# RELATIVE EFFECTIVENESS OF TWO PERSONAL INTERPRETIVE METHODS AT A COMMUNITY NATURE CENTER

Thesis for the Degree of M. S.

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ABSTRACT

RELATIVE EFFECTIVENESS OF TWO
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By

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Due to the small amount of interpretive research that has been reported, the interpretive naturalist today has little scientific reasoning to use as a resource when determining goals and priorities. It is the desire to give the interpreter scientific evidence, rather than opinions and simple observations about interpretive programs, that has prompted this investigation. Through its results the interpreter should know which of two interpretive methods will better 'get the information across' to the attending public.

The guided nature walk and the illustrated slide program are the interpretive methods compared for effectiveness in this study. These interpretive methods are used because there is subjective literature which infers superior effectiveness for each type of program.

The topic for the programs was "Insects and their Homes." The same information was presented at all the

programs and the people were not informed of the research study. After the programs the people were tested on the information presented.

The communication factors of the perceived source of the information and the environment in which the programs were presented were controlled for the research.

A control group that had not seen the programs was tested to determine what effect the pre-test knowledge of the participants was having on the test results.

The data from the testing was collected into cross-break tables and tested for significant differences using the standard T test for independent means, with the significance level for the testing set at .05.

Hypothesis: Given the same information, those persons attending a guided nature walk will retain more information than will those persons attending a slide presentation.

No significant difference was noted between the two types of programs. A significant difference was noted between the control group and the program groups, the program groups scoring nearly twice as high on the test as did the control group.

Although no other reliable significant differences were noted, there were several other interesting results of the testing.

Age and sex of the respondent appeared to be

important factors in the test results. Adult men and women scored slightly higher at the slide programs, as did teenage and younger boys. Teenage and younger girls, however, scored higher at the guided nature walks. Boys generally scored higher than girls and adult women generally scored higher than adult men.

Persons in the control group were generally upset and depressed after taking the test, complaining of its difficulty.

The people in the program groups reacted very positively to the testing, and seemed to have a better interpretive experience because of it.

This study has two main limitations. The control group was selected from visitors at the nature center, and can not necessarily be considered representative of the populations at the programs. The small sample size and use of only one topic and site limits the extent to which the results of this study can be applied in the interpretive field.

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# CHAPTER I

## INTRODUCTION

Today there is a demand for good interpretation and for new interpretive methods that has never before existed. Indeed, the very concept of interpretation is relatively new,[1] starting formally in the National Park Service between 1916 and 1920. Since then the idea has spread to state and local areas and the acknowledgement of its importance has risen steadily.

The growth of the need for environmental and historical interpretation in the United States can be correlated largely to changing population characteristics, specifically, higher education, more affluence, and more leisure time. These characteristics, together with

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[1]Two current definitions of interpretation are expressed by: 1) Freeman Tilden, in his book, Interpreting Our Heritage, "Interpretation is an educational activity which aims to reveal meanings and relationships through the use of original objects, by first hand experience and by illustrative media, rather than simply to communicate factual information." 2) Paul H. Risk, in notes taken from his class Principals of Environmental Interpretation; "Interpretation is the transmission of technical information in nontechnical language, with no loss of accuracy, in such a manner as to promote understanding, appreciation, and commitment on the part of the listener."

faster and better communication and transportation, are creating a growing public interest in viewing, taking part in, and understanding the natural history of man and nature.

Most of the burden to meet the new demand for good interpretive methods is imposed directly on the personnel of museums, nature centers, and public and private parks throughout the nation. It is here that the first real log-jam in the downstream flow of events is encountered. Essentially, there is very little material at one's disposal for planning interpretive programs other than one's own and others' experiences and conclusions drawn from subjective reasoning. Ben D. Mahaffey (1969) states that "cumulative, personal observations are helpful, but controlled studies with quantitative results are needed to isolate and identify variables, where possible."

There is, very clearly, a great lack of objective literature for planners to turn to when setting up interpretive programs. The first real analysis of interpretive theory, Interpreting Our Heritage, was written in 1957 by Freeman Tilden. After fifteen years, this book is still the foremost reading material on the subject of interpretation, and yet it is based for the main part on subjective reasoning and opinions drawn from observations of and participation in interpretive programs.

Today, when administrative boards are requiring

objective reasoning and scientific research to back up budget requests, interpretive programs can not begin to compete for funds with agencies that have research departments and economically quantifiable products. The field of interpretation needs a body of scientific research to turn to in these situations.

The subjective approach by Tilden has, however, laid important groundwork for the future of interpretation to be built upon. It has already precipitated the first sprinkles of scientific research concerning interpretation. But it is due to the presence of only a small amount of research that the interpreter is often left in an unenviable situation. He is frequently left short of funds, and has very few objectively determined facts on which to base priorities and goals. Should he use interpretive methods which will superficially approach everyone or should he concentrate on deeply involving one small group? Should his main priority be to impart factual information, to entertain, to change attitudes, or to act as a recreational center? Should he use interpretive methods operated by people or mechanical devices?

With the present lack of interpretive research it is impossible for the interpreter to know with any certainty which interpretive method, or combination of methods, will best achieve his goals. This lack of knowing what can be achieved with the different

interpretive methods, relative to each other, is, I feel, of major importance in the production of good interpretation today. Along with knowing the best way of planning and producing any interpretive method, it is important to know which method is best to use.

## Setting For Research Study

This study was conducted at the Carl G. Fenner Arboretum located within the city limits of Lansing, Michigan. For the reader to better understand the setting in which this study took place, a physical and demographic description of the Arboretum and the Lansing area follows.

Fenner Arboretum is operated through the Department of Parks and Recreation in Lansing and is the second most heavily used park in the city. The general purpose of the Arboretum is expressed in the "Welcome" pamphlet which is available to visitors.

> It is direct, personal experience in the world of nature that the Arboretum offers the families of Lansing. It gives the visitor the opportunity to see for himself insects, flowers, and ripening fruit; to see animals and plants in their natural surroundings. Each experience adds to his knowledge of the "web of life." He will come to know nature instead of merely knowing about it from books and pictures.

The nature center contains 121 acres, primarily with areas of prairie, non climax wooded areas of planted pine and maple, meadows, and marsh areas largely filled with dead elms. There are two man made ponds in the

Arboretum, one containing wild ducks, geese, and swans. Live animal exhibits out-of-doors include a prairie exhibit with buffalo, Texas long horn cattle, and prairie dogs. A pair of bald eagles are also exhibited.

Physical facilities within the park include parking and picnic areas with tables and cooking grills, 3.4 miles of nature trails, and a centrally located nature center building. Two shelters and refuse containers are located along the trails. The nature center building has two stories, the basement being used for storage and maintainence work with public rest rooms and a photographic dark room. The main floor consists of interpretive exhibits, a nature library, a lecture room, and the main office.

Fenner Arboretum has a budget of $37,500 (1971) and employs four persons full time, two maintainence workers, a naturalist and a ranger guide. The interpretive facilities of the park include an outdoor ampitheater which seats 200, a pioneer log cabin, the exhibits already mentioned, an Indian garden exhibit, an outdoor classroom, and the nature center building.

The interpretive staff is responsible for developing physical interpretive facilities, for developing public programs, and for presenting programs to specific groups attending the nature center.

In the "Annual Report for 1971," naturalist Joan Brigham states that at Fenner Arboretum "The interpretive

staff came in contact with a total of 22,000 Lansing area residents during 1971." She goes on to state that this figure of 22,000 represents public school groups, nursery school groups, college students, Cub Scouts, Brownies, Girl Scouts, physically handicapped, mentally retarded, deaf, blind, and many other groups, as well as those persons attending the public programs. The interpretive staff is available to the public Tuesdays through Fridays, and as such see only a fraction of the people that actually visit the Arboretum. The nature center itself is open to the public seven days a week.

The population that attends Fenner Arboretum is drawn from the entire greater Lansing metropolitan area. The 1972 Editor and Publisher Market Guide gives the population of the standard metropolitan statistical area of Lansing as 378,423 (1970). According to Sales Management Marketing Magazine of July 10, 1971, in the Lansing area 16% of the households have an annual income below $5,000, 22% have incomes between $5,000 and $8,000, 18% are between $8,000 and $10,000, and 36% of the households have incomes above $10,000 annually.

"Facts and Figures on the Greater Lansing Metropolitan Area," a publicity booklet printed by The State Journal, the Lansing daily newspaper, gives the following facts on the Lansing area.

The city of Lansing is the capitol of Michigan and employs 1,468 with a payroll of more than $12,921,610.

The average family size is 3.34 and the average household income is $10,914 annually. Forty eight percent of the population is under 25 years of age and 43.3% is between 25 and 65 years of age.

The largest industries in the area are the Oldsmobile-Fisher Plants, the State Government, and Michigan State University.

Fenner Arboretum is located in the south eastern part of Lansing, one mile from the University campus and 3.5 miles from the state capitol buildings in downtown Lansing.

## Problem Statement

The objective of this study is to compare the relative effectiveness of two interpretive methods by comparing the information retained by persons attending an interpretive program illustrated by slides, and by persons attending a guided nature walk, the same topic and information being presented at both programs.

## Hypothesis

The hypothesis of this study is: Given the same information, those persons attending a guided nature walk will retain more information than will those persons attending a slide presentation.

The slide program and guided nature walk were chosen for two reasons: first, because of their extensive use in the interpretive field, and second, because

of the relatively large amount of subjective literature and opinions held that one or the other of these two methods is superior to the other. The guided nature walk is hypothesized to show better test results because the arguments stating its advantages are, to me, more convincing than the arguments for the slide presentation. Information retention is used to test whether one is 'superior' or not because of its ease of objective analysis, as compared to analyzing for more intangible qualities, such as attitude change, entertainment, or relaxation.

## Related Research

There is very little research to be found in the literature that is related to this topic. In his report, "Relative Effectiveness and Visitor Preference of Three Audio-visual Media for Interpretation of an Historic Area," Ben D. Mahaffey (1969) states,

> Prominent people working in the interpretive field across the nation undoubtedly have their own ideas of which types of media are most effective, especially in selected areas. These choices are based upon experience, informal observation and personal intuition. This author was unable to find any studies published by the federal agencies or other organizations concerning effectiveness or preference for media. Letters to the National Park Service and the National Forest Service indicate no plans for research in the immediate future have been formulated. A personal interview with Raymond Nelson, Director of the Stephen T. Mather Interpreters Training and Research Center resulted in the response: ". . . we have done no research into methods or media and plan to do none in the near future. . ."

Mahaffey gives further evidence of the lack of research in a quotation he takes from James C. Allison's unpublished master's thesis, "Analysis of Interpretive Media and Their Application to Spence Gulch, Idaho" (1969). "Research concerning the effectiveness of interpretation is scarce. Most interpretive literature is descriptive and subjective in nature...practical field experience and imagination form the basis of present day interpretive techniques."

Mahaffey perhaps has done the only research which is closely related to this study. In his paper, "Relative Effectiveness and Visitor Preference of Three Audio-Visual Media for Interpretation of an Historic Area," he compared the relative information retention derived from interpretive programs using a leaflet, a sign, and a message recorder. His results showed no significant difference in the effectiveness of the three media. Mahaffey (1969) also concludes, significantly, that "Effectiveness is intercorrelated with preference because a visitor will have a low perception and information retention when faced with a non-preferred medium. The reverse is not necessarily true, however, a preferred medium is more likely to induce high perception."

Concerning the two interpretive media used in this study, there is literature of a subjective nature which

favors each method, all of which sounds intuitively reasonable.

Freeman Tilden (1957) writes, "The visitor does not so much wish to be talked at as to be talked with." Tilden goes on to say that participation on the part of the observer creates better interpretation. "Not only must (participation in interpretation) imply a physical act, it must also be something that the participant himself would regard as, for him, novel, special, and important." He continues by stating, "The point I make is that participation and demonstration are such priceless ingredients of interpretation that we should diligently search for possibilities and never let slip a real opportunity for including them."

Byron Ashbaugh (1970), in his article, "New Interpretive Methods and Techniques," states, "Educational research has shown that efficiency of learning varies directly with the number of senses that are exercised in an interpretive situation."

These quotations infer that that interpretive method which lets the visitor talk freely with the interpreter, and allows the visitor the most physical participation and the involvement of the most of his senses will be the better or best of any two interpretive methods.

This reasoning suggests a superior position of guided nature walks to illustrated slide programs,

since the guided nature walk would appear to offer more of a give and take action between the naturalist and the group. People on a guided nature walk have more chance to enter into the discussion, to ask and answer questions, than people at a slide presentation. The interpreter's approach on a guided nature walk can be changed to meet the particular needs of specific groups. Some amount of physical participation is required on a nature walk, and almost all senses of one's body become actively involved. Also, on a guided nature walk the real object is observed by the person, whereas in a slide program a person sees nature through the eyes of the photographer, not his own, which might make it difficult for him to relate with what he has seen later on (the photographer may, however, be able to illustrate examples better than a participant could see with his own eyes).

