

## **Correlation of Affect, Verbal Commitment, Knowledge, Locus of Control and Attitude to Environmentally Responsible Behavior in Designers of the Built Environment: Is Knowledge Enough?**

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### **Abstract**

This research asks the question: What characteristics in an individual are more likely to determine Environmentally Responsible Behavior (ERB)? Is it Affect (the emotional basis of behavior), Verbal Commitment (what we say we will do), Knowledge (what we know of the environmental crisis), Locus of Control (our belief that our individual actions can make a difference), or Attitude (how much we care about the consequences of our behavior)? The population tested included architects and designers based on their ability to specify construction methods and materials that have a direct impact on the energy efficiency and use of sustainable materials in building design.

The research results in this study indicate that knowledge of a problem and the skill to take action are, alone, not enough to effect environmentally responsible behavior. Information from this study can lead to a discussion of methods to more effectively motivate ERB through environmental education and, more specifically, within design and architecture programs of study.

### **Introduction**

The U.S. Energy Information Administration reports that buildings are responsible for nearly half (48%) of all greenhouse gas emissions annually. Seventy-six percent of all electricity generated by US power plants goes to supply the building sector. Edward Mazria, architect, environmentalist, and founder of Architecture 2030, a non-profit organization dedicated to research and providing innovative solutions in architecture and planning to address global climate change, said, "We know from our research that the building industry is the largest energy-consuming and greenhouse gas emitting sector; close to double any other sector, it's important for us to understand that we (architects and designers) are a large part of the problem, but we are also a large part of the solution."<sup>1</sup>

It has been nearly four decades since the state of the natural environment began being framed as a "problem"—something of negative consequence requiring a solution. Today, we see the escalation of what was once defined as a problem, now being referred to as a global environmental crisis. Much has been done, but there is still much to do to reduce the human impact on the environment.

Technology, population growth, and increasing consumption have all been identified as the root causes for the deterioration of the natural environment. There is an increasingly desperate need for both human response and human action to initiate the necessary changes to stop the escalating damage set in motion by the behaviors of the human race.

In the early seventies, psychologists, social scientists, educators and other researchers began efforts to clearly define the problem of poor human response and, hence, initiate studies to unlock the mystery of human disregard. Some of these researchers have framed the problem of poor human response and environmental irresponsibility as caused by simple lack of

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<sup>1</sup>Miller, Stephanie, *Edward Mazria, architect and environmentalist: Building Awareness of Architecture's Role in a Sustainable Future*.

[www.residentialarchitect.com/industry-news.asp?sectionID=0&articleID=526785](http://www.residentialarchitect.com/industry-news.asp?sectionID=0&articleID=526785)



knowledge.<sup>2</sup> Still others have offered theories which look at the cause as attitude-based<sup>3</sup> or grounded in values and beliefs systems.<sup>4</sup>

The research conducted in this study used, as a basis, the results of past research on the characteristics of individuals found to be correlated with environmentally responsible behavior. However, this research focused on a population of individuals who have a significant potential for dramatic change in the current state of environmental crisis. These individuals are the designers and planners of the built environment (i.e., architects, designers, and engineers, herein simply referred to as designers.) These professionals have a great deal of influence on the degree to which the building industry impacts the natural environment. Designers specify building materials and processes that can and do contribute to the destruction of the natural environment by pollution and depletion of nonrenewable natural resources.

Even though there is overwhelming evidence that environmentally responsible design and building practices can have a dramatic impact on a variety of local, regional, and global environmental problems, many design professionals are still failing to adopt practices that could significantly improve environmental conditions at all levels.

Based on past research, several factors have been identified that might explain this resistance to adopt environmentally responsible behaviors. This research has attempted to determine which of these factors are most closely correlated with environmentally responsible behaviors. When we know which of these factors have the greatest influence on ERB, education and training programs can be created to influence designers to employ such behaviors in their professional practices.

### **Summary of Past Research**

Maloney and Ward, in 1973, and again in 1975<sup>5</sup>, attempted to conceptualize the problem of environmental irresponsibility as one of maladaptive behavior and proposed that it was purely a problem that could be treated psychologically. Their ecology scale consisted of the four following subscales:

- 1) Affect (A): which measures the degree of emotionality related to pollution, environmental issues.
- 2) Knowledge (K): which measures actual knowledge related to ecological issues.
- 3) Actual Commitment (AC): which measures behaviors in which the individual is currently engaged.
- 4) Verbal Commitment (VC): which measures what a person states that he or she is willing to do in reference to environmental issues.

They proposed that "we must go to the people in an attempt to understand these behaviors. We must determine what the population knows regarding ecology, the environment, and pollution; how they feel about it; what commitments they are willing to make; and what commitments they do make. These are the antecedent steps before an attempt can be made to

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<sup>2</sup> C. E. Ramsey and R. E. Rickson, "Environmental Knowledge and Attitudes," *Journal of Environmental Education* 8 (1976): 10-18.

