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Wilderness-Related Environmental Outcomes of Adventure and Ecology Education Programming

GLENDA HANNA

ABSTRACT: The similarities and differences between adventure and ecology education programming are explained with respect to participants' wilderness knowledge, attitudes, intentions, and behavior. A longitudinal study was conducted to compare an outdoor adventure program (Outward Bound) with a field ecology program (Audubon). A model of reasoned wilderness behavior was developed on the basis of the foundational work of Fishbein and Ajzen. The model suggests that behavior in (recreational) and for (environmental) wilderness depends on the interaction of a number of predisposing factors and on the development of relevant beliefs, attitudes, and intentions. The study findings provided support for the proposed model.

Over the last 3 decades, a dichotomy has occurred in outdoor education, splitting it into adventure education and environmental education (Priest, 1986). Although both adventure and environmental education depend largely on the natural environment and are experiential in approach, each stresses a different process directed toward the achievement of somewhat different objectives. Adventure education typically uses real or apparent risk and uncertainty to create dissonance. When an individual has successfully completed the task, he or she may experience personal and social growth (Walsh & Gollins, 1975). Environmental education, on the other hand, is structured to help students learn ecological concepts and environmental issues and become motivated to work on environmental problems (Roth, 1969).

Outdoor adventure practitioners, resource managers, and researchers are concerned that without more attention to attitudinal and behavioral outcomes in adventure programs, the very environment upon which the educational/recreational experience depends will be destroyed (Newhouse, 1990; Robertson, 1986). The wilderness environment, frequently the locale of choice for these programs, is also politically sensitive, and preservation will require concentrated efforts by individuals and groups. Conversely, environmental educators and researchers are realizing that the interdisciplinary field-studies approach they have emphasized has not been as influential in achieving long-term environmental objectives as they had initially hoped (Gigliotti, 1990; McLaren, 1990; Miles, 1990). They increasingly see that adventure programming enhances internal locus of control and helps individuals and groups develop decision-making capacities. These outcomes are crucial to effective environmental activism on both the personal and the societal levels (Priest, 1986).

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Very little research has involved investigation of the environmental outcomes of adventure-education programs (Gillet, Thomas, Skok, & McLaughlin, 1991; Purdue & Warder, 1991), and none of the existing research has included longitudinal studies. In addition, I found nothing in the literature that compared adventure and environmental program outcomes. A comparison of what outdoor programmers believe occurs with what actually does occur during and after such programs would be helpful for understanding what outcomes, if any, they have.

Theoretical Foundations

In the present study I tested a model of reasoned wilderness behavior. This model was based on the work of Fishbein and Ajzen (1975, 1980), Ajzen (1988) and adaptations to leisure (Iso-Ahola, 1980), to adventure education (Ewert, 1989), and to environmental education (Hines, Hungerford, & Tomera, 1987). This explanatory and predictive model (see Figure 1) indicates that predisposing factors, such as demographics and past experience in and for wilderness, interact with what an individual knows about the natural environment and about living and traveling in it. These factors work together and lead to the development of attitudes toward wilderness issues, from anthropocentric (wilderness should be preserved as a venue for outdoor recreation and other utilitarian purposes) to ecocentric (wilderness should be preserved for environmental conservation purposes). According to the model, attitudes about wilderness issues lead to the formation of intentions in (outdoor recreation) and for (environmental involvement) wilderness. Finally, these intentions are manifest in actual, specific behavior in and for wilderness.

Review of the Literature

Predisposing Factors.

Studies of adult populations (see Table 1) have shown that the most frequently noted predisposing demographic variables affecting environmental attitudes and behavior include age, income, occupation, education, and place of residence (Larson, 1981; Tognacci, Weigel, Wieden, & Vernon, 1976). The patterns of these predisposing factors and environmental interest and activity are the same as those noted by researchers who have studied adult outdoor-recreationist characteristics (Lucas, 1979; Young, 1983).