A slightly different view is expressed by Mahaffey (1969) where he uses Marshall McLuhan's expressions of "high and low definition mediums." He states that, "A 'high definition' medium requires less participation and effort by the receiver than a 'low definition' medium. The public could probably be expected to favor 'high definition' media in recreational or interpretive areas."

This reasoning favors a slide program over a guided nature walk, since it would seem that there is

less conscious effort and participation required from attendance of a slide program, where all that is required is attention.

Mahaffey (1969) also states that, "No known studies have been found to substantiate this opinion. The effectiveness in terms of retention of correct informational data, in a recreational atmosphere, by either class of media, is apparently not known."

Another argument favoring slide type programs might be that people are more 'ready' psychologically to accept new facts at a lecture-slide type presentation because of the classroom atmosphere, in contrast to a nature walk. It could be argued that people are 'conditioned' to learn faster or better in a classroom situation, where most past experiences of conscious learning have occurred.

It is a difficult process to react objectively to much of this literature without letting it bias one's own ideas, mainly because it is so intuitive in nature. This is what has been happening with many interpreters, who, after reading the literature and having personal experiences simply 'know' that one interpretive method is better than another. Before scientific research has occurred to give possible proof, attitudes such as these can very easily lead to practices which do not give the highest and best use of an interpretive area.

## Assumptions

There are a number of assumptions which must be acknowledged before this research paper contines further. Some of these assumptions may appear questionable as to their validity. However, in conducting research in a field which has a very small amount of past research, assumptions must be made to 'limit' the variables of the study. It is only after some degree of initial research has been accomplished that the assumptions themselves can be researched, using the 'ground work' for support. I suggest that interpreters look toward the assumptions of initial research studies when seeking needed areas of interpretive research.

The assumptions for this research project are:

1. That subject matter used in interpretive programs has no effect on the relative effectiveness of the two interpretive methods used.
2. That information retention is a valid method of testing the relative effectiveness of the two interpretive methods used.
3. That the ability of the interpreter for the programs is average, or at least not superior nor inferior enough to significantly alter the test results because of his ability alone.

4. That the visitor is attending a program of preferred media, since he is responding to publicity in which he was given a choice of programs to attend.
5. That the people in the control group are similar enough to the people attending the interpretive programs for a valid comparison of the two groups to be made.
6. That I, when developing the programs, did not exert influence in the form of technique that would bias the results toward one program or the other.

# CHAPTER II

# DESIGN AND METHODS

## Development of the Interpretive Programs

The general design of this study was structured with the idea of comparing interpretive programs which were representative of a real situation. Many conditions which would be strictly controlled to increase the validity of the research were necessarily left uncontrolled in this case to meet the real situation requirement. Examples are, not waiting for perfect weather conditions to give the guided nature walks, not giving the test in the same place for both groups, and not using the same lecture approach for the two types of programs.

Developing the slide program and the guided nature walk so that each program could present the same information in its own particular style was an important part of the research. The subject "Insects and their Homes" was chosen because of its adaptability to this problem. Observations were made concerning what insects could be found frequently at the nature center, and the slide program was developed using these observations.

After the slide program had been prepared, the nature walk was developed by following nature trails where examples could be found of the topics discussed in the slide program.

This does not mean that the same information was presented in the same way for the two types of programs. In the slide programs, for instance, several examples of mimicry were used during one part of the presentation. On the guided nature walk, however, examples of mimicry usually occurred at two or three different places, and for this reason the concept was usually discussed more than once. These differences in method of presentation are considered normal and representative of a real situation.

I took all pictures for the slide program, which insured a uniform photographic style and eliminated a possible variable where participants would have had to adjust to different styles during the program. I was also the interpreter at all the programs, which maintained a level of consistency and assured that the same information was presented at all programs.

There was no attempt made to make the two programs equal in length since normally there is no such limitation put on either type of program. The programs were, however, approximately equal, the slide program lasting fifty five minutes and the guided nature walk from fifty to seventy minutes. The nature walk varied in length

because of changes in weather conditions, size of groups and type of people attending, and because of the chance involved with finding interesting examples one day while finding few on another.

## Development of the Test

Development of the test was one of the most difficult parts of the research (a copy of the test is in the appendix). Twenty six questions were asked, three of which were of the classification type. These will be discussed shortly. The remaining twenty three questions concerned the program. Seventeen were of the multiple choice type and six were of the short answer completion type. This kind of objective testing maintains a minimum of bias from the researcher and the respondent. This is so since there is only one correct answer for each question, and because every respondent is exposed in the same manner to each question, by reading it on the test sheet. Thus, the respondent's reaction to each question is his own, and is not influenced by the researcher differently than any other respondent's reaction. The researcher can not add his bias when correcting the tests, since only one answer is acceptable for each question, and since that answer is not subject to any interpretation by the researcher.

Testing of this kind should be considered sufficient for comparing retention of information presented at the

programs. Robert Ebel (1965) states that "It is not true that one type (of test) tests real understanding whereas another tests only superficial knowledge." He continues saying, "It is not true that luck is a large element in scores on one type (of test) and nearly totally absent in another. On the contrary, all three types (essay, objective, and problem) can require much the same kind and level of ability, and if carefully handled can yield results of almost equal reliability."

Multiple choice questions were constructed according to the guidelines put forth by Robert Ebel (1965) in Measuring Educational Achievement, ". . . listing responses to multiple choice items rather than arranging them tandem makes the students task easier. Designation of alternatives by number is simple and convenient." Completion questions required one word or one number answers.

The classification questions asked were age, sex, and occupation-profession. An attempt was made to keep these questions at the bare minimum, since people often respond negatively to personal questions. As Oppenheim (1966) states, "As we have noted, classification questions such as occupation, income, education, and even age, lend themselves very readily to prestige bias." Since it was not the people attending the programs that were to be studied, but rather the information they retained, age,

sex, and occupation profession were felt to be enough personal information about the respondents.

Ebel (1965) states that, "The number of questions to include in a test is determined largely by the amount of time available for it." This was kept in mind when determining the length of the test. The intention was to test the respondents as extensively as possible without causing a negative response from them. A respondent might react with a negative attitude if he felt the test took too much of his time or if the test were depressing because of its difficulty.

## Communication Factors Considered in Program Delivery

There were several variable factors affecting the participants acceptance of the information presented at the programs. These factors were controlled to some degree in order to reduce the variable factors affecting the research. Hovland, Janis, and Kelley (1953) discuss these factors in their book Communication and Persuasion,

> It is assumed that there are three main classes of stimuli present in the communication situation which are capable of producing the shifts in incentive described above. One set of stimuli has to do with the perceived source of communication. Another involves the setting in which the person is exposed to the communication, including, for example, the way in which other members of the audience respond during the presentation. Communication stimuli also include important content elements, referred to as "arguments" and "appeals." Whether or not stimuli of these various types operate successfully as incentives depends upon the predisposition of the individual. A successful communication is one in

> which these various stimuli are both adapted to the level of verbal skill of the individual and capable of stimulating his motives so as to foster acceptance of the recommended opinions.

The first factor, the observable characteristics of the perceived source of communication, was controled by having only one source. It is true that whether a person is willing to accept new facts depends to some degree on the credibility of the 'giver of the facts.' A statement concerning this is made by Hovland, Janis, and Kelley (1953). "An important factor influencing the effectiveness of a communication is the person or group perceived as originating the communication, and the clues provided as to the trustworthiness, intentions, and affiliations of this source."

I introduced myself at the programs as a graduate student at Michigan State University in the Park and Recreation Resources Department studying to become a naturalist. I told the groups that the study of insects had been a great personal interest of mine for many years. This introduction gave the groups a common bond with me, i.e., an interest in insects, and affiliated me with a respected institution of learning. The people were made to feel that I was qualified to lead the program, and yet not that I was in any way better than they. This is an important factor. Freeman Tilden (1957) writes that the visitor does not hold the interpreter in awe, he feels equal with him, he simply feels

the interpreter is knowledgeable about a subject he himself knows little about.

The second factor, that of the setting in which the person is exposed to the communication, is what this research is mainly concerned with. Settings for the programs were controlled to a large degree. For the slide presentation the people were in an enclosed, darkened, lecture room in a nature center, for both the program and the testing, with light for the testing. The guided nature walks took place entirely out-of-doors. The test was given in a quiet maple grove where the people would not be interrupted. As a result, all people were tested in an environment similar to the one in which the respective programs were presented.

The third factor, the use of arguments and appeals, was carefully avoided as part of the programs. Besides affecting attitude changes, which are not being tested in this research, this type of stimulus could also affect one's credibility with the group and the desire to retain information on the part of the participants. Therefore, appeals and demands were avoided with care.

## Control Group Testing

A control group was tested to determine that the information learned by respondents attending the programs was sufficient to test whether more was learned at the slide presentation or the guided nature walk. If people

that had not seen the programs could score as high on the test as those that had, then the relative effectiveness of the two interpretive methods could not be compared using this procedure. However, if it could be demonstrated that a large amount of the information being tested for was actually learned at the programs, then the hypothesis of this study could be tested using the proposed procedure.

The control group was made up of persons visiting the nature center where the presentations were given. On days and at times similar to those on which the programs were presented, all visitors entering the nature center were approached and asked to take the test. These dates and times were September 11 and 19, 1971, between one and three thirty in the afternoon.

## Publicity for the Programs

The programs were publicized in the Lansing, Michigan daily newspaper, the Lansing State Journal, and by fliers which were placed conspicuously at the nature center and in several Lansing area shopping centers (examples of fliers and newspaper publicity are in the appendix). The programs were not publicized in the Michigan State University newspaper, the State News, because its readers are college oriented and not representative of the general public. Undoubtedly, more people would have attended the programs had they been advertised

in the State News, because of the proximity of the nature center to the University campus. This, however, could have biased the test results, which was an undesirable effect. Even without this publicity, 10% of the respondents at the programs were college students.

Since the programs were publicized, the people were given the opportunity to attend the program using the kind of media they preferred. This eliminates from this research the variable that people will have higher perception when attending a program with a preferred media, relative to some other type of media (Mahaffey, 1969). For this study, all persons had a choice of attending either interpretive media offered, and for this reason are considered equal as to whether or not they were attending a program of preferred media.

## Order of Programs

The programs were publicized and presented between August and September of 1971, at Carl G. Fenner Arboretum in Lansing, Michigan. Each type of program was given four times, all the programs being given on weekends.

Generally, an alternating sequence was used in presenting the programs, as Table 1 demonstrates.

All programs were given at two o'clock PM with the exdeption of the Friday slide presentations, which were given at 7:30 PM. There was a conscious effort not to have two programs of the same type consecquitively nor

to have two programs of the same type on similar days in a two week period. This was accomplished with the exception of the August 27 slide presentation.

Table 1.--Calendar Order of Programs Presented.

| Day of the Week | Date | Type of Program |
|---|---|---|
| Saturday | August 21 | Guided Nature Walk |
| Sunday | August 22 | Slide Presentation |
| Friday | August 27 | Slide Presentation |
| Sunday | August 29 | Guided Nature Walk |
| Friday | September 3 | Slide Presentation |
| Saturday | September 4 | Guided Nature Walk |
| Sunday | September 5 | Slide Presentation |
| Monday | September 6 | Guided Nature Walk |

The alternating order of presentation was used to give the attending public a choice to attend a preferred time and type of program.

The participants were not informed until after each program that they would be tested or that they were part of a research project. If the people had known about the testing it might have acted as an incentive to learn or try to remember the information presented, which would not have been representative of a real situation. The

people were given the test immediately after the programs. Pencils and cardboard to write on were also handed out.

# CHAPTER III

# RESULTS

## Sample Population Composition and Comparison

Comparing the sample population of the slide programs and the guided nature walks shows a great similarity in the composition of the two groups. In fact, only twice is a difference of more than 5% observed between categories for the two types of programs. These two instances are in the categories of professionally employed and non professionally employed.

Table 2 contains the exact figures in the comparison of the sample populations of the slide programs and guided nature walks. Comparisons are made of the actual numbers attending the programs and of the percentage of the total population that each category represents, respective to each type of program.