<sup>3</sup> R.G. Kuhn and E. L. Jackson, "Stability of Factor Structures in Measurement of Public Environmental Attitudes," *Journal of Environmental Education* 20 no.3 (1989): 27-32.

<sup>4</sup> M. D. Hoff and R.J. Polack, "Social Dimensions of the Environmental Crisis: Challenges for Social Work," *Social Work* 38 no.2 (1993): 204-211.

<sup>5</sup> M. P. Maloney, M.P. Ward and G. W. Braucht, "Psychology in Action," *American Psychologist* (July, 1975): 787.



modify critically relevant behavior."<sup>6</sup> In an attempt to facilitate these ends, as much as to stimulate research, Maloney and Ward developed a one hundred twenty-eight item ecology test and later revised it to a forty-five item short form scale.

The overriding conclusion was that most persons have a relatively high degree of verbal commitment and affect, with lower levels of actual commitment and knowledge. In other words, most people say they are willing to do a great deal to help curb environmental problems and are fairly emotional about it but, in fact, they actually do fairly little and know even less.

Ramsey and Rickson (1976) conducted their studies of high school students based on the premise that "public education results in support for the aims of the movement (environmental)."<sup>7</sup> The prevailing model which they used was that "increased knowledge leads to favorable attitudes toward pollution which in turn leads to action in promoting better environmental quality."<sup>8</sup> Two types of knowledge were defined. Ecological knowledge reflects knowledge of the extent and causes of various types of pollution, and trade-off knowledge reflects knowledge of the trade-off costs associated with implementing pollution abatement programs. These two variables were measured independently. They further isolated four different types of attitudes which they believed would lead to quite different reactions to environmental programs. The following were independently measured:

1. Passionate interest: Items in this category indicate unqualified support for programs of action which would eliminate pollution.
2. Favorability: Items representing this concept give support to pollution abatement programs which are modified to minimize trade-off costs.
3. Resignation: Items in this category reflect a concern for problems of air and water pollution but indicate approval for solutions only when trade-off costs are minimized.
4. Trade-off priority: These items incorporate militant statements against pollution abatement programs because of trade-off costs.

The hypotheses to be tested were: 1) ecological knowledge would be correlated positively with passionate interest and favorability, and 2) greater knowledge of trade-off costs leads to more resignation of environmental damage and trade-off priority, i.e. the more the person realized what they would have to sacrifice in terms of convenience and consumptive lifestyle, the more willing they were to allow environmental damage to go on.

The statistical analyses lead to the following assertions:

- a) There is circularity between attitudes and knowledge in that one does not solely cause or even precede the other, but rather some knowledge may lead to initial formation of attitudes which in turn leads to further gains in knowledge, and so on.
- b) There is a tendency for respondents to have high scores on the scale measuring knowledge of ecology and at the same time to be resigned to pollution because of the trade-off cost.

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<sup>6</sup> M. P. Maloney, M.P. Ward and G. W. Braucht, "Psychology in Action," *American Psychologist* (July, 1975): 788.

<sup>7</sup> C. E. Ramsey and R. E. Rickson, "Environmental Knowledge and Attitudes," *Journal of Environmental Education* 8 (1976): 10.

<sup>8</sup> C. E. Ramsey and R. E. Rickson, "Environmental Knowledge and Attitudes," *Journal of Environmental Education* 8 (1976): 11.



c) Knowledge of either kind (ecological or trade-off) is likely to lead to only moderate attitudes rather than extreme or passionate attitudes for both pollution abatement and consideration of trade-off costs.

d) Other factors such as residence, father's occupational status, father's education, mother's education, family income, feelings of powerlessness, grades, participation in extra-curricular activities and authoritarianism were analyzed. None of these factors were related to either knowledge or attitudes with the exception of grades. Better students were found to have a higher correlation in the two moderate attitudes but were not associated with extreme attitude in either direction. Ramsey and Rickson recommended that additional research be pursued which tested their hypotheses on adult respondents.<sup>9</sup>

Three years later, Borden and Schettino (1979) applied the ecology scale to yet another group of undergraduate students and reported the following:

a) Increased concern about the environment does not lead to the seeking of knowledge.

b) The acquisition of environmental facts does not seemingly result in increased affective reactions.

c) Level of affect appeared to be a somewhat more important determinant of current commitment than level of knowledge.

d) The lack of interaction between affect and knowledge suggests that factual ecological knowledge is not a necessary condition for the occurrence of individual environmental action.

e) Increased levels of environmental knowledge had only a trivial influence on future commitment. Therefore, it appears that what a person says he or she would be willing to do in the future is based almost entirely on their emotional reactions, and finally,

f) Affect and knowledge appear to be additive in nature which suggests that they may be substitutable, i.e. individuals who were high in affect but low in knowledge were about as committed as were individuals low in affect but high in knowledge. It would seem then that intermediate levels of environmentally responsible behaviors may be associated with either affect or knowledge.<sup>10</sup>

In 1987, Hines et al. performed a study to analyze and synthesize past research on responsible environmental behavior.<sup>11</sup> By this time, over 380 studies had been conducted on the theories related to environmental behavior. The objective of these researchers was to analyze the past research results to determine which variable or variables appear to be most influential in motivating individuals to take responsible environmental action. Their methodology was a meta-analysis of research. The methods used by Hines permitted the determination of the relative strengths of associations between each of these variables and responsible environmental behavior. This meta-analysis produced a ranking of the variables that have been identified as determinants of environmentally responsible behavior.