Perhaps the largest body of research on predisposing factors has related previous significant life experiences with current environmental attitudes and/or behavior. Again, a positive, common relationship between childhood experiences and adult environmental behavior (Tanner, 1970) and outdoor recreational behavior (Christensen & Yoestling, 1978; Hendee, Catton, Marlow, & Brockman, 1968) has been identified. The research indicates that outdoor educational and recreational experiences play an important role in influencing higher levels of environmental concern and activism.

Dunlap and Heffernan (1975) specified participation in outdoor recreation as an important factor in the emergence of the environmental movement in North America in the 1960s and 1970s. They suggested that involvement in outdoor activities increases awareness of environmental problems by exposing individuals to instances of environmental deterioration, and that such exposure may lead to commitment to protect valued outdoor-recreation sites. Finally, participation in outdoor-recreation activities encourages an

FIGURE 1. Conceptual Model of Involvement in and for Wilderness
TABLE 1. Demographic Comparisons of Audubon and Outward Bound Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
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<td>Gender</td>
<td>0.6953</td>
<td>3</td>
<td>8743</td>
</tr>
<tr>
<td>Age</td>
<td>27.8384</td>
<td>12</td>
<td>0.058**</td>
</tr>
<tr>
<td>Marital status</td>
<td>9.7476</td>
<td>12</td>
<td>6381</td>
</tr>
<tr>
<td>Dependent children</td>
<td>6.4432</td>
<td>3</td>
<td>0.0919</td>
</tr>
<tr>
<td>Racial heritage</td>
<td>6.5730</td>
<td>9</td>
<td>7632</td>
</tr>
<tr>
<td>Place of residence</td>
<td>29.4940</td>
<td>15</td>
<td>0.0139*</td>
</tr>
<tr>
<td>Place of child</td>
<td>11.8391</td>
<td>15</td>
<td>6912</td>
</tr>
<tr>
<td>Highest education level</td>
<td>6.3141</td>
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<td>6586</td>
</tr>
<tr>
<td>Diplomas/degrees obtained</td>
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</tr>
<tr>
<td>Personal income</td>
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<td>0.0902</td>
</tr>
<tr>
<td>Occupation</td>
<td>41.6111</td>
<td>24</td>
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</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01

affinity for the natural environment, fostering a generalized opposition to unnecessary degradation. Similar rationales have been proposed as explanations for the pro-environmental activism of leading conservationists (Newhouse, 1990).

Psychological Factors

Research focusing on a behavioral explanation of outdoor-recreation participation has yielded positive pro-environmental results in applying the expectancy theory developed in social psychology. This theory suggests that individuals engage in particular activities in selected environments to realize specific psychological outcomes that are known, valued, and expected (Manning, 1986). Of particular relevance has been research on outdoor recreationists' motivations. A number of researchers have noted factors such as "view scenery, peace and calm" (Knopf & Lime, 1984), "relationship with nature" (Brown & Haas, 1980), and "enjoying nature, escaping civilization" (Crandall, 1980) as being first on recreationists' lists of motivations. This work has been based on the Recreation Opportunity Spectrum, a conceptual framework that recognizes that recreation experiences are directly related to the setting in which they occur and that area management must consider environmental and social factors (Driver & Brown, 1984).

In addition, researchers have suggested that gains in understanding psychological constructs, such as self-concept (Bacon, 1988; Ewert, 1983; Gillet et al., 1991), self-efficacy (Ewert, 1986; Harmon & Templin, 1987; Wetmore, 1972), and self-actualization (Graber, 1976; Kaplan & Talbot, 1983; Young & Crandall, 1984) can be enhanced through participation in adventure-education programs. These and other psychological factors (e.g., locus of control) and social factors (e.g., compassion, cooperation, communication) that are encouraged through adventure education should be studied as they apply to the development of skills necessary for solving environmental problems. I could find no research on the link between the psychological growth of individuals engaged in outdoor-adventure experiences and the transfer of these gains to changes in pro-environmental behavior. For example, if an individual improves his or her locus of control after participating in a wilderness travel experience, can this growth be processed in a way that leads to positive changes in pro-wilderness activism?

