ASSESSING ENVIRONMENTAL LITERACY IN FLORIDA’S 4-H ENVIRONMENTAL EDUCATION PROGRAM

By

PREETHI R.S. MONY

A THESIS PRESENTED TO THE GRADUATE SCHOOL OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

UNIVERSITY OF FLORIDA

2002
Dedicated to my loving grandparents,
Isaac & Stella Sathiaraj, and Ida Mony
who have influenced me with their values and principles;
and in memory of my grandfather Victor Mony who also loved nature.
ACKNOWLEDGMENTS

Success is rarely achieved solely by an individual’s efforts. I owe the successful completion of this thesis to many teachers, friends and family. I would like to thank my advisor Dr. Jerry Culen, who patiently guided me through the research process, and whose expertise in the field of environmental education was invaluable. I would also like to thank my committee members, Dr. Mickie Swisher and Dr. Taylor Stein for their assistance and advice.

I am grateful to Dr. Stephen Humphrey for all his advice and for helping me through the process of adjusting to a new system of education. I would like to thank Meisha Wade and the staff at the College of Natural Resources and Environment for their assistance in helping me sort through the required forms and procedures on time. I also owe a debt of gratitude to those teachers like Professor Richard Beilock who helped me gain new perspectives.

Without the help of my family I would never have been able to come so far. I would like to thank my parents, Frederick and Angela Mony, for believing in me. They were always there to encourage and pray for me through the frustrations I faced while working on my thesis and I am grateful. I am thankful for my sister, Swapna’s support. Finally, I would like to thank my friends from Intervarsity Christian Fellowship for their encouragement and prayers.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>x</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>2</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>4</td>
</tr>
<tr>
<td>4-H Environmental Education Program</td>
<td>4</td>
</tr>
<tr>
<td>Goals and Objectives</td>
<td>5</td>
</tr>
<tr>
<td>Youth Programs</td>
<td>5</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>6</td>
</tr>
<tr>
<td>Research Questions</td>
<td>8</td>
</tr>
<tr>
<td>Research Hypotheses</td>
<td>8</td>
</tr>
<tr>
<td>Assumptions of Study</td>
<td>9</td>
</tr>
<tr>
<td>Limitations of Study</td>
<td>9</td>
</tr>
<tr>
<td>2 LITERATURE REVIEW</td>
<td>11</td>
</tr>
<tr>
<td>Environmental Literacy</td>
<td>11</td>
</tr>
<tr>
<td>Environmental Education</td>
<td>12</td>
</tr>
<tr>
<td>Goals and Objectives of Environmental Education</td>
<td>13</td>
</tr>
<tr>
<td>Theoretical Models of Environmental Education</td>
<td>15</td>
</tr>
<tr>
<td>Environmental Education Curriculum Development</td>
<td>19</td>
</tr>
<tr>
<td>Goals for Curriculum Development</td>
<td>20</td>
</tr>
<tr>
<td>Curricular Designs</td>
<td>21</td>
</tr>
<tr>
<td>Issue investigation and action model</td>
<td>21</td>
</tr>
<tr>
<td>Extended case study model</td>
<td>22</td>
</tr>
<tr>
<td>Activity guide</td>
<td>22</td>
</tr>
<tr>
<td>Research on Instruction Methods to Promote REB</td>
<td>23</td>
</tr>
<tr>
<td>Method 1: Infusion of Environmental Education into School Curricula</td>
<td>23</td>
</tr>
<tr>
<td>Method 2: Inserting a New Course into the Existing School Curriculum</td>
<td>24</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-1</td>
<td>Summary of results</td>
<td>37</td>
</tr>
<tr>
<td>5-1</td>
<td>Summary of hypotheses tested and conclusions</td>
<td>48</td>
</tr>
<tr>
<td>5-2</td>
<td>Comparison of results (1998 and 2001-02)</td>
<td>50</td>
</tr>
<tr>
<td>5-3</td>
<td>Results from the study in Molokai, Hawaii</td>
<td>52</td>
</tr>
<tr>
<td>5-4</td>
<td>Comparison of the results from all three studies</td>
<td>53</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>K-A-B model</td>
<td>16</td>
</tr>
<tr>
<td>2-2</td>
<td>Hines model of responsible environmental behavior</td>
<td>17</td>
</tr>
<tr>
<td>2-3</td>
<td>Environmental behavior model</td>
<td>18</td>
</tr>
<tr>
<td>3-1</td>
<td>Research design</td>
<td>34</td>
</tr>
</tbody>
</table>
Concerns about the sustainability of our environment have resulted in a greater awareness of the need for environmental education (EE). The Belgrade Charter of 1975 defined the goal of EE as the process of developing a global population of citizens who are aware of, concerned about and willing toward the resolution of environmental problems. In 1977, the Tbilisi Declaration further clarified the goals and objectives of EE. Later, in 1997 the Thessaloniki Declaration recommended that schools should be given the encouragement and support needed to make necessary changes to their curricula to work towards a sustainable future.

All this attention on EE resulted in the development of a number of different EE curricula and programs. However researchers found that while there is no dearth of EE curricula the corresponding need for evaluation and assessment has not been sufficiently met. As a result this study was an attempt to evaluate the impact of the 4-H EE program in Florida on environmental literacy levels of participants.
In this study, environmental literacy was evaluated by measuring responsible environmental behavior (REB) and some of its predictors (i.e., knowledge of ecological concepts, knowledge of environmental issues, issue analysis skills, knowledge and skills in using citizenship action strategies). The Middle School Environmental Instrument (MSELI) was the survey instrument used for this purpose. The sample was comprised of 4-H students between the ages of 11 and 16. Respondents who had used EE curricula in their 4-H programs were compared with those who had not used any such curricula in their 4-H programs.

The students who had used EE curricula scored significantly higher on all sections of the survey (at the $\alpha = 0.05$ level), except on the self-reported REB section. Thus it would appear that the 4-H EE program has been partially effective in developing environmental literacy in students because it is providing them with the knowledge and skills required to act in an environmentally responsible manner, but has not been effective in changing behavior.
Many people can list environmental problems ranging from the loss of rainforests to global warming. Nonetheless, very few of these people would have any idea about what they could do to help solve these environmental problems. Most people seem to suffer from a sense of “action paralysis”, in that they believe that the only things they can do for the environment are small things such as recycling (Connell et al., 1999). However, environmental problems are of such a global nature that the actions of every citizen of planet Earth affect the local, regional environment, and also the global environment. As a result environmental protection cannot be the sole responsibility of a small group of environmental scientists. In fact, a sustainable future can become a reality only if there is a global population of environmentally concerned (i.e., environmentally literate individuals) (Strauss, 1995). However, Bjorkland and Pringle (2001) report that, despite increasing public awareness about environmental problems, environmental illiteracy is still a major obstacle to protecting our life-support base.

Recognizing this need for environmental literacy, UNESCO organized a workshop on environmental education (EE) at Belgrade, Yugoslavia in 1975. The participants at the workshop developed a global framework for EE that is now widely referred to as the Belgrade Charter. This document explains that the goal of EE is “to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the
prevention of new ones”. In 1977 UNESCO and UNEP jointly organized an Intergovernmental Conference on Environmental Education, at Tbilisi, Georgia (USSR). The Tbilisi Declaration adopted at the close of the conference built on the Belgrade Charter and developed a more comprehensive framework that defined the goals and objectives of EE. Now with a widely accepted definition for EE in place, efforts were made to define environmental literacy. In 1992, Disinger defined environmental literacy as “the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems”.

In 1997, UNESCO organized an International Conference on Environment and Society: Education and Public Awareness for Sustainability at Thessaloniki, Greece. At this conference, the participants evaluated the progress made toward sustainability since the Belgrade Conference on Environmental Education (1975). They reaffirmed the need for environmental education and for the reorientation of education as a whole towards sustainability (UNESCO, 2001).

With so much attention on EE and environmental literacy as a means to a sustainable future, more research studies were focused on developing EE programs aimed at creating environmental literacy. A variety of EE programs were also developed for this purpose, ranging from school curricula to after-school nonformal environmental clubs. In this study I evaluated one such program (i.e., the efficacy of Florida’s 4-H EE program in developing environmental literacy among 11- to 16-year old participants).

**Purpose of the Study**

With increasing awareness of the need for EE, more environmental curricula have become available for educators. These range from formal school curricula to smaller program units that can be used by environmental clubs, to issue-specific curricula that
can be covered in a few hours. Yet, do all these different curricula actually achieve environmental literacy? At present this question remains mostly unanswered. This is because while there has been no dearth of EE curricula, the corresponding need for evaluation and assessment has not been sufficiently met (Marcinkowski, 1998). Volk and McBeth (1998) report that most EE related research studies focus on measuring affect and knowledge of environmental issues. However, less than half measured environmentally responsible behavior, or ecological knowledge; none of them measured cognitive skills related to environmental literacy or additional determinants of environmentally responsible behavior. As a result, most programs and curricula have not been assessed to determine whether they do indeed achieve the goal of environmental literacy. Lucas (1980) reported the same need for research in testing effectiveness of EE programs by examining their effects on behavior rather than attitude change. The Thessaloniki Declaration (1997) also recognized this paucity of knowledge by recommending support for research in assessing the impact of EE programs.

The purpose of this study is to provide baseline information on the impact of nonformal EE programs on environmental literacy levels of middle school participants. In this study I have attempted to determine whether the Florida 4-H EE program helps youth achieve environmental literacy as measured by responsible environmental behavior (REB). I also assessed the impact of this program on precursors or predictors of REB such as knowledge of ecological concepts, awareness of environmental issues, issue analysis skills, perceived knowledge of and skills in using citizenship action strategies.

This study is a replication of a study conducted by Cullen in 1998 on Florida’s 4-H EE program. Over the past few years, new curricula have been added for use in the 4-H
EE program. This study attempts to identify and assess the positive and negative changes in the efficacy of the program in developing environmental literacy. The findings from this study will help program and curriculum developers better understand the impacts of the Florida 4-H EE program and make required changes to improve it.

**Significance of the Study**

Comprehensive assessment for nonformal EE programs is inadequate at present (Marcinkowski, 2001). This study helps develop baseline data against which other nonformal EE programs can be compared. It provides environmental educators and curriculum developers with a method and a standardized instrument by which they can assess the effectiveness of the curricula they are using and also allow them to compare two or more different environmental programs or curricula to determine which would be the most effective in developing REB. Thus this information will help curriculum developers create more effective EE programs.

**4-H Environmental Education Program**

The 4-H EE program falls under Florida Cooperative Extension’s Environmental Education Program. Extension’s EE program focuses on developing and implementing programs in natural resource and environmental education for 4-H, other K-12 youth, county faculty, teachers and adult leaders. These programs aim to improve environmental literacy in terms of ecological concepts, awareness of environmental issues, investigations and evaluation of issues and citizenship participation in issue resolution (Culen, 1998).
Goals and Objectives

The overall goal of the Extension EE program is to improve environmental literacy of Florida’s youth through science based information and educational methods (Culen, 1998).

The objectives are that youth participants will

- acquire a substantial amount of science and social foundations that directly relates to Florida’s environmental problems, issues and changes.
- increase their awareness of the varied and critically important environmental problems, issues and challenges that exist within Florida and extend beyond its borders.
- acquire and apply the skills needed to understand the complex and multiple perspectives that surround environmental issues.
- acquire investigation skills needed for independent investigation and evaluation of environmental problems, issues and challenges.
- develop and evaluate community based action plans focused on the need for responsible citizenship behavior related to environmental issues (Culen, 1998).

Youth Programs

The Extension EE program has a variety of different programs and curricula developed specifically for youth (Culen, 1998). These programs or curricula are delivered using different modes, namely: 4-H community clubs, school enrichment programs, home school instruction, day camp programs, individual participation.

A number of different curricula in the form of “Leader’s Guides” and “Project books” are developed for youth education (Culen, 1999). In order to support the curricular materials and to encourage enthusiasm for the subject, certain subject matter events are organized at different times through the year, such as the marine ecology event and the land-judging event.
Thus the 4-H EE program is designed to allow the club leader or teacher much flexibility in determining the activities and curricula that their club will use. It encourages club leaders to adapt the program to suit the needs and interests of the students in their club. In this study all respondents who have used EE curricula in their 4-H programs are considered to be involved in the 4-H EE program.

**Definition of Terms**

**Responsible environmental behavior (REB).** In this study this term refers to any behavior that aims at either preventing environmental problems or solving environmental issues. REB is the ultimate goal of environmental education (Culen, 2001). It is also often used interchangeably in EE literature with terms like citizenship behavior and environmentally responsible behavior.

**Knowledge of ecological concepts.** In this study this term refers to the ecological conceptual basis for decision making, e.g., concepts related to population dynamics, nutrient cycling, carrying capacity, etc. Research indicates that while this variable by itself is not a predictor of REB, it is a prerequisite for ecologically sound decision-making (Hungerford & Volk, 1990).

