Global Environmental Change: Modifying Human Contributions Through Education

Lynne M. Carter, Ph.D., Visiting Scientist
Graduate School of Oceanography, University of Rhode Island*

BACKGROUND

The latest Intergovernmental Panel on Climate Change (IPCC, 1996) report on the Science of Climate Change concludes that the evidence now available "points toward a discernible human influence on global climate" (p. 439) and that ". . . if the current rate of increase of anthropogenic emissions is maintained . . . it should become increasingly easy to eliminate natural variability and other natural external forcings as causes for most of the observed changes" (p. 438). The anthropogenic activities contributing to emissions that are important to climate changes are undertaken by all members of the human population. Reductions in those emissions will require changes in human behavior.

Human behavior is complex in that it can be influenced by both psychological or internal factors as well as social or external factors. According to Simon (1992) and others (e.g., Bandura 1991), an individual's goals are important directives for behavior along with their values, attitudes, circumstances, knowledge, skills, experiences, and social contexts. Knowledge, generally gained through education, is an important moderator for environmental behavior and choice (Arcury, 1990; Hungerford and Volk, 1990; Stern, 1976). Environmental knowledge is very low in the United States (Maloney and Ward, 1973; Miller, 1991; Arcury, 1990) and particularly lacking and confused related to global environmental issues (Kempton, 1991; Read et al., 1994; Bostrom et al., 1994). This is especially so in terms of understanding the anthropogenic activities that enhance natural cycles and the environmental consequences of those activities for both humans and the natural world over both the short and long term.

While there seems to be a great deal of expressed concern about environmental degradation, nationally and globally (Krause, 1993; Kempton et al., 1995; Dunlap et al., 1992), most individuals see the responsibility for changing environmentally destructive behaviors belonging to technological development and industrial practices rather than to changing their personal behaviors (Dunlap et al., 1992). The international agreements developed to reduce human interference with the Earth's atmospheric systems, the *Montreal Protocol on Substances that Deplete the Ozone Layer* and the *United Nations Framework Convention on Climate Change*, recognize the environmental consequences of human activities and look to both societal and personal behavior changes to reduce environmental destruction. Both agreements call upon educational programs to assist in moving human behavior in a sustainable direction. Sustainability is used here as it is in Our Common Future (1987):

> Sustainab[ility] . . . is . . . meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs (p.43).

The traditional success noted in behavioral research occurs when participants change their behavior during some type of intervention period. Unfortunately, that immediate behavior change is often externally derived and not durable (DeYoung, 1993). Long term change seems to be related to less quantifiable, internally derived attributes identified by many researchers as personal insight, intrinsic satisfaction, care and concern, compassion, commitment, an internal locus of control, confidence, a sense of environmental ethics, morals, personal responsibility, environmental sensitivity, or a more spiritual or traditional approach to nature (e.g., DeYoung, 1993; Geller, 1995; Milbrath, 1989; Bowers, 1995, Hines et al., 1986-87, Hungerford and Volk, 1990; Bandura, 1991). These internally derived attributes can be supported through gaining more tangible and concrete information and knowledge about an issue of importance, such as, in this case, global environmental change.

THE STUDY

To support the importance of education as a serious and durable influence on environmentally responsible behavior, this study focused on assessing the relationship between global environmental change issues and human behavior in an educational context. The study assessed a two-and-one-

* See Appendix V for authors' affiliations and addresses.

half day National Informal Educators Workshop and Videoconference held November 14-16, 1994. The workshops were located in seven down-link sites around the continental U.S. and Hawaii and were each under the direction of a Sea Grant Regional Coordinator. The program utilized a variety of pedagogical techniques during both the national portions of the program–five hours of live and pre-recorded satellite programming with national expertise on global change topics (natural variability, greenhouse effect, ozone depletion, ecosystem response, and population and resource distribution)–and the regional workshops portion that applied the newly offered information through hands-on activities and discussion with local experts on related regional issues. The question addressed was whether conference/workshop participants would change their personal and professional behavior as a consequence of learning new information about global environmental change issues. Also of interest was whether participants would gain and retain topic specific information and if so, would that information be reflected in increased participation in responsible environmental behaviors.