The composition of the control group is also compared with the populations of the slide programs and the guided nature walks in Table 2. There are several differences that are notable in this comparison. Only one girl below the age of twelve is in the control group. There is no difference between the number of professionally

Table 2.--Demographic Characteristics of Test Sample For Slide Presentation, Guided Nature Walk and Control Group.

| Demographic Category | Total Number Attending | | | Percentage of Total Attending | | |
|---|---|---|---|---|---|---|
| | Slide | Walk | Control | Slide | Walk | Control |
| Adults (≥18) . . | 28 | 23 | 40 | 59.5 | 60.5 | 65.6 |
| Female . . . . | 15 | 13 | 20 | 31.9 | 34.2 | 32.8 |
| Male . . . . . | 13 | 10 | 20 | 27.6 | 26.2 | 32.8 |
| Teenagers (12-17). . . . . | 2 | 3 | 10 | 4.2 | 7.9 | 16.4 |
| Female . . . . | 1 | 1 | 3 | 2.1 | 2.6 | 4.9 |
| Male . . . . . | 1 | 2 | 7 | 2.1 | 5.3 | 11.5 |
| Youth (6-11) . . | 17 | 12 | 11 | 36.2 | 31.6 | 18.0 |
| Female . . . . | 8 | 5 | 1 | 17.0 | 13.2 | 1.6 |
| Male . . . . . | 9 | 7 | 10 | 19.2 | 18.4 | 16.4 |
| Total Females. . | 24 | 19 | 24 | 51.0 | 50.0 | 41.0 |
| Total Males. . . | 23 | 19 | 37 | 49.0 | 50.0 | 59.0 |
| College Students . . . . | 5 | 4 | 11 | 10.6 | 10.5 | 18.0 |
| High School and Below Students . . . . | 19 | 15 | 20 | 40.5 | 39.5 | 32.8 |
| Professionally Employed[a]. . . . | 13 | 13 | 12 | 27.6 | 34.2 | 19.7 |
| Non Professionally Employed . . . . | 7 | 2 | 12 | 14.9 | 5.3 | 19.7 |
| Housewife. . . . | 3 | 4 | 6 | 6.4 | 10.5 | 9.8 |
| Total | 47 | 38 | 61 | 100.0 | 100.0 | 100.0 |

[a]A professionally employed person is defined for this study as a person having a job requiring a college education.

employed and non professionally employed in the control group, while the differences are notable for the two interpretive groups. Also, the difference between total males and total females is much greater for the control group than for the two interpretive groups.

## Test Results Compared

In Table 3 comparisons are presented of the test results. These are comparisons of the average (mean) number of test questions answered correctly, and the mean percentage of test questions answered correctly.

## Hypothesis Tested

Using the standard T test for comparing two independent means, the means of the test results for the slide programs and the guided nature walks are compared. The null hypothesis is not rejected, there being no significant difference between the two means at the .05 level of significance. The hypothesis, which states that the guided nature walk will show significantly better test results than the slide program, is rejected. A 'T' value of 1.658 or greater is needed to show a significant difference at the .05 alpha level in this case, while the observed value is only 0.1592.

## Other Significance Comparisons

The control group test results are significantly different from those of the programs, the comparison

Table 3.--Test Results in Number and Percentage Correct for Demographic Categories of Slide Presentation, Guided Nature Walk, and Control Group.

| Demographic Category | Mean Number of Correct Answers (23 Possible) | | | Percentage of Total Correct Answers | | |
|---|---|---|---|---|---|---|
| | Slide | Walk | Control | Slide | Walk | Control |
| Adults (≥18) . . | 21.0 | 20.7 | 12.1 | 91.3 | 90.0 | 52.5 |
| Female . . . . | 21.6 | 21.5 | 11.5 | 94.0 | 93.5 | 50.0 |
| Male . . . . . | 20.3 | 19.6 | 13.2 | 88.5 | 85.4 | 57.5 |
| Teenagers (12-17). . . . . | 21.0 | 21.33 | 11.6 | 91.3 | 92.5 | 50.0 |
| Female . . . . | 19.0 | 22.0 | 8.3 | 82.5 | 95.6 | 36.0 |
| Male . . . . . | 23.0 | 21.0 | 13.0 | 100.0 | 91.3 | 56.5 |
| Youth (6-11) . . | 16.1 | 16.15 | 7.5 | 70.0 | 70.3 | 32.6 |
| Female . . . . | 13.25 | 16.0 | 4.0 | 57.5 | 69.6 | 17.4 |
| Male . . . . . | 18.6 | 16.4 | 7.9 | 81.0 | 71.4 | 34.3 |
| Total Females. . | 18.7 | 20.1 | 10.4 | 81.4 | 88.0 | 45.2 |
| Total Males. . . | 19.74 | 18.6 | 11.1 | 85.9 | 81.0 | 48.2 |
| College Students . . . . | 20.4 | 20.0 | 14.5 | 88.8 | 87.0 | 16.3 |
| High School and Below Students . . . . | 16.6 | 17.3 | 9.5 | 72.1 | 75.2 | 41.3 |
| Professionally Employed . . . . | 20.85 | 21.82 | 12.3 | 90.8 | 95.0 | 53.5 |
| Non Professionally Employed . . . . | 21.3 | 15.0 | 11.0 | 92.6 | 65.2 | 47.9 |
| Housewife. . . . | 22.0 | 20.0 | 8.8 | 95.6 | 87.0 | 38.1 |
| Total | 19.21 | 19.31 | 11.19 | 83.6 | 84.0 | 48.6 |

showing a 'T' value of 14.9 and a needed value of 1.980 or below to show no significant difference at the .05 level.

Only one category demonstrates a significant difference between the scores of the slide program and guided nature walk groups. That category is the non professionally employed, the 'T' value observed being 6.131 with a needed value of 2.160 or below to show no significant difference at the .05 level. This result is questionable, however, due to the small sample size of only two people in the guided nature walk section of this category.

The sample sizes of only one or two persons in all the categories for the teenagers makes significance tests for these groups highly questionable. The different youth categories have the widest percentage spread of the groups that have sample sizes large enough to validly test for significant differences. T tests for these groups shows that there is no significant difference in the scoring between the male or female youth attending the slide programs and guided nature walks.

Significance tests comparing the adult men and women attending only the slide programs shows no significant difference in their scoring at the .05 level. Comparing the scores of the adult men and women that attended the guided nature walks gave the same result.

Table 4 shows the results of the significance

Table 4.--Results of the T Test Applied to Test Scores For Demographic Categories.

| | Comparison of | | Observed T Value | Critical Value of T at $\alpha = .05$ | Significant Difference? |
|---|---|---|---|---|---|
| | Demographic Category | Interpretive Method | | | |
| 1. | All Scores<br>All Scores | Slide<br>Walk | .1592 | 1.658 | No |
| 2. | All Scores<br>All Scores | Programs<br>Control | 14.9 | 1.980 | Yes |
| 3. | Non Professional<br>Non Professional | Slide<br>Walk | 6.131 | 2.160 | Yes |
| 4. | Female Youth<br>Female Youth | Slide<br>Walk | 1.101 | 2.160 | No |
| 5. | Male Youth<br>Male Youth | Slide<br>Walk | 1.109 | 2.160 | No |
| 6. | Adult Females<br>Adult Females | Slide<br>Slide | 1.97 | 2.056 | No |
| 7. | Adult Males<br>Adult Females | Walk<br>Walk | 1.90 | 2.080 | No |

comparisons of test results of the different groups. A table giving 'T' values for the different levels of significance appears in the appendix.

# CHAPTER IV

## EVALUATION AND DISCUSSION OF RESULTS

### Hypothesis - Discussion of Results

Hypothesis: Given the same information, those persons attending a guided nature walk will retain more information than will those persons attending a slide presentation.

The null hypothesis is not rejected. Though the test results of the guided nature walks did show a mean slightly higher than did the results of the slide programs, the difference was not significant at the .05 level. T values, on inspection, would seem to suggest very nearly equivalent information retention at the two types of programs.

The similarity of the test results of the two groups becomes very apparent when some of the specific results are looked at closely. As an example; if the mean percent score of the persons attending the slide programs (83.6) is compared with the mean percent score of persons attending the guided nature walks (84.0), the similarity is striking, as is illustrated in Figure 1.

When comparing differences between the slide program

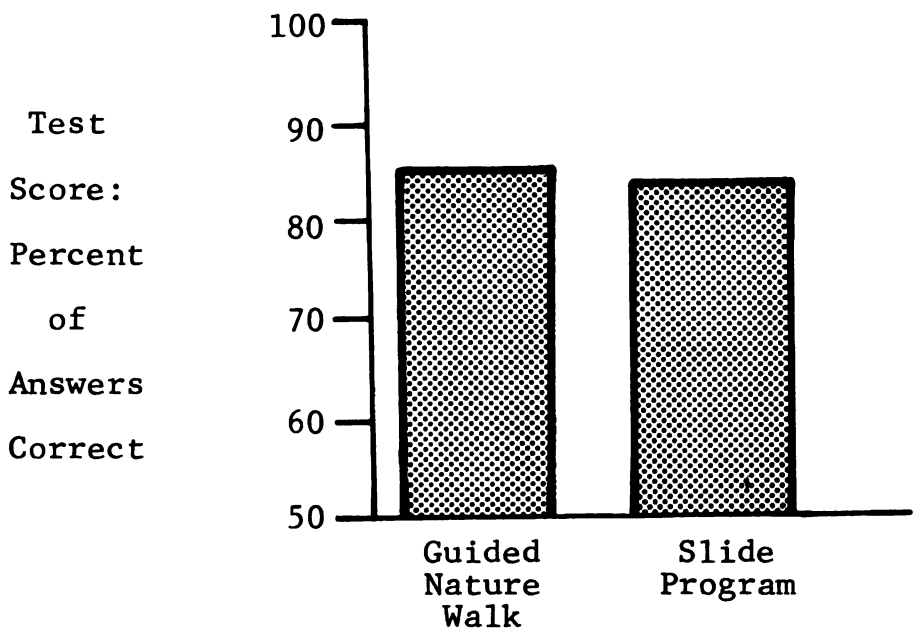


Figure 1. Comparison of test results showing mean scores in percentages correct for interpretive slide program and guided nature walk.

and the guided nature walk test results, the category of non professional employment alone shows a significant difference, the slide program scores being significantly higher (Figure 2). The validity of this result, however, is questionable due to the extremely small sample size of two people in the nature walk group in this category.

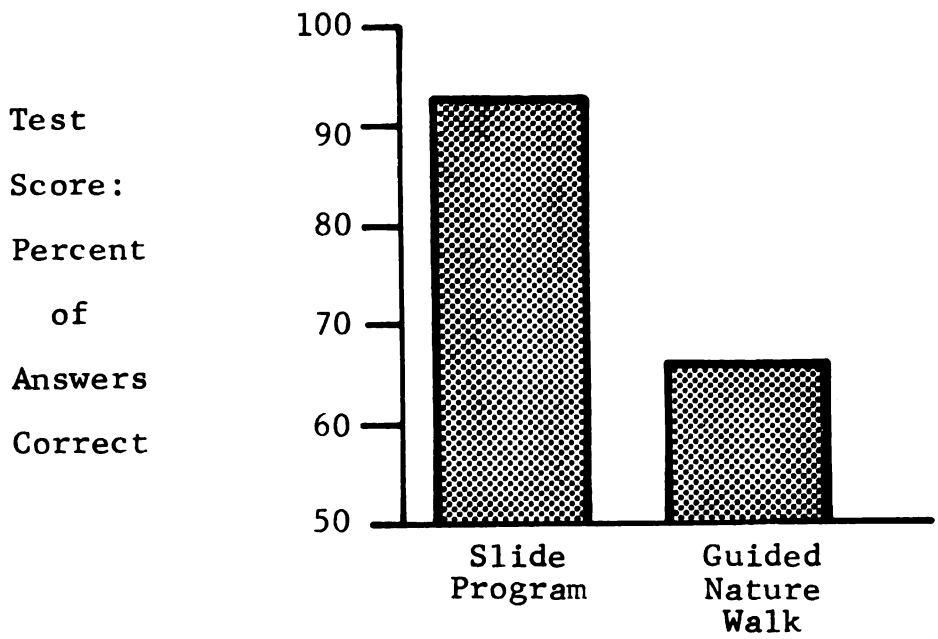


Figure 2. Comparison of test results between slide program and guided nature walk for people attending the programs that were employed in a non professional occupation.

Sample size also makes a comparison among the categories teenager, housewife, and possibly college students, questionable. Figures 3, 4, and 5 illustrate the different test results that occurred in these categories between the slide programs and guided nature walks.

