Wilderness education: Evaluation of a sixth grade approach

Garry A. Oye

The University of Montana

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WILDERNESS EDUCATION:
EVALUATION OF A SIXTH GRADE APPROACH

by

Garry A. Oye

B.S., University of Montana, 1981

Presented in partial fulfillment of the requirements for the degree of

Master of Science

UNIVERSITY OF MONTANA

1984

Approved by:

[Signatures]

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The U.S.D.A. Forest Service is involved in a comprehensive Wilderness Education Program in Region One. The initial program emphasis is on people within 100 miles of each National Forest Wilderness in Montana and Northern Idaho. Through this education effort managers hope to promote an understanding and wise use of the wilderness resource. The major component of this education program is the sixth grade class presentation. Each of Region One's 13 National Forests have programs focusing on the sixth grade level. The presentations cover Wilderness philosophy, legislation, management, and skills. There is currently no formal instrument being used to measure program effectiveness. This study attempted to evaluate changes in knowledge and attitude resulting from exposure to a wilderness education presentation. The study group consisted of eight classes of sixth grade students from two schools in Missoula, Montana. Group equivalence was established with a pre test measure. A one hour Presentation was given to four classes in the treatment group status. Control groups received no instruction on wilderness. Post tests were administered to each group and their mean scores compared. Results show a statistically significant difference in post test knowledge scores and no significant difference in post test attitude scores. The control group had a mean score of 9 (out of a maximum of 14), while the treatment group had a mean score of 13, in the knowledge section. Attitude scores were high (28 out of a maximum of 35) for both the control and treatment groups. Overall, this presentation seems to increase knowledge and reinforce already favorable attitudes. Further questions on retention and actual behavior change remain to be tested.
Acknowledgements

I would like to gratefully acknowledge the enthusiastic and understanding contributions of my thesis committee. The members are Dr. Robert Lucas, Dr. Margaret Needels, Dr. Robert Ream, and Dr. Doris Simonis. I would also like to thank the 6th grade students and teachers of Meadow Hill and Rattlesnake schools, whose participation made this thesis possible.
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CHAPTER ONE
INTRODUCTION

Our entire class really enjoyed your presentation. Montana's children should know more about the world around them, and how to use it wisely. I really liked your explanations of ways you make man-used places look more natural (for instance removing fire rings) and I learned a lot about man's carelessness. Boy, will I follow a different set of rules the next time I go camping.

Leah Pratt, 6th grade student
Washington School (1981)

Thank you for your presentation on wilderness and wilderness ethics. I think sixth grade is a prime time to introduce children to the values inherent in wilderness and wilderness camping. Your presentation was obviously well planned and as a result, effective. I know the children enjoyed it, and learned a great deal.

Jim Greene, 6th grade teacher
Meadow Hill School (1981)

Education of wilderness visitors is a potentially powerful as well as preferable tool in wilderness use management, and it should play a larger role in the future.


Wilderness education is a management tool that can help us avoid further regulations and restrictions. At the same time, it can help preserve wilderness quality and maintain a traditional freedom of choice, which is an important part of the Wilderness experience. Our current management emphasis involves the implementation of a Regional Wilderness education program. Our goal is to promote an understanding and wise use of the wilderness resource. Education is a long-term process that can best be achieved through this Regionwide program.

The U.S.D.A. Forest Service is involved in a comprehensive Wilderness Education Program in Region One. As you can see from the previous quotes, support runs high from students to Regional Foresters. Each of Region One's 13 National Forests, in Northern Idaho and Montana, have ongoing programs at the sixth grade level. These programs cover Wilderness philosophy, legislation, management, and skills (see Appendix A). At present, there is no formal evaluation instrument being used to measure program effectiveness.

Statement of the Problem

The purpose of this study was to evaluate the effects of wilderness education programs on sixth grade students. Knowledge and attitudes were measured with pre and post tests (See Appendix B). Treatment group test scores were compared to control group test scores.

Hypotheses

The following null hypotheses were addressed in this study.

1. Exposure to a Wilderness education program results in no significant difference in post test knowledge scores.
2. Exposure to a Wilderness education program results in no significant difference in post test attitude scores.
Major Assumptions

The following assumptions were made in this study.

1. The classes chosen represent a random sample of sixth grade students.
2. No significant differences existed between groups prior to the study.
3. Instruction time and content remained constant through the study. (One person made all eight presentations)

Limitations

The following are limitations of this study.

1. External validity is limited because the eight classes came from two schools in Missoula, Montana.
2. Selection of random schools was restricted due to favorable response needed from principals and teachers.
3. Length of tests was limited because of need to create least impact on regular teaching schedule.
4. Control over teacher influence was limited, although teachers were asked not to discuss subject matter.

Definitions

The following definitions correspond to terms used in this study.

Wilderness: an area of land set aside by the U.S. Congress to preserve its natural condition.

Wilderness Education Program: a one hour presentation
given by a uniformed Wilderness Ranger. Content includes Wilderness philosophy, legislation, management, and skills. Refer to Appendix A for complete program outline and photographs.