Pilot Survey

A pilot survey was developed and administered to each of the 315 participants nationwide prior to the beginning of the conference, at the conclusion of each satellite session, and at the conclusion of the conference. The pilot utilized open-ended questions to encourage the participants to reflect on their: learning expectations; learning results; the scientific content; applications of this information to real-life choices and behavior (behavior alert); and the use of the technology in the learning process. Three sections of the pilot surveys (learning expectations, learning results, process) were analyzed to provide direction for the final questionnaire.

Sample

Informal and formal educators from around the U.S. and Canada, including the U.S.–affiliated Pacific island entities were participants in this educational video conference. They were the focus for many reasons, two of which are: environmental educators are believed to embody the crucial (considered prerequisite to responsible environmental behavior) entry level variables identified by Hungerford and Volk (1990) of environmental sensitivity, knowedge of ecology, psychological androgny, and attitudes toward pollution, technology, and economics; and most have the ability to reach many members of the public through their work. Of the 315 participants nationwide, 79 responded to the follow-up/final questionnaire and became the study sample. Demographic characteristics of the sample include: age (29-72 years); income (less than $20,000 to over $60,000 per year [U.S. dollars]); gender (twice as many women as men); education (from high school graduates to Ph.D.); region (Northeast, Mid Atlantic, Gulf Coast, Mid Continent, Pacific, Great Lakes, Hawaii and the Islands); affiliation (government, non-profit agencies, and educational institutions); and educational background (mostly science–75% and education–39% = more than 100% because participants could have both types of backgrounds).

Final Survey

The results of the final questionnaire, administered eight months after the program, are reported in four sections. In the first section the participants' responses to the survey questionnaire are reported using descriptive statistics such as percentages, means, and standard deviations. In the second section three personal and three professional behavior change scales are created. Scale construction was undertaken to simplify the data resulting in new factors that represent groupings of interrelated variables used to describe the personal and professional behavior changes implemented. Scale creation was accomplished by logically grouping items and then testing the scales for internal consistency reliability. The statistic to test internal consistency was Cronbach's Alpha (Nunnally, 1978). High alphas are generally 0.7 or above. Four of the six behavior change scale alphas were above 0.7; one was very close at 0.68, and only one scale had a low alpha of 0.58.

On the personal behavior change list activities fell into three groupings, the first is the Use of Fewer Resources which included both using less (e.g., drive less) and using an alternative more (e.g., recycle more). Both forms of activities represent a change in normal social behavior that results in using fewer resources and is often under personal, volitional control. Looking ahead to more long-term decisions resulted in the second category: Purchasing Choices/Options and incorporated looking for or choosing autos and appliances that either utilized an alternative energy source (e.g., natural gas over coal or oil) or utilized less energy (e.g., more efficient appliances). The final personal category had to do with broadening one's awareness and influence related to applying global environmental change issues and became Increased Awareness and Discussion.

The professional behavior change scales incorporated items that also grouped into three categories. The first is Curriculum Development and includes items that relate to changes in planned or offered programs including revisions to programs either as an individual or as a member of a team and utilizing teaching techniques and materials gained from participation in the video conference. The second category of Networking could include networking either regionally or nationally. The third professional behavior change scale was made up of items representing changes in Office Procedures that included energy efficiency concerns in equipment purchasing review.

In the third section the relationships between the demographics and behavior change scales are explored. If the demographic variable was continuos (e.g., age), the Pearson product-moment correlation was computed. If the demographic was categorical with two categories (e.g., gender), the student t-test was employed. If the demographic characteristic had three or more categories (e.g., region or income level) an F-test was used. A further refinement was that if the demographic variable with three or more categories was also ordered (e.g., level of income, level of education), the F-test for linear trend was utilized. If the demographic was non-ordered (e.g., region), the ordinary F was calculated. The fourth section, which examined the relationship between non-demographic response to the questionnaire and the behavior change scales, used Pearson correlations because the non-demographic variables were Likert items, which could be treated as continuos variables. All the statistical analyses were done using the SAS statistical package.