The overall conclusions were:

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<sup>9</sup> C. E. Ramsey and R. E. Rickson, "Environmental Knowledge and Attitudes," *Journal of Environmental Education* 8 (1976): 12.

<sup>10</sup> R. J. Borden and A. Schettino, "Determinants of Environmentally Responsible Behavior: Fact or Feelings?" *Journal of Environmental Education*, 10 no. 4(1979): 35.

<sup>11</sup> J. M. Hines, H. R. Hungerford, and A. N. Tomera, "Analysis and Synthesis of Research on Responsible Behavior: A Meta-Analysis." *Journal of Environmental Education*, 18 no. 2(1987): 1.



1. Verbal commitment: Individuals who express an intention to perform some action related to the environment are more likely to actually engage in such behaviors than those who express no intentions.
2. Locus of control: Individuals who have an internal locus of control are more likely to engage in responsible environmental behavior than those with an external locus of control.
3. Attitude: There appears to be a moderate correlation between a positive attitude toward the environment and the propensity of an individual to actually behave responsibly toward the environment.
4. Personal responsibility: Individuals who expressed some degree of personal responsibility (regardless of the root cause of that sense of responsibility) were more likely to engage in responsible environmental behaviors.
- 5) Knowledge; A significant level of knowledge of the problem appears to be a prerequisite to action. However, a person must also possess knowledge of the courses of action which are available and which will be most effective in a given situation. Another critical component which appears to influence whether an individual converts this knowledge into action is skill in appropriately applying this knowledge to a problem.
- 6) Educational level: More highly educated individuals are slightly more likely to engage in responsible environmental behaviors.
- 7) Income: Individuals with higher income appear to be slightly more likely to engage in environmentally responsible behavior, however, the relationship is weak.
- 8) Economic orientation (an individual's concern for the economic impact of environmental regulations): There does not appear to be a relationship between individuals who are willing to spend more for environmental protection and those who are actually willing to behave environmentally responsible.
- 9) Age: There is only a very tenuous relationship between age and environmental behavior, however, younger individuals showed a slightly greater tendency toward environmentally responsible behavior than older individuals.
- 10) Gender: There appears to be no relationship between gender and environmentally responsible behavior.

Overall, the meta-analysis concluded that an individual with an internal locus of control, positive attitudes toward the environment and toward taking action, and with a sense of obligation toward the environment will likely develop a desire to take action. In other words, knowledge of a problem and skill to take such action alone are not enough to effect environmentally responsible behavior.

In 1989, Kuhn and Jackson once again pursued the study of the relationship of attitude to environmentally responsible behaviors.<sup>12</sup> They designed a twenty-one item scale, combining and modifying the "New Environmental Paradigm (NEP)" and "Dominant Social Paradigm (DSP)" scales developed by Dunlap and Van Liere (1984).<sup>13</sup> The DSP refers to the major cultural values and attitudes held by society at large. Specifically, it encompasses dimensions such as faith in science and technology, material abundance and future prosperity, and support for economic growth, individual rights, laissez-faire government, the status quo, and private property rights. The NEP characterizes an emerging cultural attitude which is essentially the opposite of DSP.

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<sup>12</sup> R. G. Kuhn and E. L. Jackson, "Stability of Factor Structures in Measurement of Public Environmental Attitudes," *Journal of Environmental Education*, 20 no. 3(1989): 27.

<sup>13</sup> R. E. Dunlap and K. D. Van Liere, "The New Environmental Paradigm," *Journal of Environmental Education*, 9(1978): 10.



Individuals which exhibit NEP attitudes embrace the concepts of "steady state," "limits of growth," "the balance of nature," and "spaceship earth."

The objective of Dunlap and Van Liere in 1984 was to determine how well-integrated the New Environmental Paradigm (NEP) was becoming in American society. Their study showed that NEP had apparently gained considerable popularity in academic and intellectual circles, but very little was determined about its overall acceptance by the general population. The objective of Kuhn and Jackson was to investigate the ability of their modified NEP and DSP attitude scales to measure dimensions of environmental attitudes consistently. The results suggested that their twenty-one item modified scale could be used to generate data for charting changes in general public attitudes to resources and the natural environment. As will be seen later in the methodology, this is one of the three scales employed for this study.