**Environmental issues.** In this study this term is used to refer to any environmental problem in which the players differ in their opinions on how it should be managed or solved. Environmental issues generally result due to differing human values and beliefs (Culen, 1994). All environmental issues are considered to be science-related social issues because they have both a science component and a social component (Ramsey & Hungerford, 1998).

**Issue analysis skills.** In this study this term refers to the skills required to study an issue in depth in order to understand the different factors, players, beliefs and values that
play a role. It requires the ability to identify environmental issues; identify players and their positions as well as their beliefs and values; investigate the issue and collect data; evaluate the data collected and determine the most effective means of resolving the issue (Ramsey & Hungerford, 1998).

**Citizenship action strategies.** In this study this term refers to the different actions that an individual/group can take to solve an environmental issue. In EE literature this term is often used interchangeable with environmental action strategies. These actions are divided into five categories: ecomanagement, consumer action, persuasion, political action and legal action. They have been defined as follows:

- **Ecomanagement** is any action in which people work directly to change or modify their natural environment to help prevent or resolve environmental issues (Marcinkowski, 1998). An example of this would be tree planting.

- **Consumer action** is any action in which people use their buying power as an economic incentive/disincentive to industry and businesses to work towards the resolution of environmental issues (Marcinkowski, 1998). Examples of this would be boycotting of certain goods or buying eco-friendly products.

- **Persuasion** is any action in which people encourage other individuals or groups to help prevent or resolve environmental issues (Marcinkowski, 1998). This would include actions like signing a petition or talking to a friend about recycling.

- **Political action** is any action in which people use political processes, organizations or offices to help prevent or resolve environmental issues (Marcinkowski, 1998). A good example would be writing a letter to a legislator.

- **Legal action** is any action in which people use their legal rights to help prevent or resolve environmental issues (Marcinkowski, 1998). This includes alerting law enforcement officials of illegal activities that are threatening the environment.

**Perceived knowledge of citizenship action strategies.** In this study the term is used to refer to how knowledgeable about citizenship individuals consider themselves. Knowledge of action strategies could affect perceived skill in using action strategies, but is not as strong a predictor of REB as the skill factor (Hungerford & Volk, 1990).
**Perceived skill in using citizenship action strategies.** In this study the term refers to an individual’s belief in his/her ability to use citizenship action strategies to solve an environmental issue. It is one of the best predictors of REB (Hungerford & Volk, 1990).

**Research Questions**

This research study addresses the following questions.

A. What is the effect of the Florida 4-H EE program on knowledge of ecological concepts?

B. What is the effect of the Florida 4-H EE program on the each of the following predictors of responsible environmental behavior: awareness of environmental issues, issue analysis skills, perceived knowledge of citizenship action strategies, perceived skill in the use of citizenship action strategies?

C. What is the effect of the Florida 4-H EE program on responsible environmental behavior?

**Research Hypotheses**

**Hypothesis 1.** Those participants who have used EE curricula in their 4-H program will have a greater knowledge of ecological concepts than those who have not used such curricula.

**Hypothesis 2.** Those participants who have used EE curricula in their 4-H program will have a greater awareness of environmental issues than those participants who have not used such curricula.

**Hypothesis 3.** Those participants who have used EE curricula in their 4-H program will have a greater ability to analyze environmental issues than those who have not used such curricula.

**Hypothesis 4.** Those participants who have used EE curricula in their 4-H programs will show a greater level of perceived knowledge of citizenship action strategies, than those who have not used such curricula.
Hypothesis 5. Those participants who have used EE curricula in their 4-H programs will show a greater level of perceived skill in the use of citizenship action strategies, than those who have not used such curricula.

Hypothesis 6. Those participants who have used EE curricula in their 4-H programs will show a greater level of responsible environmental behavior than those participants who have not used such curricula.

Assumptions of Study

This was an ex-post facto study. As a result participants could not be randomly assigned to the EE and non-EE groups. Both groups were assumed to be equal in terms of independent variables other than the treatment variable, i.e. use of EE curricula.

The study also uses the assumption that the EE groups had completed at least one 4-H EE curricular unit. No differentiation was made between groups that have used the entire curriculum and carried out the different exercises/activities listed and those that have used only part of the curricula to supplement other educational material or have not completed the curriculum due to time restraints.

In this study we did not provide instructors with any form of training. We thus assume that all the instructors were equally competent at teaching EE. Also all the groups did not return the completed survey instruments. It is possible that only those teachers/group leaders who were enthusiastic about teaching EE returned the completed survey instruments.

Limitations of Study

The sample used for the study was a sample of convenience. As a result data was only obtained from those 4-H groups that were interested in participating in the study. This increases the probability of self-selection bias.
There is no data on student attitudes and behavior before participating in the 4-H EE program. An EE group consisting of students who had used EE curricula in their 4-H programs was compared against a non-EE group consisting of students who had not used any EE curricula in their 4-H programs. Both groups were samples of convenience as participation was voluntary.

The sample used in this study may not be representative of the 4-H EE program in Florida. Thus the results of this study may not be generalizable to the entire Florida 4-H EE program. The results from this study also cannot be extrapolated to EE programs organized by 4-H in other states nor can it be used as an assessment of EE programs in Florida in general.

In this study an attempt was made to test for environmental literacy by testing for REB. For this purpose the Middle School Environmental Literacy Instrument, 8th Edition (MSELI) was used to collect data. The data collected on environmental actions using this instrument is self-reported and not from direct observation. This is another limitation of the study arising from the difficulty of measuring actual REB.
CHAPTER 2
LITERATURE REVIEW

The purpose of this study is to evaluate the efficacy of the 4-H EE program in developing environmental literacy. This chapter explains the theoretical framework underlying the study.

Environmental Literacy

Literacy level is a term often used in discussing the development of a nation or state and generally refers to the ability to read and write, but planners and politicians rarely discuss environmental literacy levels. This may be due to insufficient data about environmental literacy levels, lack of recognition of the importance of environmental literacy for a sustainable future, or a combination of both. Bjorkland and Pringle (2001) summarize the current state of affairs by stating that “environmental illiteracy is still a major impediment to protecting our life support base” (p. 279).

Environmental literacy is recognized as the primary goal of environmental education (Culen, 2001). It is defined as the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems (Disinger, 1992). Environmental literacy involves an understanding of the role of humans in nature, the importance of maintaining human habitat fit for life, and the basic scientific principles related to the functioning of nature (Wilke, 1995). In addition environmentally literate individuals have the knowledge and skills required to analyze environmental issues, which enables them to act in an environmentally responsible manner. Such environmental action is termed responsible
environmental behavior (REB). As a result environmental literacy is often measured in terms of REB. From these definitions we see that “environmental literacy is the basis for action for protecting our resources for ourselves, our species’ future and for the future of the other species with whom we share the Earth” (Kibert, 2000, p. 5).

The next section explains the means of achieving environmental literacy, i.e. environmental education.

**Environmental Education**

Environmental Education (EE) is considered a field of study in its own right today, but it was not always so. In the past, EE was treated as synonymous with environmental science, nature studies, conservation education, outdoor studies and other similar fields. In 1969, Stapp proposed a definition for EE that helped identify it as a distinct field of instruction. “Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems, and motivated to work towards their solution” (Stapp, 1969, p. 31). The Tbilisi Declaration (1977) further clarified the concept of EE and defined it as “a process of developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, skills, attitudes, motivation and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones” (Stapp, 2001). These definitions make it clear that a person is not considered environmentally literate by simply being aware of the environment and environmental issues. The individual should also have the motivation as well as the knowledge and skills required to act in an environmentally responsible manner.
EE as explained above is multi faceted. Linke (1980) defines three major components of EE: (1) developing a deeper understanding of the complex and dynamic interrelationships between humans and their physical, biological and social environments; (2) concern for maintaining and improving the quality of human life through conservation of the environment; and (3) emphasis on positive individual and collective action as a means of demonstrating this concern. Linke further reiterates that EE consists of all of these components together and cannot be completely described by any one of the components. In fact the common thread running through all the definitions is the emphasis on critical thinking and problem solving skills as well as action on a personal and public level (Simmons, 2000).

Goals and Objectives of Environmental Education

Defining EE helped clarify the scope and need for the field, but there still existed considerable debate about the goals and objectives of EE. This was reflected in environmental programs that showed considerable lack of direction. In an attempt to further clarify and define the field, the Tbilisi Declaration (1977) identified three goals of EE that are widely accepted.

1. “To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas”.

Here we see the shift from the anthropocentric worldview (Dominant Social Paradigm), to the integrative view of humans as a part of nature (New Environmental Paradigm). EE recognizes that as more and more people shift to urban areas, individuals lose sight of their interdependence with nature. EE strives to make individuals aware that humans are a part of the natural biophysical world and not separate from it.
2. “To provide every person with opportunities to acquire the knowledge, values, attitude, commitments and skills needed to protect and improve the environment”.

EE focuses on protecting the environment, not by indoctrinating children with environmental ideas, but by allowing them to analyze issues and determine how to act in a responsible manner. For years educators considered it sufficient to provide children with ecological knowledge. However, this goal is very specific in indicating that EE should provide individuals with not just ecological knowledge but also needs to equip them with the knowledge of skills needed to analyze issues. This would help them develop a better understanding of the values and attitudes involved in environmental issues, thereby enabling them to act in an environmentally responsible manner.

3. “To create new patterns of behavior of individuals, groups and society as a whole towards the environment”.

This goal focuses on REB and is considered by many to be the ultimate goal of EE. In this study we focus our research on determining whether the Florida 4-H EE programs have accomplished this goal.

These goals are further broken down to list the specific objectives of EE as identified by the Tbilisi Declaration:

**Awareness** – to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.

**Knowledge** – to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of the environment and its associated problems.

**Attitudes** – to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
Skills – to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation – to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward the resolution of environmental problems.

These goals and objectives have been recognized as the backbone of EE. Programs and curricula are developed with these goals and objectives in mind. Hungerford, Peyton and Wilke (1980) further broke these goals down into goals for curriculum development that are discussed later in this chapter.

Theoretical Models of Environmental Education

Different models have been proposed for EE. The generally accepted definition of EE focuses on an end result of responsible environmental behavior (REB). As a result most of the research focuses on identifying models of behavior.

Traditionally the Knowledge-Attitudes-Behavior model (Figure 2-1) was the accepted model for environmental education. It was theorized that with increase of ecological knowledge came a change in attitude and increased awareness of the environment and its associated problems. This increased awareness would lead to behavioral modifications resulting in actions promoting better environmental quality (Ramsey & Rickson, 1977). For a long time this model was widely accepted and environmental education curricula focused on increasing knowledge of the environment as a means to creating environmental literacy.

Later research showed that this linear relation did not hold true (Hungerford & Volk, 1990). In a longitudinal study, Burrus-Bammel (1978) found that attitudes were not correlated with knowledge. The results from Kibert’s study (2000) indicated that the
relationship between knowledge and behavior is insignificant. Increasing knowledge alone was not sufficient to change behavior. Instruction in environmental awareness by itself is not sufficient to develop the ability to initiate environmental action (Ramsey, Hungerford & Tomera, 1981).

![K-A-B model](image)

Figure 2-1. K-A-B model

As researchers attempted to identify the variables that did affect REB, Hines, Hungerford and Tomera (1986/87) discovered that the researchers in other academic fields like education, psychology, political science, etc. had also conducted research on REB. As a result they hypothesized that the “lack of knowledge of factors affecting REB did not appear to be due to scarcity of research on the topic” (p. 1), but may partially be due to a lack of communication among researchers in different academic areas (Hines et al., 1986/87). A number of different variables related to REB had been proposed, but there was no consensus among researchers. In an attempt to synthesize the findings from the different studies into a single model, they collected data from all related studies. Data from 128 different studies was finally used. Fifteen separate variables were meta-analyzed, using the Schmidt-Hunter meta-analysis procedure in an effort to determine the strength of their association with REB. The resulting model is one of the most widely used models today.

Unlike the traditional K-A-B model, Hines’ model of responsible environmental behavior (Figure 2-2) does not consider ecological knowledge to be a major predictor of
environmentally responsible action although knowledge was considered an important prerequisite of action. Hines et al. (1986/87) noted that an individual who expresses an intention to act is more likely to carry out that action than one who does not express any such intention. Thus expressed intention to act was considered to be a more accurate predictor of REB. Many factors affect intention to act. Hines et al. found that ability alone was not a sufficient predictor of action. Knowledge of issues and knowledge of citizenship action strategies were found to be important precursors. Skills in applying the appropriate knowledge to a given situation were also found to affect the ability of the individual to act. Personality factors played a role in motivating the individual to act. Other factors found to affect REB were situational factors. These include economic
constraints and social pressures. Such factors may affect REB by either strengthening or counteracting the variables in the model (Hines et al.).