Previous Involvement: involved in some outdoor education experience.

Pretest Knowledge: a student's total score on 15 true-false questions selected for analysis from the original 20 questions on the pretest.

Post test Knowledge: a student's total score on 14 multiple questions selected for analysis from the original 15 questions on the post test.

Pretest Attitude: a student's total score on 7 Likert scaled questions selected for analysis from the original 8 questions on the pretest.

Post test Attitude: same as pretest definition for attitude.

Significance of the Problem

Scarce wilderness management funds are being spent on an education effort with no empirical evidence as to its effectiveness. Presently the Forest Service relies on teacher critiques and student letters as their only source
of evaluation. This study attempted to evaluate changes in knowledge and attitude resulting from exposure to a Wilderness education program. If a positive, significant change could be documented, program expenditures would be justified. Wilderness managers could be assured that they are moving in the right direction with this education emphasis. An informed public, equipped with proper knowledge and attitude, could assist in the maintenance of a quality wilderness resource.
CHAPTER TWO
LITERATURE REVIEW

Why Educate?

Despite a long history of the wilderness idea in this country, there is widespread misunderstanding of the wilderness issue from both a biological and a political viewpoint. What is needed is not advocacy of any one position in this controversial issue, but clarification of the meaning of wilderness, its values, and the nature of uses it provides (Wood, 1974).

The Forest Service supports Wood's idea in their education programs, as they simply try "to promote an understanding and wise use of the wilderness resource" (Coston, 1984). In his 1980 study Young found that "the information level of the general public on the topic of wilderness is generally low" (Young, 1980). Wood points out that "problems of wilderness management and designation will call for citizen input in the decision-making process for a long time to come" and that "it is important for educators to provide the basic information, attitudes, and skills to prepare individuals for participation in this process" (Wood, 1974).

In analyzing results from the National Assessment of Educational Progress survey of 9-, 13-, and 17 year-old's attitudes toward science, researchers conclude that "science education is not preparing students for their role as citizens who must make informed and responsible decisions about science-related social problems during the next decades" (Bybee, et. al., 1980). This concern is parallel to the situation for wilderness. There seems to be general
agreement that what we need is an informed public. Wilderness issue decisions must be based on knowledge and fact, not misconception and myth.

The following response from a 6th grade student exemplifies the underlying purpose of the Wilderness education program. "I think the wilderness should be like it is now for the generations to come after us. This presentation will give the kids that never have the chance to go out and enjoy the wilderness a chance to see what it is like and then they might decide the wilderness is something to save" (Schmelle, 1981). Forest Service educators try to develop a general awareness, along with getting students to think responsibly about choices they can make that affect quality of life for future generations.

Need for Evaluation

Handee supports the emphasis on environmental education, but advises educators to develop and implement "rigorous evaluation" (Hendee, 1972). He claims that "environmental education programs have been guided primarily by unfounded beliefs and emotionally derived truths in need of documentation" (Hendee, 1972).

The Appalachian Mountain Club found a definite lack of empirical evidence on program effectiveness when they surveyed backcountry managers across the country. Manager's opinions of program effectiveness were the only available source of evaluation and comparison (Martin and Taylor, 1981).
In his 1984 study of Wilderness Education, Mercer also calls attention to "the lack of rigorous empirical evaluation" (Mercer, 1984).

Jaus puts the problem into perspective for this study. "The subjects used in the vast majority of environmental education studies have been high school or college students" and "there have been few studies conducted that investigate the effect of environmental education instruction on elementary or middle school students" (Jaus: 1982).

**Related Studies**

Young (1980) conducted a study on the relationship between information levels and environmental approval, concerning the wilderness issue. The survey consisted of eight informational index questions (multiple choice) and eight approval scale questions (strongly agree to strongly disagree). He found that "the amount that people know about wilderness has a greater influence on their opinions concerning wilderness than other characteristics associated with wilderness use such as their age, education, income, or residence." His findings "support a general positive relationship between wilderness information and approval."

Young suggests that "efforts to inform the general public about wilderness would result in a more favorable opinion about that issue, especially among those whose present level of knowledge is relatively low."

In 1980 Robertson conducted a study on the relationship between visitor knowledge and appropriate behavior
Robertson (1982). The survey consisted of a four part questionnaire dealing with behavior, knowledge, attitude, and descriptive characteristics. She found a strong positive correlation between visitor knowledge and appropriate behavior. Robertson concludes "visitor education is a practical method of improving visitor behavior" and suggests "further research efforts should aim at understanding educational techniques that enhance appropriate backcountry behavior."

Fazio (1979) tested Wilderness knowledge of visitors to the Selway Bitterroot Wilderness and Rocky Mountain National Park. The instrument used in the Selway Bitterroot had multiple choice questions covering ethics, biophysical and wilderness concepts, management and safety. The main purpose of this questionnaire was to determine sources and channels contributing to an individual's knowledge. The test instruments used in the Rocky Mountain study consisted of a pre and post test questionnaire. Control group responses were compared to treatment groups. Various treatments were used to gauge effectiveness of several communication channels.

