DISSERTATION

VALUES AND CONSTRUCTION WASTE RECYCLING: AN APPLICATION OF THE COGNITIVE HIERARCHY TO CONSTRUCTION MANAGEMENT EDUCATION

Submitted by

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In partial fulfillment of the requirements

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ABSTRACT OF DISSERTATION

VALUES AND CONSTRUCTION WASTE RECYCLING: AN APPLICATION OF THE COGNITIVE HIERARCHY TO CONSTRUCTION MANAGEMENT EDUCATION

Since it first emerged in the early 1990's, the green building movement has grown both in its acceptance and applications, but has yet to achieve widespread market penetration. Although there are a variety of reasons for this, including social, economic and political barriers; construction managers' lack of acceptance of green building has been identified as a major impediment. Construction management (CM) programs have sought to increase CM students' acceptance of green building, however, almost nothing is known about CM students' values and how they influence their environmental behaviors. Cognitive theory provides a framework in the form of the cognitive hierarchy that has potential for addressing this problem. This theory predicts behavior intentions as a function of values, value orientation, attitudes, and norms.

The purpose of this study was to provide insights into how CM students' values influenced their environmental behavior intentions. The present study incorporated the cognitive hierarchy as a framework to examine the relationships between values and other cognitive determinants of behavior intention. This study also sought to confirm the full cognitive hierarchy model, including the role of values, using data from a single survey. In an attempt to examine the role of values along with other cognitive functions

(environmental value orientation, attitude, and subjective norm) in determining behavior intention, this study had the following objectives: (a) to determine the direct relationship between values and each of the other components of the cognitive hierarchy, (b) to determine the direct relationships between components of the cognitive hierarchy and behavior intention, and (c) to determine the mediation role of value orientation, attitude, and subjective norm on direct relationships identified in parts *a* and *b* above. Findings of the present study have implications for both construction management education and social psychology research on cognitive determinates of environmental behavior.

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Undertaking a doctoral research agenda is a daunting, yet rewarding task that cannot be completed with out the support of those you love, the guidance of those you trust, and the perseverance of self and of those around you. This dissertation is no different. I could not have completed it without the support and patience of my family and guidance of my committee.

Throughout this process, my family – my husband Mike, my daughter Rozie Ellen, and my son Kenneth Cole, – have been my strongest supporters while at the same time they have made some of the biggest sacrifices. I want to thank them for their continued support and love. I especially want to thank my husband for his patience in listening to numerous research approaches that fell by the wayside as the present study emerged and unending support and encouragement. He never doubted that I could finish this project. In undertaking this project, it is hard to fully understand the sacrifices and demands that will impact those around you. Luckily, my family was up to the challenge and saw me through to the end.

I would also like to thank my committee members for all of their guiding questions, editorial comments and support. I would like offer a special thank you to my outside committee member Dr. Jerry Vaske, who spent numerous hours reviewing my survey design, data analysis procedures and results.

This dissertation represents not only an enormous effort but also a period of great personal change: the death of my step-son, the birth my second child, the transformation of my daughter from a baby into a young lady, and the loss of my father. I would like to dedicate this work to my father Kenneth Preston Cain who passed away on February, 23, 2007, two months after my graduation. I am fortunate and proud to have had such a wonderful father whose example of love, charity and enjoyment of life serve as a positive example of a life well spent. His memory will continue to influence my life on a daily basis.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

In this era of environmental decline, institutions of higher education are facing an added responsibility of incorporating sustainability principles into their already full curriculums. Calls for inclusion of sustainability education into higher education come from numerous national and international world leaders and have been formalized in such documents as the *Kyoto Protocol, Agenda 21* and the *Talloires Declaration* (2002). In the United States, the President's Council on Sustainable Development cited sustainability education as one of the key strategies for shifting Americans to a more sustainable way of life, noting that sustainability education is one of the greatest challenges to ever face our nation's educational systems (Sitarz, 1998). Meeting this challenge in higher education requires that educators start with understanding how students' values and value orientations impact their environmentally significant behaviors.

Study Context and Scope

While the environmental movement is not new, awareness of the stakes have definitely risen over the decades since the birth of the modern environmental movement in the 1970s (*Living beyond our means: Natural assets and human well-being*, 2005). Over the years, scientists have continuously documented the climate change crisis and America's disproportionate role in that crisis (Gore, 2006). According to data presented by Gore (2006) in *An Inconvenient Truth,* while Americans only represent 5% of the

world's population, they consume 24% of the world's energy and contribute 30% to the overall cause of global warming. Many Americans, however, have exhibited a reluctance to respond to the urgent call for a shift to a more sustainable lifestyle (Gore, 2006).

Role of Buildings in Environmental Decline

Climate change is a long-term problem that can be addressed, in part, in the built environment (Buckley, 2006). Approximately 40% of all raw materials are extracted from the earth for construction purposes, with 25% of virgin wood use going just to building construction (Bechtel, 1997). The construction process produces enormous amounts of waste, much of which ends up in our nation's landfills (Bechtel, 1997). In Colorado, approximately 35% of all waste going into landfills is either construction or building demolition waste, much of which could be recycled or reused (*Waste-Not Recycling*, n.d.). Because of its enormous consumption of materials, the construction industry has a significant impact on our environment; by changing construction management practices, this industry could significantly impact the environment on a global level. The construction industry is perhaps the *only* industry that can effect such broad changes in the future of our environment ("Drivers for sustainable construction," 2003; Roodman & Lenssen, 1995). For this industry to make the change to a sustainable industry, the concepts and principles of sustainability need to be incorporated into higher education at all levels (*Green Building SmartMarket Report*, 2005; Kibert, 2004, 2005a, 2005b; McDonough, 2004).

Need for Sustainability Education

Recognizing the enormous challenge facing Americans and their reluctance to meet that challenge, the President's Council on Development was developed in 1993 to

produce a strategy for shifting our nation's environmental attitudes. A key component of this strategy was the inclusion of sustainability education into the nation's formal educational system, specifically noting that "to achieve sustainability, indifference, lack of knowledge, and resistance to the concept of sustainable development must first be addressed" (Sitarz, 1998, p.4). By separating knowledge of and resistance to the concept of sustainability, the council acknowledges that merely providing information is not enough to achieve sustainability – individual's resistance must also be addressed and overcome. Several researchers have theorized that resistance results in a disconnect between individual's value structure and the structure of the information being presented (Elder, 2002; Kuhn, 2000; Schultz et al., 2005). Based on these assumptions, effective incorporation of sustainability concepts into higher education should begin with seeking to understand students' value structures and how they impact their environmental behaviors. The goal of sustainability education, as defined by the President's Council, is to prepare Americans to take *individual* action which not only supports national economic prosperity and social justice, but also supports the environmental quality of our natural ecosystems (Sitarz, 1998).

Sustainability Education in Construction Management Programs

Coupled with the need for sustainability education in general higher education curricula is the need for construction management programs to address sustainable construction due to the enormous demands the building industry places on the earth's natural resources. As a result, construction management programs are making efforts to facilitate changes in the construction industry by ensuring that future graduates of their programs are knowledgeable about sustainable issues as they pertain to the building

industry (Tinker & Burt, 2003). Simply providing knowledge, however, without respect to the audience's environmental values may preclude them from being sympathetic to the material being presented (Schultz & Zelezny, 2003). A need exists to go beyond just providing knowledge to providing information in a fashion that is suited to students' environmental value orientations.

Social Psychology Framework for Studying Environmentalism

The importance of changing human behaviors to make the shift to a more sustainable society directly connects to the area of social psychology, where researchers have long studied individuals' values and how they relate to attitudes and behaviors (Oskamp, 2000; Stern, 1992). The growth of sustainability has been likened to a social movement, whose purpose it is to effect changes in individuals' attitudes and behaviors (Stern, Dietz, Guagnano, & Kalof, 1999).

In social psychology, an extensive body of research exists on cognitive indicators of environmental behavior. These indicators include individuals' values, value orientations, attitudes and norms, and environmentally sensitive behaviors. These have been linked together into a cognitive hierarchy to serve as a framework for studying and understanding the role of cognitive determinants of behavior. Social psychologists have studied the relationship between measures of environmentalism, such as environmental concern and environmentally significant behaviors, and individuals' values and value orientations (Garling, Fujii, Garling, & Jakobsson, 2003; Joireman, Van Lange, & Van Vugt, 2003; Schultz et al., 2005; Stern & Dietz, 1994; Vaske, Donnelly, Williams, & Jonker, 2001); individual's attitudes (Bengston, Xu, & Fan, 2001; Kaiser, Wolfing, & Fuhrer, 1999; Mira, Deus, Rodriguez, & Martinez, 2003); and to a lesser extent, norms

(Donnelly, Vaske, Williams, & Jonker, 2001; Stern et al., 1999; Vaske et al., 2001; Vaske & Whittaker, 2004).

Of particular importance are studies correlating values and value orientations to measures of environmentalism. Social psychologists have shown that environmental attitudes and behaviors can be tied to individuals' values and value orientations. Research on values has shown correlations between self-enhancement and self-transcendence values and environmental value orientations and environmental behaviors (Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999). Building on values, value orientations reflect expressions of basic values (Manfredo, Teel, & Bright, 2003; Vaske & Donnelly, 1999). Research on environmentalism ties varying levels of environmental concern and behavior to egoistic, altruistic, and biospheric value orientations (Schultz, 2001; Stern & Dietz, 1994); ecocentric and anthropocentric value orientations (Kortenkamp & Moore, 2001; Thompson & Barton, 1994; Vaske & Donnelly, 1999); social value orientations (Garling et al., 2003; Joireman, Lasane, Bennett, Richards, & Solaimani, 2001; Osbaldiston & Sheldon, 2002); and postmaterialism (Davis, 2000). All of these studies establish a link between values and environmental value orientations and measures of environmentalism, but not always within the framework of the cognitive hierarchy.

Study Significance

Human actions are changing the natural environment on a global scale (Oskamp, 2000; Stern, 1992). Human design, construction, operation and maintenance, and ultimate demolition of buildings in the United States are significant contributors to ozone depletion, climate change, global warming, loss of biodiversity, deforestation, soil

erosion, desertification, and air and water pollution (Bechtel, 1997; Kibert, 2005b; Roodman & Lenssen, 1995). Through education, however, there may be an opportunity to make significant impacts to the sustainability of buildings. By incorporating principles of sustainability, construction management education can impact the sustainability of the building industry – significantly impacting the demands of the construction process on the natural environment.

Influencing long term change within the industry, however, requires that future construction professionals *understand*, *accept* and *support* the goal of sustainable construction (Teo & Loosemore, 2003). The research methods in social psychology and human dimensions research can help construction management educators gain a better understanding of how construction management students' sustainable behavior is impacted by their cognitive functions.

As the President's Council stated (Sitarz, 1998), the challenge of incorporating sustainability principles into higher education curricula is one of the greatest challenges of our nation's educational system, but it is one that we have to address if we are to shift to a sustainable society. Merely providing information, however, is often not enough as individuals' beliefs can act as filters if information is not provided in a manner that builds on their values and value orientations. As construction management educators seek to meet the challenge set forth by the President's Council, it becomes imperative that they understand how construction management students' values and value orientations impact their behavior intentions related to issues of sustainable construction.

Sustainable construction *is* different from traditional building construction methods. There are many different types of construction – and sustainable construction

can cut across all types of construction. A sustainable building goes beyond changing a project's design. The boundaries defining a successful sustainable building project do not end at the project's perimeter. They extend beyond the physical site and structure to the surrounding community and environment. By definition, sustainable construction involves special processes. Sustainable construction is different because it requires a change in how the constructor(s) manage and execute the construction process.

The American Council for Construction Education, which is the primary accrediting body for bachelor degree programs in construction education states that "Construction is concerned with people and their relationships. The ability to communicate, both orally and in writing *and the understanding of human behavior* are essential assets to the constructor " ("Document 103 - Standards and criteria for accreditation of postsecondary construction education degree programs, " 2006, pp. 8-9).

To summarize, this dissertation seeks to understand how construction management students' behavior intentions are determined by their cognitive functions. Utilizing research from social psychology linking values and value orientations to environmental behavior, this study responds to the need for effective sustainability education in construction management programs. Specifically, this study explores the relationship between students' values and value orientations and their higher order cognitions (attitude and norms) in relation to environmental behavior within the context of sustainable construction. The results from this study will give educators a better chance to foster change in an industry that is historically slow to adapt – but that needs to adapt *quickly* for the benefit of the environment and all humanity (Roodman & Lenssen, 1995).

Problem Statement

Since it first emerged in the early 1990's, the green building movement has grown both in its acceptance and applications. It has not, however, achieved widespread market penetration. Currently, green building accounts for only a small percentage of all new commercial projects. Although there are a variety of reasons for this, including social, economic and political barriers; construction managers' lack of acceptance of green building has been identified as a major impediment. One possible reason for this lack of acceptance is that green building, like many environmental agendas, has often been promoted using campaigns that appeal to mostly self-transcendent values (i.e. going without for the good of the environment and others). As a result, these campaigns may not be very effective for those with predominately self-enhancing values, resulting in communication breakdowns. In the arena of construction management (CM) education, I have personally seen such scenarios played out. For example, I have seen classroom audiences reject speakers that presented material in a manner that I hypothesize directly conflicted with their personal values. It is in the education arena that David Orr (2002) and William McDonough (2004), along with others (Kibert, 2005a, 2005b; Knapp, 1983; McMillian, 2002; Nobe & Dunbar, 2004; Tinker & Burt, 2003; Vanegas, Pearce, & Borsch, 2004), have stressed the need for sustainability education if the building industry is to be successful at making the shift to a sustainable industry. This includes construction management education as it is the construction manager who is ultimately responsible for managing the production of the final product.

As stated above, individuals' values can impact how they perceive and respond to environmental messages. The problem is that, currently, we know little about CM students' values and how they influence their behaviors. Cognitive theory provides a framework in the form of the cognitive hierarchy that has potential for addressing this problem. This theory predicts behavior intentions as a function of values, value orientation, attitudes, and norms. While portions of this theory have been confirmed in various studies, to date, none have confirmed the complete cognitive hierarchy model, including the role of values, in a single study.

The purpose of this study was to provide insights into how CM students' values influenced their environmental behavior intentions. It is hypothesized that these insights could assist educators as they attempt to deliver sustainability and green building principles into CM curricula. The present study incorporated the cognitive hierarchy as a framework to examine the relationships between values and other cognitive determinants of behavior intention. These determinants were environmental value orientation, attitude, and subjective norm. This study also sought to confirm the full cognitive hierarchy model, including the role of values, using data from a single survey. In an attempt to examine the role of values along with other cognitive functions (environmental value orientation, attitude, and subjective norm) in determining behavior intention, this study had the following objectives: (a) to determine the direct relationship between values and each of the other components of the cognitive hierarchy (environmental value orientation, attitude, subjective norm and behavior intention), (b) to determine the direct relationships between components of the cognitive hierarchy and behavior intention, and (c) to determine the mediation role of value orientation, attitude, and subjective norm on direct

relationships identified in parts *a* and *b* above. In this study, the model variables environmental value orientation, attitude and subjective norm may be either criterion or predictor variables depending at what level in the cognitive hierarchy the analysis is focused.

Research Question

Based on the theoretical underpinnings presented in the literature review, the research question guiding this study is: What role do construction management students' values, environmental value orientations, attitudes, and subjective norms play in determining their construction waste recycling behavioral intentions?

Hypotheses

To address this research question, the following hypotheses are advanced. The relationships between these hypotheses are shown with a path diagram in Figure 1. :

H_1: Self-enhancement/self-transcendence value index will be a direct predictor of anthropocentric/biocentric value orientation.

H_2: Anthropocentric/biocentric value orientation will be a direct predictor of construction waste recycling attitude and subjective norm.

H_3: Construction waste recycling attitude and subjective norm will be a direct predictor of construction waste recycling behavior intentions.

H_4: Anthropocentric/biocentric value orientation will mediate the relationship between self-enhancement/self-transcendence value index and higher order cognitions.

H_5: Construction waste recycling attitude and subjective norm will mediate the relationship between value orientation and construction waste recycling behavior intentions.

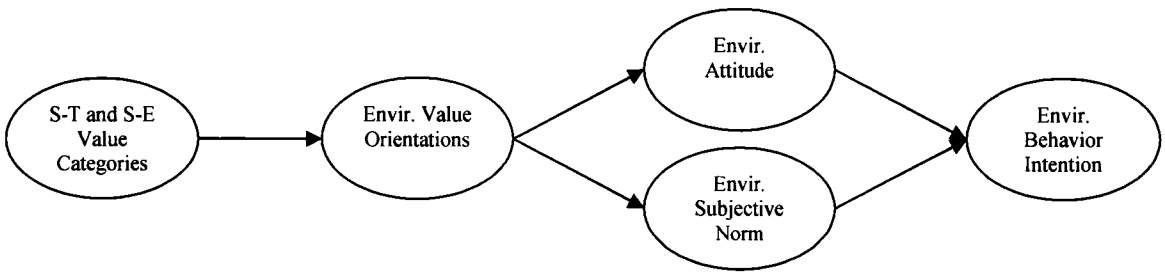

Figure 1. Hypothesized relationship between study variables.