### **Method**

The independent variables in this study were affect, verbal commitment, knowledge, locus of control, and attitude. The dependent variable was environmentally responsible behavior, henceforth referred to as ERB.

The following defines these variables both conceptually and operationally:

- a) Affect: can also be referred to as environmental concern and involves the emotionality that an individual expresses in relation to ecological issues and problems. This will be measured on Maloney and Ward's subscale A.
- b) Verbal Commitment: what an individual states he or she is willing to do in reference to environmental problems. This will be measured on Maloney and Ward's subscale VC.
- c) Knowledge: an individual's specific factual knowledge about environmental issues and problems. This will be measured on Maloney and Ward's subscale K.
- d) Locus of Control: an individual's perception of his or her ability to bring about change through his or her behavior. Individuals with an internal locus of control believe their actions can precipitate change. Individuals with an external locus of control do not attempt to bring about change because they do not believe it is within their power to do so. James' Internal-External Locus of Control Scale<sup>14</sup> was used to measure the individual's degree of internal versus external locus of control.
- e) Attitude: Dunlap and Van Liere's notion of Dominant Social Paradigm (DSP) and New Environmental Paradigm (NEP) will be used to identify an individual's attitude toward man's relationship with the environment and man's responsibility to solve environmental problems. Kuhn and Jackson's twenty-one item modification of Dunlap and Van Liere's DSP and NEP scales was used to measure the individual's degree of DSP versus NEP attitude.
- f) ERB: an individual's reported environmentally responsible behaviors, or what an individual indicated they actually do in terms of behaviors or practices that contribute to environmental well-being. Maloney and Ward's subscale AC will be used to measure the individual's degree of ERB.

The subscales A, VC, K and AC were taken from Maloney and Ward's Ecology Scale Short Form. To test for validity and reliability of the revised short form, Maloney and Ward performed one-way analyses of variance, post hoc Duncan multiple-range tests, Scott's Homogeneity Ratio and Cronbach's alpha for both the original scale and the revised short form scale which was used

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<sup>14</sup> W. H. James, "Internal versus External Control of Reinforcement as a Basic Variable in Learning Theory." (Unpublished PhD dissertation, Ohio State University, 1957)



in this study. The results indicated that reducing the number of questions in each of the four subscales (A, VC, K and AC) not only increased their practical efficiency but also increased internal consistency. Based on these results, the subscales could be used with a satisfactory level of confidence for this study.

The James' Internal-External Locus of Control Scale used in this study is reported to have split-half reliabilities ranging from .84 to .96 and retest reliabilities varying from .71 to .86 indicating that the scale appears to have satisfactory internal consistency and retest reliabilities. Further, it seems to have a simpler factor structure than other similar scales in that there is a significant number of items common to both gender groups.

Kuhn and Jackson's twenty-one item modified attitude scale used to measure the degree of positive environmental attitude was tested for reliability using initial factor analysis which resulted in four factors accounting for 44.4 percent of the total variance. Cronbach's alpha coefficient of reliability was used to determine the relative homogeneity of variables for the entire scale and within each factor. The alpha score for the entire scale was 0.82 and the scores for Factors 1 through 4 were 0.78, 0.68, 0.62, and 0.58, respectively. Therefore, the entire scale and the four most significant factors exhibited a strong degree of internal consistency. Total factor analysis attested to the stability of the twenty-one item modified scale as a measure of individual attitude toward the natural environment.

This study proposes that each of these variables operate independently and the independent variables will have a straight-line relationship with the dependent variable (Fig. 1).

### **Hypotheses**

This study sought to determine whether affect, verbal commitment, knowledge, locus of control, or attitude is most closely associated with ERB. Therefore, this study tested the following hypotheses:

Hypothesis 1: Environmental concern (affect) will be strongly associated with environmentally responsible behaviors (actual commitment).

Hypothesis 2: Strong verbal commitment will be only moderately associated with environmentally responsible behavior (actual commitment).

Hypothesis 3: Environmental knowledge will be only moderately associated with environmentally responsible behavior (actual commitment).

Hypothesis 4: A positive environmental attitude will be only moderately associated with environmentally responsible behavior (actual commitment).

Hypothesis 5: Internal locus of control will be strongly associated with environmentally responsible behavior (actual commitment).

### **Instrumentation**

This study employed a survey design in the form of a questionnaire distributed via mail to design professionals. A mailing list of 500 randomly selected names of members of professional design organizations was procured. The mailing list drew from all members who have residency



in the United States and Territories and who currently hold professional status with their respective organization. Even though the design organizations hold members with various levels of career development, the category of "professional member" serves to create a population with similar education and experience characteristics.

The research instrument was a questionnaire consisting of seventy (70) questions relating to the scale measurements of the variables Affect, Verbal Commitment, Knowledge, Locus of Control, Attitude and Actual Commitment (environmentally responsible behavior – ERB).