Researchers who study the theory of reasoned environmental behavior have recently begun to consider the impact of personal psychological factors. For example, in a meta-analysis of research on responsible environmental behavior, Hines, Hungerford, and Tomera (1987) found that ownership variables, such as in-depth knowledge of issues and proprietary investment in them, were important predictors of environmental behavior. They also found that empowerment variables, such as knowledge of and perceived skill in applying environmental action strategies, a desire to act, and a strong internal locus of control, were necessary precursors to action. Hungerford and Volk (1990) used this work to develop a model of major and minor variables of environmental citizenship. This model shows promise in helping to explain some of the variance in environmental behavior, but more research is required to verify it.

Wilderness and Environmental Knowledge, Perceptions, and Expectations

The limited research indicates the need for purposeful educational efforts directed at facilitating participants' knowledge of wilderness issues and support for wilderness preservation (Young, 1982) and appropriate backcountry behavior. Research has shown that, if the individual is not informed about the rationale and skills implied in environmentally conscientious wilderness behavior, even the well-intentioned user may, through ignorance, create unnecessary risks (Fazio, 1979; Robertson, 1986).
Empirical research supports the contention that outdoor-adventure education effectively facilitates cognitive improvement in learning environmental content (Gillet et al., 1991; Hartung, 1973). Similar results were found in a residential camp setting where, compared with control groups, camp participants learned more environmental information per unit of time spent on a given subject and understood the material better (Cancilla, 1983).

**Wilderness and Environmental Attitudes**

Jackson (1986) used the New Environmental Paradigm instrument developed by Dunlap and Van Liere (1978) to compare the environmental attitudes of recreationists who engaged in nonconsuming (e.g., cross-country skiing, hiking), consuming (e.g., hunting, fishing), and mechanized (e.g., snowmobiling, trail biking) activities. He found that individuals in the first group held stronger pro-environmental attitudes than those in either of the other two groups. He also found that outdoor recreationists tended to have stronger attitudes toward specific aspects of the environment necessary for pursuing their selected activities (e.g., quality of life, human/natural environment relationship) than toward more general environmental issues (e.g., technology, economics, biosphere limits). Jackson also found intragroup differences: Cross-country skiers and hikers exhibited significantly stronger pro-environmental views than did canoeists.

Environmentally favorable shifts in participants' attitudes have been found after a substantial number of extended, outdoor adventure-education programs (Andrews, 1978; Hartung, 1973; Moore, 1981; Purdue et al. 1981; Spracht, 1980). However, in their assessment of the relationship between environmental knowledge and attitude on a long wilderness hiking and camping trip, Gillet et al. (1991) found support for environmental knowledge gains, but not for concomitant environmental attitude shifts. Shepard and Speelman (1986) also found no support for environmental attitude changes after an outdoor education program. These contradictory findings suggest a need for more rigorous research in this area.

**Intentions in and for Wilderness and the Environment**

Intentions are by far the least studied aspect of the model (Koslowsky et al., 1988). Most outdoor and environmental researchers have made a direct connection between attitude and behavior, without attempting to measure whether the behavior was a planned occurrence.

However, connections have been shown among knowledge, attitudes, and the formation of intentions related to participation in outdoor recreation and to engagement in pro-environmental activities. Young and Kent (1985) found a high correlation between the intentions of midwestern (U.S.) urban residents to camp and their reported camping behavior. Larson, Forrest, and Bostian (1981) discovered that pro-environmental political activism (e.g., voting behavior) was a better indicator of environmental commitment than was pro-environmental home behavior (e.g., energy conservation). Additional research is needed to determine the inherent value of this aspect of the model in predicting related behavior.

**Wilderness and Environmental Behavioral Development**

There is little published research on the behavioral aspect of the model of reasonable wilderness behavior. However, positive short-term environmental shifts in participants' behavior were noted in studies involving 5-day residential outdoor education camps with sixth-grade students (Beaver & Jacobson, 1985), junior high environmental education programs (Gangloff, 1975), and university geography students (Horsely, 1974). The Horsely study was interesting in that, although the students' environmental behavior significantly changed for the better, no significant attitudinal shifts were noted. The researcher postulated that the social learning theory on which the model in the study was based focused on behavior change. This focus, Horsely believed, helps to explain why the shifts were greater in behavior than in attitude.