Jaus (1982) studied the effects of environmental education instruction on fifth grade student's attitudes about the environment. His treatment group received 10 hours of special instruction on environmental topics. A twenty item, Likert type questionnaire was administered to the treatment and control groups. Jaus found a
significant difference between treatment and control group scores. Treatment group scores registered a strongly positive response. Control group scores registered a slightly positive response. Jaus points out that these results indicate "by the time students reach fifth grade they have developed positive attitudes toward the environment." He raises the question "should we be satisfied with slightly positive attitudes toward the environment or should we provide instruction that produces strongly positive attitudes?"

Perdue and Warder (1981) utilized a pre test, post test design, along with a longitudinal post test, to measure effects of a wilderness environmental learning experience. Three attitude scores were obtained from one pretest and two post tests. Perdue and Warder had three obvious limitations to their study. The multiple completions of the same test may have resulted in a testing effect. Students knew what was being measured and this could have resulted in a "halo effect." Also, this research involved a very small sample size. The initial post test, administered directly following the experience, demonstrated no significant attitude change. However, the longitudinal post test, administered six weeks later, registered significantly higher positive attitudes. Perdue and Warder suggest utilizing longitudinal measures to study "not only the amount of change, but also the pattern of change."

Burrus-Bammel (1978) conducted a longitudinal study of information effects on attitude. She developed 16 Likert
type questions and 15 true-false questions. Pre and post tests were used, along with retention tests administered 6 months later. Results of the post test indicated a significant increase in attitude scores among the treatment group. Results from the retention test show a continued increase in attitude scores among the treatment group. The author acknowledged weaknesses in the study due to experiment design, small sample size, and use of an unstandardized test.

Born and Wieters (1978) suggest measuring attitudes with a word association test. They identify some problems associated with traditional attitude tests. "The halo effect surrounding environmental topics and the fact that most existing instruments convey very clearly to the respondent what the researcher is attempting to measure are important causes for concern." Born and Wieters developed the NEAT (natural environment awareness test) instrument composed of 100 items. Through the word association process researchers collect individual's responses to various word groupings. Responses provide researchers with a measure of a person's environmental awareness. This study was performed on two groups of college students and measured relative impact of two types of programs.

These relevant studies were used as examples during the formulation of this study's evaluation instrument.
CHAPTER THREE

METHOD

Sample Population

The study group consisted of eight classes of sixth grade students from two schools in Missoula, Montana. There were 79 boys and 78 girls in the group of 157 students. Random selection of schools was not possible, due to the need for School District, Principal, and Teacher approval.

Experimental Design

The eight classes were randomly assigned control or treatment status. A pre test, post test design was utilized following Campbell and Stanley (1963).

<table>
<thead>
<tr>
<th>School</th>
<th>Teacher</th>
<th>Status</th>
<th>Pre Test</th>
<th>Program</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadow Hill</td>
<td>Caton</td>
<td>Treatment</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Meadow Hill</td>
<td>Dayton</td>
<td>Control</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Meadow Hill</td>
<td>Green</td>
<td>Treatment</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Meadow Hill</td>
<td>O'Bagay</td>
<td>Treatment</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
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<td>Wimett</td>
<td>Control</td>
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<td>X</td>
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<tr>
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<td>Phillips</td>
<td>Control</td>
<td>X</td>
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<td>Stroup</td>
<td>Treatment</td>
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<td>X</td>
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</tr>
<tr>
<td>Rattlesnake</td>
<td>Toynes</td>
<td>Control</td>
<td>X</td>
<td></td>
<td>X</td>
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Program Treatment

The program treatment consisted of a one hour presentation given by a uniformed Wilderness Ranger. Program content included information on Wilderness philosophy, legislation, management, and skills. A program outline and photographs are provided in Appendix A. The presentation begins with a 10 minute discussion on Wilderness philosophy.
and legislation. For the next 30 minutes the discussion focuses on a series of slides showing common Wilderness management problems. The last 20 minutes are spent at a make believe campsite (on the school playground) discussing appropriate camping equipment and skills.

**Test Instrument**

The literature search yielded no instrument that specifically addressed evaluation of Wilderness education. A new instrument was developed and patterned after existing environmental and conservation education instruments. A pilot study was conducted using 10 students from a class not involved in the main study. These students reacted favorably, expressing no confusion with the test questions. The pre test consisted of nine questions on personal background, eight Likert-scaled attitude questions, and twenty true-false knowledge questions. The post test consisted of eight Likert-scaled attitude questions and fifteen multiple choice knowledge questions. Both tests are displayed in Appendix B.