Definitions

The following definitions are provided to clarify how the terms below are defined and used in this study. They are provided to assist the reader in reading this dissertation.

1. *Anthropocentric:* valuing nature for what it can provide mankind.
2. *Attitudes:* "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly & Chaiken, 1993, p. 1).
3. *Behavior:* actions by individuals.
4. *Behavior Intentions:* The intention to behave in a given way in a given context. Behavioral intentions are often used as an indicator of behavior when it is impossible to actually measure.
5. *Beliefs:* "Beliefs are the associations or linkages that people establish between the attitude object and various attributes" (Eagly & Chaiken, 1993,

103). "Beliefs are what people think the world is like" (Kempton, Boster, & Hartley, 1995, p. 12).

6. *Biocentric:* "... phenomena is judged on the basis of costs or benefits to ecosystems or the biosphere" (Stern & Dietz, 1994, p. 70).
7. *Cognitive Hierarchy:* human cognitions ordered in a hierarchical method.
8. *Environmental Attitude:* "... the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues" (Schultz et al., 2005, p. 458). It should also be noted that environmental concern is only one aspect of an environmental attitude (Schultz et al., 2005).
9. *Environmental Concern:* the affect associated with environmental problems (Schultz et al., 2005).
10. *Environmental Significant Behavior:* behavior that is motivated by perceived behavioral consequences associated with various actions (Schultz, 2000).
11. *Norms:* "...evaluative standards regarding individual behavior in a given context. They define what behavior should be, rather than actual behavior" (Donnelly, Vaske, Whittaker, & Shelby, 2000, p. 403).
12. *Self-Enhancement:* individuals measuring high in self-enhancement values tend to be more motivated to perform behaviors when they perceive direct benefits to their self.

13. *Self-Transcendence:* individuals measuring high in self-transcendence values place more importance on the impacts of their behaviors on others and the environment.
14. *Subjective norm:* A subjective norm refers to a "person's *perception* that others desire the performance or nonperformance of a specific behavior; this perception may or may not reflect what the important others actually think [s/he] should do" (Ajzen & Fishbein, 1980, p. 57).
15. *Sustainability*: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs, as defined by the Brundtland Commission, 1987" (Lopez Barnett & Browning, 2004).
16. *Values:* "A value is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposed or converse mode of conduct or end-state of existence" (Rokeach, 1973, 5).
17. *Value Orientation:* Reflection of an expression of basic values. Value orientations are revealed through the pattern and direction of multiple basic beliefs that an individual holds regarding a specific situation or issue (Manfredo et al., 2003). Value orientations are patterns of basic beliefs (Vaske & Donnelly, 1999).

Study Delimitations

This study did not seek to assess external factors that might have limited performance of the behavior focused on in this study; it was delimited to assessing the relationship of cognitive functions and construction waste recycling behavior. Results of

this study are further delimited because of the specific context in which the study was designed and implemented. This study was designed to gain a better understanding of relationships between students' values and higher order cognitions and their behavior intentions pertaining to a specific behavior related to sustainable construction. In this study, the behavior focused on was volunteering to setup a construction waste recycling program. An additional delimitation of this study is that it was conducted on one construction management program, and the participants come from a convenience sample. It should be noted, however, that age and gender demographics of participants in this study are closely related to demographics of construction management students enrolled in other programs across the nation. The program chosen for this study does differ from most ACCE (American Council of Construction Education) accredited construction management programs in that it has an established reputation for incorporating sustainability principles into its curricula; otherwise, this program is comparable to other ACCE accredited construction management programs. Therefore, these results are not generalizable to other student groups outside of construction management.

Chapter 2: Literature Review

While the modern environmental movement began in the 1970s, the sustainable building movement did not truly emerge until the early 1990s (Kibert, 2005b). Green building, a component of sustainable building, grew out of the awareness that the design, construction and operation of buildings place an enormous burden on the natural environment. As April Smith put it in her introduction to *Building Momentum* (2003), "While our offices, homes, and schools may not have tailpipes or smokestacks, building development and use causes pollution all the same" (p. 3). Like the environmental movement, the green building movement is as much a social movement as it is a technological advancement of design and construction. The purpose of green building, as with the larger environmental movement, is to change human behaviors that result in global environmental damage. To fully outline the theoretical support for this study, this literature review covers (a) the growth of green building, (b) green building's impact on construction practices, (c) green building education in construction management programs, and (d) social psychology research on environmental behaviors.

Background of Green Building

Green building is defined as healthy facilities designed and built in a resource-efficient manner, using ecologically based principles" (Kibert, 2005b, p. 57). Green building is an outgrowth of the focus on sustainable development, which became an

international focus as the result of three national and international events in the late 1980s and early 1990s (Kibert, 2005b). The first of these was a report given by The World Commission on Environment and Development (commonly referred to as the Brundtland Commission) to the United Nations General Assembly in 1987. This report, *Our Common Future*, was the first to bring sustainability to the forefront of humanity's conscience. The Brundtland Commission's definition of sustainable development has since become one of the most widely cited sustainability definitions. According to the Brundtland Commission *sustainable development* is development that "meets the needs of the present without compromising the ability of future generations to meet their needs" (*Our Common Future*, 1987, p. 43).

The second major event related to sustainable development was the 1989 meeting of the American Institute of Architects, which resulted in the establishment of the organization's Committee on the Environment (COTE). The third major event was the United Nations 1992 Conference on Sustainable Development, commonly referred to as the Rio Conference. The combined result of these events was to focus world attention on mankind's global environmental impacts. In the *Sustainable Building Technical Manual,* David Gottfried provides a clear and concise assessment of these global impacts:

> Since the Industrial Revolution, the world has witnessed incalculable technological achievements, population growth, and corresponding increases in resource use. As we enter a new century, we are recognizing the "side effects" of our activities: pollution, landfills at capacity, toxic waste, global warming, resource and ozone depletion, and deforestation. These effects are straining the limits of the Earth's "carrying capacity" – its ability to provide the resources required to sustain life while retaining the capacity to regenerate and remain viable. (Gottfried, 1996, p. vii)

The *side effects* referenced by Gottfried in 1996 have become more apparent in the years since he first wrote this statement. It is now more apparent than ever that human activity is causing widespread environmental decline (Gore, 2006). Buildings have played a significant role in these *side effects*. While they represent human advances in technology and the ability to create manmade artifacts that last for generations (Roodman & Lenssen, 1995), buildings also require large amounts of natural resources over the duration of their life. According to Roodman and Lenssen (1995), buildings account for one-sixth of the world's freshwater withdrawals, one-quarter of its wood harvest, and two-fifths of the world's material and energy flows. Results of these massive resource uses include, among other effects, ozone depletion, climate change, global warming, loss of biodiversity, deforestation, soil erosion, desertification, and air and water pollution (Kibert, 2005b; Roodman & Lenssen, 1995). Because of its far reaching effects, the building industry plays a key role in attainment of sustainable development as defined by the Bruntland Commission in *Our Common Future*. Green building may represent only one part of a larger effort, but it is one that has significant impacts on the broader sustainability movement (Kibert, 2005b). This sentiment is best summed up by the Sustainable Development Task Force of the International Federation of Consulting Engineers: "The industry has a responsibility to minimize negative environmental and social impacts and maximize positive contributions. It is potentially the main single-sector contributor to achieving sustainable development" ("Drivers for sustainable construction," 2003, p. 22). This sentiment has been widely echoed both nationally and internationally, strongly supporting research efforts in this area to foster the growth and

application of green building (Bakens, 2003; Kibert, 2004, 2005b; Roodman & Lenssen, 1995).

U.S. Building Global Impacts on the Environment

American buildings impact the environment on a global level. Their production and manufacture involves the extraction and movement of 6 billion tons of basic materials on an annual basis, many of which come from outside U.S. boarders (Kibert, 2005b). In total, American buildings account for over one-third of total U.S. greenhouse gas emissions, which are one quarter of global emissions (Bernstein, 2006). They also consume 37% of all energy used in the U.S., 68% of all electricity, 12% of freshwater and 88% of potable water supplies, and 40% of raw materials (Smith, 2003). From these data, it is clear that the environmental impacts of American buildings go far beyond the physical sites on which they are located, impacting far more people than just those who live and work in their interiors. As a result, the American building industry has a unique opportunity to make significant and positive impacts to the environment and humanity on a global scale. This realization has led to the reshaping of the building industry by unprecedented forces, forcing professionals engaged in all phases of the building industry to "fundamentally rethink their roles in the building delivery process" (Kibert, 2005b, p. 1); leading to the birth of green building. Growth of green building design and construction has been supported by efforts in both the public and private sectors. These include the U.S. Green Building Council, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the National Association of Home Builders, and the Department of Defense (Kibert, 2004).

U.S. Green Building Movement

According to Kibert (2005b), American's first realization that their buildings were extracting a toll from the environment came as a result of the 1970's *oil shocks* resulting from the Arab-Israeli conflict of the time. While these events stimulated interest in building energy efficiency, solar technologies and better insulation, they did not encompass all of what has become known as green building. Eventually, many of the energy efficiency ideas were included in model energy codes, which were adopted by the states. Further interest in energy conservation evaporated as energy prices eventually declined.

Kibert (2005b) writes that it was not until the late 1980s that the first green buildings appeared in American cityscapes as a result of renewed interest in sustainable construction. This interest was primarily spurred by the drafting of the *Declaration of Interdependence for a Sustainable Future*, which was authored in part by William McDonough, a leading architect in sustainable development. This document resulted from the combined effort of the International Union of Architects (UIA) and the American Institute of Architects (AIA) in 1993. This document acknowledged the interdependence of humanity and the natural environment and stated the commitment of these two organizations to bring the building industry up to sustainable design standards (*Declaration of interdependence for a sustainable future*, 1993) .

Since its start, the successful growth of the green building industry to date has been the result of efforts in both the public and private sectors, as mentioned earlier. Of these efforts, those of the U.S. Green Building Council (USGBC) and its green building rating program, LEED (described below), are considered to be the *watershed* events that

precipitated the shift from conventional building methods to sustainable (or green) building (Kibert, 2005b). In 2004, a little more than a decade after the emergence of green building, green building accounted for 2% of all new non-residential construction starts; by the year 2010, this percentage is projected to increase to nearly 10% (Green Building SmartMarket Report, 2005). At this rate, green building is projected to be a $60 billion market by the year 2010 (Bernstein, 2006). This rapid growth of green building over such a short period is largely due to the efforts of the USGBC.

U.S. Green Building Council (USGBC). In 1993, the USGBC was formed when leaders from some of the largest building design and construction firms joined forces with environmentalists to promote "buildings that are environmentally friendly, profitable and healthy places to work and live" (*Green Building SmartMarket Report*, 2005). As part of that goal, the USGBC developed a green building rating system, Leadership in Energy and Environmental Design (LEED), which has quickly become the national standard for assessing green building design and construction. LEED is a voluntary program through which a building can be rated on its level of performance in meeting established green building standards. Buildings are rated in five categories: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality (*LEED-NC v. 2.2 Reference Guide*, 2005). In total, there are 69 points in the LEED – NC (new construction) rating system. Each point is tied to a specific credit in the LEED rating system. The level of building certification depends on the total number of points a project obtains. The majority of credits/points focus on issues related to building design; some, however, are primarily within the contractor's domain. These include erosion and sedimentation control, site disturbance, building

commissioning, construction waste management, performance based material credits, construction indoor environmental quality, and low-emitting materials (Kibert, 2005b; Rodenberg, Merson, & Funkhouser, 2003). The USGBC also has been active in promotion of green building through its educational program for building professionals and its annual Green Build Conference.

Government support of green building. Parallel in time to the development and growth of the USGBC and the LEED rating system, governmental support for green building was also beginning to grow in the early 1990s. In 1990, Congress passed the Pollution Prevention Act, which emphasized the importance of *prevention* versus correcting pollution (*Green Building SmartMarket Report*, 2005). It was followed by the launching of the Green Lights Program to address energy consumption in commercial buildings resulting from poor lighting designs. In 1995, this program merged with Energy Star for buildings, a voluntary program to help businesses increase their bottom line through energy conservation measures. In the years since the creation of these programs, there has been additional proposed and enacted legislation supporting green building.

In the 109th U.S. legislative session, there were 29 pieces of pending legislation proposed that addressed the energy efficiency and environmental impacts of buildings, one of which was the High-Performance Green Buildings Act of 2006 (Buckley, 2006). This bill included the establishment of a U.S. General Services Administration Office of High-Performance Green Buildings, guidance for healthy high-performance schools, strengthening federal leadership in green building, and construction of a demonstration project (Jeffords, 2006). In this bill, high-performance green buildings were defined as those that, among other things, "reduce the amount of energy, water, and material

resources used during its life-cycle" (Jeffords, 2006). In this bill, the term *life-cycle* is defined as meaning all stages of the useful life of the building including construction. In further defining high-performance green buildings, reference is also made to the reduction of the "negative impacts on the environment throughout the life-cycle of the building, including air and water pollution and waste generation" (p.3). In total, this bill makes three references to recycling of waste during a building's life-cycle, clearly establishing the importance of construction waste recycling for green buildings. This bill, along with the others proposed during the 109th legislative session, is evidence of government's growing commitment to the promotion of green building.

Green Building Barriers to Growth

The past growth of green building has been significant by several accounts (Kibert, 2004; Nobe & Dunbar, 2004; Riley, Pexton, & Drilling, 2003; Smith, 2003; Tinker & Burt, 2003); yet it still remains a small percentage of new construction starts in the U.S. In *Building Momentum,* three barriers to widespread market penetration of green building are identified: (a) financial disincentives (i.e. real and perceived perceptions of higher first costs, lack of life-cycle cost analysis and use), (b) insufficient research and (c) lack of awareness (Smith, 2003). It is the third reason, lack of awareness, which is of most interest to this research. According to Smith (2003), "most architects, builders, developers, and their clients remain unaware of the full range of benefits associated with sustainable and healthy building practices" (p. 16-17). Smith goes on to note that many mainstream decision-makers have not been convinced that green building practices translate into good business practices. Coupled with this notion is the construction

industry's aversion to any perceived risk, which it often associates with new or unfamiliar practices – such as those associated with green building (Roodman & Lenssen, 1995).

Texas study. The history of green building in Texas predates the formation of the USGBC. In 1991, Austin Energy launched its Green Builder program which some have characterized as the oldest and most notable residential green building program in the Nation (Wilson et al., 1998). In 1992, this program was recognized at the United Nations Rio Conference for its excellence (Kibert, 2005b). Due to the history of green building in Texas, it would be assumed that a large portion of the construction industry in Texas would be at least somewhat knowledgeable about green building. This assumption was tested in a study conducted by Williamson, Scott and Burt (2005), the purpose of which was to examine penetration of green building ideals as set forth in the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) green building assessment program. The study surveyed 155 members of the construction industry in Texas, 19% of which were ranked in Engineering News and Record's top 400 construction companies. Job descriptions of the respondents ranged from project managers to vice-presidents to CEOs. Two-thirds of the upper-level managers surveyed could not provide an effective definition of the LEED system. Extremely low counts of LEED-familiar and LEED Accredited Professionals were found within the sample population. These results support Smith's conclusion that lack of awareness is a significant reason for lack of widespread market penetration of green building. One approach to combat this lack of awareness is through the incorporation of sustainability and green building concepts into construction management degree programs.

Impact of Green Building on Building Construction

Beyond a lack of awareness, several researchers have identified construction managers' attitudes as a major obstacle to widespread market penetration, characterizing the construction industry as being risk adverse and relatively slow to change (Kibert, 2005b; Rodenberg et al., 2003; Smith, 2003; Teo & Loosemore, 2001, 2003; Wilson et al., 1998). It is the contractor who is responsible for taking a building design and turning it into a reality; therefore, the role of the construction team in executing a green project should not be underestimated (Kibert, 2005b; Wilson et al., 1998). Project leaders' lack of knowledge, skills and/or incentives have been identified as major stumbling blocks to sustainable building, establishing the need for education in this area.