SUMMARY OF RESULTS

Section One: Direct Questionnaire Responses

- Many participants reported making personal (65% recycle more) and professional (56% utilized some or all of the resource materials provided) behavior changes.
- Respondents indicated meaningful increases in substantive and specific knowledge in all five content areas (60% and greater).
- 95% of participants reported feeling more confident in talking about global change issues while another 90% reported feeling more confident in approaching additional content material.
- More than three quarters (78%) of respondents expressed a new sense of urgency in passing on global change knowledge.
- The scientific content was extremely or quite important to 91% of respondents and 82% were extremely or quite interested in receiving teaching techniques and resources to assist in passing-on this information to others.
- Information in all five content areas (natural variability, greenhouse gases, ozone depletion, ecosystem response, and population and resource distribution) was extremely or quite important to more than 50% of individuals' environmental actions.
- National and regional components of the program, as well as content instruction and teaching techniques, were extremely or quite important to more than 80% of the respondents in ranking overall success of the program.
- Participants showed a high degree of satisfaction with participation in the program (8.2 on a 10 point scale).
- Participants rated Global Environmental Change issues as extremely important (9.5 on a 10 point scale).

Section Two: Behavior Change Scales

Personal Behavior Change Scale	Item	Internal Consistency Reliability Coefficient Alpha
Use of Fewer Resources		**.74**
1. Drive less		
2. Walk or ride bike more		
3. Use less water		
4. Use less electricity		
5. Recycle more		
6. Use fewer disposables		
Purchasing Choices/Options		**.77**
1. Look for/choose natural gas over coal or oil		
2. Look for/purchase auto with higher mpg		
3. Look for/purchase more efficient appliances		
4. Look for/purchase appliance and auto w/no CFCs		
Increased Awareness and Discussion		**.58**
1. Discuss environmental issues with family and friends more often		
2. Notice waste		

N=79

Professional Behavior Change Scale	Internal Consistency Reliability Item Coefficient Alpha
Curriculum Development	**.78**
1. Developed/offered new programs/curricula	
2. Revised programs/curricula to include new information	
3. Developed/offered new programs/curricula-disciplinary lines	
4. Developed/offered new programs/curricula interdisciplinarily	
5. Worked with a team on new programs	
6. Developed/offered new programs alone	
7. Utilized some or all teaching techniques	
8. Utilized some or all resource materials	
9. Have planned/offered a video conference	
Networking	**.74**
1. Utilized network developed through video conference	
2. Have collaborated with colleagues from video conference	
Office Procedures	**.68**
1. Instituted changes in office procedure	
2. Included energy efficiency in equipment purchase review	

N=7

Sections Three and Four: Significant Relationships between Demographic Characteristics and Descriptive Reports and the Personal and Professional Behavior Change Scales

Personal

- Those from the Pacific and the Northeast Regions made greater changes in using Fewer Resources than those from other regions.
- Those with an Education background indicated a statistically significant relationship with Increased Awareness and Discussion of Global Environmental Issues.
- Those who gained confidence in talking about Global Change issues also made statistically significant gains in Increased Awareness and Discussion of Global Change Issues.
- Those who increased their confidence in approaching additional content material made statistically significant gains in all three of the personal behavior change scales.
- Those who expressed a new sense of urgency in passing-on this information made statistically significant gains in all three of the personal behavior change scales.
- Of the five topics, greenhouse gases, ozone depletion, and ecosystem response were the most important in participants' gains in the personal behavior change scale of Increased Awareness and Discussion.
- Learning the science content related to greenhouse gases and ozone depletion supported the Use of Fewer Resources.
- Gains in the personal behavior change scales were most closely related to a number of national program components and to one regional component, the workshops (overall).