In summary, environmental-education researchers have experienced frustration in evaluating the ultimate indicators of the success of their programs, which would be indicated by an environmentally literate and active citizenry. Some researchers have suggested that although we have seen some improvements, these successes have been few when compared with the severity of ongoing environmental degradation and associated overpopulation (Gigliotti, 1990; Hungerford et al., 1990).

In the present study I addressed the similarities and differences between adventure programming and ecology-education programming and how such programs affect participants' wilderness-related knowledge, attitudes, intentions, and behavior. I focused on the identification, quantification, and explanation of wilderness-specific environmental outcomes of outdoor-adventure (Outward Bound) and ecology-education (Audubon Field Ecology) programs. Participants in each of these programs were studied quantitatively and qualitatively with respect to the components of the model. Shifts in wilderness knowledge, attitudes, intentions, and behavior were studied within each program, and general and specific levels of these factors of the two programs were compared.

**Method**

The Audubon Field Ecology Camp in the western United States and the Colorado Outward Bound School were selected for study because their programs all occurred in Rocky Mountain wilderness environments at and above 8,000 feet and were of similar duration (10–11 days), season (midsummer), and stability (both were celebrating 25th anniversaries). There were four subprograms in the study:
1. Audubon Residential Camp (54 participants)
2. Audubon Wilderness Research Backpacking (9 participants)
3. Outward Bound General (26 participants)
4. Outward Bound Patrol (6 participants)

The number of participants was the accessible population of each subprogram. Participants were self-selected in all but the Outward Bound Patrol group. At Outward Bound, participants were intentionally placed in heterogeneous patrols by camp staff according to variables such as age, sex, place of residence, occupation, and past experience. The accepting sample was at or very close to 100% on pre- and posttests.

Research Design

The study involved a quasi-experimental, nonequivalent control-group design (no randomization between groups). Participants in all groups were tested immediately before and after their program and 6 months after it ended, with a series of instruments developed to measure demographic and past experience data, wilderness/ecological and minimal-impact knowledge, wilderness-issue attitude, and self-reported intentions and behavior in and for wilderness. The instruments were administered on the following schedule:

- Pretest: predisposing factors, basic ecology, minimal impact, wilderness attitude
- Posttest: basic ecology, minimal impact, wilderness attitude, wilderness intentions
- Delayed posttest: basic ecology, minimal impact, wilderness attitude, wilderness intentions, wilderness behavior

All instruments were subjected to field testing by a panel of three experts (to determine validity) and to pilot testing with 16 participants from two outdoor-education courses run at Blue Lake Center, Alberta, Canada (to determine both validity and reliability, where applicable). The K–R 20 alpha values of the multiple-choice Basic Ecological Knowledge and Minimal Impact Knowledge instruments were .37 and .52, respectively. Revisions were made on those items with negative values on the covariance matrix.

Cronbach’s alpha for the Wilderness Issue Attitude instrument was .42 (standardized item alpha = .46). Two items were revised significantly. Although the alphas determined were relatively low, the coefficients were adequate for making decisions about groups. Ary, Chesser Jacobs, and Razavié (1985) suggested that the minimum reliability that is acceptable for an instrument depends on the use that is to be made of the results. Lower reliability coefficients (in the range of 30 to 50) are acceptable for making a decision about a group or for research purposes, as in the case at hand.

I acted as an instructor–intern/project person for the programs studied. I accepted sole responsibility for all data collection, to avoid any implementation discrepancies. Delayed posttesting was conducted by mail (75% response rate); 5% of nonrespondents were called twice by telephone. Five percent was deemed an adequate nonresponse sample size to follow up on the basis of the initial sample size and relatively high proportion of returns received from all subgroups (Aiken, 1981). No differences between respondents and nonrespondents were found on any of the instruments administered.