Construction Management Education

The construction industry and the formal educational systems that support the industry have a social responsibility to address environmental impacts of the construction industry. The growth of green building has been a significant step in this direction. To continue this effort, the next step is the integration of sustainability and green building concepts into all construction related curricula (*Green Building SmartMarket Report*, 2005; Kibert, 2004, 2005a, 2005b; Nobe & Dunbar, 2004; Smith, 2003; Tinker & Burt, 2003). Given the fragmented nature of the building industry, increasing educational emphasis on green building is a logical step. According to Kibert (2005b), for green building to continue to grow, the construction industry has to change dramatically. He also notes, however, that "changing the mind-set of this cast of actors is an enormous challenge" (Kibert, 2005b, p. 411). Through the incorporation of sustainability principles applied to the building industry, construction management programs have a unique

opportunity to play a significant role in the health of our environment (Nobe & Dunbar, 2004; Tinker & Burt, 2003)

Current state of construction management education. As of 2003, construction management programs were only starting to address green building education. In a survey of construction management programs (Tinker & Burt, 2003), only a few programs were identified as making substantial progress in the area of sustainability. Programs surveyed for this study were all members of the Associate Schools of Construction (ASC). Where principles of sustainability were being taught, incorporation methods included creation of courses specifically focused on sustainability and/or the integration of sustainability into existing courses. A majority of stand-alone sustainability courses were not required courses or were only offered at the graduate level. Those universities that reported progress in the inclusion of sustainable material represented a relatively small percentage of the total membership of the ASC. The study concluded that the demand for construction professionals knowledgeable about sustainability is unlikely to be met by the majority of construction management programs.

Green building education is not just about educating students about new technologies; it reflects an extension of the broader environmental movement into the building industry – including building construction. This is especially important since many of the issues tied to sustainability are often considered moral issues because of impacts on humans and/or the environment (Herremans & Reid, 2002; Perdan, Azapagic, & Clift, 2000; Wright, 2002), and are hence linked to an individual's value system. For contractors to support green buildings goals, they must be supported by their beliefs about the benefits and costs of such programs. This places an additional burden on

construction management programs to not only define green building, but to help students develop an *intuitive support* for green buildings that ties to their fundamental belief systems.

Construction Contributions to Green Building

During the construction process, the construction industry has numerous opportunities to impact the environmental effect of buildings. Although much of the focus of the green building trend has been on the design and operation of the building, it also encompasses building construction and management of that process, of which construction waste recycling is a significant part (*Green Building SmartMarket Report*, 2005; *LEED-NC v. 2.2 Reference Guide*, 2005). As noted by Spence and Mulligan (1995):

> The construction industry is involved in creating the physical assets which are the basis of virtually every aspect of development, and thus in the creation of much of the world's man-made capital. But the industry, together with the building materials industries which supply it, is also one of the largest exploiters of natural resources, both mineral and biological. Its activities cause irreversible transformations of the natural environment; and it adds to the accumulation of pollutants in the atmosphere. (p. 280)

Even though much of a building's environmental impacts have been determined by the time it reaches the construction stage, there are still numerous ways in which the construction process, through proper management, can reduce the environmental impacts of a project while also making it safer for workers and future inhabitants (Kibert, 2005b; Pulaski, 2004; Wilson et al., 1998). These include purchasing of materials, minimizing site disturbance, ensuring workers' and occupants' health by avoiding contamination of materials prior to installation, using materials and resources efficiently during construction, minimizing and managing construction waste, and making sure buildings

perform as designed (*LEED-NC v. 2.2 Reference Guide*, 2005; Rodenberg et al., 2003). In particular, construction waste management provides the opportunity to reduce the environmental impacts of a building regardless of the building design or materials specified; making the success of such programs completely up to the project manager and on-site personnel. Successful incorporation of such programs, however, has little to do with economics and much to do with contractor acceptance and support of program goals (Matthiessen & Morris, July, 2004; Teo & Loosemore, 2001, 2003).

Turner Construction: A leader in green building construction. Turner Construction is one construction company that has successfully adopted sustainable practices and developed a national reputation as a leader in green construction (Wilson et al., 1998). This 90-year old company has successfully incorporated fundamentals of green building (i.e. energy efficiency, improved indoor air quality, and waste management) into their definition of a quality projects. According to Ian Campbell, Turner's Director of Sustainable Construction, green building is simply "the right thing to do" (Wilson et al., 1998, p. 280). Campbell goes on to cite Turner employees and senior management as keys in Turner's success in green building. According to Campbell, this is because they bring their *passion* and *values* to the company's mission to be a leader in green building. Unfortunately, Turner's commitment to green building is not shared by the majority of construction firms as evidenced by the industry's support and willingness to implement green building practices, as discussed later in this chapter.

Construction Waste Management

Construction waste management, or recycling, is one area of green building that is almost completely at the control of contractors and it is one that can have a tremendous

effect on the building's environmental impacts. In addition to the enormous stress buildings place on the environment for raw materials, they are significant contributors to landfills as a result of the job site management practices. Over one-third of municipal solid waste comes from buildings (Smith, 2003). Nationally, it is estimated that construction and demolition contribute between 15% to 40% to the volume of waste going to landfills (Wilson et al., 1998). In Colorado, it is estimated that 35% of all waste going to landfills is either construction or building demolition waste (*Waste-Not Recycling*, n.d.). Much of the construction waste materials being sent to landfills are wood, concrete, masonry, metals and drywall, all of which are readily recyclable. Some have estimated that as much as 75% of waste construction materials have the potential to be reused or recycled. Considering that construction waste generates between 5-10 pounds per square foot for new construction and 70-100 pounds per square foot for renovations, a significant opportunity exists to divert construction waste from landfills (Kibert, 2005a). A reluctance to spend time and money to sort waste materials is often cited as a reason for lack of participation in construction waste management/recycling by contractors (Wilson et al., 1998). These assumptions were disproved in a recent review of construction costs for green building across the nation.

Davis Langdon study. This study grew out of a demand by industry to better understand the costs associated with meeting the requirements of the LEED-NC rating system (Matthiessen & Morris, July, 2004). It was conducted by the well respected international building cost consulting company, Davis Langdon. Prior to this study, many building professionals perceived a significant cost premium as the main barrier to using LEED-NC. This study analyzed the construction costs for over 138 construction projects

nationwide to determine the economic impact to construction costs when sustainable building practices were incorporated into building designs and construction processes. Sixty-one of the buildings reviewed were seeking some level of LEED-NC certification. A point-by-point analysis was conducted to determine barriers to obtaining specific credits.

Construction waste recycling is addressed in the Materials and Resources section (credits 2.1 and 2.2) of LEED-NC. The combined intent of these two credits is "to divert construction, demolition and land-clearing debris from disposal in landfills and incinerators; to redirect recyclable recovered resources back to the manufacturing process; and to redirect reusable materials to appropriate sites" (*LEED-NC v. 2.2 Reference Guide*, 2005). To obtain Credit 2.1, 50% of non-hazardous construction and demolition debris must be recycled and or salvaged. For Credit 2.2, this percentage increases to 75%.

For Credits 2.1 and 2.2, the Davis Langdon study (Matthiessen & Morris, July, 2004) concluded that successful construction waste management programs were not so much dependant on costs associated with the programs as they were with the general contractor's familiarity with and commitment to such practices. It was concluded that successful programs hinged on the ability and *willingness* of contractors to implement waste management and recycling programs. In the overall assessment of costs associated with green construction, this study concluded that there are primarily seven things that can negatively affect the cost of a green project. Among these was bidding climate, which refers to the response of bidders to the green requirements in the contract – specifically contractors' perceptions of the sustainable requirements as *onerous or risky*. This study

was recently updated by the original researchers. Although the revised results have not been published, a summary of the results from the revised study were presented at the USGBC's 2006 Green Building Conference in Denver, Colorado. With respect to construction waste management, LEED-NC credits 2.1 and 2.2, they again reached the conclusion that the contractor's predisposition to construction waste management plays just as significant, if not a more significant role in successfully meeting the requirements for credits 2.1 and 2.2. These results highlight the importance of understanding how contractors evaluate the benefits of such programs to their company and to the environment.

This area of research, however, has received little attention in the green building movement. Most of the literature about construction waste management focuses of procedural guidelines and case studies. Almost none of these studies have looked at why contractors tend to be unmotivated to implement construction waste management programs in the U.S. In Australia, however, this topic has received some attention in the last few years (Teo & Loosemore, 2001, 2003).

Australian study. Research conducted by Teo and Loosemore (2001, 2003) has shed some light on job-site support of waste management programs. Teo and Loosemore note that most prior research on construction waste management has neglected the important influence of people's willingness to change their attitudes and behaviors. By addressing these human aspects, they bring new insights into the understanding of the success or failure of construction waste management programs. One of the purposes of this study (Teo & Loosemore, 2001) was to investigate the main influences upon

operatives' attitudes toward waste. Operatives were defined as site foremen, leading hands, tradesmen, laborers, and other workers involved in technical, hands-on work.

Teo and Loosemore (2001) utilized a mixed methods approach. In phase one of the study, a paper survey was administered to 427 construction operatives. Of these, there was a 29% response rate. The survey consisted of 25 questions, 22 of these were categorical or rating scale answers to ascertain respondents' attitudinal response on a negative or positive evaluative dimension. In phase two, focus group discussions were conducted at six of the construction sites used in phase one. The purpose of these sessions was to gain insight into statistical results. Based on the combined results of phase one and two, Teo and Loosemore (2001) identified five key issues that impede operatives' adoption of positive attitudes toward construction waste management. They were: (a) management support, (b) perceptions of waste, (c) training, (d) incentives, and (e) participation. Of these, a and b are most important to the current study.

Teo and Loosemore (2001) found that managers were often seen as the "main source of responsibility for waste management efforts" (p. 746). Managers were also perceived as being unconcerned about reducing waste and that it was not a project priority. They also found that "operatives held negative perceptions of construction waste, reflecting the prevalent view of wasteful attitudes in the construction industry" (p. 747). They went on to also identify the lack of an industry norm for construction waste management as further impeding operatives' adoption of waste reduction activities. From these findings, Teo and Loosemore (2001) concluded that for construction waste management programs to be successful, managers need to make it a priority, citing management "supportiveness as the most critical determinant of waste reduction behavior

on projects" (p. 748). To further this area of research, Teo and Loosemore recommend additional attitudinal studies of waste management behavior focused on managerial attitudes.

As noted by Teo and Loosemore (2001, 2003) the environmental problem is cultural and possible solutions lie in changing attitudes to issues such as waste management. They also note, however, that we currently have little insight into the influencers of operatives' and managers' attitudes due to the lack of research in this area (Teo & Loosemore, 2001, 2003). As a result, a need exists to apply research methods from the area of social psychology to better understand behavior determinates of the individuals that make up the construction industry.

Green Building Summary

To summarize, green building has grown out of the broader environmental movement (Kibert, 2005b). Its purpose is to reduce the negative impacts of buildings on the environment through better design and construction practices. Since it first emerged in 1990, it has quickly grown to 2% of all new construction starts, but has yet to achieve widespread market penetration. Inclusion of green building concepts into formal construction management education curricula have been identified as a key component to the continued growth of green building. Currently, however, construction management education is lagging in this area. Coupled with the need for education is the need to also make that education effective by understanding how students' values impact their environmental behaviors. For sustainability education to be effective it must go beyond mere presentation of new technologies – it must enhance the acceptance of sustainability concepts. Without acceptance, successful application of sustainable concepts will

continue to be hampered as indicated by the results of the Davis Langdon study and the Australian study.

Drafting Environmental Messages

For construction management education, the need has been established for inclusion of green building, and broader sustainability, principles into construction management degree programs. There is also an unstated need for this education to be effective, meaning that it needs to impact students on a level that will change how they define quality construction. As noted by Campbell in Wilson et al. (1998), a key to Turner's success in green building has been the values of the company's employees. This highlights the importance of considering individual's values when addressing issues related to green construction. For education, this means that without understanding how student's values impact formation of their attitudes, instructors run the risk of not being effective, minimizing any potential benefits of green building education.

Green building, as mentioned earlier, is part of the larger sustainability movement. Both of these movements are social movements aimed at changing human behaviors that damage the environment. Social movements build their normative claims on value types such as that labeled by Schwartz as *universalism* (Stern et al., 1999, p. 83). Movements based on these values emphasize the importance of sacrificing for the good of others and are, therefore, "a backlash against mainstream American lifestyles (i.e., materialism, pursuit of personal wealth, self-interest)" (Schultz & Zelezny, 2003, p. 130). Environmental messages are often framed in terms of sacrificing, or going without, for the good of the whole, using terms such as *saving, helping*, and *protecting*. For example,

conservation measures are often framed in terms of *using less*, *simpler living*, or *giving up* some of the available comforts – all the while incurring greater inconveniences for the sake of a greater good (Schultz & Zelezny, 2003). In contrast, to reframe environmental appeals so that they are effective with self-enhancers, these appeals need to be consistent with self-interest values by emphasizing the benefits and rewards to the individual (Schultz & Zelezny, 2003; Stern et al., 1999).

Individual's values and value orientations can also function as information filters, providing one possible explanation why some individuals continue to deny that human activities are harmful to nature (Stern & Dietz, 1994). Several researchers have theorized that by restructuring environmental appeals in self-enhancement terms, they will be better received by those that hold predominantly self-enhancement values (Kaplan, 2000; Schultz & Zelezny, 2003; Stern et al., 1999). Schultz and Zelezny (2003) suggest that both self-enhancement and self-transcendence values can lead to environmental behavior, but for different reasons: one because of the concern for others and the environment, the other because of the concern for environmental impacts on self.

Based on the demographics of construction management students, it is likely that they will tend toward self-enhancement values. For construction management education, this implies that traditional methods of promoting sustainability may not be received by construction management students because the message format goes against their values. To begin to understand the role students' values play in their environmental behaviors, it is necessary to determine if their value and value orientations are predictors of their behavior intentions as suggested by the cognitive hierarchy. If they are, then there is

justification for construction management educators to adjust their teaching methods to be more congruent with student values and environmental value orientations.

Application of Psychological Research to Environmental Behavior

According to Paul Stern in *Psychological Dimensions of Global Environmental Change* (1992), "because of the anthropogenic nature of current global change, social and behavioral science expertise [are] necessary both to understand the causes and to bring about the changes in human behavior necessary to forestall, slow, or respond to global change" (p. 271). In the research on construction waste recycling behavior, this is supported by Teo and Loosemore's (2003) conclusion that additional research is needed to understand the determinants of job site operatives' attitudes toward construction waste recycling. The "cognitive hierarchy" is a causal model within social psychology that suggests that humans construct internal mental states (beliefs, thoughts, or cognitions) in order to perceive the world, evaluate its elements, and respond (Whittaker, 2000). This hierarchy has been useful in understanding the determinants of human behavior in other research areas (i.e., natural resource management) and has the potential to enhance the understanding of support of construction waste management practices within the construction industry.

Overview of the Cognitive Hierarchy

The Cognitive Hierarchy is based on the belief that human cognitions can be ordered in a hierarchical method (Vinson, Scott, & Lamont, 1977). It can be described as an inverted pyramid, as shown in Figure 2.

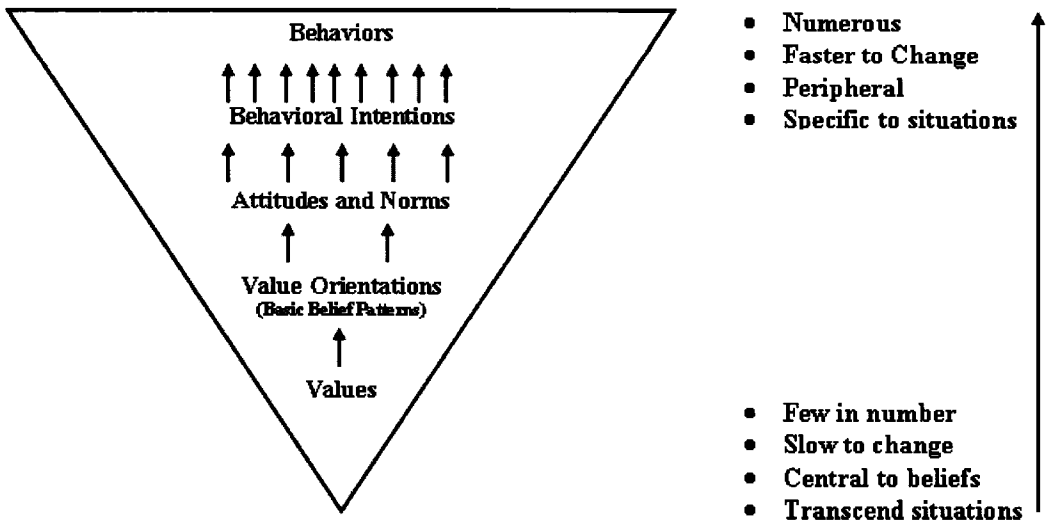

Figure 2. Graphical representation of the Cognitive Hierarchy. Source: (Vaske & Donnelly, 1999), adapted from Fulton et al. (1996).