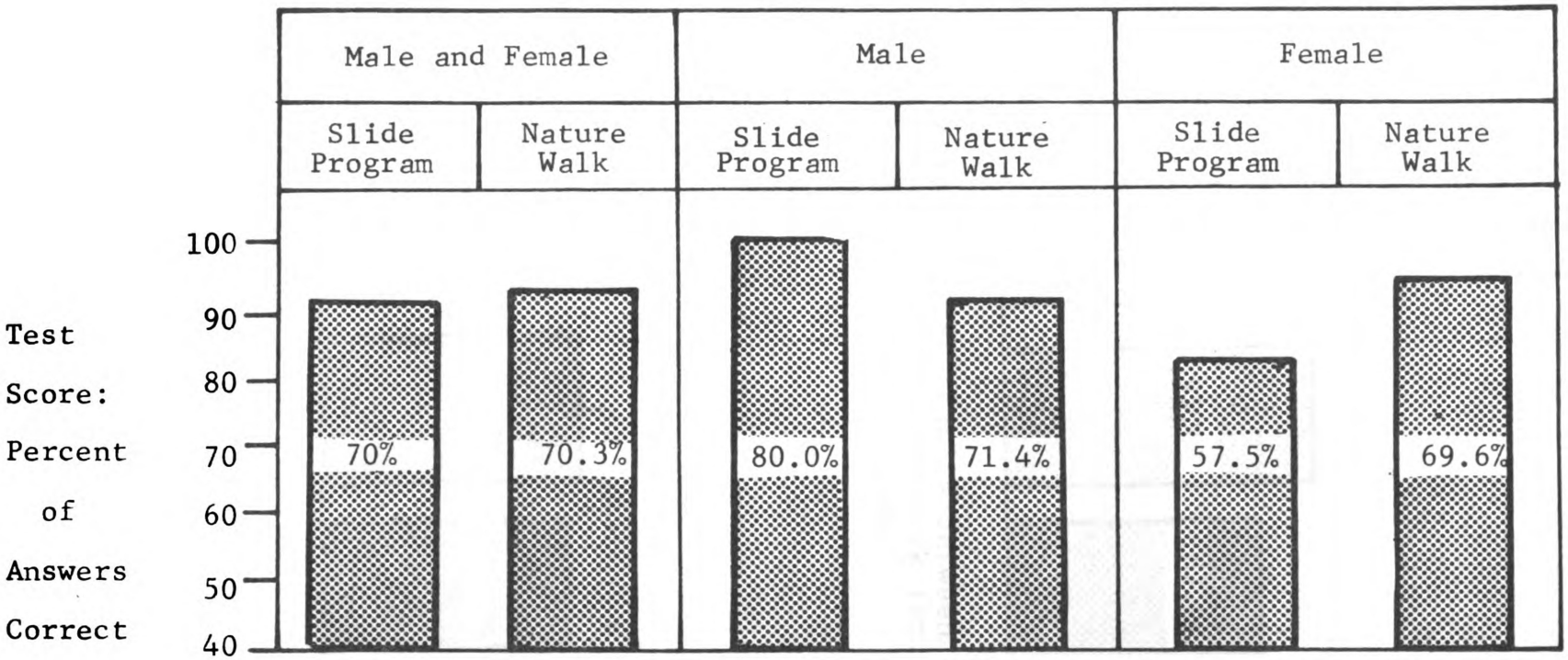


Figure 3. Comparison of Test Results between slide program and guided nature walk for teenagers attending the programs.

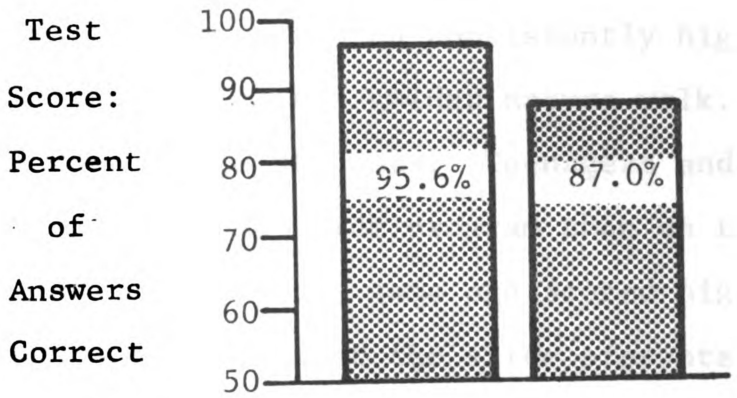


Figure 4. Comparison of test results between slide program and guided nature walk for housewives attending the programs.

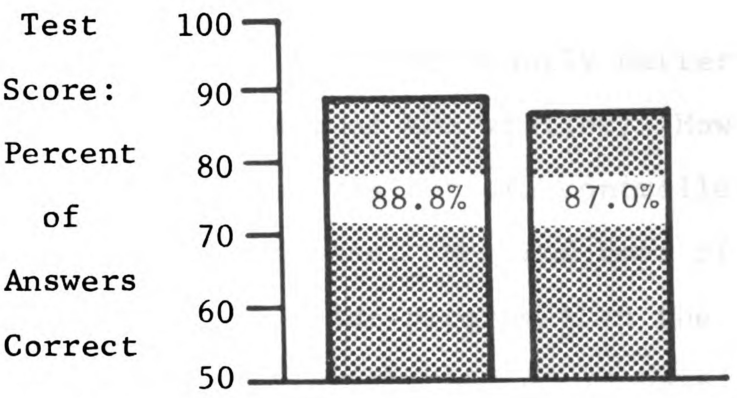


Figure 5. Comparison of test results between slide program and guided nature walk for college students attending the programs.

While none of the differences that occur in the comparisons are significant at the .05 level, other than the already mentioned category of non professionally employed, several are worth mentioning.

Adult men and women scored consistently higher at the slide program than on the guided nature walk. This is also true for college students. Teenagers and younger boys scored higher on the slide program than on the nature walk, but girls of the same age scored higher on the guided nature walk than at the slide presentation.

Boys generally scored higher than girls, regardless of the type of program, while just the opposite is true of the adult category, where women scored higher than men, regardless of the type of program. Figures 6 and 7 illustrate these interesting test results.

The general test results have shown that neither interpretive method leads to significantly better information retention on the part of the visitor. However, when the age and sex of the visitor are controlled, differences apparently increase. Men and boys of all ages scored higher at the slide program than the guided nature walk while girls below the age of 18 have scored higher on the nature walk. Adult women scored relatively equally at both types of programs with a slightly higher score for the slide program.

None of these differences were significant at $\alpha = .05$, but the possibility remains for further

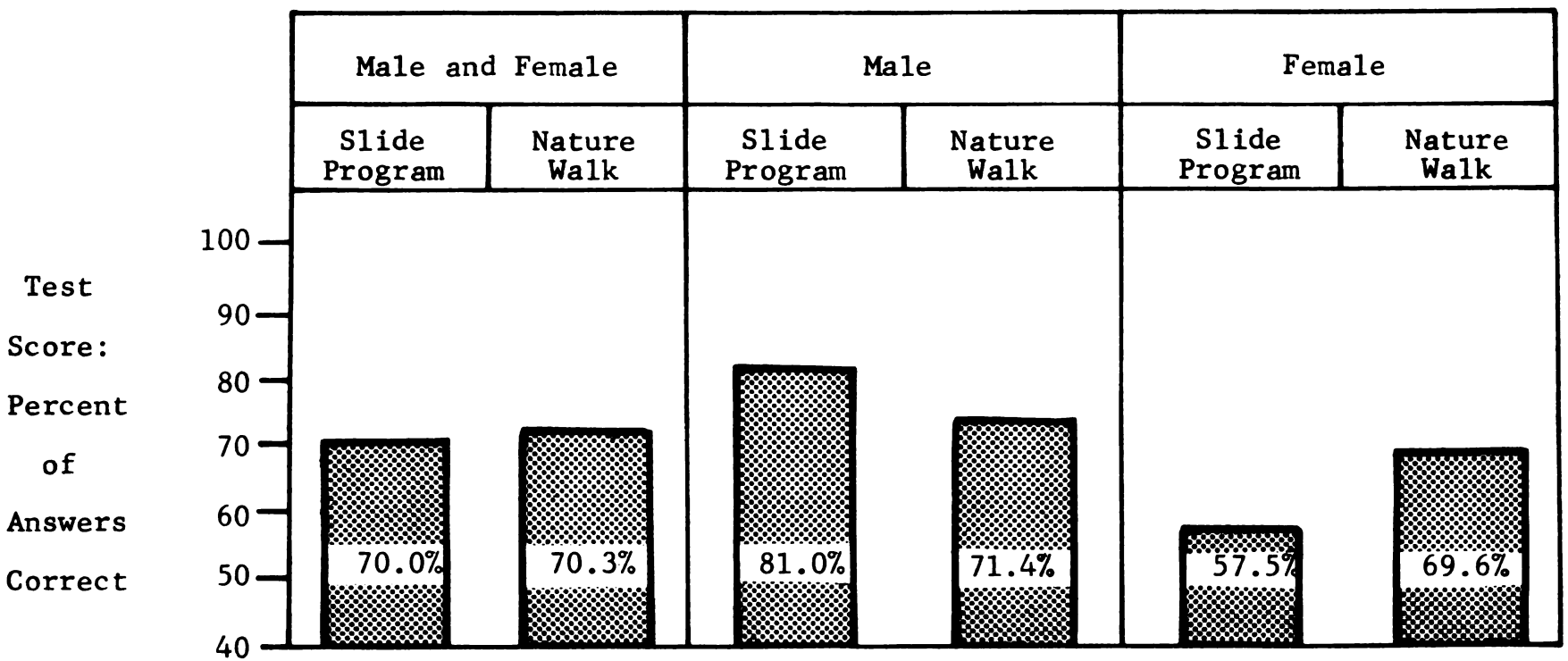


Figure 6. Influence of sex of children on effectiveness of slide program and guided nature walk. Scores are mean percentage of test answers correct.

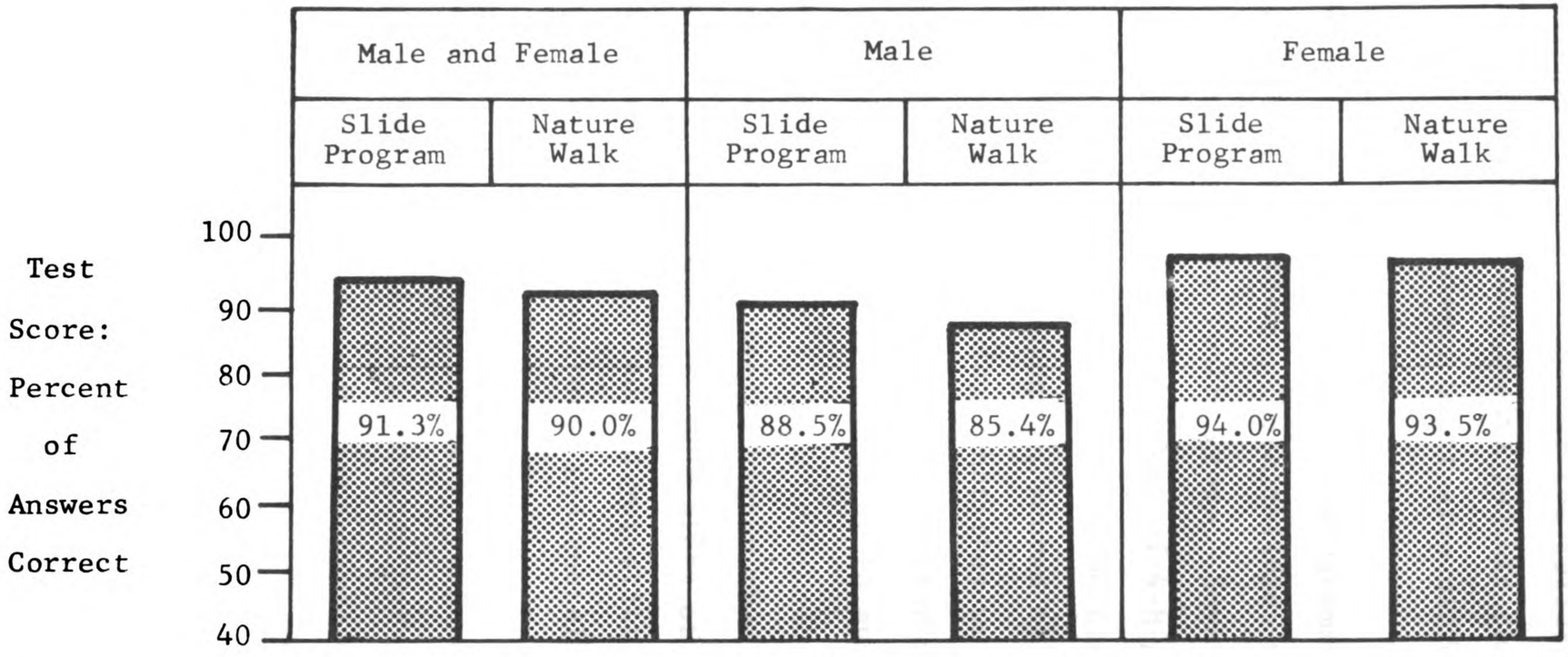


Figure 7. Influence of sex of adults on effectiveness of slide program and guided nature walk. Scores are mean percentage of test answers correct.

investigation. I do not consider the failure to show significant difference conclusive in this case. Better control or other instruments might give different results.

The adult women attending the programs generally brought children with them. These children were quite often from more than one family group. Several of the adult women were teachers or leaders of 4-H groups and took notes at the programs. Possibly the high scores, regardless of the type of program, scored by these women are explained by the fact that they were often consciously trying to learn the information presented, whether for their school classrooms or to answer their childrens' questions.

The fact that women scored higher than men, and boys scored higher than girls, regardless of the type of program, was an anticipated and yet still an interesting result. American cultural and social values give a possible explanation.

Young boys are encouraged to be curious, especially of the out-of-doors. A normal American boy is usually pictured as having a toad in one pocket and various small creatures hidden away in other places. Young girls, on the other hand, are taught to detest such things, their reactions being influenced by stories such as "Little Miss Muffit" and others. Thus boys have become attentive and curious about nature while girls try not to be.