Analysis of the quantitative data involved the application of various statistical procedures relevant to the type of data. The populations were described (demographics, experience) with frequency data. Significant differences between groups were identified using chi-square analysis. Covariate analysis (UANOVA) was used on cognitive data (i.e., basic ecology and minimal impact) within and between groups and for the wilderness-issue attitude measures over the three test administrations (pretest, posttest, delayed posttest). Self-reported intentions and behavior data were described, and UANOVA was used to determine if relationships were significant. UANOVA is a multivariate analysis of covariance program particularly efficient with complex analysis of covariance (ANCOVA) problems, including those with cells of equal or unequal size (Milliken & Johnson, 1984).

I also functioned as the primary collector of qualitative data related to the study topic (i.e., through direct observation, participant observation, interviewing, document analysis, and photography). Member checks and a journal were used to enhance credibility and reduce bias. Qualitative data were analyzed inductively (identifying facts–themes–patterns–interpretations), were used to describe the programs, and were used as needed to support, not support, or explain quantitative results.

Results

Predisposing Factors

Demographic Description and Comparison

The demographic data were subjected to chi-square analysis to determine if statistically significant differences between the groups existed (see Table 1). The Audubon participants tended to be older (mean age = 44 years versus 34 years for Outward Bound enrollees; Pearson’s $R = -0.46$), lived in metro–suburban areas compared with metro–urban areas, where more Outward Bound participants resided; Cramer’s $V = 33.1$, and tended to be involved in education-related careers (versus the business and/or professional areas more commonly represented by Outward Bound participants; Cramer’s $V = 40$).

Past Experience

Chi-square analysis also revealed a number of intergroup differences in terms of past outdoor education/recreation and/or environmental-education experiences (see Table 2). Although no significant differences were found in outdoor experiences when the participants were young (e.g., family camping, scouting/guiding, school camping, church camp-
ing), a number of significant differences did emerge in formal science coursework background. The Audubon groups tended to have taken more botany (especially the Wilderness Research Backpackers; Cramer’s \( V = .44 \)), zoology (Cramer’s \( V = .37 \)), geology (Cramer’s \( V = .31 \)), and ecology (Cramer’s \( V = .30 \)) than the Outward Bound groups.

Contrary to the study’s hypotheses, in the 2 years preceding the programs the Audubon groups not only subscribed to more environmental journals and magazines (Cramer’s \( V = .35 \)) and belonged to more environmental organizations (Cramer’s \( V = .46 \)), they also subscribed to more outdoor education/recreation publications (Cramer’s \( V = .45 \)) and belonged to more outdoor activity clubs and organizations (Cramer’s \( V = .33 \)) than the Outward Bound groups did. There were no significant differences between the Audubon and Outward Bound groups in the level of past environmental involvement.

Repeated Measures: Analysis and Results

All of the basic data on ecology, minimal impact, wilderness attitude, intention, and behavior (pretest, posttest, and delayed posttest) were subjected to UANOVA.

Basic Ecological Knowledge

Figure 2 illustrates the two- and four-group pretest, posttest, and delayed posttest means. The two-group comparison shows significant disordinal interaction between Audubon and Outward Bound over the three test administrations; the Audubon group significantly outperformed the Outward Bound group in basic ecological testing. In the four-group analysis, significant disordinal interaction also emerged between test time and group. The Audubon Residential (AR) group interacted with the Audubon Wilderness Research Backpacking (AWRB) group, AR with Outward Bound General (OBG), and OBG with Outward Bound Patrol (OBP). The ANCOVA results indicated that the AWRB group performed significantly better than the OBG group in all three test administrations. In addition, the AR and AWRB groups scored significantly higher than the Outward Bound groups at delayed posttesting. Although the AR and OBG groups retained their ecological learning, the AWRB and OBP groups exhibited serious decay of basic ecological performance on the delayed posttest. I have no explanation for these inconsistent postprogram results.