Professional

- Those who gained confidence in talking about global change issues and in approaching additional content material made statistically significant changes in Curriculum Development.
- Of the five topics, natural variability, greenhouse gases, and population and resource distribution were most important to changes in Curriculum Development.
- The professional behavior change scale of Curriculum Development was most closely related to program components that focused on teaching techniques and content, both regionally and nationally.
- Those who were more satisfied with their participation in the program tended to make more Curriculum Development changes and to participate in Networking more than those less satisfied with the program.
- Those with higher incomes Networked more than those with lower incomes.
- The professional behavior change scale of Networking was closely related to the program component of regional networking.
- Those from the Northeast made more changes in Office Procedures than other regions.
- Those with affiliations with Non-Profit Agencies made more changes in Office Procedures than those without such an affiliation.
- Those affiliated with Educational Institutions implemented more changes in Office Procedures than those without such an affiliation.
- The topic of natural variability contributed most to changes in Office Procedures.

DISCUSSION

This video conference and regional workshops was an educational program not directly aimed at encouraging behavior change, yet participants implemented many behavior changes, both personal and professional, as a result of their partici-

pation. The following discussion is focused on the two themes of personal and professional behavior change.

Personal Behavior Change

Of the twelve personal behavior changes, more than 50% of the participants implemented five changes and four of those five could be thought of more as "cures" and were ". . . acts of everyday life" (Sjorberg, 1989, p. 415), fairly easily implemented, and generally under personal volitional control. One such example is reducing resource use. On the other end of the spectrum, and implemented by fewer respondents (22% to 47%), were activities that were less frequent, more difficult to implement, often not totally under the volitional control of the respondent (e.g., family decisions) and that could be referred to as "prevention" (Sjorberg, 1989, p. 415). A decision that could be termed "preventive" would be one where the decision would have a significant environmental effect over the lifetime of that decision, e.g., a major purchase. While major purchases (automobiles, appliances, and heating systems) are not everyday occurrences, those who made them were positively influenced toward an environmentally friendly direction by participation in the Video conference. Every personal behavior change measured, no matter how difficult or rare an occurrence, was implemented by at least 22%, nearly one quarter, of the participants.

There are *four themes* that emerge from the relationships between the demographic characteristics and descriptive reports and the personal behavior change scales.

Personalizing Environmental Issues

The *first theme* echoes what other researchers have found, that making the environmental issue personal, whether in the form of perceived threat or ownership of the issue (e.g., Baldassare and Katz, 1992; Hungerford and Volk, 1990), encourages behavior change. Those who expressed a new sense of urgency in passing on this information made statistically significant gains in all the personal behavior change scales. But, American adults have a growing number of choices about where to expend their energy and focus to make an issue personal (Miller, 1991). There are increasing numbers of public causes and special interests that solicit both time and money (Thomashow, 1995). Many are two-job families, with responsibility to children and extended families and leisure time options are innumerable. So a choice is in order, since few individuals follow and participate in more than two or three of the major issue areas that are available to them (Miller, 1991) and they expend little effort on activities of little value to them (Bandura, 1991).

Knowledge Acquisition

The *second theme* related to knowledge acquisition. It was found that acquiring specific content knowledge related to emerging scientific information was very important to personal behavior change. Participants with an education background made statistically significant gains in increasing their awareness and discussion of global change issues. The clear, understandable presentation of information on topics that had been confusing to the participants, such as, the greenhouse effect and ozone depletion, (Read et al., 1994; Kempton et al., 1995), as well as learning about already measurable impacts on the ecosystem were statistically significantly related to respondent gains on all three personal behavior change scales. These findings support the important role of knowledge and education in behavior change and the likelihood that people without science backgrounds (a majority of the American public) have the most to learn. This finding also supports the theories of other researchers (e.g., Kempton et al., 1995) that clear, concise, global environmental change knowledge can lead to an increased concern about the environment and appropriate, responsible behavior change.