Men, however, are in a different situation than are boys. Men are illustrated as strong, masculine people, and should in no way be associated with the combination of shorts, pith helmets, and butterfly nets. Women, however, are often mothers, and as such are often occupied trying to answer the questions of their children. So, men are discouraged from showing too much interest in butterflies and other insects, while women often try to learn, since someone must explain such things to the children.

This explanation for boys and women scoring higher on the test than men and girls because of the topic of the programs is obviously an unsubstantiated opinion, but its possibilities can not be overlooked.

Another interesting result of the testing is the comparison of the two categories professionally employed and non professionally employed. If the test results of the 'walk' group of the non professionally employed category are not included in the comparison because of the small sample size of only two subjects, the remaining test results demonstrate almost equal scoring between the two categories. Because the professionally employed person has had more exposure generally to biological study and the type of testing used, it seems his score would be generally higher than that of the non professionally employed person. Why this did not occur can not be explained without a more intensive study of the subject.

## Control Test

The comparison of the program and control group test results have shown that common knowledge of the participant was not a variable affecting the test results, since a significant difference was demonstrated between the scores of visitors that had not seen the programs and those that had. This difference is easily observed when comparing the scores of these two groups. As Figure 8 visually illustrates, the average score of 48.6% for the control group is only slightly more than one half the average score of the program groups, a score of 83.8%.

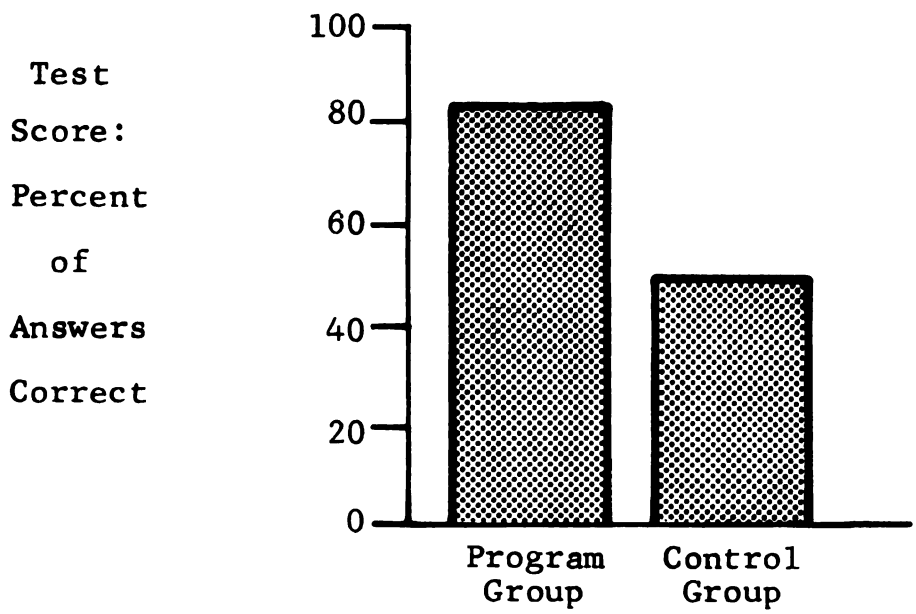


Figure 8. Test results for control group compared with test results for combined interpretive program groups.

This difference in scores has demonstrated that on the average one half of the possible score for the test tested new knowledge, which leaves enough freedom to demonstrate whether more new knowledge was retained in one or the other of two interpretive situations.

## Population Comparison

As is illustrated in Table 2 of Chapter 3, the population characteristics of the different groups were very similar overall. There were, however, some observations and specific occurrences which deserve mentioning.

There were, in all, five persons that left the programs before they were completed. These included a mother and two small children who left a slide program when one of the children asked for the restroom, and two boys of approximately ten years of age who were on a guided nature walk and not with any of the adults in the group. The two boys left the group early in the walk when the trail divided.

Three persons refused to take the test. One was a man in his early forties, well dressed with a sports coat and tie. When asked to take the test as a part of the control group he refused, stating that his wife was waiting for him in his car. The two remaining people, possibly a married couple in their late thirties, refused to take the test after attending one of the slide

programs. They were both very poorly dressed and spoke non standard English; they were very polite. They seemed to enjoy the program, the woman often making exclamations about the subject of the pictures to the man. This annoyed another visitor to the extent that she interrupted and stopped the program, asking whoever was talking to please be quiet so others could hear. This possibly embarrassed the couple, as they became very quiet and left the minute the program was over. I approached them about the test and they said they did not want to take it. It is possible that they had not enough education to read, that they were embarrassed, or both.

The three persons that refused to be tested represent 2% of the entire sample population. Ninety eight percent of those persons attending the programs were tested.

The age limits of the persons tested were 6 to 69. There was no controlled limit as to the oldest age allowed to be tested, 69 being the oldest age of anyone attending the programs. There was, however, a limit set as to the youngest age tested. This limit was 6. Many mothers brought small children, even babies, to the programs. The children below the age of 6 were not given the test since they were too young to grasp many of the concepts, to pay attention, or to read. Six

year olds were tested because many of them displayed an interest in and understanding of the program.

The age of 12 was originally set as the cut-off point for giving the test. This age limit was decided upon as the result of an interview with Michael Chubb,[2] who had found 12 a desirable cut-off point in questionnaire research when working with general public groups. Dr. Chubb had noted that at age twelve youth begin to react independently to attitude questions.

The parents of the children attending the programs reacted very negatively on the first guided nature walk and slide program when I told them that children under the age of 12 would not be tested. As I will discuss further on in the chapter, many of the parents had come to the program only because of their children, and most of the children brought by the parents were under the age of 12. They felt that their children had come to learn and not themselves.

I decided to give the test to all children, but to use only the test results of persons of age 12 years or older. When I noted how children of age six and above seemed to understand the questions of the test,

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[2]Michael Chubb is Associate Professor of Geography at Michigan State University, formerly Associate Professor in the Department of Park and Recreation Resources and Director of the Recreation Research and Planning Unit within that department, also at Michigan State University.

and to answer them correctly, I decided to use their test results in the study. As the test results indicate, they did indeed learn at the programs, as their mean test score of 70% shows when compared with the mean test score of the same age group in the control group, a score of 32.6%.

Many of the adults came to the programs for a specific reason. Several teachers attended, from both elementary and high school levels, to take notes to use in their classes. The leaders of a 4-H group also attended and took notes. Many parents, especially mothers, attended the programs with their children specifically for them to learn. On the guided nature walk I was often asked to repeat things for the children, and many parents quizzed their children during the program on what I had said.

Three different families, on different occasions, came to both types of programs, first attending the slide program and then the guided nature walk. I explained at the end of each program about the research and the different types of programs being presented. The 11 persons that did attend the programs twice were not tested the second time, since they were aware of the research situation.

The general response of the visitors to the testing was interesting. Attitudes of the different groups appeared to be effected noticibly by different factors

of the test, specifically the length of time required to take the test, the degree of difficulty individuals felt the test to have, and the number of questions a person felt he had been able to answer correctly.

Persons in the control group, especially adults, generally appeared upset and depressed after having completed the test. Many complained that the test took too long, that it was very difficult to understand, and that the questions were too hard. Several persons pointed out parts that they said were worded poorly and were deceiving, and others complained that the test was entirely too difficult for their children to take. Many other persons in the control group apologized for not knowing the answers to the test, and asked me to go over the test with them.

The persons that attended the interpretive programs had an entirely different reaction to the testing. They appeared cheerful and in good humor after taking the test. Several stated that the test helped them to understand many of the concepts that I had discussed in the programs. Some people told me they liked the test because it showed them what they had learned and gave them a chance to ask me questions about the few points they were unsure of. The test had such an effect on the last guided nature walk that most of the group waited after the testing and asked to be taken back over the

trail to be able to see the answers to the questions they were unsure of.

I believe that the slide presentations and the guided nature walks were much more effective because of the fact that the test was given. The test seemed to leave the people attending the programs in a very positive attitude. Not only did they enjoy the program, but they had learned something as well, and they had proof of it. The fact that they had done well on the test along with finding it easy and short seemed to heighten the interpretive experience for the people.

## Comparison of Results with Related Research

The results of this study are similar to those of Mr. Ben Mahaffey's (1969) study, "The Relative Effectiveness and Visitor Preference of Three Audio-visual Media for Interpretation of an Historic Area." In his study, Mahaffey demonstrated no significant difference in the effectiveness of three interpretive media, measured through information retention.

Before any common conclusions can be formed from the combination of the results of these two studies, some large differences should be acknowledged. Mahaffey's study compared three mass-media types of interpretation, or, differently stated, interpretive media which did not require the presence of an interpreter. This study is comparing two inter-personal types of interpretive media, or media which do require the presence of an interpreter.

These are two distinctly different types of interpretation. Regardless of whether one is 'better' than the other, it is notable that Freeman Tilden (1957) has mentioned that there is a difference. "No device is, other things being equal, as desirable as interpretation by direct contact with the person." "Gadgets do not supplant the personal contact; we accept them as valuable alternatives and supplements." Therefore, it should be noted that the results of a study concerning the effectiveness of one of these types of interpretation can not be used as an indicator of the effectiveness of the other type. A research study comparing the effectiveness of the two general types of interpretation, personal and non personal, would have to be conducted before conclusions could be ventured concerning their relative effectiveness.

A second major difference between this study and that of Mahaffey's is the concern of preference by the visitor for the interpretive media being used. In this study only one interpretive media was used for any one program, and because of the publicity used, the visitor had a choice of the type of interpretation he attended. In Mahaffey's study, preference for the media was not a factor associated with attendance since all visitors were presented with all three types of interpretive media. During the testing after the interpretive

experience the visitors were asked to express a preference rating for the different media used.

Few common conclusions indeed can be drawn from the two studies. Perhaps the most valid conclusion that can be drawn from both research projects is that general statements concerning the relative effectiveness of an interpretive media can not be made when referring to the general public as a whole. For instance, it can not be said that interpretive media "A" will always be more effective than interpretive media "B," or that interpretive situations using procedure "X" will always be more effective than interpretive situations using procedure "Y."

Mahaffey (1969) touches on this subject in his conclusion, "When selecting the type of media to be installed, the personal nature of the individual should be considered. Investigations into the socio-economic characteristics of expected users should precede media planning." In a 1966 master's thesis titled "A Prospectus for Improved Interpretation of the Ancient Bristlecone Pine Forest and White Mountains of California," Richard Kuehner also discusses this subject. He states,

> A variety of interpretive methods should perhaps be used because not all people will respond to all communication media. Likes and dislikes are subject to change and degrees of intensity. Some people may enjoy television but dislike color slide shows; others may not desire to be told anything until they ask a question. Thus, in order to communicate to a larger percentage of visitors, several forms of communication would be required.

## Limitations of the Study

There are numerous limitations that can influence usefulness of the results of this study. One of the most important is the manner in which the control group was selected. More programs would have been given with people given the test before they had seen the program in order to insure the control population of being as similar as possible to the program sample population.

The fact that random sampling was not used means that the statistics reported can not be strictly interpreted. T values, rather than being statements of probability are instead indicators of the magnitude of the observed differences.

Another important limitation of this study is the small sample size and the use of only one site. If a similar study could be carried out in national and state parks in different parts of the country more accurate conclusions and a greater understanding would be available as to the relative effectiveness of different interpretive media.

It is possible that the test favored the slide program people some. If a laboratory type test were given, where real examples were used, the people on the guided nature walk might do considerably better.

In this study only one topic was used, which may have limited the usefulness of the results to some

extent, since people will very possibly react differently to different topics presented through the same medium.

Only two interpretive methods are used in this study, and the conclusions are limited to representing the effectiveness of only these two methods.

Two other factors that possibly limit the effectiveness of this study are that only one time of year was used when presenting the programs, and the people were only tested immediately after the programs. It is conceivable that one interpretive method will be more effective at one time of the year than at other times. The topic being interpreted may have much influence on this subject. It is also a valid argument that effectiveness of different interpretive media should be tested a week, month, and a year following the presentation, rather than be judged entirely by the results of testing which immediately follows the encounter with the interpretive program.

## Future Research Implications

Because of the extremely small amount of scientific research which has been reported in the field of interpretation, each study raises far more questions than are answered. There are numerous questions raised by this research study which need answering and which would be good topics for future research. I have listed several that have aroused my interest and that I feel are pertinent to the understanding of interpretation as a whole.

1. The topic of this study should be further studied, with a larger sample size and using many different sites, possibly state and national parks.
2. Relative effectiveness of interpretive media should be tested a day, week, month, year, following the encounter, rather than only immediately following.
3. Personal and non personal interpretive methods should be tested together for relative effectiveness.
4. Sex and age should be tested as determinants in effectiveness of interpretive media.
5. Determine to what extent topic controls the effectiveness of different interpretive media.
6. Determine if effectiveness of different interpretive methods is influenced by time of year.
7. Are certain types of testing favorable to certain types of interpretive media?
8. Can testing after an interpretive program make the program a better experience for the visitor?
9. Test the effectiveness of different interpretive methods by some means other than information retention, for instance attitude change.