In 1990, Hungerford and Volk developed the Environmental Behavior Model (Figure 2-3) by using the Hines model of REB combined with other related research findings as the foundation. In this model variables that contribute to environmental behavior are divided into three categories: entry-level variables, ownership variables and empowerment variables. “The variable categories are hypothesized to act in a more or less linear fashion, albeit a complex one” (Hungerford & Volk, 1990).

![Environmental Behavior Model Diagram](image)

**Figure 2-3. Environmental behavior model (Hungerford and Volk, 1990).**

Entry level variables are considered to be prerequisites of REB. They are good predictors of environmental behavior, but seem to be the least affected by short-term instruction (Winther, 2001). Ownership variables are those that make the issue personal
to the individual. These variables appear to be very important in motivating an individual
to act on an issue. Empowerment variables provide the individual with the means to act in
an environmentally responsible manner. They create in the individual the sense of being
able to make a change. Some of these variables are teachable and should be an essential
part of environmental education.

Research in EE has identified many different variables associated with REB and
environmental literacy. This knowledge has been important to environmental educators
as they seek to improve the quality of existing curricula and programs.

**Environmental Education Curriculum Development**

A number of environmental education curricula are available today. However, these
curricula do not always effect positive behavior change in individuals. Frischknecht and
Bradenburg (1981/82) claim that “unstructured knowledge, unrelated pieces of
information out of a coherent context and information overload may lead to learned
helplessness and to a shift in the personality of the locus of control from internal to
external” (p. 25). Well-constructed environmental education programs are learner-
centered. They engage learners in direct experiences by providing opportunities to
construct their own understanding though hands-on investigations (Simmons, 2001).
Such programs develop higher-order thinking skills as well as help empower the learner.
Programs that actively involve the participants are also more likely to improve
environmental behavior (Zelezny, 1999). Such well-developed and effective curricula do
exist but it is up to educators to identify them (Neidermeyer, 1992). However it is
difficult for educators to identify effective programs without having some sort of
guidelines against which to compare existing curricula. EE curriculum developers face a
similar problem due to a lack of concrete goals for curricula.
Goals for Curriculum Development

In an attempt to remove intuitive guesswork in curriculum development, Hungerford, Peyton and Wilke (1980) developed a set of goals for curriculum development in EE. For further clarity they also developed a set of sub goals or goal levels that were more specific and detailed.

The Superordinate Goal: …to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment (Hungerford et al., 1980, p. 23).

Level I. Ecological Foundations Level

This [goal] level seeks to provide the receiver with sufficient ecological foundations knowledge to permit him/her to eventually make ecologically sound decisions with respect to environmental issues (Hungerford et al., 1980, p. 23).

Level II. Conceptual Awareness Level – Issues and Values

This [goal] level seeks to guide the development of a conceptual awareness of how individual and collective actions may influence the relationship between quality of life and the quality of the environment and, also, how these actions result in environmental issues which must be resolved through investigation, evaluation, values clarification, decision making, and finally, citizenship action (Hungerford et al., 1980, p. 24).

Level III. Investigation and Evaluation Level

This [goal] level provides for the development of the knowledge and skills necessary to permit receivers to investigate environmental issues and evaluate alternative solutions for remediating these issues. Similarly, values are clarified with respect to these issues and alternative solutions (Hungerford et al., 1980, p. 24).

Level IV. Environmental Action Skills Level – Training and Application

This [goal] level seeks to guide the development of those skills necessary for receivers to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of the environment (Hungerford et al., 1980, p. 24).
These goal levels lead the learner gradually towards responsible citizenship behavior. The learner is first taught ecological concepts and then led to an understanding of how humans affect the environment. The next two levels then take the learner through investigation, evaluation and action skills, thus empowering him/her to become an environmentally responsible citizen.

These goal levels also enable curriculum developers to design activities that systematically lead to environmental literacy. They assist teachers and evaluators in identifying the shortcomings of a curriculum and also help them determine the type of activities that could be used to effectively supplement existing curricula.

Curricular Designs

Looking at the goal levels we see a strong focus on environmental issues. This is because all environmental behavior is issue related (Hungerford & Volk, 1990). In an attempt to achieve these goal levels Hungerford and Volk proposed two curricular strategies built around issue investigation: the Issue Investigation and Action Model, and the Extended Case Study Model.

Issue investigation and action model

Curricula developed based on this model teach students to identify issues and train them to use issue analysis skills. It also teaches students to recognize the role of beliefs and values in issues. Finally it requires them to investigate an issue of their choice and prepare a report on their findings (Hungerford & Volk, 1990).
**Extended case study model**

This model is similar to the previous model in that many of the same skills are taught. The difference is that in this model an issue is chosen by the entire class (or is predetermined by the instructor) rather than by individual students. Also, the students all work together on the investigation. Though successful this model is not as powerful at achieving behavior change as the issue investigation and action model (Hungerford & Volk, 1990).

Both these curricular strategies are designed to guide students through a series of activities that sequentially incorporate the different goal levels that have been discussed earlier. As a result, curricula using these strategies would have to be used in their entirety in order to be effective. Generally this would involve a large time commitment on the part of the instructor. Since this is not always possible, a number of other curricular designs have been employed to develop supplemental curricula. Such curricula are designed to augment the existing curricula that the teacher is using. An activity guide is one such example.

**Activity guide**

The basic goal of this curricular design is to help the student experience nature and learn skills required to protect and preserve the environment. Activity guides are designed to supplement existing curricula over a wide range of subjects so that students have an opportunity to experience the interdisciplinary nature of EE. In these guides different activities are grouped according to subject matter or the skill level of the student. Information is generally included as to the subjects i.e., language arts, social studies, science, etc. in which each activity can be incorporated. The amount of time required for these activities generally range from about 15 or 20 minutes to a couple of
30-minute class periods. This design is seen in many of the most widely used EE curricula.

**Research on Instructional Methods to Promote REB**

One of the recommendations of the Thessaloniki Declaration (1997) was that “schools be encouraged and supported to adjust their curricula to meet the needs for a sustainable future”. In order to develop an environmentally responsible citizenry it is essential to incorporate EE throughout a K-12 curriculum in a developmentally and instructionally appropriate manner (Volk, 2001). Effective EE will not result from episodic instruction but has to be systematically constructed and theoretically valid (Ramsey, Hungerford & Volk, 1992). Two methods have been identified for this purpose.

**Method 1: Infusion of Environmental Education into School Curricula**

Infusion of environmental education curricula into existing school curricula has been identified as an extremely effective method of teaching for environmental literacy. “Infusion refers to the integration of content and skills into existing courses in a manner as to focus on that content (and/or skills) without jeopardizing the integrity of the courses themselves” (Ramsey et al.1992, p. 40). For this the curriculum developer would have to define the scope of the curriculum by breaking down the goals into smaller objectives. The objectives would then have to be sequenced in order to ensure a gradual progression of learning. At this stage it is also important to take into consideration the developmental stages of the students so that the objectives assigned for each grade level are not beyond the grasp of the students in that grade level. Finally the scope should be expanded to identify different disciplines in different grade levels that would have the potential to integrate EE into the curriculum (Volk, 2001).
This method involves a large number of faculty members from various disciplines. It requires cooperation and coordination between them. It is essential that the teachers involved in such a project be flexible and committed to the plan to ensure a logical flow as well as to maintain the comprehensiveness of the curriculum. A great deal of communication is also required between the individual teachers. The willingness and enthusiasm of the school’s faculty to participate in the infusion process is a key factor that will determine the success of the infusion method.

**Method 2: Inserting a New Course into the Existing School Curriculum**

The alternative to the infusion method is to create a separate course in EE that can be inserted into the school curriculum. This would eliminate a lot of the difficulties involved with the infusion method. Fewer teachers would be involved. Faculty members from other disciplines would not feel that the integrity of their courses would be compromised. The need for cooperation and communication between faculty members would be greatly reduced.

Environmental issues cross all disciplinary borders. As a result EE encompasses the components of a variety of different disciplines from science to social sciences to language skills. However by creating a separate course for environmental education, students would not be able to benefit from the multidisciplinary approach that EE lends itself to (Volk, 2001). Another drawback to this method is that most administrators and curriculum planners are reluctant to add another course to an already overcrowded curriculum (Ramsey et al., 1992).

These instructional methods do not need to be mutually exclusive. After considering both approaches, Volk (2001) points out that it is very likely that the most effective approach to EE would be a judicious mix of both methods.
Another factor affecting instruction in EE is the belief that it should only be taught by science teachers. The multidisciplinary nature of EE ensures that instructors from other disciplines such as the social sciences can also integrate it successfully into the courses they teach (Hungerford, 2001). One of the significant results of training faculty members in environmental content and issue investigation skills has been the recognition by teachers, from a variety of different disciplines, that such material can often be incorporated into existing courses without interfering with the content and skills desired by that instructor (Ramsey et al., 1992).

**Assessment in Environmental Education**

As seen earlier, until recently there was no consensus on the definition of environmental literacy. As a result, there has been very little assessment and evaluation carried out to determine whether EE curricula do create environmental literacy as defined by the Tbilisi Declaration. One of the biggest problems with assessment in EE is that although instructors find it relatively easy to measure environmental knowledge levels, they find it difficult to measure other outcomes like responsible environmental behavior (Tomsen & Disinger, 1998). However “evaluation is essential for effective program development in EE” (Hart 1981, p.15). It also helps to guide the selection of EE programs and to judge its appropriateness for support and adoption.

New growth in the field of EE has created new needs for assessment. Educators and curriculum developers need assessments to determine the impact of EE activities and curriculum, teacher training, curriculum guidelines and other components of comprehensive EE programs (Marcinkowski, 2001; Ruskey, Wilke & Beasley, 2001). The National Environmental Education Act (1990) recognized this need by establishing the Office of Environmental Education within the Environmental Protection Agency. One
of the activities that fall under the aegis of this office is the evaluation of programs and curricula (Marcinkowski, 1990). A survey of the status of EE in the United States found that “although only 3 states included EE in statewide assessment strategies in 1995, 19 states had this initiative in place and 15 were developing ways to include EE in assessments of student performance in 1998” (Ruskey et al., 2001, p. 8). On reviewing the results of the survey, Ruskey, et al. (2001) recommend implementing environmental literacy assessments in every state in order to generate environmental literacy at the rate needed to contribute effectively to environmental sustainability.

A number of different methods of assessment are already in use. These include pencil-and-paper form of testing, interviews, direct observation and combinations of these methods. However, there also exist alternative methods of assessment, which are often simply termed “authentic assessments” or ‘alternative assessments”.

Authentic assessments are designed not only to be assessment tools but also to be exercises through which students explore their understanding of a topic and apply that knowledge. They are student-centered, engaging and educational. They focus on developing understanding and applying knowledge, rather than assessing achievement alone. In a situation where authentic assessment is used, students learn how to learn (Moorcroft, Desmarais, Hogan & Berkowitz, 2000, p. 20).

Some of the methods of alternative assessment are described below.

- **Manipulative tasks and investigations** – This involves carrying out scientific investigations by developing hypotheses, carrying out experiments, recording observations and interpreting the results. It also includes social research such as investigating social conditions, problems and issues.

- **Writing assessments** – Here assessment is based on a collection of samples of student writing. This helps the instructor evaluate the student’s language skills as well as subject matter and analytical skills.

- **Oral discourse and examination** – This form of evaluation allows the student to present and explain his/her ideas, while allowing the instructor an opportunity to explore a student’s knowledge and grasp of concepts that have been taught.
• Exhibitions – These include live demonstrations or performance and work projects that demonstrate skill or competence.

• Portfolios – This involves saving up writing samples, project reports and other work products in order to evaluate the student’s progress over time.

• Constructed response items, essays and concept mapping – while the first two are familiar to most, concept mapping is a non-traditional method that can also be used to assess a student’s understanding of concepts as well as interactions and impacts of processes (Marcinkowski, 2001).

The need for alternative assessment in EE is growing. Marcinkowski (2001) points out that alternative assessment would prove ideal for assessment in EE because of the following reasons. First, EE is not generally taught as a separate subject, as a result very little attention has been given to the development of standardized testing programs. Secondly, as a result of infusion of EE into various subjects, alternative assessments provide methods like portfolios that allow the instructor to collect all relevant EE work done by the student in different classes and then evaluate his/her progress.

Educators in formal settings are beginning to move away from traditional forms of assessment in favor of alternative assessments, but alternative assessments have not gained much usage in informal education (Moorcroft, et al., 2000). This is because they are time consuming and can be expensive. On the other hand, by performing good assessments informal education centers can prove to schools and program supporters that they are providing quality programs. It also helps them ensure that students receive not just informative, but also effective education (Moorcroft, et al., 2000).