Minimal Impact Knowledge

Although the Outward Bound groups showed significant improvement over the three test administrations, the Audubon groups performed significantly better on all three applications (see Figure 3). In the four-group analysis, both Outward Bound groups gained significant minimal-impact knowledge between pretest and delayed posttesting. However, despite these gains, the AWRB group scored significantly higher than all other groups on all three test administrations. This may reflect more precourse relevant reading and/or training than other participants had. The AR group

| TABLE 2. Past Experience Description and Comparison of Audubon and Outward Bound Groups |
|----------------------------------------|--------|--------|--------|
| Variable                               | \( \chi^2 \) | df     | \( p \)  |
| Childhood camping                      | 1 8676  | 9      | 6420   |
| Organized outdoor programs             | 2 1922  | 27     | 5979   |
| Outdoor and environmental coursework   |        |        |        |
| Botany                                | 17 4642 | 3      | 0006***|
| Zoology                               | 12 1627 | 3      | 0068** |
| Geology                               | 8 7328  | 3      | 0331*  |
| Ecology                               | 7 9282  | 3      | 0475*  |
| Biology                               | 17 4652 | 3      | 1016   |
| Geography                             | 4 2291  | 3      | 2378   |
| Anthropology                          | 0 5088  | 3      | 9170   |
| History                               | 4 7271  | 3      | 1929   |
| Environmental education interpretation| 2 2697  | 3      | 5133   |
| Wilderness management                 | 2 0544  | 3      | 5612   |
| Outdoor pursuits                      | 3 2900  | 3      | 3562   |
| Outdoor education/recreation leadership| 2 2994 | 3      | 5126   |
| Other natural science or outdoor      | 0 7629  | 3      | 8583   |
| Outdoor education/recreation subscriptions| 17 735 | 3      | 0005***|
| Environmental subscriptions           | 10 6493 | 3      | 0138*  |
| Outdoor activity clubs/organizations  | 9 7229  | 3      | 0211*  |
| Environmental groups/organizations    | 18 4368 | 3      | 0004***|
| Environmental issue involvement       | 7 3231  | 3      | 0623   |

\* \( p < .05 \) \; \* \* \( p < .01 \) \; \* \* \* \( p < .001 \)
wilderness-evocentric attitude between pretest and delayed posttest. This difference between the two-group and four-group analyses may simply reflect the larger sample sizes in the first analysis, but it may also indicate the amount of time and energy this particular leader and group spent discussing wilderness issues.

Wilderness-Related Intentions and Behavior

The instruments for the analyses of stated intentions on the posttest, of the delayed posttest self-reported behavior, and of the delayed posttest stated intentions were identical in item ordering and wording, other than time-frame references. On the posttest intentions instrument (Int1), the participants were asked what they planned to do for the 6 months after the program. On the delayed posttest behavior instrument (Beh), they were asked what they had actually done over the 6-month period after the program; and on the delayed posttest intentions instrument (Int2), the participants were asked what they planned to do for the period from 6 months to 1 year after the program.

Significant differences that emerged between groups (2- and 4-group analyses included) and over the various test administrations described earlier are reported in Table 3. The Audubon group was only significantly better than the Outward Bound group in the amount of combination camping (minimal impact/survival—e.g., using a tent, but building fires for cooking), the number of environmental and environmental leadership courses pursued, and the amount of involvement in environmental issues. In the four-group analysis, the AWRB group planned and/or pursued significantly more wilderness activities than the other groups did, and the AR group showed more interest in combination camping and environmental-issue involvement than the OBG group showed.

In general, where differences emerged over time, they were explained by participants’ propensity to state more intentions at posttesting than they followed through on before delayed posttesting, and by their subsequent tendency to form fewer related intentions. Participants from all groups identified more intentions related to wilderness and/or wildlife-issue involvement than to any other environmental issues.

Model Verification: Path Analysis

A model of reasoned wilderness behavior was proposed to explain the relationship between participants’ predisposing factors (demographics and past experience), knowledge of basic ecological concepts and minimal-impact techniques, wilderness-issue attitudes, and intentions and behaviors in and for wilderness (see Figure 5). To test the model, I subjected the posttest data to a LISREL path analysis. To simplify the potential pathways, I considered only two personal description factors—age and occupation (exogenous variables representing the endogenous variable predisposing factors). Similarly, I selected only two intention/behavior correlates (travel into wilderness and partici-
pation in environmental issues) to represent intentions and involvement in and for wilderness.