**Data Collection**

Pre and post tests were given to students by their teachers. One week's time elapsed between the two tests. Treatment groups received the one-hour Wilderness Education program the day before the post test. Tests were then given to the researcher for analysis.
Statistical Analysis

Scoring standards were developed for each section of the test. The previous involvement section was scored (1) meaning yes and (0) meaning no. The attitude section was scored (1) for extremely unfavorable attitude to (5) for extremely favorable attitude. The knowledge section was scored (1) for correct answer and (0) for incorrect answer. Totals were then computed for each of the five sections (Pretest: Preinvolvement, Attitude, Knowledge and Post test: Attitude, Knowledge). Missing values were coded and are listed under each statistical treatment as a missing observation.

The first analysis involved a look at statistical reliability of the instrument. Cronbach's alpha reliability coefficients were computed for each of the five previously mentioned sections.

The next analysis involved looking at previous involvement effects on pre test scores. A Chi-square test was used for comparison.

Control and treatment group equivalence was then analyzed with Chi-square test of pretest mean scores on attitude and knowledge.

Effects of the program were then analyzed with Chi-square test of post test mean scores on attitude and knowledge.
CHAPTER FOUR
RESULTS

Instrument Reliability

Statistical analysis revealed inconsistencies that reduced reliability of the pre test instrument. One attitude question (#8) was removed, raising the alpha reliability coefficient to .58 for that section. Five knowledge questions (#'s 12, 14, 15, 16, 20) were removed, raising the alpha reliability coefficient to .44 for that section.

Statistical analysis revealed inconsistencies that reduced reliability of the post test instrument. One attitude question (#8) was removed, raising the alpha reliability coefficient to .68 for that section. One knowledge question (#5) was removed, raising the alpha reliability coefficient to .72 for that section.

Copies of the pre and post tests are included in Appendix B.

Previous Involvement

Most students reported previous involvement in some outdoor education experience (Table 2).
Table 2

Previous Involvement: Outdoor Education Experiences

<table>
<thead>
<tr>
<th>Organized Group</th>
<th>Yes N</th>
<th>%</th>
<th>No N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girl Scouts</td>
<td>32</td>
<td>20</td>
<td>125</td>
<td>80</td>
</tr>
<tr>
<td>Hunter Safety</td>
<td>26</td>
<td>17</td>
<td>131</td>
<td>83</td>
</tr>
<tr>
<td>Missoula Parks &amp; Recreation</td>
<td>28</td>
<td>18</td>
<td>129</td>
<td>82</td>
</tr>
<tr>
<td>YMCA or YWCA</td>
<td>75</td>
<td>48</td>
<td>82</td>
<td>52</td>
</tr>
<tr>
<td>Boy Scouts</td>
<td>42</td>
<td>27</td>
<td>115</td>
<td>73</td>
</tr>
<tr>
<td>Campfire</td>
<td>25</td>
<td>16</td>
<td>132</td>
<td>84</td>
</tr>
<tr>
<td>4-H</td>
<td>25</td>
<td>15</td>
<td>133</td>
<td>85</td>
</tr>
<tr>
<td>Family Camping</td>
<td>111</td>
<td>71</td>
<td>46</td>
<td>29</td>
</tr>
</tbody>
</table>

Twenty-six of the study subjects had no previous involvement at all.

In an attempt to get a larger sample size of "no previous involvement" respondents, the definition of previous involvement was changed. Previous involvement was redefined to mean being involved in Girl Scouts, Hunter Safety, Boy Scouts, or Campfire. These four organizations were chosen because they have a strong emphasis towards camping and survival training. This gave a sample size of 52 in the "no previous involvement" category, enabling a more meaningful comparison.

The Chi-square test yielded no significant differences in attitude or knowledge associated with previous involvement status (Table 3). It is assumed that this status will not affect initial control and treatment group equivalence.
Table 3

Previous Involvement: Pretest Score Comparisons

<table>
<thead>
<tr>
<th>Pretest Attitude</th>
<th>Degrees of Freedom</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Previous Involvement</td>
<td>102</td>
</tr>
<tr>
<td>No Previous Involvement</td>
<td>52</td>
</tr>
</tbody>
</table>

Number of missing observations = 3
*n.s.

Pretest Knowledge

<table>
<thead>
<tr>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Previous Involvement</td>
</tr>
<tr>
<td>No Previous Involvement</td>
</tr>
</tbody>
</table>

Number of missing observations = 23
*n.s.

Pretest Equivalence

In order for the study to be relevant, control and treatment groups must be initially proven equivalent. The Chi-square test yielded no significant difference between control and treatment group pretest scores (Table 4). This proves initial group equivalence.

Table 4

Program Status: Pretest Score Comparisons

<table>
<thead>
<tr>
<th>Pretest Attitude</th>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>82</td>
</tr>
<tr>
<td>Treatment</td>
<td>72</td>
</tr>
</tbody>
</table>

Number of missing observations = 3
*n.s.