Items 1 through 11 on the questionnaire measured for Locus of Control and were statements which required the respondent to indicate whether he or she would Strongly Agree (SA), Agree (A), Disagree (D) or Strongly Disagree (SD). The four possible responses to each item were coded with values ranging from 1 to 4. A response coded with a value of 1 indicated an extreme external locus of control while a value of 4 indicated an extreme internal locus of control. Items on this subscale included such statements as, "I have usually found that what is going to happen will happen, regardless of my actions," and "Many times I feel that I have little influence over things that happen to me."

Items 12 through 31 measured for attitude toward the natural environment and were also statements which required a response of Strongly Agree, Agree, Disagree or Strongly Disagree. In this scale of items, a response with a value of 1 indicated that the individual's attitude was very consistent with Dunlap and Van Liere's Dominant Social Paradigm (DSP) while a response with a value of 4 indicated the individual's attitude was very consistent with Dunlap and Van Liere's New Environmental Paradigm (NEP), or in other words, showed a positive attitude toward the natural environment. Items on this subscale included such statements as "Most problems can be solved by applying more and better technology" and "Humans must live in harmony with nature in order to survive."

Items 32 through 39 measured the individual's level of verbal commitment (what the respondent said they would be willing to do to protect the natural environment.) These items were statements which the respondent was required to indicate whether the statement would be True or False about themselves. In this scale, the possible responses were given either a value of 1 or 2. A response with a value of 1 indicated a lack of verbal commitment toward the environment while a value of 2 indicated strong verbal commitment. Items on this scale included such statements as "I probably would not go house to house to distribute literature on the environment" and "I would donate a day's pay for a foundation to help improve the environment."

Items 40 through 49 measured for Actual Commitment which is the dependent variable in the study. Operationally, this scale measures whether or not the individual actually exhibits ERB (environmentally responsible behavior.) These items were statements which the respondent was required to indicate whether the statement would be true or false about them. Again, the two possible responses were coded with either a value of 1 or 2. A response with a value of 1 indicated an absence of ERB while a value of 2 indicated the individual did engage in ERB. Items on this subscale included such items as "I guess I have never actually bought or specified a product because it had a lower polluting effect," and "I have switched products for environmental reasons."

Items 50 through 59 measured for affect which is the individual's degree of emotionality with respect to protection of the natural environment. These items were also statements which prompted the respondents for a True or False response. In this scale, a response with a value of 1



indicated an unemotional reaction toward the welfare of the natural environment while a value of 2 indicated a high degree of emotionality toward protecting the environment. Items on this subscale included such statements as "I feel fairly indifferent to the statement: 'The world will be dead in 40 years if we do not remake the environment'," and "When I think of the ways industries are polluting, I get frustrated and angry."

Items 60 through 70 measured the individual's degree of knowledge regarding the natural environment and environmental issues. The items were in the form of multiple-choice test questions which focused on facts specific to the impact of the building industry on the natural environment. Respondents received a score with a value of 1 for each correct response. This scale included such items as "Which of the following materials usually takes the longest to decompose, A) tin, B) iron, C) aluminum, D) steel?", and "Which of the following is the most prevalent indoor air pollutant, A) formaldehyde, B) tobacco smoke, C) allergenic fungi, D) ozone?"

In addition to the seventy (70) scale questions, the instrument also prompted the respondents for information relating to age, gender, income, education level, religious affiliation, political affiliation and State of permanent residence.

### **Data Analysis**

Of the 500 individuals surveyed, 185 questionnaires were returned for a response rate of 37%. Of the 185 questionnaires, 5 were not usable for the study due to incomplete responses. For data analysis, the responses on the questionnaire were scored based on the pre-coding previously described. Since the variables being measured by scales had several items within each scale, it was necessary to first compute the total scores for each respondent on each of the five subscales: Affect, Verbal Commitment, Knowledge, Locus of Control, Attitude, and Actual Commitment (ERB.)

The subscale A measuring the variable Affect consisted of 10 questions with possible responses valued from 1 to 2. Therefore, if a respondent received a score of 1 on all ten items the lowest score he or she could receive would be 10. Accordingly, the highest score a respondent could receive would be 20 or, 10 items times a score of 2. Using the same rationale, respondents' scores could range from 8 to 16 on the subscale VC (verbal commitment) based on 8 items with a value range from 1 to 2; from 0 to 10 on the subscale K (knowledge) based on 10 items with values from 0 to 1; from 11 to 44 on the subscale LC (locus of control) based on 11 items with values from 1 to 4; from 20 to 80 on the subscale A (attitude) based on 20 questions with values from 1 to 4; and, from 10 to 20 on the subscale AC (actual commitment or ERB) based on 10 items with values from 1 to 2.