# CHAPTER V

## SUMMARY

There is a demand today for good interpretation and for new interpretive methods that has never before existed. There is, unfortunately, very little scientific research to turn to that has studied interpretive methods. When developing an interpretive situation, the literature at one's disposal for decision making is subjective in nature and for the most part based on opinions and experiences of others.

Because of this lack of interpretive research, the interpreter can not know with any certainty which interpretive method or combination of methods will best achieve his goals. It is this lack of knowing what can be achieved with different interpretive methods, relative to each other, that this research study is concerned with.

The objective of this study is to compare the relative effectiveness of two interpretive methods by comparing the information retained by persons attending an interpretive program illustrated by slides, and by persons attending a guided nature walk, the same information being presented at both programs.

## Hypothesis

The hypothesis of this study is: Given the same information, those persons attending a guided nature walk will retain more information than will those persons attending a slide presentation.

## Procedure

This study was structured with the idea of comparing interpretive programs which were representative of a real situation. To accomplish this, slide programs and guided nature walks were presented at Carl G. Fenner Arboretum in Lansing, Michigan, in August and September of 1971. The topic was the same at all the programs. The programs were publicized in the local daily newspaper and by fliers placed in conspicuous areas of local shopping centers. All persons attending the programs came as a result of the publicity.

After the programs the people attending were tested, without knowing beforehand that they would be. A control group was also tested to determine what effect, if any, common knowledge of the topic discussed was having on the test results. The control group was made up of visitors to the nature center that had not attended the programs.

Since the programs were publicized and attended as a result of the publicity, it was assumed that people attended the type of program which they had a preference

for, thus eliminating the variable of preference as a factor affecting the test results.

## Results

The hypothesis of this study has been rejected. No significant difference was found between the test results of the persons attending the slide programs or the guided nature walks. There was a significant difference noted between the control group and the program group test results, the program groups scoring nearly twice as high as the control group. Apparently, the people attending the interpretive programs were learning much of the material presented.

Comparison of the test results of the slide presentation and guided nature walks show the scoring at the two types of programs to be nearly equal, with only one exception. The one exception occurs in the category of non professional employment, where the slide program test results were significantly higher than those of the guided nature walk. This result is questionable, however, because of the small sample size of two persons for the guided nature walk in this category.

All other differences in the interpretive program comparisons were not significant at the .05 level. Several are interesting to note, however.

All men and boys and adult women scored slightly higher at the slide programs than on the guided nature

walk. Girls below the age of 18 scored slightly higher on the guided nature walk than on the slide program.

Generally boys scored higher than girls and women scored higher than men, regardless of the type of program.

Comparing the different populations tested shows that the different groups were all very similar in composition as to age, sex, and occupation-profession. Differences noted were; fewer young girls in the control group, the program groups having nearly equal adult men and women, while the control group did not, and the control group having nearly equal "professionally employed" and "non professionally employed," while the program groups had more "professionally employed."

Only three persons refused to be tested, two of these people possibly did not have enough education to read the test (they were adults). Of the people attending the programs, 98% were tested.

Many adults came to the programs for specific reasons. These included taking notes to help teaching in school classrooms and with 4-H groups, and for the direct education of their children.

Eleven persons attended the programs twice, first attending the slide program and then the guided nature walk.

The people in the control group seemed upset after taking the test, especially, it seemed, with their lack of ability to do well on it. The people attending the

programs, however, appeared to have a much better experience because of the testing, several saying that it helped them to understand the programs better. It took the control group from ten to twenty minutes to take the test, while the program groups took only from three to ten minutes.

## Application of Results - Conclusions

From the results of this research one can conclude that when presenting programs at a community nature center similar to Fenner Arboretum on the topic of insects, in the late summer, the interpretive methods of slide presentation and guided nature walk are probably equally capable of communicating the desired information. Women will possibly learn more than men and boys will possibly learn more than girls, but no significant differences in learning will occur.

This research has shown that possibly, participants in an interpretive program enjoy some form of testing what they have learned in the experience.

Perhaps when dealing with general public groups in interpretive situations it is unimportant which interpretive method is used, slide program or guided nature walk. Because Mahaffey indicates that people have different preferences for different interpretive media, perhaps both slide programs and guided nature walks should be available to the public in any interpretive

situation. When only one interpretive media can be offered at a time, for what ever the reason, it should be changed as often as possible to benefit those people that prefer the other type of media. Indulge a personal choice if only one interpretive method can be used.

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# APPENDICES

# APPENDIX A

## LIST OF SLIDES PRESENTED AT SLIDE PRESENTATION

List of Slides Presented at Slide Presentation

1. Dragonfly
2. Polyphemus moth caterpillar
3. Grasshopper exoskeleton
4. Caterpillar exoskeleton
5. Spider and web
6. Spider showing eight legs
7. Harvestman
8. Harvestman eating beetle
9. Pill bugs
10. Centipede
11. Dragonfly
12. Fly in pine pitch
13. Fly in pine pitch-close
14. Tiger swallowtail butterfly
15. Cecropia moth
16. Bumble bee
17. Honey bee
18. Lady beetle
19. Cartoon - Pesticides
20. Cartoon - Pesticides
21. Outdoor winter scene
22. Moth cocoon
23. Moth cocoon
24. Plum gall
25. Goldenrod gall
26. Oak leaf gall
27. Paper wasp nest - in pine tree
28. Paper wasp nest - in building
29. Wasp eating caterpillar
30. Bald faced hornet nest
31. Bald faced hornet nest opened
32. Ant hill
33. Ant hill
34. Ants attacking earth worm
35. Ants and aphids
36. Ants and aphids
37. Tent caterpillar nest
38. Tent caterpillar nest
39. Bag worm nest

40. Leaf miner insect-in leaf
41. Cricket
42. Cricket up close
43. Digger wasp tunnel
44. Leaf curling worm - leaf
45. Leaf curling worm - leaf
46. Leaf curling worm - leaf opened--worm inside
47. Open field scene
48. Close up of grasses
49. Moth on bark
50. Moth on leaves
51. Moth on leaves--close up
52. Sphinx moth larvae on Virginia creeper
53. Katy-did
54. Walking stick
55. Ambush bug
56. Grasshopper
57. Grasshopper
58. Tree hopper - thorn
59. Bird dropping caterpillar
60. Stick worm caterpillar
61. Stick moth
62. Caterpillars using numbers for protection
63. Squash bugs using numbers for protection
64. Bumble bee hawk moth
65. Bumble bee hawk moths mating
66. Fly mimicing bee
67. Fly mimicing bee
68. Monarch butterfly caterpillar
69. Milkweed beetle
70. Beetle
71. Scale insect
72. Swallowtail butterfly caterpillar
73. Swallowtail butterfly caterpillar
74. Swallowtail butterfly caterpillar--scent organs exposed
75. Black swallowtail
76. Milkweed plant
77. Ambush bug
78. Milkweed bug
79. Soldier Beetle
80. Milkweed beetle
81. Grasshopper on milkweed
82. Grasshopper on milkweed
83. Caterpillar on milkweed
84. Spider on milkweed

85. Tree cricket on milkweed

86. Dragonfly on milkweed

87. Bee on milkweed

Monarch Butterfly Series

88. Egg

89. Caterpillar eating egg

90. Caterpillar

91. Caterpillar

92. Caterpillar

93. Larvae changing to chrysalis

94. Larvae changing to chrysalis

95. Chrysalis

96. Chrysalis

97. Chrysalis

98. Butterfly emerging

99. Monarch butterfly

100. Cecropia moth

101. Walking stick

102. Ants and aphids

103. Cocoon

104. Sphinx worm

105. Beer can and giant water bug

106. Dragonfly

# APPENDIX B

# TALK GIVEN AT SLIDE PRESENTATION

## Insects and Their Homes

Slide Number

Since this is a program on insects and their homes, the first thing we should do is find out just exactly what an insect is. All of us have seen insects before, but in order to keep from confusing insects with many of the other small creatures in the world, it would be a good idea to look for just a moment at a few of the more distinguishing characteristics of those little creatures commonly called 'bugs.' 1

The first and most distinguishing characteristic of the insects is that all insects have six legs. You may think that some insects have more than six legs, this caterpillar here for instance. It certainly looks as if it has many more than six legs, but if you look up here at the head of the caterpillar you can see three of its six <u>true legs</u>. All the legs that you see down on the body of the caterpillar are called false, or psuedo, legs, that will disappear when the caterpillar changes into a moth. All insects have six true legs during the active parts of their lives. 2

A second characteristic of all insects is 3

the exoskeleton. People have bony-internal skeletons with muscles and flesh covering the outside of their bodies, but all insects have their skeletons on the outside of their bodies, very similar to the suits of armor the knights used to wear in King Arthur's Court. One of the problems that the insects have with their suits of armor is that they do not grow. Just as a knight would have to take off a suit of armor if he grew too big for it and have another made, insects grow too big for their exoskeletons, crawl out of them, go off and grow another. Here you can see where a grasshopper has left his "suit of armor," or exoskeleton, on a piece of grass. Here a caterpillar has just crawled 4
out of its exoskeleton and is growing another one. You can see that the new exoskeleton is still damp from being in the old one.

Before we get too far into the world of insects 5
it might be a good idea to briefly look at some of the close relatives of insects, many of which are commonly mistaken as insects.

The spider is closely related to the insect, and, like it, has an exoskeleton. All spiders, 6
however, have eight legs instead of six, as you can see in this picture.

The harvestman, or daddy-long-legs, is also 7
a close relative of the insects, and like the

spiders which it is also closely related to, it also has eight legs. Harvestmen do not spin webs 8
to catch their food as do many spiders. Instead, they catch their food by using stealth and speed in the manner of many wild predatory animals. Here you can see the harvestman has caught a small beetle and is eating it.

Pill bugs are also closely related to insects 9
and are often mistakenly called insects. The pill bug is the small dark grey or brown creature you often see under rocks and logs when you turn them over. They will instantly curl up into a tight ball and when they feel the danger has left they open up and dash away on their many feet.

The millipede is another small creature 10
mistaken for an insect often. You can see that the millipede has many more legs than insects, the name millipede, in fact, means a thousand feet. Millipedes have two pairs of legs on each segment of their body, and if you count you can see that this millipede has 18 segments on his body. That is a grand total of 72 legs. A lot of people have trouble with only two legs, can you imagine what it would be like to run across a leaf if you had 72 legs?

Insects have been on the earth for millions 11
of years. Some dragonfly fossils are over 200 million years old and have a wingspread of over

thirty inches. Just imagine a dragonfly the size of a hawk swooping down out of the air catching its food!

Most insect fossils that have been found are 12
in a substance called amber. Amber is the sap or pitch that oozes from wounds in pine trees. This amber is very sweet and sticky as it oozes from the tree, but it becomes very clear and hard, like plastic, as it grows older. While the amber is clear and sticky insects often get stuck in it, as you can see this fly has become caught. The sap will continue to flow and the fly will become 13
completely covered. After some time the sap will harden into amber and the fly will be perfectly preserved. Perhaps a few million years from now this piece of amber will be washed up on a beach somewhere and a descendent of ours will pick it up and wonder what life was like so long ago.

Today insects are all around us. They are in 14
the air, in the lakes, in the ground, and in the fields. There is no place on earth where insects do not live. There are insects that live in the freezing temperatures at the south pole, and insects that live in the hot springs, where the water is so hot it would scald us. There is even a queer little insect that lives in petroleum for a

short part of its life, breathing through a tube it sticks through the surface.

There are more insects on the earth than any other animal. In fact, if you were to take all species of plants and all the species of animals in the world and combine them, they would not come close to equaling the number of insects. 15

Insects serve many vitally important functions in the world, one of the most important of which is fertilizing flowers. Without insects to fertilize them, most of the plants on the earth would soon die. Insects have been important to man since the beginning of man's existence. The honey bee, for example, has been a source of food and sugar for thousands of years. In this picture you see a swarm of honey bees that were put into a hive and gave me several pounds of honey a few months after this picture was taken. 16 17

It has only been recently that man has started to use insects to rid himself of many insect pests. The lady beetle has turned out to be such a good natural pesticide that there are many places today where you can buy them by the bushelful to put on crops and in gardens. It is kind of ironic that it has taken the chemical control of insects and all the problems and misfortunes that have come out of chemical control to create the public awareness that 18 19 20

we see today about environmental and ecological problems of the world.

During different seasons of the year, insects 21
have different types of homes. When it begins to get cold out insects will develop the kind of home in which they can spend a very inactive part of their lives. The cocoon is one example of an 22
insect home in winter.

This is a good place to stop and explain just exactly what purpose an insect home has. Since the insect lives a life and death struggle every-day, there is only one major reason why they need a home, as such, and that reason is for protection. In other words, all insects have some kind of "home" and the purpose of that home is protection.