<table>
<thead>
<tr>
<th>Pretest Knowledge</th>
<th>Degrees of Freedom</th>
</tr>
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<td></td>
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<tr>
<td>Control</td>
<td>73</td>
</tr>
<tr>
<td>Treatment</td>
<td>63</td>
</tr>
</tbody>
</table>

Number of missing observations = 21
*n.s.
Post test Comparison

Post test scores were compared to measure the effect of the treatment. The Chi-square test yielded no significant difference between control and treatment attitude scores (Tables). This same test yielded a significant difference between control and treatment knowledge scores.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>Treatment Effect: Post test Comparison</th>
</tr>
</thead>
</table>
| **Post test Attitude** | \[ \begin{array}{ccc}
N & \bar{x} & SD & \text{Chi-square} & \text{Freedom} \\
Control & 81 & 28.5 & 3.6 & 17.15^* & 17 \\
Treatment & 75 & 28.8 & 3.9 &   &   \\
\end{array} \right. |

Number of missing observations = 1

*n.s.

<table>
<thead>
<tr>
<th></th>
<th>Post test Knowledge</th>
</tr>
</thead>
</table>
| \[ \begin{array}{ccc}
N & \bar{x} & SD & \text{Chi-square} & \text{Freedom} \\
Control & 61 & 9.2 & 1.9 & 102.01 & 11 \\
Treatment & 72 & 13.0 & 1.3 &   &   \\
\end{array} \right. |

Number of missing observations = 24

\( x^2 \text{ crit} = 31.3; \ p < .001 \)

The Hypotheses

Null Hypothesis #1

Exposure to a Wilderness education program results in no significant difference in post test knowledge scores.

The analysis of Chi-square statistical treatment yielded significant differences between control and treatment group means. Statistical significance beyond the one tenth percent (.001) level was met. The null hypothesis was
rejected. Exposure to a Wilderness education program results in a significant difference in knowledge.

Null Hypothesis #2

Exposure to a Wilderness education program results in no significant difference in post test attitude scores.

The analysis of Chi-square statistical treatment yielded no significant difference between control and treatment group means. Statistical significance at the five percent (.05) level was not met. The null hypothesis is supported. Exposure to a Wilderness education program results in no significant difference in attitude.

Other Findings

Individual question responses add to the significance of the study findings. Responses on eight of fourteen post test analysis questions show large gains from exposure to the education program (Table 6).

Table 6

Significant Differences in Post test Question Responses

<table>
<thead>
<tr>
<th>2. Wilderness areas are set aside or designated by</th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. local city councils.</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. State Fish and Game agencies.</td>
<td>53</td>
<td>11</td>
</tr>
<tr>
<td>*c. U.S. Congress</td>
<td>44</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Which of these are names of nearby Wilderness areas?</th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>*a. Bob Marshall and Rattlesnake.</td>
<td>64</td>
<td>97</td>
</tr>
<tr>
<td>b. Greenough and Blue Mountain.</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>c. Blackfoot and Clark Fork.</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>

* = correct answer
6. Which of these sleeping bag materials keeps you warm even when it is damp?
   - a. cotton. 10% 4%
   - b. down (goose or duck feathers). 48% 1%
   - c. polyester (holofil or polarguard). 42% 95%

9. Untrammelled means
   - a. free, untamed, or uncontrolled. 34% 80%
   - b. not trampled, without garbage. 41% 13%
   - c. without trains or tramways. 25% 7%

10. Which is the best method for rinsing soap off your dishes?
    - a. dip in a fast moving stream. 40% 7%
    - b. rinse away from the lake or stream. 55% 92%
    - c. dunk in a lake. 5% 1%

11. What is the best method for "going to the bathroom" in the woods?
    - a. leave waste and toilet paper hidden in the bushes. 7% 0%
    - b. bury 6 inches deep, well away from water. 59% 97%
    - c. bury 2 feet deep, well away from water. 33% 3%

13. Which of these is not a step in the process of erasing all trace of your campfire?
    - a. go through the ashes. 30% 8%
    - b. scatter the rocks. 5% 4%
    - c. sprinkle pine needles and twigs 20% 8%
    - d. dig a hole and bury everything. 45% 80%

15. What should you do with garbage in the wilderness?
    - a. bury it. 33% 1%
    - b. leave it for the animals to go through 1% 1%
    - c. pack out what you can't burn. 65% 97%

Based on these results (Table 6), it appears that children exposed to the education program are learning some important Wilderness concepts. Wilderness managers should be interested in the following comparisons. On question #10 when
asked for proper methods of dishwashing, 40% of the control group answered incorrectly with "dip in a fast moving stream." On the same question, 92% of the treatment group answered correctly with "rinse away from the lake or stream." On question #15 when asked for proper methods of garbage disposal, 33% of the control group answered incorrectly with "bury it." On the same question, 97% of the treatment group answered correctly with "pack out what you can't burn." These results are especially important considering that water quality and campsite impacts are two of the major problems facing Wilderness managers. Results from these 8 questions show how misinformation can be replaced with correct information. It is assumed that this newly gained knowledge will then encourage appropriate behavior.
CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to evaluate effects resulting from exposure to a Wilderness education program. A pretest was administered to control and treatment groups. Results showed no significant differences and confirmed group equivalence. The treatment group received the one-hour Wilderness education program described in Appendix A. The control group received no instruction on Wilderness during the time of this study. A post test was administered to control and treatment groups. Results showed no significant differences in attitude and significant differences in knowledge. Specific question-by-question analysis of the post test shows that students are learning some important Wilderness concepts.