To assist in interpreting the data, ranges for responses were determined (Table 2). Once each respondent was computed with a single score for each variable, analysis of the correlations between the variables could be performed. The first statistical operations performed on the raw data were counts and percentages for the discrete variables such as age, gender, religious affiliation, income, education and political affiliation. This provided a general understanding of the demographics of the sample population. The next operation was to generate descriptive statistics on the independent and dependent variables as measured on the respective scales. This resulted in mean scores, median scores and standard deviations for each of the six variables: (x1) Affect, (x2) Verbal Commitment, (x3) Knowledge, (x4) Locus of Control, (x5) Attitude, and (y)



ERB. This again provided a general understanding of the responses from the total sample population.

The next statistical analysis performed was a multiple regression analysis of the independent variables ( $x_1 - x_5$ ) toward the dependent variable ( $y$ ). The regression equation was:

$$y = 5.92 + 0.185x_1 + 0.150x_2 + 0.091x_3 + 0.917x_4 + 0.0307x_5$$

This particular operation goes specifically to the hypothesis testing in this study. The results of the multiple regression analysis indicated which of the five independent variables had a higher correlation to the dependent variable. In other words, this analysis determined whether Affect, Verbal Commitment, Knowledge, Locus of Control, or Attitude was most closely associated with ERB.

Additional statistical analyses included a one-way analysis of variance (ANOVA) for each of the discrete variables (age, gender, religious affiliation, income, education and political affiliation) with the dependent variable (ERB.) This was done to determine if any of these demographic characteristics were more consistently present in individuals reporting ERB. In other words, did the age of the individual, the gender of the individual, the person's religious affiliation, his or her income level, his or her level of education, or political affiliation have anything to do with whether or not the person exhibited ERB? The last statistical procedure was a simple correlation of the independent and dependent variables to produce correlation coefficients. This determined if there was any significant correlation between any two of these variables, such as a possible relationship between Affect and Knowledge, or between Locus of Control and Attitude.

## Results

The results indicated that over one-half (51.67%) of the respondents were age 26-39 years, nearly 80% were women of the Christian faith, with two-thirds (66.66%) of the respondents in the middle to upper-middle income categories. Ninety-two percent of the individuals held a bachelor's degree or higher. The discrete variable of political affiliation indicated that nearly 50% (48.89%) of the respondents were Republican, while only 26% were Democratic and 24% indicated some other political affiliation. The later ANOVA statistics will show that although Republicans are more likely to respond to the questionnaires regarding environmental issues, those of Democratic or other political affiliations were more likely to engage in ERB.

The results of the descriptive statistics for the independent and dependent variables indicated that the group of individuals in this study exhibited the following characteristics:

1. A higher than average degree of emotionality regarding the natural environment.
2. An average degree of verbal commitment toward behaviors that would help the environment.
3. A lower than average knowledge of contemporary environmental issues.
4. A generally more internal locus of control versus an external, i.e. they have a better than average belief that their actions toward the environment can make a difference.
5. A predominantly NEP attitude (New Environmental Paradigm), indicating that their attitudes are very favorable toward protection of the natural environment.
6. Only exhibit an average degree of ERB.

The results of the multiple regression analysis used to test the hypotheses in this study are summarized in Table 4. The results indicated that Affect (degree of emotionality) is most strongly correlated to ERB. Locus of Control also shows a significant correlation, with Verbal



Commitment being only moderately associated with ERB. Additionally, these results would indicate that there is little correlation between Knowledge and ERB or Attitude and ERB. It would appear that the above results fail to reject the research hypotheses set forth in this study.

Hypothesis 1 stated that environmental concern (Affect) will be strongly associated with environmentally responsible behaviors (ERB) as measured by actual commitment. The results of this study area not only consistent with this statement but are consistent with past studies reporting the same strong correlation.

Hypothesis 2 stated that strong verbal commitment will be only moderately associated with ERB. The results of this study are extremely consistent with this statement and, again, are also consistent with past studies.

Hypothesis 3 stated that environmental knowledge will be only moderately associated with ERB. The results of this study show a slightly weaker than moderate relationship, suggesting that among the population of designers, knowledge of environmental issues has little bearing on whether the designer will practice environmentally responsible.

Hypothesis 4 stated that a positive environmental attitude will be only moderately associated with ERB. As with knowledge, this study suggests that attitude has a slightly weaker than moderate relationship to ERB. This would suggest that even a positive attitude toward the environment was not enough to guarantee a subsequent presence of ERB.

Hypothesis 5 stated that an internal locus of control will be strongly associated with ERB. The results of this study supported that assumption and were also consistent with similar studies done in the past. However, affect remains to be the most significant predictor of ERB.