Cocoons are made by caterpillars that spin a 23
fine silk thread from their mouths around and around their bodies until they have wrapped themselves up very snugly. It might interest you to know that silk cloth is made by unravelling many cocoons and weaving the fine threads into thicker threads and by then weaving the threads into cloth. So the next time you use a silk handkerchief or are wearing something made of silk, remember that it came originally from the mouth of a big, juicy, probably green, caterpillar.

Another insect home which is used in winter 24

as well as in summer is the gall. Galls are tumor like growths on plants that are caused by insects. What happens is that an insect lays an egg in the stem or leaf of a plant and the egg hatches. Scientists think that the insect larvae then secretes a kind of hormonal substance which causes the plant to grow a very horny, tumor-like growth around the insect. The insect then lives inside the gall and comes out in the fall or spring as an adult insect. You may be familiar with the goldenrod gall which 25
grows in the fields in this area, or with one of 26
these oak galls.

Most of us are familiar with wasps and their 27
nests, although we seldom see them as they are found outside of man's buildings. This is a
picture of a wasp nest as it is found in nature. 28
You will probably recognize it better in this picture, which shows the nest as it is often found around houses and garages.

Wasps are hunters in the same fashion that 29
lions and tigers are. A wasp flies into the fields, flying up and down the stems of plants looking for something to eat. Often they find a small caterpillar, as this wasp has, and after forming a ball with the meat, they fly back to the nest to feed the young.

Hornets and wasps were the first paper-makers 30

of the world. Long before man was here hornets were making their homes of paper. Hornets make their paper nest by chewing up wood and bark and swallowing 31
it. When they return to the nest they regurgitate or "throw-up" the wood and bark in a liquid paper-like mass, which they mold into the walls of their home. This makes a very tough, weather proof home for the hornets, which often lasts for several years in nature.

All of us have seen ants before, but few of 32
us have seen more of their homes than just a hole in the ground. Ants are considered by scientists to be some of the most highly developed of all insects, and accordingly, they have very complex homes. Their tunnels in the ground have special 33
rooms for the queen, for eggs, for babies, for workers, and for soldiers, which you see here 34
attacking a worm that has come too close to their front door.

Some ants have gardens and others have corrals 35
where they keep cows. Actually, ants were the first farmers in the world, and the cows that the ants take to pasture every day and milk are called aphids. Every day the ants take their aphids up onto a plant where the aphids suck the jices out 36
of the plant. The ants rub the backs of the aphids with their antenna, or feelers, and the aphids

secrete a sweet substance that the ants eat. The ants also protect the aphids, and take them down into corrals at night to keep them safe.

The nest of the tent caterpillar is obnoxious, 37
and for that reason is commonly known. Everywhere
the tent caterpillar walks, he leaves a silk thread 38
behind, similar to a spider. If all the caterpillars walk around enough, as they are doing in
this picture, very soon they have a tough "tent" 39
like structure that they can hide in, and as
a result they are protected very well.

Probably the smallest and strangest miner in 40
the world is the leaf mining insect. This insect is so small that it can dig tunnels between the top and bottom layers of a leaf. Inside his tunnel he has plenty to eat and is very well protected because he is so small and nothing can get at him in his tunnel.

The cricket was the world's first musician. 41
To protect themselves while they make their music, crickets dig trenches into the ground or deep caves into the side of a hill. There they live in
crowded conditions with all the freeloaders of the 42
small animal world, who find the cricket's caves fine rent-free homes.

The solitary wasp is a wasp that digs a tun- 43
nel deep into the ground instead of making a paper

nest. After digging the tunnel the wasp catches a spider or a caterpillar and puts it in the tunnel and lays an egg on it. One reason that solitary wasps are interesting is that one species is the only insect known to use a tool. After closing her tunnel with dirt, this wasp picks up a small pebble and packs down the dirt in front of the hole to hide it so enemies will not be able to find it.

Some insects are very proficient at using 44
their food for a home. One of these is the caterpillar that curls up a leaf and eats it while hiding inside. If you open one of these leaves you find a fine, fat, juicy caterpillar inside 45
that a bird would make a tasty meal of if he were 46
in your place.

Many insects do not build homes, as such, 47
they simply live in the open, where they have to develop other means of protection than having a roof over their heads. The most common and most practiced form of this type of protection is called camouflage. Camouflage is when an animal looks 48
so much like its surroundings that it simply blends in and can not be seen. Here are some examples.

Probably the most discussed example of 49
camouflage in insects is the moth that looks like tree bark. You have probably already found the

moth in this picture, it is a little different color than the bark and is fairly easy to see.

Some moths try to look like something in their surroundings. For example, if you were a bird flying over these weeds, you might think that white spot to be a bird dropping or the effect of the shadows, but if you were to fly in a bit closer you would see that you were missing a very tasty meal, because that white spot is actually a very juicy moth.

Some insects grow things on their bodies that help them to avoid being spotted. This caterpillar feeds on grape and Virginia creeper. As you all know, vines like grapes have what are called tendrils, the long coiled up threads that grow from the stems to other objects that hold the plant up. This caterpillar has grown a tail that looks very much like a tendril and helps camouflage the insect.

The katydid is not only green and shaped like a leaf, but it has even developed veins in its wings to make it look more like a leaf. As it moves from leaf to leaf it moves with a quaking motion helping to make it look like a leaf fluttering in the wind.

The walking stick is one of the real masters of the art of camouflage. Its body and legs look

so much like twigs that few people ever see these insects in nature.

The ambush bug is another master at the art 55
of camouflage, but he uses his camouflage to catch his food as well as to protect himself. We can see here that if it were not for the fact that he has caught a beetle for dinner we probably would not be able to see him. Incidently, all true bugs have sucking mouth parts, and you can see the tube-like mouth of this ambush bug going into the beetle as he sucks all the body juices out of it

The grasshopper not only has strong hind legs 56
to jump with but it has developed colors and markings on its body to help it blend in with its surroundings. This grasshopper blends in quite 57
well, but this beetle over here that somehow got into the picture is quite easy to spot.

This tree hopper is one of my favorites. 58
These ants crawled over him about five times before they decided he was not part of the limb, and you can see that one has come back to investigate. This tree hopper has disguised itself to look like a thorn, and is quite often found on rose bushes and other thorny plants where it is almost impossible to distinguish him from the real thorns. I have always thought that this particular tree hopper looked like one of the dwarfs in "Snow White and the Seven

Dwarfs." You can see his hood here, and here his nose and mouth, and up here his two beady eyes staring out at you.

This is a picture of a bird dropping, or, at least something that is trying to look like a bird dropping. This caterpillar has been very appropriately named the "bird dropping caterpillar," and it protects itself very well by using this type of camouflage. This is the tail here, with the body and psuedo, or false, legs, and here is the head with several growths on it to make it look a little more grotesque. 59

I get muscle cramps just looking at this caterpillar. This is the stick caterpillar, it holds itself very rigid when danger is near to make itself look more like a stick. He does this so well that if you were to take his head and pull it down and then let go, he would spring back just like a twig. Here are his false legs down here and three of his true legs up here. 60

One day while I was taking pictures of some milkweed plants, what looked like a small piece of grass or dead weed kept blowing back and forth from leaf to leaf. Finally I got curious and looked a little closer and noticed that it had legs, a head, and wings. It was a moth that had done a very good job of making itself inconspicuous. 61

Some insects have not developed very good 62
camouflage so they live in large groups to confuse
their enemies by their large group size. If one
of these caterpillars crawled out on a leaf by
itself a bird would recognize it and make a very
tasty meal of it. As long as they remain bunched
up as they are here, the bird would not recognize
them and would ignore them. Here is another 63
example of some stink bugs doing the same thing.

Some insects look like other insects that 64
predators do not like. This type of protection
is called mimacry and is illustrated throughout
nature. The bumble bee in this picture is actually
a harmless moth that stays alive because birds,
people, and frogs think it is a bumble bee. Here
are two of these bumble bee hawk moths mating, 65
you can see now that they are moths from the long,
club like antenna and the colored wings.

In this picture a fly has developed colors on 66
its body that make it look like a bee. Here is
another fly of the same type on the flower of the 67
wild carrot. Notice that it is right out in the
open. Since its enemies will mistake it for a bee
it does not have to worry about being in the open.

Some insects eat very bitter-tasting plants, 68
and, as a result, themselves become very bitter
tasting. Many insects use this bitter taste to

great advantage. Using bright colors on their bodies to warn enemies that they are poisonous or taste very bad, these insects lead well protected lives in often otherwise unprotected areas.

We can see that this monarch butterfly caterpillar does not blend in very well with his surroundings. It eats milkweed, which is a very bitter tasting plant, and the caterpillar is also very bitter tasting. It knows it does not taste good, as do its enemies, so it does not worry about being seen.

This milkweed beetle is very conspicuous, and 69
its bright colors warn all predators that it would not at all make a very tasty meal.

Beetles are the turtles of the insect world. 70
They protect themselves very well by carrying a hard shell around on their backs. This works so well that many beetles do not use any other kind of protection, because their enemies can not break trhough the very tough shell that they grow around their bodies.

Scale insects are very small and look like 71
scars or bumps on a leaf or branch. They attach themselves so well that it is almost impossible to pry them off. For this reason they are quite well protected even if a bird or other enemy manages to discover that they are insects and very tasty.

The insect world even has a skunk in it, in 72
the form of the swallowtail butterfly caterpillars.
This is a picture of a very young one, whose scent
organs are quite small. Since it is so small it
also uses camouflage to protect itself. As it 73
grows bigger it still uses camouflage, but as a last
resort it has some very powerful scent organs in 74
its head. These scent organs are frightening
enough in appearance, but the foul smelling odor
that comes out of them is sure to frighten all
enemies away. This particular caterpillar eventually 75
becomes the black swallowtail butterfly, a very
beautiful and common inhabitant of the fields and
flower gardens of this area.

The milkweed plant is one of the tenement 76
houses of the insect world. It is interesting
because many insects base their entire lives in
and around it, and many insects use it as a stop
over area in their wide wanderings.

If we start walking up the stairway of the 77
milkweed apartment house, down in the basement we
could very possibly see the ambush bug lying in
wait for some victim to come walking by. A little
further up we see the brightly colored milkweed bug, 78
not worrying much about predators because he knows
his bright colors warn them of his bitter taste.
We find a soldier beetle hiding in the shadows, his 79

name easy to understand because of the uniform he wears. A milkweed beetle is seen on a leaf, conspicuous but unworried because of the warning his bright colors give. Just as we near the top floor of the apartment we see a large grasshopper. His strong legs suggest a good jumping ability, but his colors and markings show that he will be well camouflaged in the grasses below. We interupt a caterpillar's lunch as we continue up the stairs, and we watch as he quickly scurries off a seedpod and under a leaf to hide. A spiders nest is found just beneath the top floor, under a bent leaf where the spider lies waiting to dash out and capture an unwary wanderer. Down the hall from the spider is a tree cricket, wondering why he is called a tree cricket when he spends almost all of his time in bushes and grasses. As we come out of the stairs onto the roof we see a helicopter type landing area being used by a dragonfly. The dragonfly waits for a slow flying insect to come by. He will swoop out and snatch it out of the air, returning to his landing pad to eat his trophy. Off to one side we see the dead body of a bee, whose acidy taste or deadly sting repulsed some greedy predator who discarded the dying insect onto the milkweed graveyard.

The monarch butterfly is one of the insects

that spends its entire life in and around the milkweed plant. In the next few pictures we will follow this interesting insect through its entire life cycle, which is often completed in less than one month.

Here the egg can be seen on the underside of a milkweed leaf. Barely a sixteenth of an inch high and a thirty second of an inch wide, the larvae will hatch from the egg in two or three days. The first thing the larvae does after hatching is 89
to eat the egg, which a predator might find, and as a result go looking for the caterpillar that came from it. The egg also has essential chemicals the larvae needs. In a few days the small caterpillar 90
has already developed the bright colors that warn its predators of its bitter taste. After one week the caterpillar is half grown and its 91
bright colors are at their best. At two weeks of 92
age the larvae is full grown. It makes a silk button with its mouth on one of the leaves. It will attach its tail end to this and hang upside down while pupating. After hanging for 24 hours 93
the caterpillar is ready to change into a crysalis. There has been very little physical activity in the last 24 hours but an immense amount of chemical change has occurred. With a sudden jerk the skin 94
of the caterpillar splits down the back, and within 95

a few seconds a form emerges that looks like a growth of the plant and not an animal at all, the pupae. The pupae never moves but the colors inside it change to a dark red and black slowly. After ten days the monarch butterfly emerges from the crysalis. For several minutes the beautiful monarch remains motionless as he pumps his body liquids into his wings as they dry. And without giving notice, suddenly, he flies.