Increases in Confidence

The *third theme* that emerged was an increase in confidence related to both an understanding of the complexity of global change issues and in approaching additional content information. Along with those increases in confidence came significant changes in all the personal behavior change scales. Neither intention nor desire will result in responsible behavior change if individuals do not have confidence in their ability to choose appropriate actions. "Among the mechanisms of personal agency, none is more central or pervasive than people's own beliefs about their capabilities to exercise control over their own level of functioning and over events that effect their lives" (Bandura, 1991, p. 257). Increased confidence results in participants' determination to triumph over obstacles blocking achievement of their goals rather than being dissuaded by failures or difficulties (Bandura, 1991). This also applies to identifying ways to have some amount of control over one's behavior even in "environments containing limited opportunities and many constraints" (Bandura, 1991, p. 269). This is particularly important in the concept of learning to live sustainably since there are no clear directives on how to ac-

complish that goal. We all need to continue to learn and find ways to live more lightly on the earth and confidence encourages ingenuity and "figuring it out" (Bandura, 1991, p. 269; Walsh, 1991). The behaviors that made-up the personal behavior change scales were not explicitly recommended behaviors but were the result of self-reflection on the content information and its application to personal behavior. Self-reflection is the first step to behavior change, but without knowledge and the confidence that knowledge engenders there is little basis for self-directed change. Much of the scientific content information is still considered *science-in-the-making*, however, providing a solid foundation and a broad understanding of the complexity of the issue from which to proceed encouraged participants to attempt to grasp and apply information that was previously too formidable to them.

National Perspective

Finally, gains in the personal behavior change scales were related to many of the program components that were National in scale. It seemed important to the participants that they were involved in a program of national scale and that they were able to interact nationally, that they all received the same content information, and that they all were exposed to the same national demonstrations and teaching techniques. All these program components statistically significantly influenced the use of fewer resources and an increase in the awareness and discussion of global environmental change issues. Knowing that a national network of interested others was developing was also important in encouraging increases in awareness and discussion of global change issues. Being part of a large, national program seemed to bring a seriousness and importance to the issue that enhanced the participants' sense of self-esteem and worth. According to Bandura (1982), there are two sources of futility for people: one relates to the individual's abilities and the other relates to their inability to produce results because of an unresponsive environment. Societal codes and sanctions influence social conduct. Personal confidence was increased through increased knowledge, while the national perspective encouraged people to feel that the social environment was becoming responsive in encouraging and supporting environmentally responsible behavior changes. That national level of concern is implemented regionally, influences each region uniquely, and was expressed through the Pacific and Northeast regions making significantly more changes in the use of fewer resources. In the words of one respondent "being invited gave us credibility–this year we are able to function because of being involved last year" (MC-4). Increases in ownership variables, particularly, content knowledge, self-esteem, worth and credibility support increases in empowerment variables, such as confidence and self-efficacy, which in turn lead to action (Hungerford and Volk, 1990). Also, according to Prochaska and DiClemente (1992), if the new behavior does not continue to be valued (in this case by society as well as the individual) then the behavior is likely to revert back or be difficult to maintain. The recognition of these issues as of national and global importance helps to support and maintain behavior change.

Professional Behavior Change

Of the professional behavior changes measured, more than half (56%) the respondents utilized some or all of the resource materials provided through the program and one third to nearly half the respondents developed and offered new programs or revised programs or curricula to include information from the Video conference. Again, regardless of difficulty, every measurable professional behavior change activity was implemented by at least 5% of the respondents. The themes that emerged related to professional behavior changes can be characterized by the three professional behavior change scales: curriculum development, networking, and office procedures.

Curriculum Development

Three factors seemed to influence the professional behavior change scale of curriculum development: confidence, content knowledge, and satisfaction. Development of confidence in talking about global environmental change issues and in approaching additional content materials was extremely important in encouraging changes in curriculum development. It is the rare person who is willing to teach something about which they have little confidence in their level of knowledge. "People avoid activities that they believe exceed their coping capabilities, but they undertake and perform assuredly those that they judge themselves capable of managing" (Bandura, 1982, p. 123). The previous discussion related to confidence also applies here.