Summary

Internationally the focus on EE and environmental literacy as the means of achieving sustainability of our natural environment is growing. Over the years
researchers have made progress in defining and developing concrete goals for EE. The primary goal of EE is REB. Research on REB has yielded many precursor and predictor variable. Proposed models of REB have helped the development of EE curricular goals and sub goals. Researchers have developed curricular strategies, and alternative assessments suitable for a variety of different needs. Despite all this progress there has not been sufficient evaluation of available EE materials and programs.
CHAPTER 3
METHODOLOGY

The purpose of this research project is to determine whether the Florida 4-H EE program is effective in developing environmental literacy in students between the ages of 11–16. In this study I measured environmental literacy in terms of REB and also assessed other predictors of REB including knowledge of ecological concepts, environmental issue investigation and analysis skills, knowledge and skill in using citizenship action strategies.

4-H clubs, schools, and other groups like home schools use EE curricula. In this study I compared the environmental literacy levels of two groups of students. The EE group consisted of 4-H participants who had used EE curricula in their 4-H programs, while the non-EE group was made up of 4-H participants who had not used any EE curricula. The survey instrument was administered to both groups and the results compared.

The Instrument

For this study I used the short form “Middle School Environmental Instrument” or MSELI (8th edition, 1996). This instrument has its roots in the Environmental Literacy Instrument (ELI), fourth edition. Hungerford, Ramsey, Volk and Bluhm developed the original ELI as an attempt to standardize the method of assessment of environmental literacy, and to meet the demands of various scholars and state agencies to conduct assessments that were non-traditional (Bluhm, Hungerford, McBeth & Volk, 1995). This instrument has sections designed to test students over a range of environmental literacy
components. In 1993, when asked to develop a similar instrument for middle school students, Hungerford et al used the ELI as a basis to create the Middle School Environmental Literacy Instrument (Bluhm et al 1995).

Validity and Reliability

The MSELI has been extensively tested for validity by a panel of 19 environmental educators. Seventy-four percent of the panel reported that the instrument adequately represented the literacy framework (Bluhm et al 1995).

Reliability of each of the sections was measured using both test-retest and interrater reliability estimates. The test-retest scores obtained from sixth grade students showed acceptable reliability scores. Test 1, part 1: $r = 0.76$; test 1, part 2: $r = 0.88$; test 2, part 1 Total score: $r = 0.88$; Test 2, part 2 Total score: $r = 0.79$ (Bluhm et al. 1995). The interrater scores for the subjective parts of the instrument indicated an acceptable level of reliability; they were 0.94 and 0.95 respectively (Bluhm et al.). The readability was measured using the Flesch Scale. Test 1 was found to correspond to Grade 6 while Test 2 corresponded to Grade 6 and 7 (Bluhm et al.).

Components of the Survey Instrument

The instrument (appendix A) consists of a section dealing with the demographics of the participant followed by questions designed to measure the individual’s environmental knowledge, skills and behavior. These questions are assigned to four different parts that are designed to test for different variables. Guidelines provided in the report on the development of the instrument were used to score the completed instruments.

Demographics

This section collects the respondent’s demographic data including the type of community where they reside and their involvement in 4-H programs. Respondents are
also asked to rate what they perceive to be the level of their family’s appreciation and concern for nature. The remaining questions in this section deal with what they believe are the sources of their environmental knowledge.

**Part I: The issues with which I am familiar**

This part of the survey instrument measures respondents’ awareness of environmental issues in the world around them. They can score up to four points for each issue they mention depending on the level of specificity. This enables us to determine the extent of their understanding and knowledge of the issue. The lowest score for this section is 0 and the highest is 12. This section provides data required to answer research question B (1). This question seeks to determine the effect of the Florida 4-H EE program on awareness of environmental issues, which is a predictor of REB.

**Part II: Ecological foundations**

This part of the survey instrument measures knowledge of ecological concepts. The questions are in the multiple-choice format and test knowledge and understanding of ecological principles. Each correct response is worth one point. The minimum score for this section is 0 and the maximum is 17. These data helps us answer research question A that seeks to determine the effect of the Florida 4-H EE program on respondents’ knowledge of ecological concepts.

**Part III: How I feel about things and what I do about things**

This part of the survey instrument goes beyond the theoretical and asks the student about his/her perceptions and actions. Most of the questions in this part deal with self-reported behavior or perceived knowledge and skills. It is divided into two sections

Section 1 – This section tests for perceived knowledge of and skills in using citizenship action strategies. Here different types of environmental citizenship action
strategies are first explained. Respondents are then asked how knowledgeable and skilled they perceive themselves to be in using these strategies. Each of the questions is scored on a Likert type scale ranging from zero to four. The instrument used in this study includes two questions on perceived knowledge in using these action strategies and two on perceived skill in the use of these action strategies. The total score for perceived knowledge ranges from zero to eight and the total score for perceived skills also ranges from zero to eight. These data helps us evaluate research questions B (3 and 4) that deal with the effect of the 4-H EE program on perceived knowledge of and skill in the use of citizenship action strategies.

Section 2 – This section measures responsible environmental behavior by asking the respondents to report performance of environmental actions. The score for this section is calculated by adding up the numerical responses for each question and the total score can range from 0 to 50. These data helps us answer research question C that deals with the effect of the 4-H EE program on REB.

**Part IV: An evaluation for issue analysis and action skills**

In this part of the survey instrument, the respondents are given a scenario with an environmental issue. They are required to identify the issue and the motivation behind the stand taken by the each of the players. They are then required to identify the citizenship action strategy that would be most effective in the situation. This exercise helps evaluate the respondent’s ability to analyze an issue and identify effective action strategies.

This part of the survey instrument is further subdivided into three components. The issue identification component involves correctly identifying the issue in the given situation. The scores for this component range from zero to six points. In the issue analysis component, correctly identifying a player’s belief statement is worth two points
and each correctly identified value associated with the belief statement is also worth two points. The score for the issue analysis component ranges from 0 to 16. The action plan component is scored on the basis of legitimacy and potential impact of the selected action. The minimum score for this component is 0 while the maximum is 20. The total score for part IV ranges from 0 to 42. However the data for the three different components (issue identification, issue analysis and selection of action plan) are all analyzed separately. These data help evaluate research question B (2) that deals with the effect of the Florida 4-H EE program on respondents’ issue analysis skills.

**Research Design**

I conducted an ex-post facto study because of the difficulty in obtaining pre-test information. The EE group consisted of participants who had been used EE curricula in their 4-H program, while the non-EE group consisted of participants who had not used EE curricula in their 4-H programs. Kerlinger (1986) refers to the research design used in this study (Figure 3-1) as two groups, no control, because this design can also be used to measure differences in two groups without any experimental treatment. For the purpose of this study, the two groups were considered to be equivalent in terms of other external variables. Post-test data were tested for differences in (1) knowledge of ecological concepts, (2) awareness of environmental issues, (3) issue analysis skills, (4) perceived knowledge of citizenship action strategies, (5) perceived skill in using citizenship action strategies, (6) responsible environmental behavior.
<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>EE group</th>
</tr>
</thead>
<tbody>
<tr>
<td>~X</td>
<td>Y</td>
<td>non-EE group</td>
</tr>
</tbody>
</table>

X : Group which has used EE curricula.

~X : Group which has not used EE curricula.

Y : Post-test data

Figure 3-1. Research design

**The Sample**

Both the EE group and the non-EE group were samples of convenience as teachers/group leaders were asked to participate on a voluntary basis. Only students between ages 11 through 16 were included in the study. The total sample size was 66 of which 44 belonged to the EE group and 22 to the non-EE group. This sample may not be representative of the entire 4-H EE program in Florida.

**Data Collection**

4-H agents and volunteers from the different counties in Florida were contacted. Those willing to participate in the study were given information packets and survey instruments. The 4-H agents and volunteers then contacted teachers/group leaders in their counties to identify those willing to participate in the study. The 4-H agents then sent the teacher/group leaders who volunteered to participate in the study a package containing a cover letter explaining the study, a sheet of instructions on administering the survey instrument, parental consent forms and copies of the MSEL (short form). Our study focused on respondents between 11 and 16 years of age, creating the need for parental consent. The teachers/leaders participating in the study were responsible for conducting the survey among their group/club members. We provided them with the
parental consent forms as required by the Institutional Review Board of the University of Florida. The teachers/leaders were responsible for handing out parental consent forms to the participants in their group and collecting the signed forms before administering the survey. Before administering the survey they also reminded students that participation was completely voluntary, and gave them other instructions for completing the survey.

Respondents required approximately 45 minutes to complete the instrument. A total of 80 completed instruments were collected. Of these 14 (7 test and 7 control) instruments could not be used because the ages of those respondents did not fall into the pre-determined age range of 11 through 16 years.

**Data Analysis**

I scored the completed survey instruments using the guidelines laid down in the final report on the development of the MSELI. I entered data into a spreadsheet and used SPSS 10.0 for Windows to analyze the data. I ran a t-test to compare means. The statistical program provided me with an analysis of variance as well as corrected t-values where the variances were not equal.
CHAPTER 4
RESULTS

This chapter presents the results from the data analysis that I conducted. Demographic information is first presented to help better understand the composition and background of the sample used. After this is a general overview of the findings, followed by a more detailed description of the results pertaining to each research hypothesis.

Demographics

The total sample size was 66, of which 44 had used some sort of EE curricula and 22 had not. There were 36 (54.5%) females and 30 (45.5%) males in the sample. The respondents were from 16 different counties in Florida. Of the 66 respondents, 50.0% described their community as rural, while 42.4% claimed to be from a suburban community and 6.1% from an urban community. One subject did not answer this question. Respondents indicated that in general their main sources of information about the environment were 4-H and their parents, followed by books and television. Church, newspapers, computers/internet and friends did not score highly as sources of information about the environment.

Research Findings

On analyzing the data I found that in general those respondents who had used EE curricula in their 4-H programs scored higher on the survey than those who had not used EE curricula. Their scores were higher on all the sections measuring for predictors of REB. The EE group also did better than the non-EE group in the section measuring knowledge of ecological concepts, which is a prerequisite of REB. On the self-reported
environmental action section, however, the difference between the two groups was not noteworthy. The results from the data are summarized in table 4-1. The following section provides results pertaining to each research hypothesis.

Table 4-1. Summary of results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean scores</th>
<th>Mean diff.</th>
<th>S.E. diff.</th>
<th>t</th>
<th>One-tailed p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological foundations (17 pts.)</td>
<td>13.09</td>
<td>11.64</td>
<td>1.4545</td>
<td>0.7564</td>
<td>1.923</td>
</tr>
<tr>
<td>Knowledge of issues (12 pts.)</td>
<td>2.66</td>
<td>1.23</td>
<td>1.4318</td>
<td>0.5689</td>
<td>2.517</td>
</tr>
<tr>
<td>Issue identification (6 pts.)</td>
<td>4.36</td>
<td>3.00</td>
<td>1.3636</td>
<td>0.6722</td>
<td>2.029</td>
</tr>
<tr>
<td>Issue analysis (16 pts.)</td>
<td>8.00</td>
<td>2.55</td>
<td>5.4545</td>
<td>1.2816</td>
<td>4.256</td>
</tr>
<tr>
<td>Action planning (20 pts.)</td>
<td>11.55</td>
<td>6.00</td>
<td>5.5455</td>
<td>1.4916</td>
<td>3.718</td>
</tr>
<tr>
<td>Perceived knowledge of action (8 pts.)</td>
<td>4.23</td>
<td>3.32</td>
<td>0.9091</td>
<td>0.5062</td>
<td>1.796</td>
</tr>
<tr>
<td>Perceived skill in action (8 pts.)</td>
<td>4.32</td>
<td>3.14</td>
<td>1.1818</td>
<td>0.4590</td>
<td>2.575</td>
</tr>
<tr>
<td>Self reported REB (50 pts.)</td>
<td>27.52</td>
<td>28.36</td>
<td>-0.8409</td>
<td>2.1155</td>
<td>-0.397</td>
</tr>
</tbody>
</table>

* Significant p < 0.05

**Research Question A**

What is the effect of the Florida 4-H EE program on knowledge of ecological concepts?
Hypothesis 1. Those participants who have used EE curricula in their 4-H program will have a greater knowledge of ecological concepts than those who have not used such curricula.

The results for this section were scored out of a total possible of 17 points. The EE group had a mean score of 13.091 while the non-EE group showed a mean score of 11.636 for this section. The one tailed t-test showed a p-value of 0.031 (t = 1.923). Statistically this would indicate that as the hypothesis predicted, the EE group scored significantly higher than the non-EE group at the $\alpha = 0.05$ level.

Research Question B

What is the effect of the Florida 4-H EE program on the each of the following predictors of responsible environmental behavior: awareness of environmental issues; issue analysis skills; perceived knowledge of citizenship action strategies; perceived skill in the use of citizenship action strategies?

Hypothesis 2. Those participants who have used EE curricula in their 4-H program will have a greater awareness of environmental issues than those participants who have not used such curricula.