The large black dots on the hind wings identify this monarch as a male. These are scent pouches and aide the male butterfly in finding a mate. Since butterflies only see well close up, it is very difficult for a butterfly to find another of its kind, let alone know if it is a male or a female. The male monarch has a fascinating and maybe brash way of finding a girl friend. He dips two special feathers on the end of his body into his scent pouches, and when he sees another butterfly he flies up behind it and then over the top of it. As he flies past it he touches the head of the other butterfly with the feathers on his abdomen. He kind of gives the other butterfly a chance to smell his perfume. Only a female monarch butterfly will be attracted by his perfume. When the male finally finds a female that responds to his scent,

they mate, and the female then lays eggs, beginning the entire cycle over again.

The insect world is very fascinating and in- 100
triguing. In it one can find everything from 101
beautiful moths and great artists of camouflage 102
to farmers with cows and homes made of 100% silk. 103

Through it all man must put up with the 104
insects, like this tomato hornworm, and the in- 105
sects must put up with man.

No one really knows where it will all end, 106
especially not the dragonfly, who has been darting back and forth for over two million years, and who makes even more fascinating the world of insects and their homes.

# APPENDIX C

## DESCRIPTION OF GUIDED NATURE WALKS

## Description of Guided Nature Walk

The guided nature walks were given along the "Sugarbush Trail" at Carl G. Fenner Arboretum. This trail takes approximately twenty minutes to walk without stopping. It was used because of its length and because of the different environments found along it. The trail begins at an open field, leads into a section of hardwoods and then into a section of pines. From the pine area the trail follows an edge zone between the pines and a marsh area, and eventually passes through the marsh to a small pond. From the pond the trail turns back toward the nature center building, passing through an open grove of maples where the outdoor classroom is located. The guided nature walk formally ends here where the test is given.

The spoken text of the guided nature walk was different at each program. This was true because of the different groups that attended the walks and because of the different events and examples that were seen on the different nature walks. Questions were invited throughout the walks. There were, however, stopping points along the trail that were planned for certain examples and concepts to be discussed. A description of

each stop, what was discussed and what was hoped to be seen at that stop follows.

STOP 1 The guided nature walks began at the nature center building where the group formed outside. I introduced myself, and, using a live preying mantis as an example, introduced insects. The distinguishing characteristics of insects were discussed here, and everyone was given an opportunity to touch and handle the preying mantis. Because of the difficulties of finding them on the trail, a cocoon and a hornets nest were also discussed here, with examples of each. The people were also given an opportunity to handle these objects. The purpose of insect homes was explained at this point.

STOP 2 At the beginning of the trail near a large pile of stone there were several large spiders and their webs. Crickets could also be found easily here. A discussion of the close relatives of insects and their differences occurred here. The kind of home crickets make was also discussed.

STOP 3 About twenty feet from stop number 2 there was a large area of wild carrot and thistle, the flowers extending into the trail. There were many insects here. Grasshoppers were caught and the concept of camouflage was discussed. Beetles were also caught and the use of

their hard shells as a home was explained. It was very possible for an example of mimicry to be seen here, for the flies which mimic bees are often found in this type of setting.

STOP 4 The trail passes several milkweed plants in the open field area, and the group stopped at one of these to observe a monarch butterfly larvae, and the concept of bright colors and bad taste was explained.

STOP 5 At another milkweed plant ants were busy with aphids. Their relationship was discussed and an explanation of ant homes was given. Several lady beetles were usually on the milkweed plant and the concepts of natural pesticides and current environmental concern were discussed.

STOP 6 At the edge of the wooded area a large oak tree gave an opportunity for the people to see insects using camouflage differently than in the open field. The people were asked to find insects themselves, if possible.

STOP 7 Bushes line the trail in the woods. More examples of camouflage were seen, as well as scale insects. Caterpillars that were using group size for protection were seen in a small oak tree, as well as a group of saw fly larvae.

STOP 8 In the middle of the pine tree area there was a fly trapped in some pine pitch. The group gathered

around this tree and for several minutes a discussion followed concerning the history of insects, where they can be found, and how numerous they are. This was the longest stop of the guided nature walk, and the people were very intrigued with the fly being "fossilized" in the pine pitch.

STOP 9 As the trail leads along the edge between the pine trees and the marsh area a variety of insects and concepts could be seen and discussed. In the grape vines along this area leaf mining insects were easily found and talked about. Caterpillars rolling leaves up and feeding inside were also easily found. There were many galls in the bushes in this area, and also many examples of mimicry were seen here.

STOP 10 In the marsh area there was much jewelweed along the trail. On one plant a cast skin of a caterpillar was used as an example of the insect exoskeleton. Flies mimicing bees were often found around the jewelweed. In this same area tree crickets were always making their music, and the group would find some of these and watch them.

STOP 11 At the edge of the marsh area a tent caterpillar nest hung over the trail in the limb of a cherry tree. This type of insect home was discussed as well as the subject of galls, since several goldenrod galls were present in this area.

STOP 12 At the pond aquatic insects were observed and discussed.

STOP 13 In the area between the pond and the test site (about 200 yards) there was no formal discussion. Informal questions and answers occurred and if someone wished to stop and discuss something they had found we did. Several cicada shells were found on maple trees in this area, reemphasizing the distinguishing characteristics of insects.

STOP 14 In an open grove of maple trees the guided nature walk formally ended. The research project was explained and the group was given the test.

Although the nature walk formally ended at this point, an informal discussion about nature and environmental issues in general usually followed, often resulting in an informal nature walk along some of the other trails of the nature center.

# APPENDIX D

# PUBLICITY FOR PROGRAMS

# WEEKEND OUTLOOK

With the coho salmon fishing season hitting an early peak between Muskegon and Frankfort on Lake Michigan, many will be heading for the outdoors for the Labor Day holiday.

Most popular lodging spots are already booked full for the weekend and only 15 of the 52 state parks in the state's Lower Peninsula are expected to have vacancies.

In the Upper Peninsula, only Tahquamenon State Park is expected to fill up.

For those not wanting to be on the highways during the 78-hour holiday, there will be several activities in the Lansing area.

**SOFTBALL TOURNEY**

In sports, the Amateur Softball Association fast pitch tournament begins tonight with a tripleheader at Ranney Park. Nine teams including Lansing Stober's and Lansing's Solomon Bombers will play in the double elimination tourney that runs through Labor Day with the title game set for 7:30 Monday night.

Tonight Detroit plays Toledo at 6:30; Stober's meets Hamilton at 8; and Solomon Bombers play Ecorse at 9:30. Games also on tap all day Saturday and Sunday.

**BASEBALL BENEFIT**

Play opens at 6:30 tonight with VanDervoort's facing Ann Arbor in the Oz Hartley benefit double elimination baseball tournament at Municipal Park. State-Wide Realty and the Cardinals meet at 8:30 tonight and opening round action concluding at noon Saturday when the Orioles challenge Muskegon.

Second round games are scheduled at 3, 6 and 8:30 p.m. Saturday, followed by a multi-game wind-up Sunday afternoon.

The Portland Open Horse Show will be Monday at the Portland arena on Morris Street at 9 a.m. with halter, showmanship and performance classes and at 2 p.m. with contesting divisions.

**DAHLIA SHOWS**

Flower enthusiasts may want to attend a dahlia show Saturday and Sunday in the Meridian Mall. The show, sponsored by the Michigan Dahlia Association, will be Saturday from 4-9 p.m., and Sunday from noon to 5 p.m.

The Ledges Players will perform "Stop the World—I Want to Get Off," at their playhouse in Fitzgerald Park, Grand Ledge, at 8:30 tonight, Saturday and Sunday.

A nature hike on insect homes will be conducted at Fenner Arboretum Saturday and Monday at 2 p.m. There will be a slide program on insects tonight at 7:30 and Sunday 2 p.m.

**'DESTINATION MARS'**

MSU's Abrams Planetarium will show "Destination Mars" tonight at 8, Saturday at 2:30 and 8 p.m., and Sunday at 4 p.m.

Eleven MSU artists will have their works on display at the Kresge Art Center Saturday and Sunday from 2 to 5 p.m.

An exhibit on old-time Great Lakes fishing can be seen in the MSU Museum Saturday and Sunday, from 1 to 5 p.m.

# Insect Safari

## Slide Program

Sunday, Sept. 4 at 2 PM There will be a slide program on insects and their homes at Fenner Arboretum.

COME! PEEK into the WORLD of INSECTS for a short while..

INSECT SLIDE PROGRAM

# Insect Open House

The insects at Fenner Arboretum will be having an open house at 2PM Saturday + Monday Sept. 3+5. A naturalist will be leading the tour starting at 2PM From the nature center building. COME SEE and LEARN about Insects and their Homes.

# GUIDED NATURE Walk

# APPENDIX E

## EXAMPLE OF TEST

Insect Homes Interpretive Method

Age_____

Sex M F

Occupation-Profession_____

1) Spiders are
__1) Insects
__2) Closely related to insects
__3) Not even remotely related to insects
__4) Reptiles

2) Insects are found everywhere on the earths surface,
__1) Except at North & South Poles
__2) Except at Poles and hot springs
__3) No exceptions--insect are everywhere!
__4) None of the above

3) Hornets make their huge paper nest by
__1) Collecting spider webs and molding them together with front feet
__2) By spinning it the way a caterpillar spins a cacoon
__3) Chewing up wood and bark to make a paper like substance
__4) None of the above

4) Ant homes are
__1) Simple tunnels in the ground
__2) Very complex with rooms for the queen, the eggs, the workers, and other special purposes
__3) Are not really homes, ants find food by digging tunnels
__4) Made by curling up a leaf

5) The tent caterpillar got its name by
__1) Weaving large tent-like structure in tree limbs where it hides
__2) Being a common nuisance in tents
__3) Its body markings, which look like a tent
__4) Lawrence P. Tent was the scientist that discovered it

6) A good example of an insect u sing its food for a home is
__1) An ant digging a tunnel
__2) A moth that looks like tree bark
__3) A caterpillar curling a leaf up and staying inside of it
__4) All of the above

7) One group of small insects makes up probably the smallest and strangest miners in the world. What material do they mine in?
__1) Leaves
__2) Dead wood
__3) Animal blood vessels
__4) Feathers of birds

8) Why is it usually easy to know if an insect is bitter tasting or poisonous?
__1) They have bad smells
__2) They are brightly colored to warn their enemies
__3) They all have painful bites
__4) There is no way of knowing

9) If ants play the part of the farmer in the insect world, what insect is the cow that gets milked?
__1) Beetles
__2) Caterpillars
__3) Small moths
__4) Aphids

10) Where can one find insects being fossilized today?
__1) In old swamps
__2) In fresh tar on roads
__3) Some scientists have developed a method
__4) In the sap or pitch running out of injuries in pine trees

11) What type of home do all beetles have?
__1) They use stones to build their homes
__2) They spin a cacoon every nigh
__3) They have hard shells on their backs
__4) They make their homes in fur

12) When an insect looks like another insect that predators don't eat
__1) It is using mimacry
__2) Probably closely related to the other insect
__3) Only lucky
__4) None of the above

13) One type of insect that looks like a bump or bruise on a leaf or branch is a(n)
__1) Ant
__2) Fly
__3) Grasshopper
__4) Scale insect

14) Insects that make cacoons do so because
__1) Cacoons are warm and the insect can remain active all winter
__2) They serve as protection during their completely inactive winter
__3) They can lay their eggs in them
__4) They were bred to do so to make silk for man

15) Insects are outnumbered in the world by
__1) Reptiles
__2) Nothing
__3) Birds
__4) Fish

16) Caterpillars that are found in large groups stay together because
1) There is more warmth in a large group
2) They have a highly developed social caste system
3) They confuse their enemies by their large group size
4) None of the above

17) What has been one of the main factors in creating public awareness about the environmental problems of today?
1) Swarms of mosquitoes coming out of the swamps every year
2) The highly successful destruction of the malaria carrying mosquito
3) The chemical control of insects, use of pesticides, and all their effects
4) None of the above

18) How many legs do all insects have? _____

19) What is the main purpose of an insect home? _____

20) Some insects cause a tumor-like growth on plants that they use as a home. What is this tumor-like growth called? _____

21) When an insect looks so much like its surroundings that it is almost impossible to see, it is using _____ as a means of protection.

22) What kind of a home do crickets make in nature? _____

23) What kind of a skeleton do all insects have? _____

THANKYOU FOR YOUR HELP

# APPENDIX F

## T VALUE LEVELS OF SIGNIFICANCE

Table 5.--T Value Levels of Significance.

| Degrees of Freedom | Alpha level of significance for directional tests | | | | | |
|---|---|---|---|---|---|---|
| | .25 | .05 | .025 | .01 | .005 | .0005 |
| | Alpha level of significance for non-directional tests | | | | | |
| | .50 | .10 | .05 | .02 | .01 | .001 |
| 7 | .711 | 1.895 | 2.365 | 2.998 | 3.449 | 5.405 |
| 11 | .697 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 13 | .694 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | .692 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 18 | .688 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 21 | .686 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 26 | .684 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 30 | .683 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| 40 | .681 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | .679 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | .677 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| ∞ | .674 | 1.645 | 1.960 | 2.326 | 2.576 | |