Content information, particularly in three of the five topical areas (natural variability, greenhouse effect, and population/resource distribution), was important to changes in curriculum development. An understanding of the topic of natural variability is at the heart of the global environmental change issue. A major focus of both national and international global change research programs is

to clarify natural from anthropogenic influences on the Earth's climate system (Our Changing Planet, 1995). The greenhouse effect issue is one that promotes misunderstanding (e.g., Read et al., 1994) so that the incorporation of clear, concise content information into curriculum development in this and other areas could be helpful in answering many questions posed by students and the public. The issues of population and resource distribution help to clarify the causes of anthropogenic influences on the climate system. These three topical areas make the crucial connection between scientific knowledge and the environmental effects and consequences of human activities that are important to society. Many authors and reports (e.g., National Research Council, 1994; Costa, 1995) in the educational arena, have called for clarifying these connections. Relating cause and effect is important in helping people take ownership of their personal decisions and ultimately to make environmentally responsible behavior changes.

The respondents who were more satisfied with what they learned at the National Informal Educators Video conference made more changes in curriculum development than those who were less satisfied with the program. Satisfaction implies setting and attaining some valued personal standard. An overwhelming majority of participants indicated in the pilot survey that they were looking to attain both scientific (content) knowledge and an increased understanding of the complexity of these global environmental issues from this conference. Attainment of some level of their goal generated self-satisfaction and self-motivation to pass-on what had been learned and to continue the process of understanding and learning.

Networking

Three factors statistically significantly influenced the professional behavior change scale of networking: income, satisfaction with the learning that occurred from participation in the video conference, and the program component of regional networking. While other researchers have stated that behavior change, knowledge, and income are not positively related (Thompson and Stoutmeyer, 1991), increased income was found to be related to the professional behavior change scale of networking in this study. This is likely more related to professional seniority than to income per se. There is a certain professional level that must be attained before one can actually participate and benefit from networking. The authority to make decisions and the ability to develop and implement new programs comes with experience and so does income. Respondents who were more satisfied with what they learned from participation in the program increased their networking more than those who were not as satisfied. Again, satisfaction implies gaining something valued, in this case, global environmental change knowledge which in turn spurred a sense of personal responsibility to get this information out. Networking with interested others is a useful way to try out new teaching ideas, to glean information on what others have tried and their resulting levels of success, and to continue learning.

Office Procedures

Three factors significantly influenced changes in office procedures, a professional behavior change scale: affiliation, the scientific content related to the topic of natural variability, and region. Those subjects affiliated with Educational Institutions or with Non-profit Agencies made more changes in office procedures than those without such affiliation. The affiliations of the respondents fell into three major groups: non-profit, education, and government. Of those three groups, presumably, the most institutionalized would be government, followed by education and finally non-profit agencies. It appears that the most changes were implemented in the least institutionalized of the affiliations which were, it is assumed, easiest to change. Content information in the topic of natural variability was significantly correlated with changes in office procedures. It could be that an increase in clarifying the roles of natural variability and anthropogenic activities in enhancing global environmental changes increased the understanding of the importance of applying this knowledge to making additional professional changes. (This topic was important in increasing curriculum development as well.) Inappropriate behavior, in general, can be encouraged when any of the following are in effect: responsibility for the behavior lies elsewhere (i.e., with the institution); collective responsibility (everyone is responsible while no one is held responsible); when it is the norm (activities harmful to others occur because of social inducements); and when the recipients of the behavior are impersonal, strangers, or different (e.g., other living beings, the next generation, or those from developing countries) (Bandura, 1991, p. 281). Scientific information gained through program components of this conference effectively disengaged those inducements to inappropriate environmental behaviors by: personalizing the responsibility; and encouraging self-recognition of the environmental consequences of normative behavior. By moving responsibility from the collective and impersonal institution to the self, changes in office procedures were encouraged and

implemented where possible. The Northeast region participants implemented statistically significantly more changes in Office procedures than the other regions. There was a higher percentage of non-profit agency participants from the Northeast (>56%) than from other regions which could support the affiliation finding.