The results on this section were based on a total possible score of 12 points. Respondents scored very low on this section. The mean score for the EE group was 2.659 while that for the non-EE group was 1.227 points. The p-value for the one-tailed t-test was 0.007 (t = 2.517). The results support the hypothesis at the $\alpha = 0.05$ level.

Hypothesis 3. Those participants who have used EE curricula in their 4-H program will have a greater ability to analyze environmental issues than those who have not used the 4-H EE curricula.
The results relating to this hypothesis were obtained in three parts because the instrument used three different types of question to test for this variable. The data for each of these questions were analyzed separately.

The first question involved identifying the issue in the given scenario. This question was worth a total of six points. The EE group scored a mean of 4.364, while the control group’s mean score was 3.000. The one tailed t-test used to compare the means reported a t score of 2.029 (p-value of 0.024). These results indicate that statistically speaking the EE group did significantly better than the non-EE group at the $\alpha = 0.05$ level.

For the second question, the respondent was asked to identify belief statements and the values underlying them. The maximum possible score for this question was 16. The mean score for the EE group was 8.000 while that of the non-EE was 2.546. The p-value obtained by running a one-tailed t test was <0.001 ($t = 4.256$). From this we would infer that statistically the EE group did significantly better than the non-EE group at the $\alpha = 0.01$ level.

The final question involved choosing suitable action strategies. The maximum possible score for this question was 20 points. On this question the EE group scored a mean of 11.546, while the mean for the non-EE group was 6.000. The one tailed t test reported a p-value of <0.001 ($t = 3.718$). The results point to a statistically significant difference between the EE group and the non-EE group ($\alpha = 0.01$).

The results support the hypothesis at the $\alpha = 0.05$ level.
**Hypothesis 4.** Those participants who have used EE curricula in their 4-H programs will show a greater level of perceived knowledge of citizenship action strategies, than those who have not used such curricula.

The results on this section were out of a maximum possible score of eight points. The EE group scored a mean of 4.227, while the non-EE group’s mean score was 3.318. The p-value from the one-tailed t-test was 0.040 (t = 1.796). These results support the hypothesis at the $\alpha = 0.05$ level.

**Hypothesis 5.** Those participants who have used EE curricula in their 4-H programs will show a greater level of perceived skill in the use of citizenship action strategies, than those who have not used such curricula.

The results for this section were based on a maximum possible score of eight points. The mean scores for the test and control groups were 4.318 and 3.136 respectively. On comparing the means using a one-tailed t test the p-value was found to be 0.007 (t = 2.575). Statistically this would indicate that the EE group has a significantly greater level of perceived skill in the use of citizenship action strategies than the non-EE group at the $\alpha = 0.01$ level. Thus the results support this research hypothesis.

**Research Question C**

What is the effect of the Florida 4-H EE program on REB?

**Hypothesis 6.** Those participants who have used EE curricula in their 4-H programs will show a greater level of REB than those participants who have not used such curricula.

The results for this hypothesis were based on a maximum possible score of 50 points. The mean score for the EE group was 27.523 while that of the non-EE group was
28.364. The p-value obtained from the one-tailed t-test was 0.654 (t = -0.397). These results indicate that there is not sufficient evidence at the $\alpha = 0.05$ level to support the hypothesis. In terms of practical significance, though the EE group did score lower than the non-EE group, the difference is very small and may not be sufficient to indicate a true difference.

**Summary**

The results from the study indicate that the EE group did better on all the variables, except REB. The next chapter explains these results in greater detail.
CHAPTER 5
DISCUSSION OF RESULTS

This chapter explains the results of this study, as well as the generalizability of the results. It also includes a discussion of the implications of the findings. Finally, it concludes with a few recommendations for the program and for further research.

Research Findings

Students in the EE group scored higher on all sections of the survey testing for the predictors of REB, than those in the non-EE group. These results are surprising because most of the curricula in use today are designed to provide information and not to empower (Hungerford & Volk, 1990). They do not focus on developing issue analysis skills or training students in the knowledge and use of citizenship action strategies. Instead they simply provide information about ecology and ecological processes. Let us look at the research findings for each of the hypotheses.

Hypothesis 1

Here I hypothesized that students in the program would have a greater knowledge of ecological concepts than those not in the program. The results support this hypothesis. Data collected from the demographic section of the survey also support the results pertaining to this hypothesis. Of the students in the 4-H EE program, 70% (31 of 44) indicated that they received a large to great extent of their environmental knowledge through 4-H. In addition another 18% (8 of 44) indicated that 4-H was their source of environmental knowledge to a moderate extent. From the study results it would appear that that the 4-H EE program is an important source of information on the environment.
In terms of the Hungerford and Volk’s environmental behavior model, knowledge of ecology is considered to be a minor entry-level variable. Nonetheless, this variable is an important prerequisite to sound decision-making (Hungerford & Volk, 1990), because it establishes a sound foundation in ecology that is important to gain an adequate understanding of the problem. This would lead to developing the best action strategy to solve an environmental issue.

**Hypothesis 2**

Here I hypothesized that the students in the program would have a greater awareness of environmental issues than those not in the program. Statistically the results supported this hypothesis in terms of the difference between the two groups. However, the scores on this section were very low. This would indicate that though the EE group had a greater awareness of environmental issues than the control group, they were not very familiar with real world environmental issues happening around them. There are two possible explanations for this. The first would be that students had not learned how to identify environmental issues, but were simply reporting those issues addressed in their curricula or in the course of their EE activities and meetings. However, the first sub-question in the section dealing with issue analysis required the respondent to identify the environmental issue in the scenario they were presented with. The scores indicate that students in the 4-H EE program did have the ability to identify that issue.

The other possibility is that students were familiar with the issues that had been taught to them but were not actively seeking out environmental issues from other sources of information like newspapers and television. This apathy towards news happening in the world around them is not limited to environmental news. In a research study, Ferle, Edwards and Lee (2000) reported that teenagers identified newspapers over other media
including the internet, as the source they would most frequently use to obtain information on news and current events. Yet, on a demographic analysis of newspaper readership, Kees (2000) found that younger generations are less likely to read newspapers. This would indicate that, in general, today’s teenagers are not gaining a lot of information on current affairs and thus may not be well informed about issues around them, whether of an environmental nature or otherwise.

In terms of the reporting of environmental issues in news media, Graham and Dziuban (1996) found that environmental reporters often fail to adequately report on environmental concerns and high-risk issues. Thus it would appear that students are not faced with the task of simply identifying environmental issues in news media. In many cases they have to actively seek out environmental issues based on small pieces of information they receive that may or may not be linked to an environmental problem. As most of the curricula used in the 4-H EE program focuses on information, there is not sufficient impetus for seeking out environmental issues.

**Hypothesis 3**

Here I hypothesized that students in the program would have better issue analysis skills than those not in the program. The results support this hypothesis. This variable was tested using three sub-questions. As mentioned earlier, students in the program appear to have the skills required for the issue identification component.

The second sub-question required the respondents to identify the belief statements in the given situation and the values that these statements reflected. It is possible that those students who had not used EE curricula were simply unfamiliar with the method used. Students who had not performed such an exercise before might have scored less because they were unable to articulate the values they identified. As a result this may
have favored EE students who may have used similar exercises in their curricula. However, the final sub-question requires an answer not based on method, but on the result of the respondent’s analysis of the situation. On this sub-question the EE group scored much higher than the non-EE group. These results would indicate that the 4-H EE program does indeed provide students with the skills required to analyze issues, whether of an environmental nature or otherwise.

Skill in analyzing environmental issues is not a variable included in either of the two most commonly used models of REB (i.e., Hines model of REB and the environmental behavior model proposed by Hungerford and Volk). The environmental behavior model does however include in-depth knowledge of issues as a major ownership variable and a minor empowerment variable. Hungerford and Volk (1990) explain that “before individuals can engage in responsible citizenship behavior they must understand the nature of the issue and its ecological and human implications” (p. 12). They also went on to state that when individuals do have an in-depth understanding of the issue they are more inclined to take on the responsibility of acting to solve the issue. An in-depth knowledge of issues as defined here, includes a good grasp of ecological concepts as well as an understanding of the human aspects of the issue. Issue analysis skills play an important role in helping an individual understand this human component in terms of identifying the players involved and the beliefs and values at play. In this study it would appear that the students in the program have a better ability to gain an in-depth knowledge of issues than those not in the program. This is because the EE group scored better than the non-EE group on the sections of the survey dealing with knowledge of ecological concepts and issue analysis skills.
**Hypothesis 4 and 5**

These hypotheses state that students in the program would have a greater level of perceived knowledge and skill in using citizenship action strategies. Perceived knowledge of and skill in the use of action strategies are both very closely related. The extent to which these variables are separate is still unknown (Hungerford & Volk, 1990). They are therefore listed together in the environmental behavior model. In a meta-analysis of three research studies on predictors of REB, Marcinkowski (1998) identified knowledge of action strategies as the best single variable model predictor of REB. According to Hungerford and Volk (1990) perceived skill in using citizenship action strategies is one of the very best predictors of REB. They state that “knowledge about action strategies per se is not as powerful a predictor as the skill variable” (p. 12). However, the skill variable could be dependent on the knowledge variable (Hungerford and Volk, 1990).

In the study the scores for both the variables were similar. The results supported both of the hypotheses. Students in the EE group had a greater level of perceived knowledge and skill in the use of action strategies, but the scores were not very high. On an average, students in the program believed that they were only moderately knowledgeable and skilled in citizenship action. These results would also tie in with Frischknecht and Bradenburg’s (1981-82) findings that unstructured knowledge and information overload lead to learned helplessness. Connell et al. (1999) refer to this as “action paralysis”, where individuals believe that the only things they can do are small things like recycling. Currently available EE materials often seek to shape students’ behavior by advocating certain behavior rather than by providing them with the tools to make environmentally responsible decisions. Instead of developing responsible citizens,
such educational materials can breed cynicism among students (Salmon, 2000). Even if such curricula did not result in negative attitudes, students’ perception of their knowledge and skill in using citizenship action would not be sufficiently influenced to cause an increase in REB.

**Hypothesis 6**

Here I hypothesized that students in the program would show a greater level of responsible environmental behavior than those not in the program. The results do not support the hypothesis. The other hypotheses deal with predictors of REB and thus give us an insight into possible explanations of these results. We found that students in the EE group had a low level of awareness of environmental issues. Nonetheless, they did have better issue analysis skills and greater levels of perceived knowledge and skills in citizenship action than the non-EE group. Hungerford and Volk (1990) point out that it is unlikely that citizenship action skills without issue related knowledge would initiate REB. Thus, if students are not familiar with real world environmental issues around them, it is unlikely that they will take action toward issue resolution. As discussed earlier, the scores on perceived knowledge and skill in citizenship action were not very high despite these skills being easily teachable (Hungerford & Volk, 1990). As important predictors of REB, the results for those variables do not support an increase in REB.

In terms of the environmental behavior model, Hungerford and Volk (1990) state that most EE efforts focus on awareness rather than on developing ownership and empowerment. This is true of most curricula in use today. The result may be an absence of behavior change as seen in this study.
Summary of Study Findings

A summary of the hypotheses tested and the conclusions from the data results is presented in table 5-1. Statistically the hypotheses dealing with predictors of REB were supported by the results. An inspection of the scores reveals that although the EE group appears to be better equipped to act than the non-EE group, this might not really be the case.

Table 5-1. Summary of hypotheses tested and conclusions

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Variable</th>
<th>Comparison</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge of ecological concepts</td>
<td>EE &gt; non-EE</td>
<td>Not rejected</td>
</tr>
<tr>
<td>2</td>
<td>Awareness of environmental issues</td>
<td>EE &gt; non-EE</td>
<td>Not rejected</td>
</tr>
<tr>
<td>3</td>
<td>Issue analysis skills</td>
<td>EE &gt; non-EE</td>
<td>Not rejected</td>
</tr>
<tr>
<td>4</td>
<td>Knowledge of citizenship action strategies</td>
<td>EE &gt; non-EE</td>
<td>Not rejected</td>
</tr>
<tr>
<td>5</td>
<td>Skill in using citizenship action strategies</td>
<td>EE &gt; non-EE</td>
<td>Not rejected</td>
</tr>
<tr>
<td>6</td>
<td>Responsible environmental behavior</td>
<td>EE &gt; non-EE</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

In terms of ecological knowledge, results would indicate that the program is successful in teaching students about ecological concepts and processes. The issue awareness of the EE group was very low, but this might be due to factors not limited to EE. Results for the issue analysis variable indicate that students in the program are better equipped to gain an in-depth knowledge of issues than those not in the program. The scores of the EE group on perceived knowledge and skill in citizenship action point to a familiarity with these action strategies rather than empowerment. All of these results
taken together would indicate low levels of ownership and empowerment, resulting in limited behavior change, as was seen in the results of the study.

In the next section the results from this study are compared with those from similar studies to determine the comparative efficacy of the 4-H program in developing environmental literacy.