At the bottom of this hierarchy are values, which are central to all other human cognitions. As represented in Figure 2, all other human cognitions tie back to values, although not directly. With progression up the hierarchy, the number of human cognitions increases. By definition (Rokeach, 1973), values are tied to end-states of life; and, since there are only so many end-states one can strive for, there are only so many values one can have. Examples include salvation, peace of mind, world peace, and brotherhood (Rokeach, 1973). Values orientations, the next level up in the cognitive hierarchy, represent groupings of basic beliefs along a continuum. Theoretically, an individual can have any number of value orientations; however, this number is usually small. The next level is attitudes, which build upon value orientations but have a more specific focus in terms of context and time. It is estimated that the number of attitudes an individual possesses could easily be in the thousands (Vinning & Ebreo, 2002). Since numerous behaviors can result from one attitude, the number of actual behaviors an individual

possesses is unlimited. Therefore, because behaviors and attitudes less central to individuals' belief structure, they are relatively easier to change when compared to change in values and value orientations. Values and value orientations, which are more central to individuals' belief structure, tend to be difficult to change. It is thought that change in values and value orientations happen over generations – not day or years.

Values and Value Orientations

Values. In 1973, Milton Rokeach wrote the *Nature of Human Value* and in it he defined *value* as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" (p. 5). His definition of values has since become the foundation for most of the studies referenced in this literature review. In his book, Rokeach laid out five assumptions about human values:

1. the total number of values that a person possesses is relatively small;
2. all [people] everywhere possess the same values to different degrees;
3. values are organized into value systems;
4. the antecedents of human values can be traced to culture, society and its institutions, and personality;
5. the consequences of human values will be manifested in virtually all phenomena that social scientists might consider worth investigating and understanding. (p. 3)

Rokeach (1973) further defines values by highlighting the fact that values endure or transcend across different situations; they are not specific to a given context. He also notes that values do not act in isolation from each other; they act in conjunction and in

opposition with each other, resulting in multiple values operating at the same time in any given situation. The behavioral outcome is a result of the relative importance of all the competing values that a particular situation has activated.

Rokeach (1973) defines groups of values acting at the same time as *value systems,* which are "enduring organization of beliefs concerning preferable modes of conduct or end-states of existence along a continuum of relative importance" (p. 5). Organization of beliefs (values) implies that some values will be given more weight than other values and that these weights may vary according to context. Therefore, value systems are rankings of values. When researchers refer to *changing* individuals values, they are often referring to changing the relative rankings of certain values (Ball-Rokeach, Rokeach, & Grube, 1984; Conroy, 1979; Grube, Mayton, & Ball-Rokeach, 1994; Rokeach, 1979; Sanders & Atwood, 1979). Additionally, when values are analyzed within a context, researchers are starting to tap into value orientations, the next level up on the cognitive hierarchy.

Building on Rokeach's work, Schwartz (1992, 1994) identified four groups of values. Schwartz's four value categories have become the foundation for many of the studies on environmentalism, environmental concern, and environmental behavior.

Schwartz's four value categories. As the emergence of environmentalism continues to grow and the importance of switching to a more sustainable form of existence becomes more pressing, several lines of research have applied the concept of values, or more specifically value orientations, to environmental attitudes and behaviors. These have included studies of post-materialist value orientation; utilitarian value orientation; ecocentric and anthropocentric environmental value orientations; social value

orientations; and Schwartz's model of human values (Schultz & Zelezny, 2003). Many of the studies referred to in this review make use of Schwartz's model of human values.

Building on Rokeach's definition of and work with values, Schwartz (1992, 1994) further clarifies the definition of a value with the following definition. "A value is a (1) belief; (2) pertaining to desired end states or modes of conduct [behaviors]; (3) that transcends specific situations; (4) guides selection or evaluation of behavior, people, and events; and (5) is ordered by importance relative to other values." (Schwartz, 1994, p. 20).

Through the analysis of 86 independent samples from 38 countries, with approximately 44,000 participants, Schwartz (1992, 1994) identified 10 universal types of values, which were then grouped into 4 value categories: openness to change, conservationism (also called traditionalism after one of the values used to make up this group), self-transcendence, and self-enhancement (Figure 3).

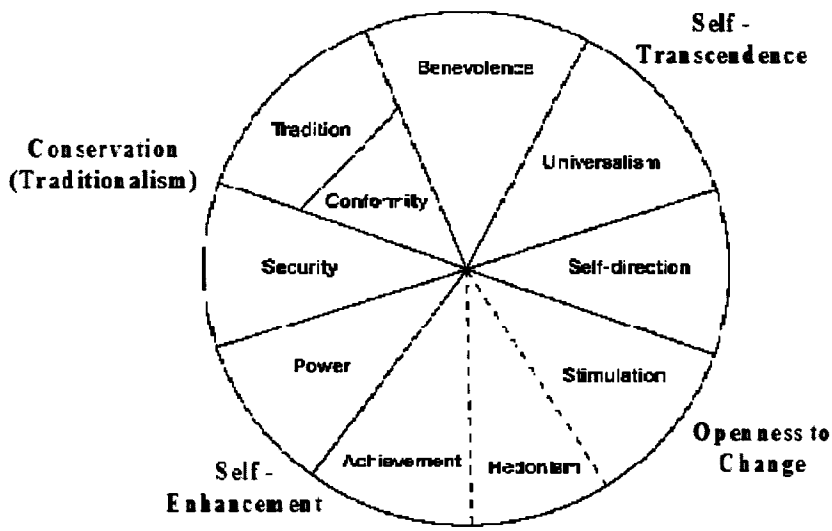

Figure 3. Schwartz's 10 value types and 4 categories. Source: Dietz, et al, 2005

Schwartz (1994) theorized that the four categories were not separate but could be represented by two continua. The first of these two continua is openness to change and traditionalism. The second one is self-enhancement and self-transcendence. Schwartz's four categories and two continua have been widely applied to the research on environmentalism with consistent findings between his value survey and other measures of environmentalism (i.e. environmental concern and environmental behavior). Schwartz's four value categories and two continua have been treated by some researchers as value orientation, which are defined in the next section.

Value orientations. Value orientations are groupings of basic beliefs; they differ from values in that value orientations are specific to a general context (i.e., the environment) and do not transcend situations (Vaske & Donnelly, 1999). The construction of a value orientation starts with identifying individuals' basic beliefs in a broad context such as the environment. These individual beliefs are then grouped and placed on a continuum. For example, to assess environmental value orientations, individuals' basic beliefs about the environment would first be identified. These beliefs might be that nature has as much right as humans to exist or that the primary function of forests is to provide resources for human use (Vaske et al., 2001). As more basic beliefs are identified and grouped together, they reveal an individual's value orientation which can be represented by the position of basic values groupings on a continuum (Fulton, 1997; Fulton, Manfredo, & Lipscomb, 1996; Vaske & Donnelly, 1999).

This continuum represents the possible groupings of basic beliefs that individuals might hold related to a context (i.e., the environment). For example, one environmental value orientation that has been identified in the literature is a biocentric – anthropocentric

value orientation (Vaske & Donnelly, 1999). One extreme of this value orientation is that the environment has intrinsic value separate from the benefits that it provides to humans; the other end represents the view that the environment is only valuable because of the resources and services it provides for human use. Examples of other value orientations that have been used to explain environmental attitudes include "protection – use" (Manfredo et al., 2003), "pro-social – pro-self" (Joireman et al., 2001), and "materialist – post-materialist" (Inglehart, 1977).

Value orientations are important to understanding human behavior because they serve as a foundation for individual's attitudes and norms within a specific context (i.e., the environment) (Kluckhohn & Strodtbeck, 1961; Manfredo et al., 2003). Based on their definitions, values and value orientations are a fundamental starting point for understanding environmental behavior since all behavior is rooted in individuals' values and beliefs (Stern et al., 1999). They do not, however, provide a completed understanding of human environmental behavior because they are separated from behaviors by attitudes, norms, and behavior intentions, which are discussed in the following sections.

Attitudes and Norms

Attitudes. In the cognitive hierarchy, attitudes and norms are the next step up from value orientations. They influence behavior through their influence on behavioral intentions. Attitudes are expressions of disfavor or favor for a given situation or object (Eagly & Chaiken, 1993). Norms can be defined as "...any standard or rule that states what human beings should or should not think, say, or do under given circumstances" (Blake & Davis, 1964, p. 456).

Attitudes can be general, referring to a group of behaviors (i.e. construction waste recycling) or they can be specific to a certain behavior (i.e. construction recycling on a specific construction job). Attitude formation is based on an individual's belief that a behavior will lead to certain outcomes and their evaluation of those outcomes (Ajzen & Fishbein, 1980; Eagly & Chaiken, 1993). For example, if an individual believes that recycling is good for the environment and that by recycling, s/he is helping conserve natural resources, then s/he would likely have a favorable attitude toward recycling.

In the cognitive hierarchy, values and attitudes are separated by value orientations; however, these two terms are sometimes confused or defined differently. For example, Eagly and Chaiken (1993) do not consider values to be a separate category from attitudes; they define values as a *type* of attitude. To clarify this distinction based on Rokeach's 1973 definition of values, Vaske and Donnelly (1999) identifies four significant ways in which values differ from attitudes. First, values represent single beliefs (i.e., honesty) that are stable and that are used to evaluate attitudes and behaviors. Second, values *are not* specific to an object; they transcend situations, issues and objects, whereas attitudes are specific to a particular situation, object, or issue. Third, values are central to an individual's belief system, while attitudes are more peripheral. Fourth, values are limited in number; however, an individual may have thousands of attitudes.

Norms. Norms, like attitudes, are based on beliefs; and, also like attitudes, vary within and across individuals and situations (Vaske & Whittaker, 2004). Norms differ from attitudes; however, because they refer to what one feels is acceptable. In the area of social psychology, norms have been defined in three different ways. Social norms are group level norms that refer to what people are (descriptive norm) or ought to be

(injunctive norm) doing (Cialdini, Kallgren, & Reno, 1991; Vaske, Shelby, Graefe, & Heberlein, 1986). Personal norms are learned from shared expectations and are akin to a sense of moral obligation to either humanity and/or the environment (Schwartz, 1977). Last, subjective norms are an individual's perceptions of how others expect them to behave and their motivation to behave in accordance with those expectations (Ajzen & Fishbein, 1980).

All three types of norms (personal, social, and subjective norms) provide motivations for performing or not performing a behavior; however, for norms to be effective, they first must be salient, activated, or focused upon (Cialdini et al., 1991; Schwartz, 1977). Additionally, attitudes and norms are theorized to function at the same level in the cognitive hierarchy, as direct predictors of behavior intentions.

Behavioral Intentions and Behaviors

Behaviors are the last step in the cognitive hierarchy; they represent actions by individuals. Behaviors are the most numerous, and therefore can change often and rapidly (Eagly & Chaiken, 1993). Ajzen and Fishbein (1980) note that the majority of behaviors of social relevance are under volitional control; as a result, the direct antecedent to behavior is intention, not attitude. Social, economic and/or political impediments may exist that are outside the individuals' control that may prevent them from performing the behavior in question. In this type of situation, it makes more sense to measure behavior intention as opposed to actual behavior. For example, if one is interested in correlations between recycling attitudes and recycling behavior in an area that did not have public recycling facilities, results could be misleading if the individual was inclined to recycle but did not because of a lack of available recycling centers. For both of these reasons,

behavioral intentions have been added to the cognitive hierarchy as a precedent to actual behaviors and are often used as effective, although not perfect, predicators of actual behavior. (Vaske & Donnelly, 1999). In this study, the focus was on behavior intentions as it was not possible to measures students' onsite construction recycling behavior. Another reason for measuring behavior intentions is that it is not always possible to measure actual behavior.

Summary of Cognitive Hierarchy

In review, the importance of the the Cognitive Hierarchy to this study is (a) provision of a foundation to ground and guide this study and (b) to provide a framework for understanding the importance of value orientations to individuals' behaviors. The Cognitive Hierarchy helps to clarify that the impact of value orientations on behavior intentions is not a direct one. It is mediated by attitudes and norms, which can have a significant impact

Environmentalism and Human Cognitions

In this section, research is reviewed that ties research on human cognitions to research on environmentalism. While all of these articles reviewed here stem from social psychology, they all represent application of various portion of cognitive theory to a variety of environmental research questions with one exception, which will be discussed later. This section is broken up into three subsections, each focusing on specific elements of the cognitive hierarchy in the context of environmental behaviors: role of values and environmental value orientations, mediation effect of environmental attitudes and norms.

Role of Values and Environmental Value Orientations

Stern and Dietz (1994) hypothesized that value orientations "may affect beliefs about the consequences of attitude objects for the things an individual values and thus have consequences for that individual's attitudes and behaviors" (p.68), leading to the importance of understanding how value structures impact aspects of environmentalism. For example, if one has more concern for the health and well-being of self then they would likely be more concerned about threats to one's health than to the health of the environment. On the other hand, if an individual attaches more concern to "nature", then one would place the health of the environment above his or her own. These two examples represent two extremes. In between these two examples is the case where an individual attaches more concern to society than to nature. All of these can result in environmental behaviors, but for different reasons.

In the first case, one would be environmentally active because of the possible negative impacts of environmental changes on one's health. In the other extreme, one would be environmentally active because of concern for the environment. In the middle case, one would be environmentally active because of concern about changes in the environment on society. Thus, according to theory, there are three possible value bases for environmentalism: concern for self, concern for others, and concern for the biosphere (Stern & Dietz, 1994). These are referred to as egocentric, social-altruistic, and biospheric. It should be noted, that while a theoretical distinction is made between three possible value orientations, a consensus does not exist in the research within this area. As a result, the terms egocentric and biocentric have predominantly been used in the research

in this area to distinguish between environmental concerns resulting from concern of environmental impacts on humans versus a concern for the environment for its own sake.

Similiar definitions have also been provided by Thompson and Barton (1994), who define ecocentrism as valuing nature for its own sake, where anthropocentrism is valuing nature because of its value in maintaining (or enhancing) quality of life for humans. In the research literature on environmentalism, egocentric and anthropocentric are both used to refer to a human-centered concern for the environment, while ecocentric and biocentric are both used to refer to a non-human-centered concern for the environment.

In two related studies conducted by Thompson and Barton (1994), anthropocentrism and ecocentrism were found to correlate with environmental apathy and behavior. Specifically, in both studies anthropocentrism measures correlated positively with environmental apathy (.27 and .18) and negatively with environmental behavior (-.22 and -.09). Measures of biocentrism, on the other hand, correlated negatively with environmantal apathy (-.51 and -.61) and positively with environmental behavior (.23 and .49). In later research, Schultz and associates (Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999, 2003) found correlations between Schwartz's self-enhancement and self-transcendence value categories (Schwartz, 1994) and Thompson and Barton's (1995) ecocentric and anthropocentric environmental value orientations.

In a review of Schwartz's research on values, Schultz and Zelezny (2003) note that, relative to other countries, American respondents showed a relatively high degree of endorsement for self-enhancement values (i.e. successful, capable, independent, choosing own goals), and a relatively low degree of self-transcendent values (i.e. social justice,

responsible, loyal). Schultz and Zelezny (2003) also reviewed other related studies of environmental behavior, noting that self-reported environmental behaviors correlate positively with self-transcendent values and negatively with self-enhancement values, citing studies by Karp (1996), Nordlund and Garville, (2002), and Schultz and Zelezny, (1998). These studies suggest that Americans, on average, tend to hold more self-enhancement values and are less likely to engage in environmental behaviors when compared to other countries. To better understand why this relationship exists between self-transcendence and self-enhancement value categories and environmental behavior it is necessary to look at how they link to environmental value orientations.

In cross-cultural research conducted by Schultz and associates (Schultz, 2001; Schultz et al., 2005; 1999) Schwartz's self-enhancement and self-transcendent value categories were shown to correlate with measures of biocentric and anthropocentric basic beliefs. In their 1999 study, Schultz and Zelezny administered a four page survey to college students in 14 countries, including the United States. In total, there were 2,160 completed surveys returned. The survey instrument measured values as well as anthropocentric and biocentric environmental basic beliefs. The value items used in the survey came from Schwartz's 10 value types. Only 37 of Schwartz's 56 value items were included in the survey. Value items included in the survey were selected based on the "empirical location of each value item in regions generated from a series of smallest space analysis reported by Schwartz (1994); the four value items with the highest frequencies in each of the 10 primary regions were selected for inclusion in the survey" (p. 259). Mean responses for each value category were used in subsequent analysis. According to the researchers, reliability coefficients were not calculated for the value

items because they are considered to be universal across cultures. Fourteen items were selected from Thompson and Barton's scale to represent ecocentrism. Alpha reliabilities for the ecocentric items ranged from .80 to .60 by country, with an average alpha of .73. Anthropocentrism alpha reliabilities ranged from .81 to .64 between countries, with an average alpha of .74.