The next set of statistics is the results of the one-way analysis of variance (ANOVA). As shown in Table 3, if  $p \leq .05$ , it indicates there is a significant difference within the subgroups of the source variable. For example, if the p value for gender was  $\leq .05$ , it would indicate there is a difference between men and women with respect to ERB. The results above indicate the subgroups of the variable income show a marginal difference between groups. A closer look at the mean scores for each subgroup indicates that those individuals in the two upper income categories of \$50,000 - \$99,999 and \$100,000+ are slightly more likely to exhibit ERB. However, this relationship is somewhat tenuous and would require further study before general conclusions could be drawn. When the source variable for the ANOVA was political affiliation, the p value clearly indicated there was a significant difference between subgroups. Although the sample population showed a greater response rate from those reporting to be Republican, it was the two smaller groups, Democrats and those from all other affiliations that exhibited the higher degree of ERB. One possible explanation for this is that non-Republican beliefs tend to have more liberal attitudes toward mankind and his environment. The ANOVA scores for all other demographic variables indicated there was no appreciable difference among the subgroups. Age, gender, religious affiliation and level of education appears to have little or nor bearing on whether an individual is environmentally responsible.

The last statistical operation was a simple correlation between the independent and dependent variables to determine if there was a significant association between any two of these variables. Table 4 shows the significant results of this analysis. The closer the correlation coefficient is to +1, the stronger the relationship.

The relationship between Affect and ERB, and Verbal Commitment and ERB are consistent with the results of the multiple regression analysis performed previously on these same variables. However, the multiple regression analysis did not test for any relationships among the independent variables. The results would suggest, as one might expect, a very strong



relationship between one's degree of emotionality about the environment and what he or she says they are willing to do for the environment. Also significant was the relationship between an individual's positive attitude toward the environment and their degree of emotionality. These correlations substantiated results from prior studies done on a variety of populations.

### **Implications**

The environmental crisis is imminent and there is much that behavior research can do to address this crisis:

- a) The building industry is a growing industry and design programs are producing thousands of design professionals annually. Educational recommendations founded on valid research placed in the hands of design educators, can begin to impact future design practices.
- b) The actions of designers can be far reaching. Designers can choose to specify only building materials, finishes, and furnishings that are produced by manufacturing processes that do not contribute to the destruction of the environment or deplete nonrenewable natural resources. By doing so, they are boycotting irresponsible practices. Designers can further choose to specify building materials which do not lead to future environmental deterioration either by non-recyclability or by the creation of hazardous and harmful substances (i.e., poor indoor air quality, inefficient lighting systems, practices which deplete nonrenewable sources of energy, etc.). And, designers can become advocates and educators by enlightening their clientele to the economic, political, as well as environmental advantages of environmentally responsible building practices.
- c) The results of this study will provide a basis for prescribing educational tools and techniques for architectural, interior, and environmental design programs.
- d) The specific combination of scales used in this study may create a prototype instrument that effectively combines the best efforts of previous research results.
- e) And finally, as a comprehensive study of environmental behaviors of design professionals, it is hoped that this study will provide a foundation and impetus for future research.

### **Conclusion**

This study confirmed that the two pre-existing conditions most closely associated with environmentally responsible behavior are Affect and Locus of Control. From the perspective of environmental design, this poses some real challenges. What this study suggests is that to effect behavior change, it is not enough to provide the knowledge of a given environmental problem and its accompanying solutions. Nor is it enough to have a positive attitude toward the environment. This study showed that even individuals with very positive attitudes toward the environment were only marginally likely to engage in ERB. It would seem that these attitudes represent an infancy stage, where the attitudes have yet to be internalized into deeper values associated with the emotionality that later leads to environmentally responsible behavior. Individuals who do not adopt ERB have not been raised or conditioned to feel emotional about the environment. It would appear that the problem lies in whether the individual had developed an integrated emotional attachment to the environment. Other descriptors of affect and emotional attachment have been described as "sense of place"<sup>15</sup> and "place attachment."<sup>16</sup> Kellert (1985) found that life experiences, particularly ones causing a sense of loss, were most

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<sup>15</sup>Nicole M. Ardoin, "Sense of Place and Environmentally Responsible Behavior: What the Research Says." Unpublished paper, Yale School of Forestry and Environmental Studies, 2004)

<sup>16</sup> Jerry J. Vaske and Katherine C. Kobrin, "Place Attachment and Environmentally Responsible Behavior," *Journal of Environmental Education*, 32 no. 4 (2001): 16-21.



influential in creating a devotion or passion to a cause.<sup>17</sup> An example of this would be an individual becoming an avid environmentalist because he or she witnessed destruction of a cherished habitat whereby the sense of loss is the motivational force behind their strong emotions and convictions. Another example of this might be an individual who begins campaigning for heart research after having experienced a heart attack or known a close friend or relative who had. In both cases emotions or affect become the driving force behind their behavior change. In applying this to environmental education, it would suggest that an effective way to encourage environmentally responsible behavior would be to expose students to a natural setting, give them a sense of ownership, foster a sense of love for the area, then expose them to a similar area that has been degraded by human practices. Following this, the students would be shown alternatives whereby the human needs are met without damaging the environment. To be most effective, students should then experience activities whereby their actions make a difference such as cleaning refuse from a river or planting wetland foliage. To be effective, all steps of such a program are important for the evolution of the student's affect toward the environment and his or her sense that they can make a difference, i.e. Locus of Control.