**Study Results from 1998 (Florida 4-H)**

My study was in part a replication of Culen’s study conducted on 4-H students in Florida in 1998. The 1998 study was carried out on respondents between the ages of 8 and 17. The MSELI was the survey instrument used. Total sample size for the study was 170, of which 118 respondents had used EE curricula while the remaining 52 had not used any such curricula.

The results from the 1998 study indicate that students using EE curricula in their 4-H programs scored higher on all sections of the survey than those who had not used any such curricula. On comparing data from the 1998 study with that from the current study (table 5-2), we find that the difference in scores between groups for all predictors of REB have improved in the 2001-02 study from those reported in the 1998 study. It would appear that there is an improvement in the EE curricula used or teaching methods from 1998, with regard to the goal of environmental literacy.

The other variables do not follow this positive trend. On the knowledge of ecological concepts variable, which is a prerequisite for environmentally sound decision making, the difference between the groups has marginally decreased from 1998. For the self-reported REB the difference between groups is not significant in both studies when compared to the maximum possible score of 50 for this variable. In both studies there does not appear to be a difference between the level of REB of the EE group and the non-
EE group. This is not surprising as the results of the 2001-02 study have already shown us that the levels of certain predictor variables in the EE students is still not sufficiently high enough to effect change. The results indicate that while there is an improvement from 1998 in certain areas, the improvement is not sufficient to affect REB levels.

Table 5-2. Comparison of results (1998 and 2001-02)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean diff</th>
<th>S.E. diff</th>
<th>One-tailed p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological foundations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(17 pts.)</td>
<td>1998</td>
<td>1.6265</td>
<td>0.5542</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>1.4545</td>
<td>0.7564</td>
</tr>
<tr>
<td>Knowledge of Issues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12 points)</td>
<td>1998</td>
<td>0.5867</td>
<td>0.5490</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>1.4318</td>
<td>0.5689</td>
</tr>
<tr>
<td>Issue identification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6 pts.)</td>
<td>1998</td>
<td>0.3924</td>
<td>0.3610</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>1.3636</td>
<td>0.6722</td>
</tr>
<tr>
<td>Issue analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16 pts.)</td>
<td>1998</td>
<td>1.2119</td>
<td>1.1091</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>5.4545</td>
<td>1.2816</td>
</tr>
<tr>
<td>Action planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(20 pts.)</td>
<td>1998</td>
<td>1.3292</td>
<td>1.0549</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>5.5455</td>
<td>1.4916</td>
</tr>
<tr>
<td>Perceived knowledge of action</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8 pts.)</td>
<td>1998</td>
<td>0.5417</td>
<td>0.3109</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>0.9091</td>
<td>0.5062</td>
</tr>
<tr>
<td>Perceived skill in action</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8 pts.)</td>
<td>1998</td>
<td>0.5561</td>
<td>0.3081</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>1.1818</td>
<td>0.4590</td>
</tr>
<tr>
<td>Self reported REB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(50 pts.)</td>
<td>1998</td>
<td>1.6265</td>
<td>1.4707</td>
</tr>
<tr>
<td></td>
<td>2001-02</td>
<td>-0.8409</td>
<td>2.1155</td>
</tr>
</tbody>
</table>

*Significant p < 0.05

Study Results from Molokai, Hawaii

In May 2001, Cheak, Culen, Volk, Hungerford and Kim carried out a similar study in Molokai, Hawaii. The researchers compared students from fifth and sixth grade classes who were using traditional curricula to those who were using IEEIA curricula. IEEIA
(Investigating and Evaluating Environmental Issues and Actions) as the name suggests is an issue based curriculum. The total sample size was 66 (IEEIA students = 38, non-IEEIA students = 28). The study incorporated both qualitative and quantitative methods. Quantitative assessments were carried out using the MSELI and the Critical Thinking Test of Environmental Education (CTEE) instruments. For the purpose of this discussion I will focus on the environmental literacy component of the study.

The results from the study (table 5-3) are similar to the results of my study on Florida’s 4-H EE program in that there is a positive difference in mean scores for the following sections: familiarity with environmental issues, ecological foundations and issue analysis. However, while my study did not find any noteworthy difference in self reported environmental action, in the study in Hawaii the non-IEEIA did much better than the IEEIA group. The non-IEEIA group also outscored the IEEIA group on the perceived knowledge and skill in citizenship action sections of the survey.

Cheak, Volk and Hungerford (2002), suggest that the low scores on self-reported action might be due to the way the question was worded in the MSELI. The MSELI provides ten different actions and asks how often the respondent had performed those actions in the past six months. Thus if the student had performed actions that had not been listed, they would not have been able to report it. Another explanation they suggested was that the non-IEEIA students may have exaggerated while reporting their REB in order to look good. On the perceived knowledge and skill in using citizenship actions Cheak et al. (2002) suggest that the two questions on ecomanagement and persuasion were not a sufficient measure. If the respondents had used consumer or political action they would not have been able to report it. In 1999, some of the students
then in the 6th grade at the same school and in the same program used many different action strategies to address issues associated with municipal solid waste, including legal action (Winther, 2001). The publicly visible nature of some of these strategies could have increased awareness of citizenship action throughout the school. However, the students in the program facing the difficulties in using such action strategies may be more circumspect in their perceptions about their knowledge and skill levels in using citizenship action. This could possibly be the reason for those unexpected scores.

Table 5-3. Results from the study in Molokai, Hawaii (Cheak et al., 2002)

<table>
<thead>
<tr>
<th>Environmental literacy component (maximum possible score)</th>
<th>Group</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>Prob (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological foundations (17 points)</td>
<td>Non-IEEIA</td>
<td>7.86</td>
<td>2.18</td>
<td>4.254</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>10.55</td>
<td>2.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of issues (12 points)</td>
<td>Non-IEEIA</td>
<td>1.24</td>
<td>1.33</td>
<td>3.418</td>
<td>.001*</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>2.84</td>
<td>2.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue identification (6 points)</td>
<td>Non-IEEIA</td>
<td>3.44</td>
<td>2.10</td>
<td>1.432</td>
<td>.157</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>4.21</td>
<td>2.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue analysis (16 points)</td>
<td>Non-IEEIA</td>
<td>4.32</td>
<td>3.26</td>
<td>4.592</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>9.24</td>
<td>5.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action planning (20 points)</td>
<td>Non-IEEIA</td>
<td>5.68</td>
<td>4.43</td>
<td>1.566</td>
<td>.122</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>7.53</td>
<td>5.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived knowledge of action (8 points)</td>
<td>Non-IEEIA</td>
<td>4.89</td>
<td>1.69</td>
<td>1.781</td>
<td>.080</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>4.13</td>
<td>1.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived skill in action (8 points)</td>
<td>Non-IEEIA</td>
<td>4.61</td>
<td>1.87</td>
<td>1.880</td>
<td>.065</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>3.71</td>
<td>1.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported environmental action. (50 points)</td>
<td>Non-IEEIA</td>
<td>32.25</td>
<td>7.13</td>
<td>3.251</td>
<td>.002*</td>
</tr>
<tr>
<td></td>
<td>IEEIA</td>
<td>25.97</td>
<td>8.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant p < 0.05

Comparison of Results

A comparison of the data from the three studies (table 5-4) indicates that the results from Hawaii do not follow the pattern seen in the results of the studies in Florida, where the EE group scored higher than the non-EE group for all predictors of REB. The self-
reported REB is also an anomaly in the Hawaii study where the non-IEEIA group reported a much higher number of actions than the IEEIA group. Nevertheless, the scores on the remaining predictors do not support this result. Thus, it is possible that as suggested by Cheak et al. (2002), the non-IEEIA respondents did in fact over-report their REB.

Table 5-4. Comparison of the results from all three studies

<table>
<thead>
<tr>
<th>Environmental literacy component (maximum possible score)</th>
<th>Group</th>
<th>Florida 2001-02</th>
<th>Florida 1998</th>
<th>Hawaii 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological foundations (17 pts.)</td>
<td>EE</td>
<td>13.09</td>
<td>12.70</td>
<td>10.55</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>11.64</td>
<td>11.08</td>
<td>7.86</td>
</tr>
<tr>
<td>Knowledge of issues (12 pts.)</td>
<td>EE</td>
<td>2.66</td>
<td>3.36</td>
<td>2.84</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>1.23</td>
<td>2.77</td>
<td>1.24</td>
</tr>
<tr>
<td>Issue identification (6 pts.)</td>
<td>EE</td>
<td>4.36</td>
<td>4.08</td>
<td>4.21</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>3.00</td>
<td>3.69</td>
<td>3.44</td>
</tr>
<tr>
<td>Issue analysis (16 pts.)</td>
<td>EE</td>
<td>8.00</td>
<td>9.71</td>
<td>9.24</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>2.55</td>
<td>8.50</td>
<td>4.32</td>
</tr>
<tr>
<td>Action planning (20 pts.)</td>
<td>EE</td>
<td>11.55</td>
<td>9.48</td>
<td>7.53</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>6.00</td>
<td>8.15</td>
<td>5.68</td>
</tr>
<tr>
<td>Perceived knowledge of action (8 pts.)</td>
<td>EE</td>
<td>4.23</td>
<td>4.62</td>
<td>4.13</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>3.32</td>
<td>4.08</td>
<td>4.89</td>
</tr>
<tr>
<td>Perceived skill in action (8 pts.)</td>
<td>EE</td>
<td>4.32</td>
<td>4.44</td>
<td>3.71</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>3.14</td>
<td>3.88</td>
<td>4.61</td>
</tr>
<tr>
<td>Self-reported REB (50 pts.)</td>
<td>EE</td>
<td>27.52</td>
<td>30.20</td>
<td>25.97</td>
</tr>
<tr>
<td></td>
<td>Non-EE</td>
<td>28.36</td>
<td>28.58</td>
<td>32.25</td>
</tr>
</tbody>
</table>

Another factor to keep in mind while comparing the results is that the studies in Florida were conducted with 4-H students, whereas the study in Hawaii used students
from a school, and attempted to evaluate what had been taught to them in class. No information was available as to whether these students were involved in any other programs outside the school where they could have received EE. The respondents in the Hawaii study were using an issue-based curriculum, while most of the curricula used in the 4-H EE program at present is knowledge based. All these factors could also affect the study results.

**Conclusions**

The results from this study indicate that the Florida 4-EE program is moving students towards environmental literacy. The 1998 study showed that in general students within the program scored higher than those who were not part of the program, even though the difference was not always very large. The results from my study show a positive increase in most of these differences indicating an improvement in terms of achieving the goal of environmental literacy. However, the program still has a long way to go. It has not yet been successful in changing behavior, but does appear to be increasing ecological knowledge and equipping students with some of the skills required to act in an environmentally responsible manner.

The study results indicate that students in Florida’s 4-H EE program are likely to be better equipped to apply ecological knowledge to real world issues than those not in the program. They have a better ability to analyze and understand these issues and thus are able to make better decisions about the best methods of action to prevent or solve an environmental problem. However it is possible that the curricula used do not provide students with sufficient opportunities to make practical use of this knowledge and skills. Efforts should be made to engage students in activities or projects that involve real world issues on a level at which they can act.
The findings from this study point to the need for developing ownership and empowerment variables. One method of doing this would be by incorporating concepts like “the ecological footprint” into the EE curricula to help students chart the positive impact they make through their environmental actions. This could positively affect their attitudes and other empowerment variables like locus of control. In addition, field trips to natural areas and farms would help students become aware of their interconnectedness with nature, of which they already have a theoretical understanding. This would help them understand their responsibility towards a sustainable future and develop a sense of personal investment and ownership.

Finally, alternative assessments could be used to determine students’ progress. Manipulative tasks and investigations are a good way to train students in issue analysis and environmental action skills (Marcinkowski, 2001). Instructors could break the task into smaller assignments that could be used to assess the issue investigation abilities of the student.

**Implications for Future Research**

This study provides baseline data about environmental literacy levels in 4-H students in Florida. However this study also shows us the need for further research in the field.

- A qualitative study should be undertaken to identify the variables that determine whether a student joins the 4-H EE program or not. This would help eliminate confounding variables like environmental sensitivity, and thus help better understand the effect of the program and curricula used on environmental literacy levels.

- Research should also be conducted to study the locus of control and environmental sensitivity of students in Florida’s 4-H EE program. These are other factors that have been shown to play an important role in affecting intention to act and REB.
• In order to understand the long-term impacts of the 4-H EE program on environmental literacy levels, longitudinal studies should be conducted. Alternatively a follow up study with the same sample would be useful.

• Similar studies should be conducted using the MSELi in various other states. This would help standardize the procedure for evaluating youth extension education programs. Standardization of the evaluation process would be an important step towards creating effective EE curricula and programs.

• Curricula should also be evaluated using a standardized instrument like the MSELi. This would help educators compare EE materials to identify those best suited for their students.