Table 1 *Correlations Between Self-Enhancement and Self-Transcendent Values and Basic Beliefs*

Value		Biocentrism			Anthropocentrism		
Category	Type	B	Beta	*t*	B	Beta	*t*
Self-Enhancement	Power	-0.03	-0.10	-3.40***	0.06	0.15	5.36***
	Achievement	-0.01	-0.02	-0.54	-0.00	-0.00	-0.16
Self-Transcendent	Universalism	0.16	0.31	11.11***	-0.01	-0.01	-0.44
	Benevolence	0.02	0.03	1.17	-0.04	-0.06	-2.13*

*p<0.05, ***p<0.001

Results from this study (Schultz & Zelezny, 1999) showed positive relationships between the self-transcendence value categories (universalism and benevolence) and ecocentrism (also referred to as biocentrism) and a negative correlation with anthropocentrism (Table 1). A negative correlation existed between both self-enhancement value categories (power and achievement) and ecocentrism. Only one of the self-enhancement value categories (power) was positively correlated with anthropocentrism. Achievement had a zero correlation with anthropocentrism. Relationships between value items and ecocentric or anthropocentric variables were small most likely due to end piling of responses to value items.

These results were later replicated in a similar cross-cultural study conducted by Schultz and associates (Schultz et al., 2005) in which surveys were administered to college students in 6 countries (none of these countries were used in the previous study). In total, 988 completed surveys were returned. The survey instrument used in this study also measured Schwartz's value items. This survey included all 56 of Schwartz's value items. The survey also contained measures of environmental concern (more properly referred to as environmental value orientation) and self-reported environmental behaviors. Egocentrism is defined as concern for the environment at a personal level; egocentrism is very similar to the term anthropocentrism used in the previous study. Biocentrism is based on concern for all species. In this study, self-enhancement value categories correlated positively with egocentrism (r = .16) and negatively with biocentrism (r = -.12). Self-transcendence values correlated negatively with egocentrism (r = -.28) and positively with biocentrism (r = .24). This study also tied values and value orientations (egocentrism and biocentrism) to self-reported environmental behaviors. Self-transcendence was positively correlated with environmental behavior, while self-enhancement tended to be negatively correlated with environmental behaviors. Egoistic value orientation was shown to correlate negatively with environmental behavior (r = -.26, $p < .001$), and biospheric value orientations correlated positively with environmental behavior (r = .21, $p < .001$). None of the studies conducted by Schultz and associates reviewed here addressed mediation effects of environmental value orientations. As a result, it is unclear if self-enhancement/self-transcendent values were direct predictors of environmental behaviors or if value orientations were a mediator in this relationship.

In addition to the previous two studies, others have also shown correlations between Schwartz's value items and measures of environmentalism. Stern and Dietz's (1994), research on value orientations showed that correlations exist between environmental value orientations, beliefs and environmental behavioral intentions. Stern and Dietz (1994) tested the relationship between Schwartz's value clusters and environmentalism using data from previous telephone interviews of residents in Fairfax County, Virginia. Participants were asked to respond to a series of questions including (a) willingness to take action to protect the environment; (b) measures of awareness of consequences of environmental changes for self- others, other nonhuman species and the biosphere; and (c) a selection of 34 value items, some coming from Rokeach's work, and others coming from Schwartz's.

Using factor analysis with oblique rotation of the 34 value items selected for this study, Stern and Dietz (1994) produced four factors which corresponded to Schwartz's four value categories. The first factor grouping corresponded with Schwartz's self-transcendence category and included the value items a world at peace, equality, social justice, and helpful. The second factor included the value items authority, social power, wealth, and influential and corresponds to Schwartz's self-enhancement category. The third factor included an exciting life, a varied life, curious, and enjoying life and corresponds to Schwartz's openness to change cluster. The fourth factor contained values such as honoring parents and elders, honest, family security, corresponding to Schwartz's traditionalism category plus one item, loyal, from the self-transcendence grouping. When participants' rankings were compared to items in Schwartz's four value clusters to the measures of environmentalism included in the survey, only the self-enhancement

(egoistic) and self-transcendence (biospheric-altruistic) value cluster were predictive, explaining 35% of the variance in behavioral intentions. The combined results from the above studies provide strong support for the inclusion of value items in models seeking to explain environmental behaviors.

Mediation Role of Attitudes

Homer and Kahle (1988) conducted one of the earlier tests of the hierarchical relationship between values → attitudes → and behaviors. Their study focused on the role of values and attitudes in predicting behaviors in the context of natural food shopping. More specifically, Homer and Kahle (1988), using a simplified List of Values (LOV), assessed the causal relationships between values, attitude toward nutrition, and natural food shopping behaviors. Their study did not incorporate the concept of value orientations as defined by Fulton et al. (1996), nor did Homer and Kahle (1988) utilize the concept of behavior intention. Instead, they identified three value categories that predicted the attitude toward nutrition and used individuals' estimates of past behaviors. Data for their study came from self-explanatory surveys handed out at supermarkets (n = 831) and natural food stores (n = 383). The survey instrument contained questions assessing attitudes and behaviors related to shopping at food stores. Respondents were also asked to rate 9 values contained in the simplified LOV using a 10 point scale. Factor analysis of the 9 values extracted three factors. The three factors identified supported the authors' theoretical distinction between internal and external locus of control and were used in the structural equation modeling conducted later in the study. The three value factors were each entered into the structural equation model separately as opposed to being combined into a single index or continuum. All three value factors were shown to

be significant predictors (p = < .05) of the attitude toward nutrition variable with standardized path coefficients of .493 (t = 3.196) for value factor 1, -.571 (t = -5.841) for value factor 2, and .334 (t = 2.533) for value factor 3. The attitude variable was also shown to be a significant predictor of past natural food shopping behaviors (ß = .560, t = 6.089, p < .001). The mediation effect of the attitude variable was assessed based on (a) the small and non-significant relationships between the three value factors and the behavior variables and (b) a goodness-of-fit statistic of .931 showing an acceptable fit of the data to the model. Results from Homer and Kahle's (1988) study provide empirical data of (a) the hierarchical relationship between values → attitudes → behavior and (b) the mediation roles of attitudes on the relationship between values and behavior.

In a similar study, Fulton et al. (1996) focused on the hierarchical relationship between value orientations → attitudes → behavior intentions. Fulton et al.'s (1996) study focused on (a) the role of wildlife value orientations as direct predictors of attitudes and (b) the mediation effect of attitudes on the relationship between value orientations and behavior intentions. Data for Fulton et al.'s study came from a stratified sample of Colorado residents living in the Front Range (n = 401), eastern portion (n = 401), and western portion (n = 400) of Colorado. Respondents were contacted by telephone and asked to participate in the survey. They were asked to respond to questions assessing (a) their basic beliefs about wildlife; (b) their attitudes toward participating in hunting, fishing, and wildlife viewing; (c) and their behavioral intentions to participate in fishing, hunting, and wildlife viewing. Thirty-five items were used to measure eight basic wildlife belief dimensions. Responses to these items were then used to identify and construct two wildlife value orientations: wildlife benefits/existence and wildlife rights/use. Four

questions were used to determine respondents' attitudes toward hunting, fishing, and wildlife viewing. Three questions were used to identify behavior intentions

Fulton et al. (1996) used two structural equation models to assess the relationship among wildlife value orientations, attitudes, and behavioral intention. One focused on hunting and fishing activities. The other focused on wildlife viewing activities. In the first model, both the wildlife benefits/existence value orientation (ß = .19, $t = 6.74$, $p < .001$) and the wildlife rights/use value orientation (ß = .64, $t = 16.60$, $p < .001$) were significant predictors of attitude toward hunting and fishing. Combined, these two wildlife value orientations explained 45% of the variance in attitude. The attitude toward hunting and fishing explained 75% of the variance in the behavior intention related to participating in hunting and fishing activities. Similar results were also found with the second model used to predict wildlife viewing behavior intention. In this model, both the wildlife benefits/existence value orientation (ß = .58, $t = 12.97$, $p < .001$) and the wildlife rights/use value orientation (ß = -.14, $t = -4.00$, $p < .001$) were significant predictors of attitude toward wildlife viewing, explaining 36% of the variance in attitude. This attitude explained 27% of variance in the behavior intention related to wildlife viewing. Mediation tests were conducted on both models and in both cases attitudes were shown to fully mediate the relationship between wildlife value orientations and behavior intentions. Fulton et al.'s (1996) study provides empirical support for the hierarchical relationship between value orientations → attitudes → behavior intentions.

Vaske and Donnelly (1999) also tested the relationship between value orientations, attitudes and behavior intentions as set forth in the cognitive hierarchy. The context of their study was wildland preservation voting intentions. The purpose of their

study was to provide additional support for the value → attitude → behavior portion of the cognitive hierarchy as it pertained to natural resource management, similiar to Fulton et al. (1996). Data for this study came from a random sample (n = 960) of Colorado residents. Study participants were asked to fill out a detailed survey about their environmental basic beliefs, their attitudes toward wildland preservation, and their wildland preservation voting intentions. From these responses, biocentric/anthropocentric value orientation index, attitude, and voting intention variables were constructed. Relationships between these variables were tested using structural equation modeling.

Structural equation modeling results showed that the biocentric/anthropocentric value orientation was a significant predictor of wildland preservation attitude (ß = .73, p < .001) explaining 53% of the variance in the attitude variable. Additionally, wildland preservation attitude was a significant predictor of wildland preservation voting intentions (ß = .94, p < .001) explaining 88% of the variance in the behavior intention variable. Further, full mediation of the attitude variable on the relationship between the value orientation and behavior intentions variables was supported by path coefficients and chi-square statistics.

Based on the results, (Vaske & Donnelly, 1999) concluded that the wildland preservation attitude fully mediated the relationship between wildland preservation voting intention and the biocentric/anthroprocentic value orientation. Their results were similiar to previous emperical research conducted by Fulton et al. (1996) and Homer and Kahle (1998). Vaske and Donnelly (1999) noted that similiar findings are likely to emerge for other natural resource-related issues, which would include conservation practices (i.e. construction waste recycling). They further acknowledge that they did not

incorporate all components typically described in the cognitive hierarchy. In their study, they focused strictly on value orientations and did not consider the influence of values in the formation of value orientations. "Exploring the role of values as well as value orientations on respondents' attitudes, behavioral intentions, and actual behaviors would further understanding of these relationships" (Vaske & Donnelly, 1999, p. 543). In addition, they noted that their study did not include norms, which are included in cognitive hierarchy theory, citing the need for additional research in this area.

Combined, these three studies reviewed above provide empirical support for cognitive theory with respect to values, value orientations, attitudes, and behavior intentions or behaviors. None of these, however, have incorporated both values and value orientations into one model as theorized in the cognitive hierarchy, nor the theorized mediation role of value orientations on the relationship between values and higher order cognitions. Additionally, the role of norms within the context of the cognitive hierarchy has received little attention as presented in the following section.

Mediation Role of Norms

While the studies reviewed thus far in this literature review have provided both theoretical and empirical support for the values, value orientation, attitude, behavior intentions, and behavior components of the cognitive hierarchy, few have assessed the role of norms within the cognitive hierarchy. The following three studies all address the role of norms in predicting behavior intentions and actual behaviors as a function of norms. One addresses the role of subjective norms (Teo & Loosemore, 2001), another the role of personal norms (Nordlund & Garvill, 2002), while the last one incorporates both subjective and personal norms (Oom Do Valle, Rebelo, Reis, & Menezes, 2005) in

determination of environmental behaviors. Two of these studies (Nordlund & Garvill, 2002; Oom Do Valle et al., 2005) incorporate other variables that are not generally considered within the cognitive hierarchy. These variables are presented here to provide a complete picture of the cognitive models used in each of the studies, but they are not discussed in detail.

Teo and Loosemore's (2001) Australian study on construction waste management, which was reviewed in the first half of this literature review, addressed the importance of subjective norms in determining construction waste recycling behaviors. Teo and Loosemore (2001) did not provide any empirical data to support their conclusions, nor did they address the role of either values or value orientations in determinations of individuals' attitudes and norms. The results from their study, however, do provide support for inclusion of subjective norms in the study of construction waste recycling behaviors.

Nordlund and Garvill (2002) assessed the hierarchical relationship between values, value orientations, attitude, problem awareness and personal norms in determining proenvironmental behavior. Proenvironmental behaviors included in Nordlund and Garvill's study were self reported (a) recycling/reuse, (b) environmentally responsible consumption, (c) energy conservation, and (d) transportation behavior. Data for this study came from a mailed-back survey of residents in Umea, Sweden. Of the 2,500 surveys mailed out, 56% (n = 1,429) were returned. In their study (Nordlund & Garvill, 2002), personal norms were shown to be a significant direct predictor of proenvironmental behavior. The path coefficient for this relationship was .46. Additionally, personal norm was shown to fully mediate the relationship between all

other model variables (values, value orientations, attitudes and problem awareness) and behavior based on a goodness-of-fit index (GFI) of .99 and a root mean square error of approximation (RMESA) of .95 for the model used. The results of Nordlund and Garvill's (2002) study provide empirical support for the role of personal norms in determining proenvironmental behavior and as mediating between lower order cognitions and behaviors as proposed by cognitive theory.

Oom Do Valle et al.'s (2005) study on determinants of recycling behavior incorporates both subjective and personal norms. According to the researchers subjective norms are important determinants of personal norms, which are strong predictors of recycling behavior. Data for this study came from personal interviews, based on a structured questionnaire, of 2,093 households in various Portuguese municipalities. Oom Do Valle et al. (2005) included a total of nine latent variables in their model for predicting recycling behaviors. These included: personal values, environmental value orientations, attitude toward recycling, perceived behavior control (calculated from communication, specific knowledge, and perceived convenience variables), and norms (including both subjective and personal norms). Combined, these variables explained 72% of variance in recycling behavior. Of these variables, perceived behavior control was the strongest direct predictor of recycling behavior. The only two other direct predictors were the subjective and personal norms, with personal norms mediating the relationship between subjective norms and recycling behavior. Results from this study provide additional support to inclusion of norms within a full model as proposed by the cognitive hierarchy. Additionally, Oom Do Valle et al.'s (2005) study provides evidence that norms play a significant role in determination of recycling behavior and that this

impact starts with individuals' subjective norms, which influence the development of their personal norms pertaining to recycling behaviors. Based on these results, Oom Do Valle et al (2005) concluded that higher standards of recycling involvement can be found [in] households where members possess stronger subjective norms related to recycling.

The above studies provide support, both theoretical and empirical, for the incorporation of subjective norms into a cognitive hierarchy model to predict participation in environmental behaviors (i.e. construction waste recycling). As a side note, two of these studies (Nordlund & Garvill, 2002; Oom Do Valle et al., 2005) incorporated both values and value orientations into their models. Neither, however, addressed mediation role of value orientation. Oom Do Valle et al. (2005) did depict value orientations as mediating between values and attitudes, but not between values and norms; however, they neither addressed this mediation assumption nor provided data in its support.

Summary

This literature review provides support for the assumptions underlying the present study. First, self-enhancement and self-transcendent values, as identified by Schwartz, have been shown to correlate with environmental value orientations and behaviors. It is not clear, however, if self-enhancement and self-transcendent values are direct predictors of environmental behavior intentions, or if this relationship is mediated by value orientations as suggested in cognitive theory. Additionally, the studies reviewed here provide clear empirical support for the hierarchical relationship between values→attitudes→behaviors. In other studies, subjective and personal norms have been shown to be predictors of environmental behavior and in some cases mediating the

relationship between other cognitions (including attitudes) and behaviors. This mediation effect of norms is only partially consistent with cognitive theory, which predicts that norms and attitudes act at the same level within the cognitive hierarchy. In the context of this study, subjective norms are of the most interest due the newness of waste management practices in the construction industry. Finally, each of the studies reviewed here provide partial support for the cognitive hierarchy theory, but none have tested the complete hierarchy within the context of a single study.

Chapter 3: Methodology

Cognitive hierarchy theory suggests that causal linkages exist between higher and lower order cognitions. Based on this theory, it is assumed that values influence values orientations, which in turn influence attitudes and norms, which influence behavior intentions. Research supporting application of these assumptions has linked environmental concern (an environmental attitude) and behaviors to individuals' values and environmental value orientations (Dietz, Fitzgerald, & Shwom, 2005; Schultz, 2001; Schultz et al., 2005; Stern & Dietz, 1994). Most research only addresses the impact of attitudes on behavior intentions. The mediation role of norms in the cognitive hierarchy has received little attention. Those studies that do focus on normative influence on behaviors do not place norms within the framework of the cognitive hierarchy. Cognitive theory, however, postulates that both attitudes and norms should mediate the relationship between value orientations and behavior intentions. This study seeks to test the role of norms within the cognitive hierarchy structure. More specifically, this study examines the causal linkages between values, environmental value orientations, attitudes, subjective norms and behavior intentions. The behavior focused on for this study was volunteering to set up a construction waste recycling program.

Based on the theoretical underpinnings presented in the literature review, the research question guiding this study was: What role does construction management students' values, environmental value orientations, attitudes, and subjective norms play in

determining their waste recycling behavior intentions? The remainder of this chapter outlines the research design, development of the survey instrument used in this study and results from the pilot study.