Analysis of the model involved finding the significance of the beta and gamma weights of the factors identified. The path analysis yielded a chi-square of 3.47 and a probability of .176. The insignificant chi-square suggests that the model is plausible. However, because there were only 2 degrees of freedom (because of the rather small sample size combined with the relatively large number of parameters included in the model), the reader is cautioned to keep this qualification in mind when reading and interpreting the results of the analysis.

In general, the gamma weights suggest that the relationships were strongest between predisposing factors and knowledge (age = -.01, occupation = -.005) and somewhat weaker in the direct link to attitude (age = .303, occupation = -.305). The relationship between basic ecological knowledge/minimal-impact knowledge and attitude, as evidenced by beta weights of .221 and .171, respectively, were also quite strong. Attitude about wilderness issues was also found to be related to the formation of specific intentions to go into wilderness ($\beta = .740$) and to become involved in environmental issues ($\beta = .355$). The final connection between intentions related to activity in and for wilderness and self-reported involvement in those activities appeared to be the weakest link in the model ($\beta = .508$ and $\beta = .185$, respectively).

**Discussion**

Qualified verification of the proposed model of reasoned wilderness behavior suggests that there may be a link between the components of the model: demographics, past experience related to basic ecological knowledge of wilderness, knowledge of minimal-impact technology, attitude toward wilderness issues, intentions in and for wilderness, and behavior in and for wilderness. Interpretations of these
TABLE 3. Postprogram Wilderness-Related Intentions and Behavior of Audubon and Outward Bound Groups and Subgroups

<table>
<thead>
<tr>
<th>Factor</th>
<th>Group</th>
<th>Time</th>
<th>Significant Difference</th>
<th>p</th>
</tr>
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<tbody>
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<td>Postprogram wilderness travel</td>
<td>AWRB/AR</td>
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<td>0.0071***</td>
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<td>Number of wilderness activities</td>
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<td>Survival</td>
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<tr>
<td>Minimal impact</td>
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<td>Combination</td>
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<td>AR/ORG</td>
<td></td>
<td>0.0038**</td>
<td></td>
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Note: A = Audubon, OB = Outward Bound, AR = Audubon Residential, AWRB = Audubon Wilderness Residential, OBG = Outward Bound General, OBP = Outward Bound Patrol. Int. = interaction. Int 1 = intention stated at posttest. Beh 1 = behavior stated at delayed posttest. and Int 2 = intention stated at delayed posttest.

results and analyses are generally supported by the literature and by the qualitative data.

According to the model, predisposing factors (demographics and past experience) affect both the participants’ knowledge about wilderness (basic ecological knowledge and minimal-impact knowledge) and their attitudes toward its preservation and use. This hypothesis suggests support for providing children and young adults with direct experiences in outdoor-adventure activities and an early introduction to ecological concepts. This holistic, physical, cognitive, and affective experience may be valuable in promoting a personal relationship with nature and a positive, ecocentric attitude toward wilderness and the environment.

The relatively strong relationship between basic ecological knowledge/minimal-impact knowledge and wilderness-issue attitude indicates that it is important to develop positive, ecocentric wilderness attitude through cognitive channels as well as through affective and physical channels (i.e., teaching facts and concepts about the natural world and how to live and travel in it with the environment in mind). The more one knows about a given object, in this case wilderness, the more strongly one is likely to feel about it.

The relatively weak link between wilderness-related intentions and related, self-reported, postprogram behavior is not all that surprising, because this relationship is the furthest removed from the program. There are always many reasons for individuals not fulfilling their best intentions. In the case of the Audubon participants, although they had the motivation, environmental action knowledge and skill, and strong internal locus of control (as evidenced through interview data and behavior observation), they failed to follow through on many of their intentions. The fact that the Outward Bound group did a poor job of following through on their many postprogram intentions was not as surprising, because members of this group were not given any direction for follow-up activity. They were, in fact, actively discouraged from joining any existing environmental groups (where they could have received support and assistance in their initial efforts), but were told to get involved on their own. Although they felt motivated to act, the qualitative data suggest that most lacked the perceived competence or confidence to select and apply appropriate environmental-action strategies. I hypothesize that once they returned to their “real” lives, their life-cycle stage (in their 30s/single or married) and careers left them with little time and energy to figure out what to do and then to actually do it. Certainly,
Figure 5. Path Analysis Involving Posttest Knowledge and Attitude Data.

there is a need for additional research focusing on more in-depth analysis of these and other factors that may affect the attitude–intention–behavior relationship.

