	1	1	
	Match grasshopper with grasshopper	1	1	
	Match cicada with cicada larvae	1	1	
	Match housefly with maggot	1	1	
	Match beetle with nymph	1	1	
	Match ladybug with nymph	1	1	
	Match bee with eggs	1	1	8
Drawing	Drawing legs	1	6	
	Drawing three legs on one side (2)	1	2	
	Drawing legs attached to thorax	1	1	
	Drawing wings	1	1	
	Drawing antennae on head	1	1	11
Environment	Naming each harnful insect	1	3	
	Naming each helpful insect	1	3	
	Naming combinations of help and harm	1	6	12
Puzzles	Put all three pieces of same puzzle	1	4	
	Put a piece in sequence	1	12	16
Tapes	Use of preselected vocabulary	2	40	40

PROGRAMMED SEQUENCE ACHIEVEMENT GAIN TEST-ENTOMOLOGY
SCORE SHEET

Name: _____ PRE or POST Testing Date: _____
First Last

School: _____ Score: _____ Examiner: _____
last

1a___	1. Identity Group: (18 pts)	a. insect	b. animal	c. identity
1b___				
1c___		(7)	(7)	(4)
1T___				
2a___	2. Flannel Board: (9)	a. B	b. D	c. C	d. G
2b___					
2c___		(2)	(2)	(3)	(2)
2d___	3. Insect Replica: (12)	a. styrofoam	b. name	c. movement
2T___				
3a___		(3)	(3)	(6)
3b___				
3c___	4. Match-Stages: (8)	a. stages		
3T___				
4a___		(8)		
4T___				
5a___	5. Drawing: (11)	a. legs	b. attachment	c. wing-an
5b___				
5c___		(6)	(3)	(2)
5T___				
6a___	6. Environment: (12)	a. harmful	b. helpful	c. both
6b___				
6c___		(3)	(3)	(6)
6T___	7. Puzzles: (16)	a. similarity	b. sequence
7a___			
7b___		(4)	(12)
7T___				
8a___	8. Tapes: (40)	a. responses	
8T___		x2	

Total _____ 126

Comments:

Verbal Directions and Procedure for PSAG Test

The hidden tape recorder was turned on. "Hello, (child's Name), I have some special games and I was wondering if you would like to play them with me?" The experimenter mixed the 9 x 12 cards randomly by shuffling. Then, the cards were held in the experimenter's hand so the child could see only the front card. "I'll show you these pictures one at a time. When you see an insect picture tell me." As the picture cards were presented one at a time the experimenter asked the child, "Is this a picture of an insect?" The cards were placed at the back of the stack and the child saw each picture only once. When the butterfly, grasshopper, cicada and dragonfly picture appeared the experimenter asked the child, "Can you tell me the name of this insect?" If no reply the child was asked, "What do we call this insect?"

The experimenter then placed the three flannel boards on the table in front of the child. The first board had a scene of water and cat-tails, a tree and brown ground was on the next, flowers, grass and sky composed the third board. "Look, here is a flannel insect. I want you to place the insect on the flannel board. Put it where the insect lives or where you have seen it." As the child would place it he was asked, "Have you seen it anywhere else?" The experimenter permitted the child to place each insect three different times, if he chose to do so. The felt insects were presented in the predetermined order. The order was such that the child began and ended with an easy insect. The grasshopper was first, dragonfly second, cicada third, and butterfly last.

As the experimenter dumped the three styrofoam body pieces onto the table, she told the child, "I want you to make me an insect. What

did you make? Do you know the name of this body part of the insect?" The experimenter then pointed to each piece. The styrofoam pieces were then put away. Next a plastic grasshopper was placed before the child. "Pick this insect up. Show and tell me how it moves. Can it move another way? Is there any other way it can move?" The grasshopper was put away and the procedure was repeated with each of the following insects: cicada, dragonfly, butterfly.