Research Design

Data for this study comes from a survey of construction management students enrolled in the Department of Construction Management (CM) at Colorado State University (CSU). For the Fall 2006 semester, there was a combined total of 975 students enrolled in both the undergraduate (n = 917) and graduate (n = 58) construction management programs at Colorado State University. The CSU Construction Management Program is the largest in the country. This program was chosen for this study due to its national reputation for incorporating sustainability concepts into its overall curriculum, increasing the possibility that students surveyed have had a chance to form attitudes about issues related to sustainable construction such as Construction Waste Recycling.

Participants were recruited based on their enrollment is courses selected for this study. Courses were chosen to represent the full diversity of students enrolled in the Construction Management program at CSU, in which 8% of undergraduate and 17% of graduate students were female. The percentage of female construction management majors enrolled in courses selected for this study was 8%. This was reflective of both the overall female enrollment in construction management at Colorado State University (8%) and to the national average (10%). As expected, males make up the majority (92%) of combined undergraduate (n = 848) and graduate (n = 48) enrollments. Of the 975 students enrolled in the undergraduate and graduate construction management programs

at CSU, 17% were freshmen (n = 166), 18% were sophomores (n = 174), 24% were juniors (n = 233), 35% were seniors (n = 343), and 6% were graduate students (n = 58). The ethnic background of the majority (88%) of students was white (n = 861). The remaining 12% were Native American (n = 13), Black (n = 5), Asian American, (n = 19), Hispanic (n = 40), and International (n = 5). The ethnic background for 32 students was listed as 'other'. All enrollment data were for the Fall 2006 semester as provided on Colorado State University's Office of Budgets and Institutional Analysis website ("Office of Budges and Institutional Analysis: Enrollment Data Fall 2006, 2006).

Participants

The five courses used for this study were (a) MC 151: Material and Methods, (b) MC 364: Advance Construction Systems, (c) MC 365: Construction Cost Estimating, (d) MC 465: Construction Management Professional Practice and (e) MC 562: Issues and Trends in Construction Management. All were required courses for construction management students at either the undergraduate or graduate level. MC 151, MC 364, MC 365, and MC 465 were required at the undergraduate level and MC 562 was required at the graduate level. The goal was to select courses (a) whose combined enrollments would be reflective of overall enrollment for the program, and (b) to minimize the possibility that students would be enrolled in more than one course used in this study.

Total enrollment for the courses selected was 577, representing 59% of the total undergraduate and graduate construction management majors. Combined course enrollments of courses selected for this study were comparable to the total enrollment for the department. The majority (84%) of students enrolled in the selected courses were male (n = 486) construction management majors (87%, n = 502). Grades represented by

the sample were as follows: 21% were freshmen (n = 123), 16% were sophomores (n = 93), 23% were juniors (n = 130), 32% were seniors (n = 184), and 5% were graduate students (n = 29). In total, 17 students did not have a major listed. Course enrollment information for each individual class is provided below.

MC 151: Construction Materials and Methods introduced students to construction materials common to most construction projects (i.e. concrete, masonry, wood, steel, etc.). In response to the growth of green building, an overview of sustainability and its implications for building construction professionals such as the recycling of building materials and their subsequent re-use in future construction is given.

Table 2 *Demographics of Students in MC 151: Construction Materials and Methods*

	Sex		Major			Class				Total Enrollment
Section	Male	Female	CM	ID	Other	Fresh	Soph	Jr	Other	
Sec. 1	47	14	43	11	7	28	16	12	5	61
Sec. 2	50	11	48	9	4	34	15	11	1	61
Sec. 3	51	10	48	8	5	32	16	12	1	61
Sec. 4	46	17	45	12	6	29	21	10	3	63

Note: Demographic information based on class rosters dated September 20, 2006.

Fall 2006 enrollment for all sections of MC 151 was 246 students. Demographics for MC 151 are shown in Table 2. Of the total number of students enrolled in the course 21% were female, 6% percent were sophomores, 40% were juniors, 50% were seniors, 3% were graduate students, and less than 2% fall in the other category for class (both were seeking their second bachelor's degree). Three fourths of the students enrolled in the course were construction management majors (75%). Interior design students make

up 16% of the course enrollment and represent the majority of females enrolled in the course; of the 52 females enrolled in the course, only 12 (23%) were construction management majors. The remaining quarter of majors represented were comprised of finance and/or real estate (n = 7), business administration (n = 4), civil engineering (n = 2), landscape horticulture (n = 2), marketing (n = 1), liberal arts (n = 1), agricultural education (n = 1), equine science (n = 1), psychology (n = 1), and two guests who did not indicate a major.

MC 364: Advanced Construction Systems teaches students about advanced building systems used in building construction. This course builds directly on MC 151 by going into more detail on commercial construction field procedures such as sitework, foundations, concrete, steel, wood, enclosures, and finishes.

Table 3 *Demographics of Students in MC 364: Advanced Construction Systems*

Section	Sex		Major		Class			Total Enrollment
	Male	Female	CM	Other	Soph	Jr	Sr	
Sec. 1	51	8	57	2	8	26	24	59
Sec. 3	32	4	33	3	10	14	12	36

Note: Demographic information was based on class enrollment as of October 17, 2006.

Fall 2006 enrollment for all sections of MC 364 was 95 students. Demographics of MC 364 are shown in Table 3. Of total enrollment for this course, 13% were females, 19% were sophomores, 42% were juniors, and 38% were seniors. Almost all students enrolled in this course were construction management majors (95%). The remaining five

majors represented were interior design (n = 1), landscape horticulture (n = 1), civil engineering (n = 1), real estate (n = 1), and management (n = 1).

MC 365: Construction Cost Estimating prepares students for creating estimates for proposed construction projects. According to Means Cost Data (2006) 10 – 15% of the construction estimate relates to general conditions, which stipulates the owner's requirements pertaining to management of the construction project. Examples of general requirements include how payment requests are submitted and processed, project schedule requirements, and special items such as construction waste recycling. With the growth of green building, more owners are making construction waste recycling a job requirement through the general conditions, increasing the importance for construction management students to have a working knowledge of construction waste recycling programs prior to producing cost estimates for CWR programs.

Table 4 *Demographics of Students in MC 365: Construction Cost Estimating*

Section	Sex		Major		Class					Total Enrollment
	Male	Female	CM	Other	Soph	Jr	Sr	Master	Other	
Sec. 1	37	2	35	4	0	9	27	1	2	39
Sec. 2	37	3	38	2	1	18	19	2	0	40
Sec. 3	31	3	32	2	6	18	10	0	0	34

Note: Demographic information was based on class rosters dated August 18, 2006.

Fall 2006 enrollment for all sections of MC 365 was 113 students (Table 4). Of the total number of students enrolled in the course 7% were female, 6% were sophomores, 40% were juniors, 50% were seniors, 3% were graduate students, and less

than 2% fall in the other category for class (both were seeking their second bachelor degree). The majority of students enrolled in the course were construction management majors (93%). The remaining 7% was comprised of liberal arts majors (n = 2), finance-real estate majors (n = 2), landscape horticulture majors (n = 2), one management major, and one human development & family studies major.

MC 465: Construction Management Professional Practice was the senior capstone course for the construction management program. In this course, students were required to apply information learned in previous courses to class projects. Total enrollment for all sections of this course was 95 (Table 5). Females represent 14% of the total class enrollment. Since this was the capstone course for the undergraduate construction management degree, all students enrolled in this course were construction management majors and the majority was seniors (97%). Of the 3 students listed under Other for class, one was a graduate student and two were finishing their second bachelor degree.

Table 5 *Demographics of Students in MC 465: Construction Management Professional Practice*

Section	Sex		Class		Total Enrollment
	Male	Female	Senior	Other	
Sec. 1	15	2	16	1	17
Sec. 2	18	2	18	2	20
Sec. 3	18	3	21	0	21
Sec. 4	14	5	19	0	19
Sec. 5	17	1	18	0	18

Note: Demographic information was based on class enrollment as of October 17, 2006.

MC 562: Issues and Trends in Construction Management addresses current issues related to construction management, of which green building was a significant trend (Nobe & Dunbar, 2004). Total enrollment for Fall 2006 was 28 (Table 6). Of total enrollment for this course, 21% were female and 89% were construction majors. Majors for three students were unknown; however, because of the course content, it was assumed that these three students were also construction majors.

Table 6 *Demographics of Students in MC 562: Issues and Trends in Construction Management*

	Sex		Major		
	Male	Female	Masters	Other	Total Enrollment
Section 1	22	6	25	3	28

Note: Demographic information was based on class rosters dated August 18 2006.

Total, for the Fall 2006 semester, there were 577 student enrolled in the five courses included in this study, representing 59% of the total enrollment for the Department of Construction Management. These students were reflective of the overall demographics for the department and construction management students nation wide.

Study Design

In each course section, a 20-25 minute presentation about construction waste recycling was presented by the researcher. This presentation defined construction waste recycling and what is needed to have a successful CWR program on any construction site. The purpose of the presentation was to inform participants, not to convince them that they should or should not support construction waste recycling programs. Power point slides used in this presentation are provided in Appendix A.

At the conclusion of the presentation, students were recruited to participate in the study. In the recruitment, students were asked to voluntarily fill out the survey. They were assured that their responses would be completely anonymous and that their grade in the course would not be impacted by their choice to participate or not participate. During this time, students were also recruited to participate in a follow-up group discussion or individual interviews designed to solicit information about their interpretation of the survey instrument. Those willing to participate in the interviews were asked to provide their name and phone number on a sign-up sheet. Again, students were assured that their participation would not impact their course grade in any way. Additionally, of those that volunteer, only 10-15 would be contacted for interviews. Selection of interviewees would be completely random.

After handing out the surveys, class was dismissed. All surveys (completed and not completed) were turned into a box located at the front of the classroom. As students left, they were provided with a debriefing handout that also invited them to attend the group discussion session or to volunteer to be interviewed. A signup sheet for the interviews was located near where the students exit the room and were handed the debriefing flyer.

Instrument

The survey instrument used for this study was designed specifically for the purpose of analyzing components of the construction management students' cognitive hierarchy in the context of construction waste recycling. Questions on the survey measure self-enhancement/self-transcendence values; environmental value orientation; CWR

outcome beliefs and outcome evaluations; CWR normative beliefs and motivations to comply; and CWR behavior intentions; as well as basic demographics. Table 7 cross references each variable with the hypothesis it was used to test. Table 7 also ties each variable in this study to the specific questions on the survey used to measure the variable or variable components. All of the variables in this study were latent scaled variables.

Table 7 *Variables, Research Questions and Items on Survey Instrument*

Variable Name	Hypothesis	Item on Survey
Self-Enhancement and Self-Transcendence Values	H_1, H_4	See question 1: Rating of Schwartz's value items comprising self-transcendence and self-enhancement value categories.
Environmental Value Orientation	H_1, H_2, H_3, H_5	See Question 2: Environmental basic beliefs.
Construction Waste Recycling Attitude	H_2, H_3, H_4, H_5	See Question 3: Overall attitude toward construction waste recycling.
		See Questions 4 and 5: General outcome beliefs and evaluations used to calculate attitude.
		See Questions 7 and 8: Attitude toward advocating and volunteering.
		See Questions 9 and 10: Outcome beliefs and evaluations tied to advocating and volunteering behaviors.
Construction Waste Subjective Norm	H_2, H_3, H_4, H_5	See Questions 11, 12, 13 and 14: Subjective norms about advocating, volunteering, and voting.
		See Questions 15 and 16: Normative beliefs and motivation to comply with referents for advocating and volunteering.
Behavior Intention	H_3, H_5	See Question 6: individual's behavior intention with respect to construction waste recycling.

A pilot test was conducted with construction management students enrolled in the construction management department at Washington State University. Results from this

pilot study were used to refine questions and organization of the survey instrument. A copy of the revised survey instrument is provided in Appendix B. The following outline of the survey instrument content reflects changes made based on the pilot results.

Variables

Values. Initially, 26 of Schwartz's 56 value items were included in the survey. These 26 items represent all of the items identified by Schwartz as representing the self-enhancement and self-transcendence value categories. For each item, participants were asked to rate the importance of each value item as a guiding principle in their life using a 7-point scale ranging from low importance (1) to high importance (7). Pilot results showed very little variance among the 26 value items included due to end-pilling (mean scores ranged from 4.72 to 6.67; std. dev. ranged from 0.57 to 1.45, $n = 43$). In an effort to reduce end-pilling, a most-least rating procedure was adopted for the value items (McCarthy & Shrum, 2000). This survey method of determining value rankings combines ranking and rating responses. First, participants were asked to scan the value items and identify the one item that is most important to them and assign it the highest possible rating (7). Next, they were asked to rescan the value items to identify the value that is least important to them and to assign it the lowest possible rating (1). Last, they were asked to assign ratings to all remaining values using the scale provided (1 = low importance, 4 = medium importance, and 7 = high importance). The purpose of this procedure is to force respondents to rank their most important and least important values using the full range of the scale to make salient to them the differences between the rankings for their most important and lest important values. To facilitate the use of the most-least rating procedure, the list of value items was reduced from 26 to 16 based on

Schultz and Zelezny's (1999) cross cultural study correlating Schwartz's value categories with biocentric and anthropocentric basic beliefs (Table 8).

Environmental value orientations. The environmental value orientation used in this study was the anthropocentric/biocentric value orientation previously identified by Vaske and associates (Vaske & Donnelly, 1999; Vaske et al., 2001). Measures of environmental value orientations were based on responses to a series of 12 environmental beliefs. Of these twelve basic beliefs, five were anthropocentric: (a) the primary value of forests is to generate money and economic self-reliance for communities; (b) the primary value of forests is to provide timber, and grazing land for people who depend on them for their way of life; (c) forests are valuable only if they produce jobs and income for people; (d) nature's primary value is to provide products useful to people; (e) the value of forests exists only in the human mind; without people forests have no value.

The remaining seven basic belief statements represent biocentric views: (f) forests have as much right to exist as people; (g) nature has as much right to exist as people; (h) wildlife, plants, and people have equal rights to live and develop; (i) forests have value, whether people are present or not; (j) forests should be preserved so that future generations can enjoy them; (k) the opportunity for spiritual renewal is the most important value of forests; (l) the opportunity for spiritual renewal is the most important value of nature. For both sets of basic belief statements, respondents were asked to indicate their level of agreement or disagreement with each of the anthropocentric statements using a 7-point Likert scale ranging from *strongly agree* (1) to *strongly disagree* (7).

Table 8 *Schwartz's Value Items Included in Survey Instrument*

Value Type	Self-Transcendent	Self-Enhancement	Included in Survey
Universalism			
PROTECTING THE ENVIRONMENT	✓		✓
A WORLD OF BEAUTY (beauty of nature & arts)	✓		✓
UNITY WITH NATURE (fitting into nature)	✓		✓
BROAD-MINDED (tolerant of ideas and beliefs)	✓		✓
SOCIAL JUSTICE (correcting injustice)	✓		
WISDOM (a mature understanding of life)	✓		
EQUALITY	✓		
A WORLD AT PEACE (free of war and conflict)	✓		
INNER HARMONY			
Benevolence			
HELPFUL (working for the welfare of others)	✓		✓
HONEST (genuine, sincere)	✓		✓
FORGIVING (willing to pardon others)	✓		✓
LOYAL (faithful to my friends, group)	✓		✓
RESPONSIBLE (dependable, reliable)	✓		
TRUE FRIENDSHIP (close companionship)	✓		
A SPIRITUAL LIFE	✓		
MATURE LOVE (sexual and spiritual intimacy)	✓		
MEANING IN LIFE	✓		
Power			
SOCIAL POWER (control over others)		✓	✓
AUTHORITY (the right to lead or command)		✓	✓
WEALTH (material possession, money)		✓	✓
PRESERVING MY PUBLIC IMAGE (saving face)		✓	✓
SOCIAL RECOGNITION (respect, admiration)		✓	
Achievement			
SUCCESSFUL (achieving goals)		✓	✓
CAPABLE (competent, effective)		✓	✓
AMBITIOUS (hard-working, aspiring)		✓	✓
INFLUENTIAL (having an impact)		✓	✓
INTELLIGENCE (logical, thinking)		✓	
SELF-RESPECT (self-esteem)		✓	

Construction waste recycling attitude. The survey instrument included several attitude measures pertaining to different aspects of construction waste recycling. Only the attitude measures used in this study are presented here. For this study, measures of participant's attitudes toward volunteering to set up a construction waste recycling

program were of the most interest. Attitude measures were based on responses to four scales pertaining to volunteering to set up a construction waste recycling (CWR) program. Respondents were asked to respond based on the hypothetical assumption that they were starting a new job in the near future. Participants were asked to indicate their evaluation of volunteering to set up a CWR program by using the following scales: (a) 'bad/good', (b) 'foolish/wise', (c) 'harmful/beneficial to the environment', and (d) 'personally punishing/rewarding.' A seven point scale ranging from -3 to +3 was used with each scale. For example the bad/good scale included *extremely bad, quite bad, slightly bad, neither, slightly good, quite good,* and *extremely good.* Similar format and wording were used for each of the three remaining scales.