Overall, although there were some mixed results, the Audubon participants tended to show more outdoor recreational and pro-environmental (including wilderness) action tendencies than the Outward Bound participants did. This result comes, in part, from the Wilderness Research Backpacking option, which tended to draw people with environmental backgrounds and objectives into a small-group wilderness-travel experience similar to those of Outward Bound programs.

However, the Outward Bound patrol group did exhibit the most significant gains in ecocentric attitude toward wilderness, suggesting that physical and affective adventure-education programs can have substantial impacts on participants. I attribute this outcome, in part, to the great interest the patrol leader showed in issues affecting the area the group explored. He frequently shared his opinions on these issues and generated discussions on related topics, and the members of his patrol seemed to be affected positively. Unfortunately, without a concomitant understanding of the ecology of the mountain environment and demonstrated understanding of conservation action strategies (minimal-impact technology and pro-environmental activism), his group performed relatively weakly on the cognitive tests, and their great motivation to act on behalf of wilderness dissipated relatively quickly after their program ended.

The results of this study suggest that people exposed to either field ecology or adventure-education programming experience changes in what they know about the natural environment and traveling in it, and how strongly they feel about its preservation. However, the weak translation of these gains to pro-wilderness environmental behavior suggests that other factors are at work besides knowledge and attitude.

Conclusions

Adventure-education program leaders should consider including an introduction and application of basic ecological concepts and interpretation of the environment traveled. Initial interview data suggest that participants want and expect this sort of information. Data from follow-up interviews, from observations and from delayed posttest basic ecological tests suggest they did not receive very much of this information.

Both adventure and environmental educators should include attention to minimal-impact outdoor living and traveling technologies and skills practice. The one group with a high level of this knowledge (Audubon Wilderness Research Backpacking) had the least impact on the environment. Because both intention and behavior data suggest that many participants from both adventure and environ-
mental programs become involved in wilderness excursions after their program experience (with many overnighting), their leaders have a responsibility to teach them how to carry out these explorations with minimal impact on the environment.

Adventure educators who lead programs in wilderness environments should consciously include explanations of the history and philosophy of wilderness and discussions of current environmental issues relevant to that environment. The increase in ecocentric attitude in the Outward Bound patrol after exposure to such lectures and discussions illustrates how adventure leaders can influence participants’ development of positive attitudes toward wilderness.

Toward the end of a program, adventure and environmental instructors/leaders should consider spending some time discussing participants’ future intentions in and for wilderness and looking at ways for them to achieve their personal goals in these areas. The Outward Bound participants formed strong intentions to become involved in environmental issues, but they demonstrated little postprogram follow-up. I suspect this was largely due to the lack of direction they received regarding the issues, facts, and ways to take action.

Outdoor leaders themselves must have a basic working knowledge of ecological concepts, current minimal-impact technology, wilderness-related history and philosophy, and environmental issues. They not only must be taught the relevant facts, concepts and skills, they must be trained in effective and efficient processes for delivering these messages in a manner that adds to the overall program experience.

The strength of this study is the holistic approach and the general picture it provides of the environmental outcomes of the adult-adventure and field-ecology programs studied. Although this approach has undoubtedly been advantageous in opening this area for research and helping identify potentially important relationships, additional and more rigorous research efforts are necessary to further support or deny the theory of reasoned wilderness behavior and the effects of adventure and ecology-education programming on such outcomes. Replication of this study with programs of different duration, different leadership approaches, and other parameters would increase our understanding. Only with such understanding can we hope to provide optimal inclusion of environmental content and processes in all of our outdoor-education programs.

REFERENCES


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