**Recommendations**

The 4-H EE program should be evaluated in a more systematic manner. This can be undertaken only if there are records of all the groups involved in the program. In addition group leaders should be asked to report if they intended to start using EE curricula in their 4-H program in the near future. This would help identify a potential sample that could be pre- and post-tested to better evaluate the effect of the program on environmental literacy levels. Also samples that are representative of the entire program should be used.

In terms of the instrument used, the font could be larger and/or clearer, so as to be easily read. The instructions for the section of the instrument, in which respondents are asked to report their REB, should make it clear that respondents only need to report the number of times they had performed that action if they had performed that action. Alternatively the options could start from zero, rather than one. This would provide students with an answer they could select if they had not performed that action. These changes would help clarify some of the ambiguities that seemed to result from the instrument.
Over-consumption is one of the biggest environmental problems our world is facing today. It is also a major environmental concern in this region. Eco-friendly consumers play an important role in helping to solve this problem. As a result it would be useful to include a question on perceived knowledge and skill in using consumerism as a form of environmental action in Part III section 1 of the instrument (MSELI short form). This is important as teenagers do have pocket money that they can choose to use in an environmentally responsible manner. Also consumerism will continue to play a larger and larger role in their lives, as they grow older. This question would thus provide us with important data regarding teenagers’ perceptions of the change they could effect by their behavior as consumers. The current length of the instrument is a concern, adding questions would only increase the time required to complete the survey. Also, the instrument used has already been validated and tested for reliability, making changes to this instrument difficult.

As seen in the study conducted in Hawaii, the accuracy of self-reported REB is a concern. Measuring actual REB is difficult and expensive. One method of increasing accuracy of these data would be to shorten the period of time over which they are reporting behavior. The MSELI asks students to report actions carried out over the past six months, which is a considerable period of time over which to recall one’s actions. Instead the time period could be shortened to the previous week or previous month. This would eliminate some of the guesswork and estimation respondents must make to report behavior.

Teachers/leaders should be encouraged to use alternative assessment methods like manipulative tasks and investigations. These could include environmental issue
investigation tasks. The instructor could break down these investigations into a series of carefully sequenced assignments that could be used to evaluate the student’s progress (Marcinkowski, 2001). At the same time this method would provide students to develop ownership and empowerment variables as they seek to understand the issue and to work towards an effective solution.

**Final Comments**

This study while useful does not provide all the answers to fully understand the impact of the 4-H EE program on participants. Further research is needed. Nonetheless, this program is doing a good job in leading students towards environmental literacy. Research would definitely help improve the program. The very nature of 4-H that allows it to impact people at a local, state and national level, combined with their commitment to a sustainable future make it worth the resources required to conduct further research to improve the program.
THE ENVIRONMENTAL LITERACY INSTRUMENT

[Short Form]

For the Florida 4-H Program

STUDENT EDITION

Your Name: ___________________________
Club Leader/Teacher: ________________ County:______________
Years in 4-H: ______________________ Date:_________________

© 1996 – 8th Edition

The Center for Instruction, Staff Development and Evaluation
1925 New Era Road, Carbondale, IL 62901

This instrument is not to be used or distributed in any manner without permission
Demographics About You

Gender:  M ___  F ___  Age: ______

Number of years you have been involved in 4-H:

Type of community in which you live: ___ Urban  ___ Suburban  ___ Rural

Have you ever been to 4-H Camp? ___ Yes  ___ No; If yes, how many years? ___

1. Please give your BEST ESTIMATE of the extent to which your family APPRECIATES the natural environment. Circle one of the X’s below.

   X       X       X       X
   No Extent  A Little Extent  Moderate Extent  Large Extent  Great Extent

2. Please give your BEST ESTIMATE of the extent to which your family IS CONCERNED ABOUT environmental problems and issues. Circle one of the X’s below.

   X       X       X       X       X
   No Extent  A Little Extent  Moderate Extent  Large Extent  Great Extent

3. Please give your BEST ESTIMATE as to where your KNOWLEDGE of the environment comes from. Circle the X’s below which best describes the extent of knowledge you believe you receive from each source.

<table>
<thead>
<tr>
<th>Source</th>
<th>No Extent</th>
<th>A Little Extent</th>
<th>Moderate Extent</th>
<th>Large Extent</th>
<th>Great Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-H</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>School</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Parents</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Church</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Television</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Books</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Newspaper</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Computers/Internet</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Friends</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Part I

The Issues With Which I am Familiar

Directions: Below, you are asked to list up to three (3) environmental issues with which you are currently familiar. The examples show you ways to write issues for your own list. It is important to include both the cause and the effect in your issues. In the first example, the cause is industrial pollution. The effect is lowered water quality.

Examples:

The effect of industrial pollution on lowering water quality in the Mississippi River south of St. Louis, Missouri.

or, if written as a question . . .

What is the effect of housing construction on loss of habitat for fox squirrels in Maryland?

Please write a list of environmental issues with which you are familiar. You do not have to fill in all the blanks if you do not know three (3) issues.

1. __________________________________________

2. __________________________________________

3. __________________________________________
Part II - Ecological Foundations

Directions: Please circle the letter of the correct response for each multiple choice item. Every item will have four (4) responses from which to select.

Example: Which one of these mammals can fly?
   a. elephant  d. bat
   b. mouse      c. dog

1. A flower with colorful petals and a sweet smell would most likely be pollinated by:
   a. rain, c. a gardener.
   b. wind. d. insects.

2. A small bird eats a butterfly that has been eating some nectar from a flower. Then the bird is eaten by a hawk. This is an example of:
   a. mutualism. c. competition.
   b. a food chain. d. survival of the fittest.

3. Which of the following is a predator-prey relationship?
   a. A flea bites a dog. c. A caterpillar eats a leaf.
   b. A robin eats a worm. d. A deer eats grass that has a grasshopper in it.

4. A fox dies. This creates a problem for:
   a. the fleas that were drinking the fox’s blood.
   b. a rabbit that has a nest nearby.
   c. another fox whose territory is nearby.
   d. an animal that hunts in the same area that the fox did.

5. Termites eat only wood; however they cannot digest it. Tiny organisms that live in termites' stomachs and intestines digest the wood. The relationship the tiny organisms and the termites have is:
   a. helpful to one and has no effect on the other.
   b. helpful to one and harmful to the other.
   c. helpful to both of them.
   d. helpful to neither of them.
6. A cat and a snake are hunting the same mouse. What is the relationship between the cat and the snake?
   a. One is using the other but not harming it.
   b. They are competing with each other.
   c. They are helping each other.
   d. One is trying to eat the other one.

7. If there were no decomposers on Earth, what would happen?
   a. Dead plants and animals wouldn’t become part of the soil.
   b. Many human diseases would disappear.
   c. More meat would be available for humans to eat.
   d. Little would change.

8. A grassland turns into a desert. What will most likely happen to the animals that live in the grassland?
   a. Most will leave or die.
   b. They would have more babies to survive.
   c. Those that eat grass would adapt to new food.
   d. Many will pass on traits that would help their young survive in the desert.

9. The original source of energy for almost all living things is:
   a. the sun.
   b. water.
   c. the soil.
   d. plants.

10. Some people started a program in a national forest to protect deer. They started killing wolves. Ten years later there were no wolves in the forest. For a few years after the wolves were gone there were many more deer than there had ever been. Then suddenly there were almost no deer. The people who wanted to protect the deer didn’t know that:
    a. deer only live to be a few years old.
    b. fires would kill so many deer.
    c. other animals would eat so much of the deer’s food.
    d. the deer would eat all of the food and that many would starve.

11. A dead bird is decomposing. What happens to the energy that was stored in the bird’s body?
    a. Nothing happens to it. Once the bird is dead the energy is lost.
    b. It passes through the organisms that decomposed the bird.
    c. It is destroyed by solar radiation.
    d. The bird used up its energy when it was alive.
12. A rabbit eats corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why?
   a. A fox can't digest corn.
   b. The rabbit had already digested the corn.
   c. Corn doesn't have much energy.
   d. Most of the corn's energy was used by the rabbit.

13. Most of the oxygen in the atmosphere comes from:
   a. Insects.
   b. Plants.
   c. The soil.
   d. The sun.

14. Which of the following would give humans the most food energy from 1,000 pounds of plants?
   a. Feed the plants to insects, feed the insects to fish, and then humans eat the fish.
   b. Humans eat the plants.
   c. Feed the plants to cattle then humans eat the cattle.
   d. Feed the plants to fish then humans eat the fish.

15. After living things die, they decompose. As a result of this process nutrients are:
   a. Released back into the environment to be recycled.
   b. Destroyed by the bacteria of decay.
   c. Changed from nutrients to oxygen and water vapor.
   d. Evaporated due to the heat produced during decomposition.

16. Which of the following is a part of the water cycle?
   a. Erosion.
   b. Ocean tides.
   c. Evaporation.
   d. Decomposition.

17. A pollutant gets into an ecosystem and kills large numbers of insects. How might this affect the ecosystem?
   a. Plants are not damaged so it doesn't affect the ecosystem.
   b. It damages part of the ecosystem so it may effect the whole ecosystem.
   c. It kills only insects so the other animals in the ecosystem stay healthy.
   d. Most animals eat plants so it doesn't affect the ecosystem much.
Part III
How I Feel About Things and What I Do About Things

Section No. 1

| Directions: Each of the following items looks at different aspects about you and the environment. Please be completely honest. There are no right or wrong answers. Think carefully about each item before you circle the "X" that seems to be the most appropriate one. The "X" you choose should look like: |

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Ecomanagement refers to those environmental actions in which people work directly with the natural world to help prevent or resolve environmental issues. Examples would be: (1) recycling glass and/or plastic, (2) building and putting up nest boxes for birds, and (3) cleaning up littered areas.

**A. How knowledgeable do you think you are about ecomanagement? Circle one "X."**

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>Moderately</td>
<td>Greatly</td>
<td></td>
</tr>
</tbody>
</table>

**B. How skilled do you think you are in your ability to use ecomanagement? Circle one "X."**

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>Moderately</td>
<td>Greatly</td>
<td></td>
</tr>
</tbody>
</table>

2. Persuasion refers to those environmental actions in which individuals or groups appeal to others to help prevent or resolve environmental issues. Examples would be things like: (1) trying to get your family to begin saving energy by lowering the thermostat, (2) convincing a friend to get a cat sterilized, or (3) convincing your mom to recycle aluminum and glass.

**A. How knowledgeable do you think you are about persuasion? Circle one "X."**

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>Moderately</td>
<td>Greatly</td>
<td></td>
</tr>
</tbody>
</table>

**B. How skilled do you think you are in your ability to use persuasion? Circle one "X."**

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>Moderately</td>
<td>Greatly</td>
<td></td>
</tr>
</tbody>
</table>
Section No. 2

Directions: In Section No. 2 you are asked to circle the number of times you have taken one or more of the following environmental actions in the last six (6) months. It is very important for you to be completely honest in your answers here.

<table>
<thead>
<tr>
<th>Action</th>
<th>Number of Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Used alternative forms of transportation, for example, walking, bicycling, car pooling, taking mass transit.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>2. Taken steps to reduce the energy used for heating, cooling, and/or lighting.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>3. Taken steps to reduce water consumption.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>4. Recycled things like paper, glass, plastic, metals, or organic refuse.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>5. Picked up litter.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>6. Talked to someone and encouraged him/her to support a positive environmental action.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>7. Encouraged an individual or a group involved in some kind of destructive environmental behavior to stop that activity.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>8. Wrote a letter to a person, group, or company encouraging them to stop an activity, or to take an action, for the purpose of improving the environment.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>9. Purchased products packaged in reusable, returnable or recyclable containers.</td>
<td>1 2 3 4 5+</td>
</tr>
<tr>
<td>10. Avoided buying products with excess packaging.</td>
<td>1 2 3 4 5+</td>
</tr>
</tbody>
</table>
Part IV

An Evaluation For Issue Analysis And Action Skills

The Story: A QUESTION OF PROGRESS

Recently the city of Ironton experienced a problem. This problem dealt with a land-use management question. A developer talked to Mr. and Mrs. Tillman who owned a farm. He offered to buy the Tillman farm to build a mall.

The Tillman farm was inside the city limits. It was an ideal location for a mall. The developer was Mr. Hank Smith. Smith said he would pay one million dollars ($1,000,000) for the farm. The Tillmans knew that the farm was only worth about $50,000 as farm land. They decided to sell if Ironton's city officials would give permission. Ironton's officials had to approve selling farm land for business purposes.

Mr. Smith went to the city officials. He requested that he be given permission to build a mall using the Tillman farm land. He explained that the mall would bring millions of dollars to Ironton. It would also encourage additional development on that side of town. Also, many jobs would be created. The officials agreed to study Smith's request. They would act on this request at their next meeting.