Subjective norms. As with the attitude variable, the survey also contained several measures of subjective norms related to construction waste recycling. Only the subjective norm related to volunteering to set up a CWR program will be discussed here. Construction waste recycling is a relatively new concept in construction management education and is not widely addressed in construction management courses. As a result, students were likely to have limited knowledge about construction waste recycling. According to Ajzen and Fishbein (1980), when participant knowledge about a particular subject is limited, or not well formed, it is likely that their subjective norms become more important in determining their behaviors. One question was used to directly measure students' subjective norm related to CWR: Most people who are important to me think I should volunteer to set up construction waste recycling programs on all projects that I work on. Participants were asked to indicate their level of agreement with this statement using a seven point scale ranging from *extremely unlikely* (-3) to *extremely likely* (+3).

Behavioral intentions. Behavioral intentions were identified through the use of six statements reflecting increasing levels of support for construction waste recycling. Behavioral intention statements were placed into a job site context by asking respondents to assume that they were 'starting a new construction job today'. These six behavior intentions included: (a) I intend to verbally support construction waste recycling program efforts (i.e., reminding people that they should recycle construction materials); (b) I intend to support construction waste recycling efforts through my actions (i.e. picking up materials that have been discarded and placing them in the appropriate recycle bin); (c) I intend to go out of my way to insure that all materials that can be recycled are being recycled; (d) I intend to volunteer to organize an on-site construction waste recycling program; (e) I intend to be a strong advocate for construction waste recycling programs; and (f) If given the chance, I would vote for mandatory construction waste recycling programs. Participants were asked to indicate the likelihood that they would engage in the listed behavior using a 7 point scale ranging from *extremely unlikely* (-3) to *extremely likely* (+3).

Student's perceived level knowledge of CWR. Although the construction management department at CSU has been recognized for its incorporation of sustainability concepts into course curricula, CWR is still a relatively new concept and it is likely that many students have only limited knowledge about CWR programs. Since this could impact the relationship between their attitudes, subjective norms, and behavior intentions, students were asked to indicate their level of knowledge about CWR by using a scale ranging from *thorough* (7) to *not at all* (1).

Demographic questions. Demographic variables included in the survey are: sex, age, major, construction work experience, and urbanisity. These variables have been included to facilitate future comparison of this study's results with other studies related to environmental behavior.

Model Variables

Variables used to test the hypotheses of this study were value index, value orientation index, construction waste recycling attitude and subjective norm, and construction waste recycling behavior intention. Both of the higher order cognitions (attitude and subjective norm) and behavior intention were focused on volunteering to setup a construction waste recycling program. In the following sections, methods for obtaining these variables from the survey data are presented. SPSS 14.0 statistical package was used for construction and analysis of all variables. Syntax used for creation of the model variables is included in Appendix E.

Self-Enhancement / Self-Transcendence Value Index

The self-enhancement/self-transcendence value index (referred to as the value index) was constructed from the self-enhancement and self-transcendence value items. The self-enhancement value items consisted of (a) ambitious, (b) authority, (c) capable, (d) influential, (e) preserving my public image, (f) social power, (g) successful and (h) wealth. The self-transcendence value items consisted of (i) forgiving, (j) helpful, (k) honest, (l) a world of beauty, (m) protecting the environment, (n) unity with nature, (o) loyal, and (p) broad-minded.

For these survey items, respondents were asked to first identify the value that was most important to them as a guiding principle in their life and assign it a score of 7 for highest importance. Next, they were asked to identify the value that was least important to them as a guiding principle and assign it a value of 1 for least importance. Last, they were asked to rate the remaining values on a scale ranging from *low importance* (1) to *high importance* (7). Individual high and low ratings were not used for any further analysis.

Internal consistencies of the self-enhancement and self-transcendence value items were examined using Cronbach's alpha reliability coefficients (Table 9). The self-enhancement value items had a reliability coefficient of 0.78 and the self-transcendence value items had a reliability coefficient of 0.76. In both cases, deleting any of the value items did not increase the alpha, so all value items were used in the construction of the Value Index. Prior to constructing the scale, the self-enhancement value items were reverse coded. The Value Index was then constructed by taking the mean of all responses to the value item questions.

Anthropocentric / Biocentric Environmental Value Orientation Index

The anthropocentric/biocentric environmental value orientation index (referred to as the value orientation) was constructed using the same method used for the value index. The five variables measuring anthropocentric basic belief were: (a) the primary value of forests is to generate money and economic self-reliance for communities; (b) the primary value of forests is to provide timber, and grazing land for people who depend on them for their way of life; (c) forests are valuable only if they produce jobs and income for people;

(d) nature's primary value is to provide products useful to people; (e) the value of forests exists only in the human mind; without people, forests have no value.

Table 9 *Reliability Analyses of Value Items*

	Item Total Correlation	Alpha if Item Deleted	Cronbach Alpha
Self-Enhancement[a]			.78
Ambitious	.37	.76	
Authority	.58	.74	
Capable	.42	.77	
Influential	.51	.75	
Preserving My Public Image	.58	.74	
Social Power	.58	.74	
Successful	.48	.76	
Wealth	.43	.77	
Self-Transcendence[b]			.76
Forgiving	.44	.74	
Helpful	.55	.72	
Honest	.37	.75	
A World of Beauty	.51	.73	
Protecting the Environment	.57	.72	
Unity with Nature	.53	.73	
Loyal	.34	.76	
Broad-Minded	.41	.75	

[a] There were 412 usable surveys for the self-enhancement value items.
[b] There were 409 usable surveys for the self-transcendence value items.

The seven variables measuring biocentric basic beliefs were: (f) forests have as much right to exist as people; (g) nature has as much right to exist as people; (h) wildlife, plants and people have equal rights to live and develop; (i) forests have value, whether people are present of not; (j) forests should be preserved so that future generations can enjoy them; (k) the opportunity for spiritual renewal is the most important value of forests; (l) the opportunity for spiritual renewal is the most important value of nature.

For both the anthropocentric and biocentric basic belief statements, respondents were asked to indicate their level of agreement with the statement. Response options ranged from *strongly agree* (1) to *strongly disagree* (7). These items were then reverse coded so that response options were in the same direction as the value items.

Internal consistencies of the anthropocentric and biocentric basic beliefs were examined using Cronbach's alpha reliability coefficients (Table 10). For the anthropocentric basic beliefs, the reliability coefficient was 0.72. As indicated in Table 10, deleting item *e* increased Cronbach's alpha to 0.74. The remaining belief statements were reverse coded prior to constructing value orientation. For the biocentric basic beliefs, the reliability coefficient was 0.83. Since deleting any of the belief items from the biocentric group did not increase alpha, all of the biocentric belief items were used in construction of the value orientation. Construction of the value orientation was based on mean responses to the basic belief statements.

Attitudes

An attitude scale was created for volunteering to setup a construction waste recycling (CWR) program. Participants were asked to indicate their evaluation of volunteering to set up a CWR program by using the following scales: (a) 'bad/good', (b) 'foolish/wise', (c) 'harmful/beneficial to the environment', and (d) 'personally punishing/rewarding.' The reliability coefficient for items included in the volunteering attitude was 0.85. Since excluding any of the variables did not increase alpha, all four items were used to construct the attitude by summing all four responses (Table 11).

Table 10 *Reliability Analyses of Basic Belief Statements.*

	Item Total Correlation	Alpha if Item Deleted	Cronbach Alpha
Anthropocentric Basic Beliefs[a]			.72
The primary value of forests is to generate money and economic self-reliance for communities.	.56	.64	
The primary value of forests is to provide timber, and grazing land for people who depend on them for their way of life.	.40	.70	
Forests are valuable only if they produce jobs and income for people.	.59	.64	
Nature's primary value is to provide products useful to people.	.56	.64	
The value of forests exists only in the human mind.	.32	.74	
Biocentric Basic Beliefs[b]			.83
Forests have as much right to live as humans.	.70	.79	
Nature has as much right to exist as people.	.71	.79	
Wildlife, plants and people have equal rights to live and develop.	.66	.79	
Forests have value, whether people are present or not.	.53	.82	
Forests should be preserved so that future generations can enjoy them.	.45	.83	
The opportunity for spiritual renewal is the most important value of forests.	.51	.82	
The opportunity for spiritual renewal is the most important value of nature.	.51	.82	

[a] There were 434 usable surveys for the anthropocentric basic beliefs.

[b] There were 429 usable surveys for the biocentric basic beliefs.

Table 11 *Reliability Analyses of Volunteering Attitude*

	Item Total Correlation	Alpha if Item Deleted	Cronbach Alpha
Volunteering Attitude[a]			.85
Volunteering to setup a construction waste recycling program is bad/good.	.77	.76	
Volunteering to setup a construction waste recycling program is foolish/wise.	.75	.77	
Volunteering to setup a construction waste recycling program is harmful/beneficial to the environment.	.59	.85	
Volunteering to setup a construction waste recycling program is personally punishing/rewarding.	.66	.82	

[a] There were 426 usable surveys for the volunteering attitude.

Subjective Norm

One item on the survey was used to measure individuals' subjective norm for volunteering to setup a CWR program: Most people who are important to me think I should volunteer to setup construction waste recycling programs on all projects that I work on. Respondents were asked to indicate their agreement with the normative statement using a scale ranging from *extremely unlikely* (-3) to *extremely likely* (3).

Behavior Intention

The behavior intention for volunteering to setup a CWR program came from a single survey item: I intend to volunteer to organize an on-site construction waste recycling program. Response options ranged from *extremely unlikely* (-3) to *extremely likely* (3) with a *neutral* option (0) in the middle.

Prior to analysis of the hypothesis, correlations between model variables were compared to check for possible collinearity between variables (Table 12). According to

Allison (1999), if correlations between variables are below .60 collinearity likely does not exist in the data set. Since all of the correlations between model variables are below .60, it is assumed that collinearity between variables does not exist.

Table 12 *Correlations Between Model Variables*

	Vol. Attitude	Vol. Subjective Norm	Vol. Behavior Intention	Anthro/ BioV.O. Index	S-E/S-T Value Index
Vol. Attitude	1				
Vol. Subjective Norm	.49	1			
Vol. Behavior Intention	.52	.54	1		
Anthro/ Bio V.O. Index	.34	.32	.26	1	
S-E/S-T Value Index	.33	.24	.26	.35	1

Note: For all comparisons, N was > 400. All relationships were significant the $p < .01$ level.

Measurement Validity

Content and construct validity were enhanced by grounding the study in accepted terms and definitions of social psychology relevant to the understanding of environmental behaviors. Further, previously developed and tested measures were used for components of the value index and the environmental value orientation. Measures of attitude, subjective norms and behavior intention were based on published recommendations that have also been widely used in similar survey instrument designs (Ajzen & Fishbein, 1980).

Data Analysis

Hypotheses were analyzed using path analysis, which is a "multivariate analysis in which causal reliabilities among several variables are represented by figures showing the paths among them" (Gliner & Morgan, 2000, p. 207). Paths between variables were tested using ordinary least squares (OLS) linear regressions. Results from the regression analysis were reported using standardized beta coefficients, R and R^2 values, *t*-test values, significance levels, and effect sizes. Effect sizes were reported using the coefficient correlation *r* as recommended by Gliner & Morgan (2000). Cronbach's alpha was used to access reliabilities for survey items used to measure similar concepts and to construct model variables. These included the self-enhancement and self-transcendence value items, the anthropocentric and biocentric basic beliefs, and the attitude questions. SPSS 14.0 was used for all statistical analysis. Results from sub populations of students (i.e. sex, construction work experience) were used for exploratory purpose only, since there was very little diversity within the courses used in this study.

Assessment

Feasibility and Ethical Issues

Course instructors for all courses included in this study have given their permission for this study to be conducted during their regular scheduled class time. Additionally, they have made allowances in their course schedules to accommodate this study. To ensure that this study is conducted in an ethical manner, the researcher followed CSU's Regulatory Compliance Office's guidelines for Human Research. In order to assure that this study met federal requirements regarding use of human subjects,

the researcher has met and discussed the research procedures with representatives of Colorado State University's Regulatory Office and has received approval from this office to conduct this study as designed. Copies of the H-100 application and the Regulatory Office's approval are provided in Appendix C.

Chapter 4: Results

Descriptive Statistics

A total of 472 surveys were handed out. Of those, 439 were returned, resulting in a response rate of 93%. The response rate is calculated based on the number of students attending each class on the day the surveys were handed out. Allowing class time for students to fill out the survey before leaving class resulted in most surveys being returned as students left. The survey had a total of 122 response items, not including the demographic questions. Not all response items were used in the analysis of this study's hypotheses. Of the surveys returned, some were only partially completed, while most were completely filled out. In total, 317 (72%) were completely filled out, 71 (16%) had between 1 and 3 missing responses, and 22 (5%) had 20 or more missing responses. All responses were entered into an SPSS data file with unanswered questions coded as missing data. In the following analysis, listwise deletion was used for all of the regression models. Frequency tables for all variables is provided in Appendix D.

Demographic percentages were calculated based on the number of valid responses for a survey question item (Appendix D). Overall, 84% of the respondents were male (n = 356). For major, 89% were construction management majors (n = 342), 7% were interior design majors (n = 29) and 2% were business and/or finance majors (n = 8). Two percent (n = 8) listed their major as 'other.' For grade level, 94% were undergraduate students (n = 401) and 6% were graduate students (n = 25). Age of respondents ranged from 18 to 58

years, with 80% being between 18 and 23 years old (n = 328) and 20% being 24 years old or older (n = 93). A majority of participants (51%, n = 213) came from cities with populations greater than 100,000 and had little or no construction work experience (53%, n = 225). A quarter of respondents did have at least two years construction work experience (26%, n = 111). Between grade levels, there was very little difference in knowledge of construction waste recycling; average rating on a 7-point scale (1 = never heard of, 7 = thorough knowledge) ranged from 4.3 for MC 151 students to a high of 4.9 for students in MC 365. To summarize, the majority of respondents were male, construction management majors, from large urban areas with 3 months or less construction experience. Most had some knowledge of construction waste recycling concepts.

Participants' mean scores for the constructed self-enhancing/self-transcendent value index, anthropocentric/biocentric value orientation index, and volunteering attitude index are presented in Tables 13 and 14. For the construction management majors, there was very little variation in the self-enhancing/self-transcendent value index across undergraduate courses. Means for value index ranged from 4.10 in MC 465 to 4.15 in MC 364 at the undergraduate level. On the value index, higher endorsement of self-enhancing values is indicated by an index score that is closer to 1 than 7. Higher endorsement of self-transcendent values is indicated by a index score closer to 7. Based on the mean index scores for the undergraduate courses, and the lack of variance between courses, it appears that undergraduate construction management students at CSU place slightly more importance on self-transcendent values than they do self-enhancing values.

In comparison, the graduate CM students placed more emphasis on self-transcendent values (mean = 4.47) than did the undergraduate CM students.

Table 13 *Variable Means for Construction Management Majors by Course Section.*

	MC 151	MC 364	MC 365	MC 465	MC 562
S-T/S-E Value Index[a]	4.13	4.15	4.14	4.10	4.47
Anthro/Bio Value Orientation[b]	5.07	5.01	5.21	4.79	5.16
Vol. Attitude[c]	6.29	6.95	7.15	5.87	7.00
Vol. Subjective Norm[d]	0.35	0.62	0.69	-0.29	0.22
Vol. Behavior Intention[e]	0.03	0.24	0.38	0.02	0.70

[a] Value Index is measured on a scale from 1 to 7. A higher score indicates higher endorsement of self-transcendence values.
[b] Value Orientation Index is measured on a scale from 1 to 7. A higher score indicates higher agreement with biocentric basic beliefs.
[c] Volunteering attitude index is an additive index comprised from four measures of attitude. Each of these was measured on a scale from -3 (extremely unlikely) to 3 (extremely likely). The resulting attitude scale is measured on a scale from -12 to 12.
[d] Volunteering subjective norm is measured on a scale from -3 (extremely unlikely) to 3 (extremely likely).
[e] Behavior intention is measured on a scale from -3 (extremely unlikely) to 3 (extremely likely).

The anthropocentric/biocentric value orientation index means varied slightly more. Means for value orientation ranged from 4.79 in MC 465 to 5.21 in MC 365, including graduate CM students. For the value orientation index, scores closer to 1 would indicate that respondents hold more anthropocentric value orientations. Index scores closer to 7 would indicate that respondents hold more biocentric basic beliefs. Based on the participants' mean responses, it appears that both graduate and undergraduate CM students tend to hold more biocentric than anthropocentric value orientations.