For the next game the experimenter placed the magnetic board that held the adult picture of the butterfly, bee, beetle, and dragonfly before the child. Also, on the magnetic board, to the right of the adult pictures, were places for four matching pictures of an earlier stage of the adult insect. As the four pictures of an earlier stage of the insect were randomly placed in front of the child the experimenter told the child, "These are baby insects. I want you to pick up the baby or young insect and place by its parent on the board." If the child hesitated the experimenter pointed to the young insect pictures and said, "These are pictures of young insects." "How do you think this adult insect looked when it was young?" The experimenter then pointed to the magnetic board and the first adult picture. The exact procedure was followed for the second magnetic board with pictures of a fly, ladybug, grasshopper, and cicada.

The score sheet that was being used by the experimenter was then turned over and placed near the child. The child was handed a lead pencil. "I want you to draw a picture of an insect on this paper for me. It can be any kind of an insect you want to draw." If the child hesitated in beginning to draw, he was told, "You can draw any kind of an insect. It doesn't have to be very good." When the child appeared

to finish the picture the child was asked to, "tell me about the picture." Each part of the picture was then pointed to by the researcher.

"Now I have another game. Look, here are some insects that can be helpful, harmful, or both helpful and harmful. Would you pick up the insects that you think are harmful and put them in my hand? Would you pick up the insects that you think are helpful and put them in this hand?"

Next the experimenter placed two three-piece sequence boards on the table. The six square pictures that made up the sequence of metamorphical growth were randomly placed above the sequence boards. Care was taken that the three life stages of one insect were not placed next to each other. The child was told, "These are pictures of two different insects. I want you to pick out the three pictures that show the way the one insect grows. I want you to put them in order the way the insect grows from the baby to the parent in this board here." Experimenter pointed to the first board on the child's left. "Then you can pick out the other three pictures and place them in the way this insect grows from the baby to the parent." These six puzzle pieces were removed and the same procedure was repeated for the second group of six pieces.

The above details make up the test proper; however, for the last test question the tape recorder was turned on at the beginning of the test session and turned off at the end. The child was identified by name several times during the recording. This enabled correct identification when analyzing the tapes for preselected vocabulary words at a later time.

APPENDIX D

VERBAL DIRECTIONS FOR USE OF THE BOOTH

Verbal Directions for Use of the Helicopter Booth

Since the main purpose of the booth was to create a stimulating learning environment for individualized instruction of young children, the instructions for use were limited to the following:

1. Would you like to sit in the helicopter?"
2. "You can make the movie and sound go like this." (Experimenter operates machine once pushing forward on the control lever to start the movie and synchronized sound and pulling backward to stop it.)
3. "Now you can do it." (If subject does not respond, ceases to respond, or asks questions, experimenter repeats instructions two and three.)
4. "You may watch the movie if you want to."
5. The session is terminated when subject stops the film for two minutes or a cycle is completed.
6. (After the film is viewed one time a blank white space appears on the screen before the film automatically begins to repeat.) "All finished?" or "You have seen the film, you may get out of the helicopter now, you can watch the movie again another time."

APPENDIX E

MOVIE SOUND SCRIPTS

Entomology Program Sound Scripts

Movie Sound Script for Butterfly

"Program Entomology. The Butterfly. Butterflies are insects. This is a Monarch Butterfly. You can hold Monarch Butterflies in your hand. Butterflies have many colors: blue, orange, and brown and yellow. Can you see the colors? Some butterflies are small and some butterflies are big. Butterflies are helpful because they are so pretty. I saw a butterfly one day. And watched it fly around. I crept after the butterfly to catch it but it landed on the ground. All butterflies have six legs. Butterflies' legs are small and hard to see. The butterfly has two antennae on the top of his head. One, two. Two antennae. Now let's count the butterflies' legs: one, two, three, four, five, six. All butterflies have four wings. One, two, three, four. One, two, three, four. They have two front wings and two back wings. Here is a Monarch Butterfly. Have you seen a Monarch Butterfly? Every butterfly has three main body parts. The head is first. The thorax is the middle body part and the abdomen of the tail is last. These are butterfly eggs. The mother butterfly lays round eggs on leaves. This is a caterpillar. Caterpillars are young butterflies. The caterpillar grows into a butterfly. The beautiful butterfly then flies away. Here are three cocoons. Butterflies are our friends. The egg changes into a caterpillar. Then the caterpillar changes into a cocoon and the cocoon changes into a pretty butterfly."