Conclusions

Students' attitudes seem to be highly favorable to Wilderness, regardless of program exposure. Mean scores of 28 (out of a possible high of 35) in both pre and post tests translates into a solid "agree" category for positive Wilderness attitude. Implications are that this program could act as a reinforcer to these already favorable attitudes.

Students' knowledge seems to be the most affected by program exposure. As can be seen in post test mean score comparisons and question-by-question analysis, there is
a significant increase in knowledge levels following treatment.

Questions still remain concerning retention and actual behavior change. Program educators can only provide the tools for proper behavior. If we can raise knowledge levels and reinforce positive attitudes, children should be more likely to carry out the desired behavior when they visit wilderness.

These results document an increase in knowledge. Program costs, along with a brief economic analysis, are outlined in Appendix C. Wilderness managers must now decide if knowledge gains are worth dollars spent. My analysis suggests that it is worthwhile if actual behavior is influenced by increased knowledge.

As these children grow older they will be faced with choices concerning wilderness. How much is enough? How much use will be allowed? What impacts or changes are acceptable? Should it be set aside and preserved? Can we take better care of it? They will make decisions that may influence the quality of life for themselves and for generations to come. This program gives children a base knowledge to start from. As they grow and mature, they will learn more about Wilderness and its place among other resources. And when choices are required, they will be able to make more informed and responsible decisions about the future of Wilderness.
Recommendations

Recommendations for further study:

1. School districts are very concerned about new programs and experimental testing. Researchers and educators must work closely with science committees to demonstrate why the research is needed.

2. There is a need for research that shows whether knowledge and attitude actually affect behavior.

3. Longitudinal studies should be used to measure retention and long term effects of program exposure.

4. The "previous involvement" section of the pre test could be expanded to try to trace specific knowledge from its source.

5. There is a need for an instrument to evaluate different communication techniques used by various educators.

6. There is a need for a more sensitive attitude instrument that could more effectively measure changes that may result from the education program.

7. Researchers should periodically evaluate programs across the Region. This would help identify Regional strengths and weaknesses.
APPENDICES
APPENDIX A

OUTLINE OF GARRY OYE'S WILDERNESS EDUCATION PROGRAM
OUTLINE OF GARY OYE'S
WILDERNESS EDUCATION PROGRAM

Part I  In Classroom

A. Wilderness Philosophy and Legislation (Discussion)
   1. Who I am
   2. Where I work
   3. Highlight Wilderness areas around Missoula
   4. The Wilderness Act
   5. Definitions (ask kids)
      a. Wilderness
      b. Untrammelled
      c. Solitude

B. Wilderness Management (Slides and Discussion)
   1. Things you don't see in Wilderness
   2. Exceptions and Pre-established Uses
   3. Things you do see in Wilderness
   4. Take a Trip
      a. Trail erosion
      b. Problem campsite
      c. Resource damage
   5. General Scenery

Part II  On Playground

A. Wilderness Skills
   1. Make them all Wilderness Rangers
   2. Have them correct a problem campsite
      a. Clean up garbage
      b. Discuss washing technique
      c. Naturalize fire ring
d. Discuss human waste disposal

B. Camping Equipment

1. Look over various pieces of equipment
   a. Tent
   b. Backpack
   c. Food containers
   d. Sleeping bags

2. Discuss advantages and disadvantages
   a. Weights
   b. Colors
   c. Strengths

* A video tape copy of a condensed version of this program is available for loan at no cost from:

Recreation, Wilderness, and Lands
U.S.D.A. Forest Service
P.O. Box 7669
Missoula, Montana 59807
Part of the wilderness program is given inside the classroom. Students participate in a discussion on wilderness. Then a slide show helps further develop their wilderness awareness.
Students learn the importance of packing light.
Students clean up litter around their campsite.
Students discuss camping techniques that can help them minimize impacts on the wilderness.
APPENDIX B

Pre and Post Tests
WILDERNESS TEST

The purpose of this test is to determine your knowledge and attitude about wilderness. You will not be graded on the test. The results will be used to develop a new program on wilderness. Your cooperation is greatly appreciated.

GENERAL INFORMATION

Your Name _____________________ Boy ___ Girl ___ (Check one)

Have you been involved in any of the following? Check the ones that you have. (√)

___ Girl Scouts       ___ Boy Scouts
___ Hunter Safety    ___ Campfire
___ Missoula Parks and Recreation ___ 4-H
___ YMCA or YWCA     ___ Family Camping

How many overnight camping trips did you take last year?

Name two of your favorite camping places.