Crucial Elements

The methods used in this educational program and the findings from this study should be applicable to many developing global change education programs. There are four crucial aspects of this educational program that should be staples for any global environmental change education effort. The first must include an interdisciplinary perspective. Interdisciplinary perspectives are crucial to help individuals recognize that global environmental changes can be studied and understood from many disciplines, thereby increasing the approachability of the topic to a wide variety of individuals of varying educational backgrounds and levels.

The second important aspect to any global change education program relates to both a national and a regional dimension. The national dimension requires national participation and support and at the same time provides a broad social comparison for people to recognize their role in an important issue. The regional dimension brings the issues to a personal level, considered crucial to action.

The third important aspect is providing knowledge through understandable scientific content. Knowledge builds confidence that encourages risk taking in the form of environmentally responsible behaviors but must include clear connections to social impacts. For many, science and society have no connections. Those interactions must become explicit and thereby guide appropriate environmentally responsible behavior and policy choices.

Finally, using a multimodal approach with a variety of teaching techniques and demonstrations, including lectures, visuals, discussions, and hands-on activities, reaches a wide range of learners and models successful teaching strategies useful to a broad spectrum of educators.

Concluding Comments

This research inevitably suffers from the weaknesses inherent in mail response surveys. While there were 315 registered participants only 79 took the time to respond to the follow-up questionnaire, even with prompting. That number of respondents limited the sophistication of the statistical analyses that could be performed on the data. Also, those who participated were self-selected through an application process which makes the participants biased toward those already interested in such environmental issues rather than representative of the general public. However, the exploratory nature of the study has allowed a preliminary assessment of outcomes on important components of the program. The behavior changes implemented by respondents as a result of participation in the subject education program were internally derived, self directed, and effective many months after the program, which leads one to suspect that they may be durable. This finding is very encouraging and supports DeYoung (1993), Hungerford and Volk (1990), and the IPCC Response Strategies Working Group, among others, that suggest that providing specific environmental issue knowledge can lead to personal insight with environmentally responsible behavior changes as an outcome. However, the environmental challenges that face us are on long time scales, decades to centuries, and environmentally responsible behaviors must remain and continue to increase in frequency and complexity. Further work on whether these behaviors are transmitted to others and if so, how, would be important.

Humans do not live socially isolated and many of the environmental challenges and difficulties that we face into the future reflect group problems and will require sustained collective efforts to produce significant change. "The strength of groups, organizations, and even nations, lies partly in people's sense of collective efficacy that they can solve their problems and improve their lives through concerted effort. Perceived collective efficacy will influence what people choose to do as a group, how much effort they put into it, and their staying power when group efforts fail to produce results" (Bandura, 1982, p. 143). Building confident, self-efficacious individuals is a crucial step in collective efficacy. "Inveterate self-doubters are not easily forged into a collectively efficacious force" (Bandura, 1982, p. 143). Kempton et al., (1995) showed that environmental values were already integrated into core American views (p. 214) but that inappropriate behavior and policy choices were often made because what was lacking was the in-depth knowledge and understanding of consequences of those choices. This program presented up-to-date scientific information in a concise, understandable way that resulted in more appropriate choices for responsible environmental behavior.

Humans have spent most of their history living harmoniously with other species and with nature and the behaviors that are wreaking havoc on the

planet and that we are working to change are relatively new. We must find ways to rethink our present activities and societal structures that support unbridled growth that results in unsustainable behavior. Interest or concern alone are not enough. Knowledge alone is not enough. Confidence alone is not enough. But, provide concerned and interested individuals with informative and applicable global environmental change education programs that build confidence and the result is responsible environmental behavior and choices. In the words of Baba Dioum (a Senegalese conservationist):

> We will conserve only what we love;
> We will love only what we understand; and
> We will understand only what we are taught.

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