Movie Sound Script for Grasshopper

"Program Entomology. The Grasshopper. The grasshopper is an insect. Have you ever found a grasshopper? There are different colors of grasshoppers. There are large grasshoppers and there are smaller grasshoppers. See the different sizes and shapes of grasshoppers. Grasshoppers are harmful because they eat leaves of plants. One, two, three, four, five, six. Grasshoppers have six legs. Grasshoppers have the antennae on their head. Grasshoppers have long and strong back legs to jump with. One, two. Two back legs. The grasshopper has three main body parts. One, two, three. The head is the first body part, the thorax is the middle body part and the abdomen is last. Head, thorax, and abdomen. See the three body parts. The mother grasshopper lays long thin eggs underground. See the two adult grasshoppers. See the two small grasshoppers. Young grasshoppers are called nymphs. Young grasshoppers do not have wings. This grasshopper is growing wings. This mother grasshopper has long wings. Can you point to the grasshopper in this picture? Here is the grasshopper."

Movie Sound Script for Cicada

"Program Entomology. The Cicada. Cicadas are insects. Cicadas are also called locust. Cicadas have two eyes. Cicadas make a very loud noise. Some people don't like the noise. Cicadas have six legs. Here is a shell of a cicada. It has six legs. One, two, three, four, five, six. Cicadas have four wings. One, two, three, four wings. One, two, three, four. Cicadas have three main body parts. Head, thorax and abdomen. One, two, three body parts. Cicada are harmful because they damage trees. The mother cicada lays her eggs on branches.

Young cicadas are called nymphs. They crawl out of the ground to shed their skins. Cicadas have large eyes. Here are three skins or shells of a cicada. See the two cicada skins. Can you point to the cicada skins?"

Movie Sound Script for Dragonfly

"Program Entomology. The Dragonfly. Dragonflies have four wings. Two front wings and two back wings. Dragonflies have two antennae and two eyes. One, two, three, four. The dragonfly has four wings. One, two, three, four. Dragonflies have six legs. Dragonflies have three main body parts--head, thorax, and abdomen. The head is first, the thorax is second, and the long tail or abdomen is last. The dragonfly has a very long tail. Do you see the very long tail? Mr. Dragonfly, would you like to watch television? It looks like the dragonfly is going to have trouble sitting down because of his long tail. There, I think he's finally comfortable. Young dragonflies live under the water. Young dragonflies are called nymphs. The dragonfly lays eggs near water. There are different colors of dragonflies. Dragonflies have large eyes. Some dragonflies are large and some are small."

APPENDIX F

INDIVIDUAL TEST SCORES

TABLE IX

INDIVIDUAL FOUR-YEAR-OLD NURSERY SCHOOL SUBJECTS' PSAG TEST SCORES (N=13)

Child No.	Males		Child No.	Females	
	Pre-Test	Post-Test		Pre-Test	Post-Test
1	54	49	8	30	48
2	35	37	9	32	38
3	59	59	10	48	53
4	43	49	11	37	46
5	45	49	12	50	46
6	25	42	13	44	47
7	27	27			

TABLE X

INDIVIDUAL FIVE-YEAR-OLD CLASSROOM KINDERGARTEN SUBJECTS' PSAG TEST SCORES (N=28)

Child No.	Males		Child No.	Females	
	Pre-Test	Post-Test		Pre-Test	Post-Test
1	76	79	15		66
2		67	16		61
3		79	17	40	49
4	54	50	18		45
5	52	59	19	49	58
6		58	20		30
7		69	21		60
8	96	96	22	64	56
9	55	66	23	49	52
10		45	24		54
11		59	25	102	109
12		37	26	44	53
13	52	47	27		68
14	29	43	28	55	84

TABLE XI

INDIVIDUAL FIVE-YEAR-OLD OUTSIDE THE CLASSROOM KINDERGARTEN SUBJECTS' PSAG TEST SCORES (N=24)

Child No.	Males		Child No.	Females	
	Pre-Test	Post-Test		Pre-Test	Post-Test
1	87	104	13		60
2		55	14	54	78
3	72	94	15		71
4		77	16	59	74
5	37	50	17		73
6	63	90	18		78
7		93	19	72	102
8	73	84	20	66	87
9		60	21		70
10	56	76	22	55	75
11		67	23	40	64
12		105	24		74

VITA

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Master of Science

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