ATTITUDES

We are interested in knowing how people feel about various things concerning wilderness. On the following page are statements like these:

I don't like strawberry ice cream.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don't Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

I am interested in the job of mayor.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don't Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Please check the answer that tells best how much you agree or disagree with each statement about yourself. For example, if you really like strawberry ice cream, you'd put a (√) on the line above strongly disagree. If you really don't care about the job of mayor, you'd put a (√) on the line above don't care.

There are no right or wrong answers for these exercises. They simply tell how you feel.
1. I'd like to learn about the wilderness resource.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

2. I'd be bored going on a hike with someone who explained things about the plants and animals.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

3. I would like to help keep wilderness around for years and years.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

4. I don't think grizzly bears and wolves need a place to live.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

5. I am interested in learning about places near Missoula to go camping.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

6. I am not interested in learning about man's relationship with wilderness.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

7. I think Montana has enough land set aside and protected as wilderness.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

8. I believe wilderness is a place where nature should be left alone. People should not be allowed to go into wilderness.

   Strongly Agree    Agree    Don't Care    Disagree    Strongly Disagree

KNOWLEDGE

We are interested in learning what people know about wilderness. On the following page are statements like these:

   T   F   Water is wet.
   T   F   Snow is hot.

When you know the statement is true, you circle the T. When you know the statement is false, you circle the F.

There are twenty statements on the next page. Read each statement carefully.
<table>
<thead>
<tr>
<th>#</th>
<th>T/F</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>T</td>
<td>Wilderness Areas are set aside or designated by the U.S. Congress.</td>
</tr>
<tr>
<td>2.</td>
<td>T</td>
<td>There are restrooms and garbage cans inside most Wilderness Areas.</td>
</tr>
<tr>
<td>3.</td>
<td>T</td>
<td>Bob Marshall and Rattlesnake are names of nearby Wilderness Areas.</td>
</tr>
<tr>
<td>4.</td>
<td>T</td>
<td>Solitude in Wilderness involves getting away from other people.</td>
</tr>
<tr>
<td>5.</td>
<td>T</td>
<td>Hunting is not allowed in any Wilderness Areas.</td>
</tr>
<tr>
<td>6.</td>
<td>T</td>
<td>You can cross-country ski in Wilderness Areas.</td>
</tr>
<tr>
<td>7.</td>
<td>T</td>
<td>Burying garbage is a good wilderness skill.</td>
</tr>
<tr>
<td>8.</td>
<td>T</td>
<td>If you tie a horse to a hitchrail or highline you will limit damage to trees.</td>
</tr>
<tr>
<td>9.</td>
<td>T</td>
<td>All forest fires are bad.</td>
</tr>
<tr>
<td>10.</td>
<td>T</td>
<td>The best method for rinsing soap off your dishes is to dunk them in the lake.</td>
</tr>
<tr>
<td>11.</td>
<td>T</td>
<td>A backpack made out of steel and canvas is heavier than a backpack made out of aluminum and nylon.</td>
</tr>
<tr>
<td>12.</td>
<td>T</td>
<td>Snowmobiles are not allowed in Wilderness Areas.</td>
</tr>
<tr>
<td>13.</td>
<td>T</td>
<td>You should try and leave your Wilderness campsite looking like you were never there.</td>
</tr>
<tr>
<td>14.</td>
<td>T</td>
<td>Grazing livestock is a permitted Wilderness use.</td>
</tr>
<tr>
<td>15.</td>
<td>T</td>
<td>Building a big rock fireplace is a good Wilderness practice.</td>
</tr>
<tr>
<td>16.</td>
<td>T</td>
<td>When you &quot;go to the bathroom&quot; in the woods it is best to bury your human waste and toilet paper in a hole far away from water.</td>
</tr>
<tr>
<td>17.</td>
<td>T</td>
<td>You need to get a permit before you can enter any Wilderness Area.</td>
</tr>
<tr>
<td>18.</td>
<td>T</td>
<td>There are no Wilderness Areas east of the Mississippi River.</td>
</tr>
<tr>
<td>19.</td>
<td>T</td>
<td>Aluminum foil and cans burn completely away when left in your campfire.</td>
</tr>
<tr>
<td>20.</td>
<td>T</td>
<td>You should always cut lots of firewood and leave a pile for the next camper.</td>
</tr>
</tbody>
</table>
WILDERNESS TEST

The purpose of this test is to determine your knowledge and attitude about wilderness. You will not be graded on the test. The results will be used to evaluate this program on wilderness. Your cooperation is greatly appreciated.

ATTITUDES

Please check the answer that tells best how much you agree or disagree with each statement about yourself. There are no right or wrong answers for these exercises. They simply tell how you feel.

1. I'd like to learn about the wilderness resource.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

2. I'd be bored going on a hike with someone who explained things about the plants and animals.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

3. I would like to help keep wilderness around for years and years.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

4. I don't think grizzly bears and wolves need a place to live.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

5. I am interested in learning about places near Missoula to go camping.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

6. I am not interested in learning about man's relationship with wilderness.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

7. I think Montana has enough land set aside and protected as wilderness.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree

8. I believe wilderness is a place where nature should be left alone. People should not be allowed to go into wilderness.