If we begin early enough with young citizens and follow through with integrated programs that affect attitudes, nurture value development, allow room for passions and convictions to blossom, and follow with proper knowledge of effective practices, then, and only then, can we expect a population-wide sense of responsibility for the quality of life on this planet.

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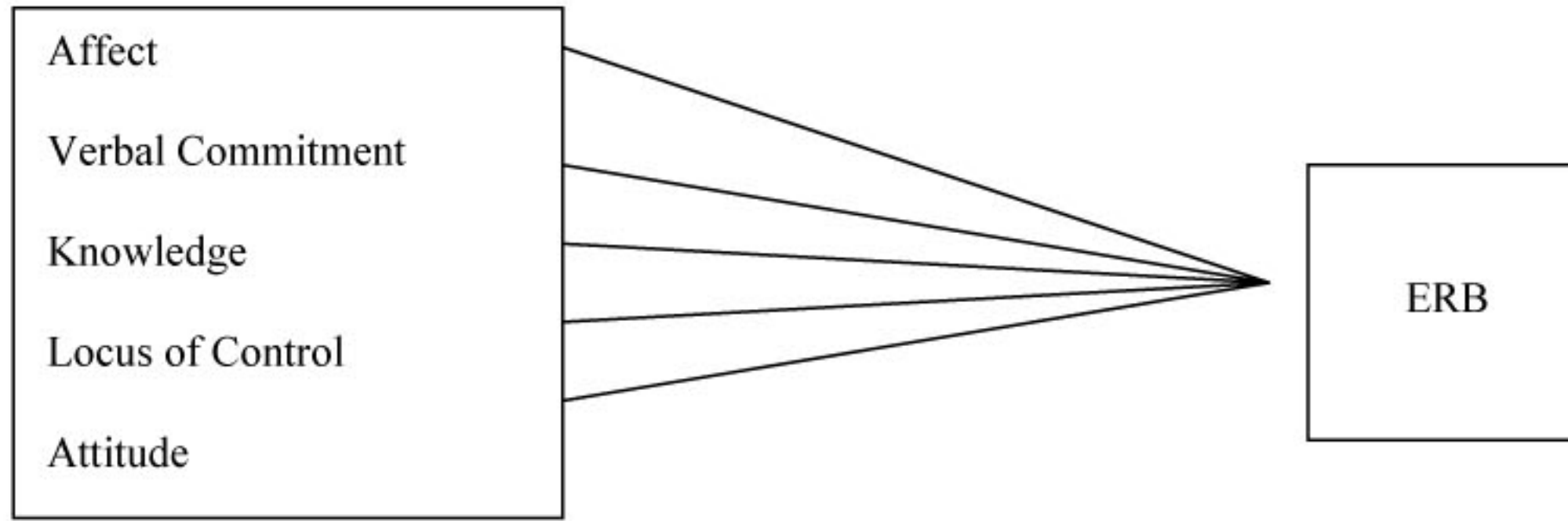
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**Figure: 1. Model of Theoretical Concept Relationships**

**Table 1 - Respondent Score Ranges on Scaled Variables**

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<b>Variable</b>	<b>Respondent Score Ranges</b>
Affect	unemotional 10 ..... 20 emotional
Verbal Commitment	low degree 8 ..... 16 high degree
Knowledge	little knowledge 0 ..... 10 much knowledge
Locus of Control	external 11 ..... 44 internal
Attitude	DSP 20 ..... .80 NEP
ERB	weak ERB ..... 20 strong ERB

**Table 2 – Multiple Regression Analysis**

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<b>Independent Variable</b>	<b>Probability of Predicting Change in ERB</b>
x1-Affect	0.005
x2-Verbal Commitment	0.092
x3-Knowledge	0.428
x4-Locus of Control	0.042
x5-Attitude	0.291

Values with  $p \leq .05$  indicated a strong correlation between the independent and dependent variables.



**Table 3 – Analysis of Variance for the Dependent Variable (y) when the Source is a Demographic Variable**

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<b>Source Variable</b>	<b>p (Variance in y)</b>
Age	0.328
Gender	0.161
Religion	0.362
Income	0.070
Education	0.608
Political affiliation	0.000

**Table 4 – Pearson's r – Significant Correlations between Variables**

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<b>Relationship of Variables</b>	<b>Correlation Coefficient</b>
a) Verbal Commitment (x2) to Affect (x1)	0.440
b) Attitude (x5) to Affect (x1)	0.371
c) Affect (x1) to ERB (y)	0.322
d) Attitude (x5) to Verbal Commitment (x2)	0.295
e) Verbal Commitment (x2) to ERB (y)	0.247

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