The Ironton Daily News published Mr. Smith's request the next day. Reactions were immediate. Several groups disagreed with the proposal. Others supported it. They wanted the mall to be built.

The information above contains an environmental issue. Circle the letter in front of the statement that best identifies this environmental issue.

a. Should Ironton's city officials be involved in a land-use management decision?

b. Should city officials allow the Tillman farm to be converted to a shopping mall?

c. Should the city of Ironton build a mall on the Tillman farm?

d. Should the Tillmans be able to sell land worth only $50,000 for $1,000,000 (one million dollars)?
The County Agricultural Association opposed the mall. It believed that the area was losing too much farm land to commercial development. The local builders' union supported the mall. The union thought the development would provide jobs for its unemployed members.

The local Sierra Club argued against the mall. It was concerned that development would threaten the rare natural area located next to the farm.

The Tillmans talked to the Ironon Daily News. They told the reporter they wanted to sell their farm. They said that the money would be great for retirement. They also said that they should be able to sell their land because it was theirs. They could do anything they wanted with it.

There is an environmental issue here. There are numerous “players” and all of the players have beliefs and values.

A belief is something that someone or a group of people holds to be true. A value is the worth placed on something by someone or a group of people. Values are closely related to beliefs.

For example, your mother might believe that it is important for you to go to school. Her belief would be: "It is important for you to go to school." The value associated with this belief is an "educational" value.

Below, you will find a list of some of the key players. For each player, you are to list one belief. Also name the most important value present in that belief. One example is provided.

<table>
<thead>
<tr>
<th>Player</th>
<th>The Player's Belief</th>
<th>The Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hank Smith</td>
<td>The mall would bring millions of dollars to Ironon,</td>
<td>Economic</td>
</tr>
<tr>
<td>The Tillmans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County Agricultural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Builder's Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Club</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
One month after the initial proposal, city officials decided to allow the mall to be built.

Assume that you were a citizen in Ironton. You discover that others feel the same way about this local issue as you do. Basically, you do not want the mall to be built on the Tillman farm land.

Below you will find eight action strategies that you might use to prevent the mall from being built. Select what you believe to be the best two (2) action strategies. Put an "X" in front of each of the two action strategies that you select.

_____ 1. Write to your U. S. Senators and ask for a federal law to be passed to prohibit the sale of the Tillman farm land.

_____ 2. Write to your state representative and urge him/her to write and get a law passed prohibiting the sale of the Tillman farm land.

_____ 3. Organize a group to hold a bake sale of cookies and cakes in an attempt to raise enough money to purchase the Tillman farm land for the same price that Mr. Smith offered.

_____ 4. Circulate a petition opposing the building of the mall and present this petition to Ironton’s city officials.

_____ 5. Organize a group of citizens with the same position as yours to write persuasive letters to the Editor of the Ironton Daily News for publication.

_____ 6. Organize a group of citizens with the same position as yours and offer its services to the Sierra Club in the hope that a coalition of groups could influence city officials to reverse their decision.

_____ 7. Organize a group of citizens with the same position as yours and ask for a meeting with the Chamber of Commerce in which the group would threaten to boycott the mall if it is built.

_____ 8. Make an anonymous phone call to Mr. Smith threatening to sabotage the construction equipment if the mall development plan goes through.

End of the Environmental Literacy Instrument
APPENDIX B

TEACHER/LEADER INFORMATION

4-H Leader/Teacher Information

1. County where group is located:

2. My Background is in Environmental Education or a related field ___ Yes ___ No
   If yes, please briefly describe

3. My Teaching Background (check one):
   ___ I am currently a classroom teacher.  ___ I have past experiences as a teacher.
   ___ I have no previous classroom experience.  ___ I have been involved in other non-
   formal education experiences.

4. My group is best described as (circle one):
   4-H community club  4-H after-school enrichment  Classroom  Homeschool

5. Environmental Education Curriculum Used in My Club (check all that apply)

   Florida 4-H curriculum                     Other curricula
   a. ___ Aquatic/Marine Ecosystems Leader’s  h. ___ Project Wild
      Guide                                     i. ___ Project Learning Tree
   b. ___ Earth Connections (ages 5-8)       j. ___ Project Wet
      Leader’s Guide                           k. ___ Going places, making choices
   c. ___ Earth Connections (ages 9-11)      (National 4-H curriculum)
      Leader’s Guide                           l. ___ Florida Forests Forever
   d. ___ Soil, Water, Land Use I:         m. ___ Threatened and endangered animals:
      Understanding Pesticide Interaction      an extended case study.
      (ages 15-18)                             
   e. ___ Soil, Water, Land Use II:         Other:
      Understanding Nitrogen Interaction      ______________________________________
      (ages 15-18)                            ______________________________________
   f. ___ Recycling Adventures (ages 5-11)   ______________________________________
   g. ___ Water Wise Guys (ages 9-11)        ______________________________________
   h. ___ Coastal Marine Environmental issues ______________________________________

Continued on next page
6. If you have used more than one of the curricula listed in (5) please list in order of most use to least use. Rank the most used curriculum with a 1, second most used 2, etc.

8. Approximately how many hours have you used the above materials in your club?
   ____ 1-5 _____ 6-10 _____ 11-15 _____ 16 +

9. Please check here if your club has a focus other than environmental (e.g., animal science, clothing etc.).

10. What is the focus of your group?
APPENDIX C
INFORMATION PACKET

Dear 4-H Leader/Teacher,

You have been identified as an individual willing to assist in a research project for the Extension program. This project involves collecting data to begin a baseline study for environmental literacy in the Florida Environment Education Extension Program. For the purposes of this study we request that only 11 through 16 year olds complete the instrument. Evaluation is an important dimension of education, and the data we collect from your participants will help us assess the overall environmental knowledge and success of the environmental education curriculum.

Prior to administering the enclosed evaluation instrument, parental consent should be obtained from each participant. This is required by the Institutional Review Board of the University of Florida for all research projects involving minors. Copies of the "Parental Consent Form" are enclosed for your use. Once these are signed and returned you may administer the instrument.

I have enclosed the number of copies you requested of the evaluation instrument. This evaluation should take approximately 45 minutes to administer. Please ask your participants to approach this evaluation in a serious manner. Do not assist them in any way in the completion of the instrument other than explaining or clarifying the directions. Let the participants know that we are interested in finding out what kinds of skills they have developed and how they feel about these skills. They are the only ones who can give us that information, so they are very important people to us. A sheet titled "Instructions for Administering Environmental Literacy Instrument" (Child Assent Script) is enclosed to assist you with preparing the participants.

Also, enclosed is a "4-H Leader/Teacher Information" sheet that we would like you to complete. This information is very important to the overall study because it will tell us what environmental education curricula, if any, you have been using with your group.

We are requesting names of the participants on the instruments. This information will only be used for an anticipated follow-up study during the next three to five years. All information on the student section as well as the leader sheet is strictly confidential.

It will be best if you can keep your group together as they complete the instrument. The instrument is in five parts, which are described below. Ask them to complete it one section at a time and to wait for your directions to proceed. The participants may use either pen or pencil to complete the instrument. Leaders, please remember, feel free to answer clarifying questions, but do not provide answers!

The test is set up as follows:

Participant Information and Demographics. These pages should be self-explanatory.
Part I - The Issues With Which I am Familiar. Please read the directions and the examples aloud. Encourage your participants to think about their answers carefully and to use their best handwriting.

Part II - Ecological Foundations. This section uses multiple-choice questions and there is one best response to every item. Again, please read the directions aloud to your students.

Part III - How I Feel About Things and What I Do About Things. As the title states, this section focuses on how the participants feel and what they do. As you read these directions aloud, make sure the participants understand that the first section of Part III asks them about their feelings and the second section asks them about their actions.

Part IV - An Evaluation For Issue Analysis and Action Skills. Please tell students that this final section will ask them to read a story and then to make some decision about what they have read. If you have a wide variation in reading abilities in your group, you may want to read the story aloud. This is perfectly acceptable. If you do, be sure that you give them ample time to respond to the task in the box before going on to the issue analysis and action sections. As you proceed through issue analysis and action planning, read the sections in bold to them.

Collect the instruments as the participants complete them. Place the completed instruments into the enclosed self-addressed stamped envelope and return as soon as possible. Don’t forget to include your “4-H Leader/Teacher Information” sheet with the instruments. Should you have questions please contact me at (352) 846-0996 or by email JRCU@gnv.ifas.ufl.edu.

Thank you very much for your assistance.

Sincerely,

Jerry Culen, Assistant Professor
Environmental Education/Camping Programs
Instructions for Administering
Environmental Literacy Instrument
(Child Assent Script)

- Explain to the participants that they are involved in an important evaluation project for 4-H that is measuring environmental literacy. Information they provide is important to the 4-H Environmental Education and Camping Program.
- Information is kept confidential. Their names will never appear in any report. All data is reported out as a group.
- Explain to the youth participants that their participation in this study is completely voluntary and they may withdraw at any time.
- Inform them that, should they decide not to participate, there will be no penalties for doing so.
- State that the participant does not have to answer any questions that s/he does not wish to answer.
- Confirm ages for each of the participants. Remember we are testing only 11 through 16 year olds.
- Make sure all students have a pen or pencil to complete the instrument.
- Remind participants to use their best handwriting or to print their responses.
- Remember this is not a contest; no awards or grades will be given. The responses should reflect what the participant genuinely knows or feels when responding to items.
- Distribute copies of the instrument and ask participants to start with the participant/information section at the beginning of the booklet.
- Once they have completed a section, they should stop and wait for you (the leader) to indicate they may go on. Sections are numbered I, II, III, IV.
- Remind participants that some items are open ended and therefore have no right or wrong responses.
- Do not assist participants with items other than explaining the directions or clarifying questions.
- Return the parental consent form and the survey instruments as soon as possible in the addressed stamped envelope.
- Remember all information is confidential.

Thank you.

[Signature]

Jerry Cullen

APPROVED BY
University of Florida
Institutional Review Board (IRB 02)
Protocol # 2001-254
For Use Through

APR 06 2002
APPENDIX D
PARENTAL CONSENT FORM

UNIVERSITY OF FLORIDA

Institute of Food and Agricultural Sciences
Department of Family, Youth and Community Sciences

Parental Consent Form: Assessing Environmental Literacy Study.

Dear Parent/Guardian,

I am a faculty member in the Department of Family, Youth and Community Sciences at the University of Florida. I am conducting research on environmental literacy levels in youth involved with Extension education programs. The purpose of this study is to determine whether environmental education curriculum/activities offered through Extension programs helps children develop environmentally responsible behavior. The results of the study may help 4-H and environmental educators better understand the shortcomings and strengths of the current practices and curriculum. The results may also aid future curriculum development projects for the Extension programs in Florida. With your permission, I would like to ask your child to volunteer for this research.

For this study, children will be given a survey, which they will be asked to complete under the supervision of their teacher or club leader. The survey will take about 45 minutes to complete. Your child will not have to answer any question he/she does not wish to answer. Although the children will be asked to write their names on the survey for matching purposes, their identity will be kept confidential to the extent provided by law. During the actual data analysis your child’s name will be replaced with code numbers. Results will only be reported in the form of group data. Participation or non-participation in this study will not affect the child’s placement or grades in any programs.

You and your child have the right to withdraw consent for your child’s participation at any time without consequence. There are no known risks or immediate benefits to the participants. No compensation is offered for participation. Group results of this study will be available upon request at the completion of the project. If you have any questions about this research study, please contact me at (352) 846-0996 or email lucu@env.cs.ufl.edu. Questions or concerns about your child’s rights as research participant may be directed to the UFIRB office, University of Florida, Box 112250, Gainesville, FL 32611, (352) 392-0433.

Thank you.

Sincerely,

Jerry Cullen
Associate Professor
Department of Family, Youth and Community Sciences

I have read the procedure described above. I voluntarily give my consent for my child, _, to participate in Assessing Environmental Literacy for Florida’s Extension youth programs.

Parent / Guardian Date __________________________

2nd Parent / Witness Date __________________________

Equal Opportunity / Affirmative Action Institution

75
LIST OF REFERENCES


BIOGRAPHICAL SKETCH

Preethi Mony, was born in Madras, India. Growing up in the busy city of Bombay she was introduced to the beauty and serenity of the natural forests of the Sanjay Gandhi National Park by Prof. Sudhakar Solomonraj. On entering college she became actively involved in the Sophia college nature club, where she served on the executive committee from August 1995 to April 1998. After graduating with a bachelor’s degree in life science from the University of Mumbai, India, she sought to enter a degree program focusing on the social aspects of conservation.

In August 1999, she joined the College of Natural Resources and Environment, at the University of Florida. After completing a bachelor’s degree in environmental science in May 2000, she started work on a master’s degree in interdisciplinary ecology. Under the guidance of Dr. Jerry Culen, she was able to follow her interest and further her knowledge of the field of environmental education.

After graduation she will return to India and will be involved in nonformal environmental education programs there.