   Strongly Agree  Agree  Don't Care  Disagree  Strongly Disagree
We are interested in learning what you now know about wilderness. For each of the following questions, circle the answer you think is best. Circle only one answer for each question.

1. Forest fires are good because they
   a. limit human use in an area.
   b. produce warmth for the animals.
   c. open up the forest, allowing for new growth.

2. Wilderness areas are set aside or designated by
   a. local city councils.
   b. State Fish and Game agencies.
   c. U.S. Congress

3. Which of the following travel methods is allowed in Wilderness?
   a. snowmobile.
   b. cross country ski.
   c. motorcycle.

4. Which of these are names of nearby Wilderness areas?
   b. Greenough and Blue Mountain.
   c. Blackfoot and Clark Fork.

5. Which of these is an example of a pre-existing use (existed before the area became Wilderness) that is not allowed in Wilderness?
   a. airstrips.
   b. grazing livestock.
   c. building new roads.

6. Which of these sleeping bag materials keeps you warm even when it is damp?
   a. cotton.
   b. down (goose or duck feathers).
   c. polyester (holofil or polarguard).

7. Wilderness areas are located
   a. only in the West.
   b. only in Montana and Idaho.
   c. throughout the U.S. (East and West).

8. Which of these techniques damages trees the most?
   a. tie your horse to a highline or hitchrail.
   b. use hobbles on your horse.
   c. tie your horse directly to a tree.
9. Untrammelled means
   a. free, untamed, or uncontrolled.
   b. not trampled, without garbage.
   c. without trains or tramways.

10. Which is the best method for rinsing soap off your dishes?
    a. dip in a fast moving stream.
    b. rinse away from the lake or stream.
    c. dunk in a lake.

11. What is the best method for "going to the bathroom" in the woods?
    a. leave waste and toilet paper hidden in the bushes.
    b. bury 6 inches deep, well away from water.
    c. bury 2 feet deep, well away from water.

12. When breaking camp you should
    a. leave at least one improvement (bench or table) for the next camper.
    b. leave a big pile of firewood.
    c. leave "no trace" of your stay.

13. Which of these is not a step in the process of erasing all trace of your campfire?
    a. go through the ashes.
    b. scatter the rocks.
    c. sprinkle pine needles and twigs.
    d. dig a hole and bury everything.

14. Solitude involves
    a. making something solid or strong.
    b. getting away from people, noises, and civilization.
    c. reducing the size of an object.

15. What should you do with garbage in the Wilderness?
    a. bury it.
    b. leave it for the animals to go through.
    c. pack out what you can't burn.
ECONOMIC ANALYSIS

Cost of Treatment

Treatment Group Size
4 classes
75 students

Instruction Costs
$6.50/hour Wilderness Ranger (GS-5)
$.20/mile Mileage

Breakdown

Initial Preparation 1 hr. $6.50
Actual Program Time 4 hrs. $26.00
Travel Time 1 hr. $6.50
Mileage 40 miles $8.00

Total Cost $47.00

Cost Per student
$.63/student

Cost Per Unit Knowledge Gain Per Student
$.16/unit gain/student

*Treatment group had a 4 unit gain over control group on post test knowledge scores.

Estimated Cost of Inappropriate Behavior

Control Group Size
4 classes
82 students

Corrective Action Costs
$6.50/hour Wilderness Ranger (GS-5)
$.20/mile Mileage
Results to consider

- 33% of the control group (27 students) indicated on the post test that burying garbage was an appropriate disposal technique (incidentally, 97% of the treatment group said you should pack it out).

- 68% of the control group (56 students) indicated that they have gone camping with their family.

Possible situation

Lets suppose that one of those 27 students actually makes it out into the Wilderness for an overnight camping trip with his family of four. When it comes time to break camp, they bury some garbage and scatter the rest. The student and his family return home. Another camper finds the messy camp and reports it to the Forest Service. A Wilderness Ranger is dispatched to clean up the camp and return the area to its natural character.

Cleanup Cost Breakdown

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip Preparation</td>
<td>1 hr.</td>
<td>$6.50</td>
</tr>
<tr>
<td>Travel To and From Trailhead</td>
<td>1 hr.</td>
<td>$6.50</td>
</tr>
<tr>
<td>Travel From Trailhead to Campsite</td>
<td>4 hrs.</td>
<td>$26.00</td>
</tr>
<tr>
<td>Camp Cleanup and Rehabilitation</td>
<td>1 hr.</td>
<td>$6.50</td>
</tr>
<tr>
<td>Mileage (To &amp; From Trailhead)</td>
<td>40 miles</td>
<td>$8.00</td>
</tr>
<tr>
<td>Total Cost</td>
<td></td>
<td>$53.50</td>
</tr>
<tr>
<td>Cost Per Student</td>
<td></td>
<td>$53.50/student</td>
</tr>
</tbody>
</table>
REFERENCES AND LITERATURE CITED