Volunteering attitude ranged from 5.87 in MC 465 to 7.15 in MC 365. This index ranged from -12 to +12, with -12 corresponding with a extremely negative attitude and +12 corresponding with a extremely positive attitude toward volunteering to set up a construction waste recycling program. Based on this scale, an index score of 4 indicates a slightly positive attitude and a score of 8 indicates a quite positive attitude. As a result, although there appears to be a larger variance between mean attitude scores, they are actually relatively close together. All means for attitude fall in the slightly to quite positive category for attitude.

Table 14 *Variable Means for Non-Construction Management Majors by Course Section*

	MC 151	MC 364	MC 365
S-T/S-E Value Index[a]	4.35	4.18	4.83
Anthro/Bio Value Orientation[b]	5.24	4.97	6.12
Vol. Attitude[c]	6.65	5.67	9.0
Vol. Subjective Norm[d]	0.51	1.67	1.67
Vol. Behavior Intention[e]	-0.05	0.17	2.00

[a] Value Index is measured on a scale from 1 to 7. A higher score indicates higher endorsement of self-transcendence values.
[b] Value Orientation Index is measured on a scale from 1 to 7. A higher score indicates higher agreement with biocentric basic beliefs.
[c] Volunteering attitude index is an additive index comprised from four measures of attitude. Each of these was measured on a scale from -3 (extremely unlikely) to 3 (extremely likely). The resulting attitude scale is measured on a scale from -12 to 12.
[d] Volunteering subjective norm is measured on a scale from -3 (extremely unlikely) to 3 (extremely likely).
[e] Behavior intention is measured on a scale from -3 (extremely unlikely) to 3 (extremely likely).

Volunteering subjective norm had the largest range of all the variables used to test the hypotheses of this study. Mean responses for volunteering subjective norm ranged

from -0.29 in MC 465 to 0.69 in MC 365. The scale used to measure volunteering subjective norm ranged from -3 (extremely unlikely) to +3 (extremely likely). On this scale, 0 indicated a neutral response. Based on the range or mean responses, most students perceived that it was slightly likely that people who are important to them would expect them to volunteer to set up a construction waste recycling program. For MC 465, however, the subjective norm mean was actually negative. This would indicate that students in MC 465 mostly perceived that most people who are important to them *would not* expect them to volunteer to set up a construction waste recycling program.

Last was volunteering behavior intention, which ranged from 0.02 in MC 465 to 0.70 in MC 562. As with the subjective norm, behavior intention was measured on a scale ranging from -3 (extremely unlikely) to +3 (extremely likely). Based on the lack of range between means, all of the students were only slightly likely to volunteer to set up a construction waste recycling program.

Although differences between variable means for construction management majors were not tested for statistical significance, it is important to note that in all cases MC 465 had the lowest mean scores. The highest scores predominately came from either MC 365 or MC 562. One possible reason for this trend could be the amount of construction related work experience. All of the MC 465 students reported having construction related work experience compared to only 94% of MC 365 students. Additionally, 44% of the MC 465 students indicated that they had 2 plus years of construction work experience, while only 29% of the MC 365 students had an equivalent amount of construction work experience. The majority or MC 365 students (63%) had one year or less construction experience. These results suggest that *real life* construction

experiences have a negative impact of cognitive determinants of construction management students' construction waste recycling behavior intention.

Mean responses for non-construction management majors in MC 151, MC 364 and MC 365 are shown in Table 14. In most cases, mean scores for non-construction management majors were either similar to or higher than mean scores for construction management majors. The one exception is the behavior intention variable. Non-construction management students in MC 151 indicated that they are not likely to volunteer to setup a construction waste recycling program. One possible reason for this negative behavior intention is that many of these students are interior design majors and will probably never be involved in on-site construction management processes. Although differences in means between construction management and non-construction management majors were not tested for statistical significance, these results imply that construction management majors tend to hold more self-enhancing values and that they tend to hold more anthropocentric basic beliefs than non-construction management majors. Both groups of majors, however, do have basically the same attitude and subjective norm toward volunteering to setup a construction waste recycling program.

Results for the Hypotheses

The hypotheses for this study, which were originally presented in Chapter 1, are presented again here for convenience. They include the following:

H_1: Self-enhancement/self-transcendence value index will be a direct predictor of anthropocentric/biocentric value orientation.

H_2: Anthropocentric/biocentric value orientation will be a direct predictor of construction waste recycling attitude and subjective norm.

H_3: Construction waste recycling attitude and subjective norm will be a direct predictor of construction waste recycling behavior intentions.

H_4: Anthropocentric/biocentric value orientation will mediate the relationship between self-enhancement/self-transcendence value index and higher order cognitions.

H_5: Construction waste recycling attitude and subjective norm will mediate the relationship between value orientation and construction waste recycling behavior intentions.

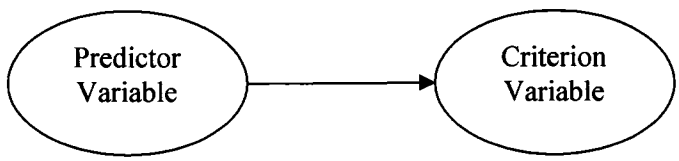

Figure 4. Example of path diagram and relationship between variables as indicated by direction of arrow.

Path diagrams are used to show relations between model variables based on hypotheses results. In the path diagrams, variables are represented by ovals. Arrows between variables indicate a direct relationship between the predictor and criterion variable. When arrows originate from a variable, that variable is functioning as a predictor variable. When an arrow terminates at a variable, the variable is a criterion variable. Figure 4 provides an example of how the relationship between one predictor and criterion variable would be diagramed.

Figure 5 shows the relationships between model variables based on results from the hypothesis tests. In the path diagram, hypotheses are tied to the relationships between variables that they affect. Hypotheses H_4 and H_5 are not shown in Figure 5 because they were mediation hypotheses. As indicated in Chapter 3, all of the hypotheses were tested using ordinary least squares (OLS) regression models. Table 15 provides the results from regression models used to test hypotheses H_2, H_3, and H_4. Each of these hypotheses is discussed individually in the following paragraphs.

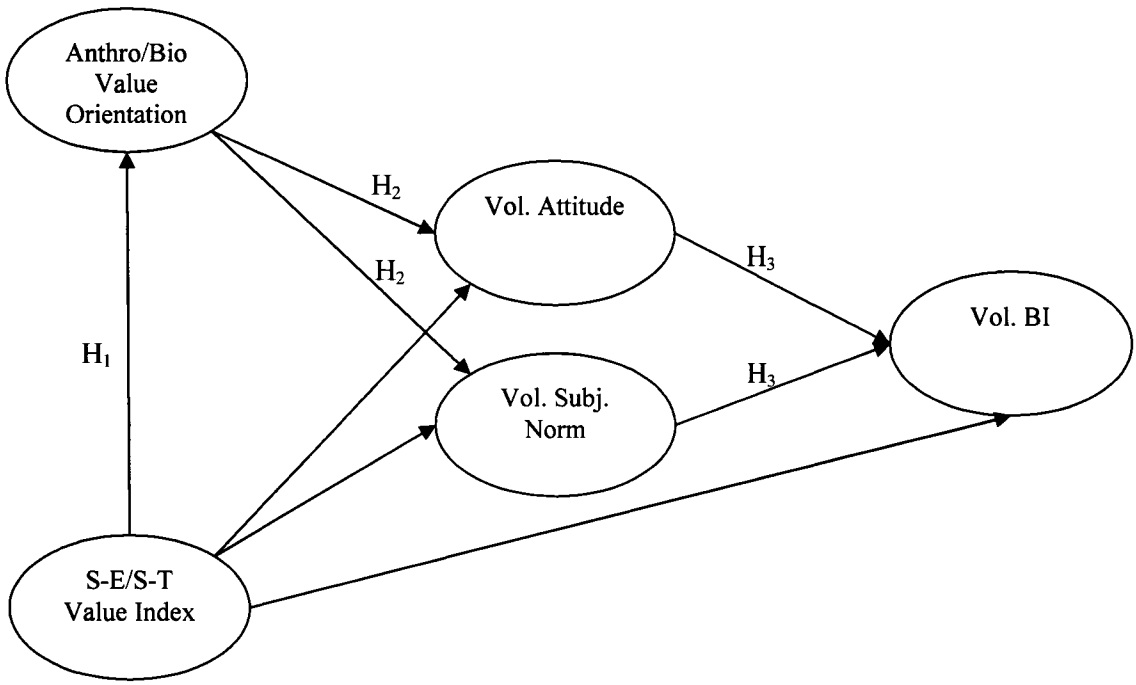

Figure 5. Relationship between cognitive elements based on hypothesis results. Only statistically significant relationships are shown.

The first hypotheses H_1 stated that the self-enhancing/self-transcendent value index would be a direct predictor of anthropocentric/biocentric value orientation (referred to as value orientation). This relationship is represented in Figure 5 by the arrow connecting value index and anthropocentric/biocentric value orientation and labeled H_1.

This hypothesis was tested using linear regression (see Model 4, Table 15). Based on these results, as predicted, self-enhancement/self-transcendence value index was a significant direct predictor of anthropocentric/biocentric value orientation (ß = .35, p <.001). This model had a medium effect size (r = .35, Table 15). Hypothesis H_1 is supported based on these results.

Table 15 *Volunteering Behavior Intention Model*

	DV	IV	*R*	Standardized Beta	*t*-test	*p*-value
Model 1	Vol. Behavior Intention	Volunteering Attitude	.62	.30	6.357	<.001
		Vol. Subjective Norm		.37	8.212	<.001
		Anthro/Bio V.O.		.00	-0.036	.971
		S-E/S-T Value Index		.09	2.009	.045
Model 2	Volunteering Attitude	Anthro/Bio V.O.	.45	.31	6.634	<.001
		S-E/S-T Value Index		.23	4.813	<.001
Model 3	Vol. Subjective Norm	Anthro/Bio V.O.	.35	.27	5.373	<.001
		S-E/S-T Value Index		.15	2.944	.003
Model 4	Anthro/Bio V.O.	S-E/S-T Value Index	.35	.35	7.697	<.001

Hypothesis H_2 stated that anthropocentric/biocentric value orientations would be a direct predictor of higher order cognitions: volunteering attitude and volunteering subjective norm. These relationships, as identified in Figure 5 and labeled with H_2, were also tested using linear regression (see Model 2 and 3, Table 15). Results showed that significant relationships existed between anthropocentric/biocentric value orientation and volunteering attitude (ß = .31, p < .001) and volunteering subjective norm (ß = .27, p < .001). Thus hypothesis H_2 is supported. In addition to the hypothesized relationship between anthropocentric/biocentric value orientation and the volunteering attitude and volunteering norm, self-enhancement/self-transcendence value index was also a

significant direct predictor of volunteering attitude (ß = .23, $p < .001$) and volunteering subjective norm (ß = .15, $p = .003$). In both cases, the effect of value index was smaller than value orientation, as would be expected based on cognitive theory. Effect sizes for Model 2 and 3 were both medium ($r = .38$ and .35 respectively, Table 15).

Hypothesis H_3 stated that volunteering attitude and subjective norm would be direct predictors of volunteering behavior intentions as diagramed in Figure 5 and labeled with H_3. Model 1 (Table 15) tested the relationship between the higher order cognitions (volunteering attitude and subjective norm) and volunteering behavior intention. Both attitude (ß = .30, $p <.001$) and subjective norm (ß = .37, $p <.001$) were significant predictors of behavior intention. Effect size for Model 1 was very large ($r = .62$, Table 15). These results support hypothesis H_3.

The remaining two hypotheses, H_4 and H_5, stated that anthropocentric/biocentric value orientation would mediate between self-enhancement/self-transcendence value index and higher order cognitions (volunteering attitude and subjective norm) (H_4) and that higher order cognitions would mediate between value orientations and behavior intentions (H_5). Mediation tests were based on Baron and Kenny's (1986) method for determining if a variable mediates the relationship between two other variables. According to this method, a series of three regression models are needed to establish if mediation exists. In the first test, the criterion variable is regressed on the predictor variable. The relationship between these two variables must be significant (path *c,* Figure 6). In the second test, the mediator is also regressed onto the predictor variable (path *a,* Figure 6). Again, a significant relationship must exist between mediator and predictor variables. In the third regression model, the criterion variable is regressed onto both the

predictor variable and the mediator variables. For mediation to exist, the mediator must affect the outcome variable in this last regression model (path *b*, Figure 6). Full mediation exists if (a) the effect of the mediator on the criterion variable is significant (path *b*, Figure 6) and (b) the relationship between the predictor variable and the criterion variable goes to zero and is no longer significant (path *c*, Figure 6). Partial mediation exists if the effect of the predictor variable is reduced by the addition of the mediator to the regression model. Path diagrams for each of the following mediation tests are provided in Appendix F.

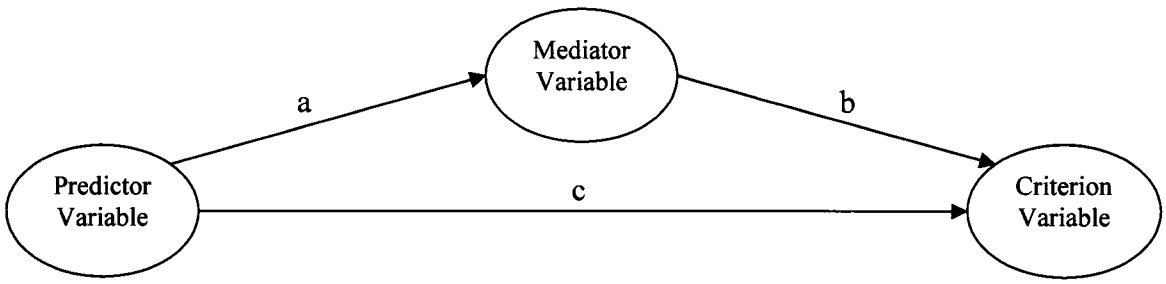

Figure 6. Path diagram of mediation test.

Hypothesis H_4 predicted anthropocentric/biocentric value orientation (referred to as value orientation) would mediate the relationship between self-enhancement/self-transcendence value index (referred to as value index) and the higher order cognitions (attitudes and subjective norms). The relationship between value index and behavior intention is shown in Figure 5 but is not labeled because this hypothesis is a mediation hypothesis and requires multiple paths to diagram. To test this hypothesis, two separate mediation tests were conducted: one used volunteering attitude as the dependent variable (Test 1, Table 16), the other used volunteering subjective norm as the dependent variable (Test 2, Table 16). In both cases, the value index remained a strong predictor of attitude

(ß = .23, $p < .001$) and subjective norm (ß = .15, $p = .003$). The effect sizes for all regression models used in these two regression tests were in the medium to large range with R values between .24 and .45 (Table 16).

Table 16 *Tests for Mediation Effect of Value Orientation, Attitude, and Subjective Norm*

Test	DV	IV	R	Standardized Beta	t-test	p-value
#1: Test for mediation effect of value orientation between value index and volunteering attitude.						
1A:	Volunteering Attitude	S-E/S-T Value Index	.33	.33	7.187	<.001
1B:	Anthro/Bio Index	S-E/S-T Value Index	.35	.35	7.697	<.001
1C:	Volunteering Attitude	Anthro/Bio V.O.	.45	.31	6.634	<.001
		S-E/S-T Value Index		.23	4.813	<.001
#2: Test for mediation effect of value orientation between value index and volunteering subjective norm.						
2A:	Vol. Subjective Norm	S-E/S-T Value Index	.24	.24	5.095	<.001
2B:	Anthro/Bio Index	S-E/S-T Value Index	.35	.35	7.697	<.001
2C:	Vol. Subjective Norm	Anthro/Bio V.O.	.35	.27	5.373	<.001
		S-E/S-T Value Index		.15	2.944	.003
#3: Test for mediation effect of attitude between value orientation and behavior intention.						
3A:	Vol. Behavior Intention	Anthro/Bio V.O.	.26	.26	5.622	<.001
3B:	Volunteering Attitude	Anthro/Bio V.O.	.40	.40	8.822	<.001
3C:	Vol. Behavior Intention	Anthro/Bio V.O.	.52	.08	1.764	.079
		Volunteering Attitude		.49	10.800	<.001
#4: Test for mediation effect of subjective norm between value orientation and behavior intention.						
4A:	Vol. Behavior Intention	Anthro/Bio V.O.	.26	.26	5.622	<.001
4B:	Vol. Subjective Norm	Anthro/Bio V.O.	.32	.32	7.023	<.001
4C:	Vol. Behavior Intention	Anthro/Bio V.O.	.55	.11	2.438	.015
		Vol. Subjective Norm		.51	11.796	<.001

Based on the results from the mediation tests for hypothesis H_4, anthropocentric/biocentric value orientation did not fully mediate the relationship between self-enhancement/self-transcendent value index and the higher order cognitions. Therefore, hypothesis H_4 was supported for partial mediation. As a result, the final model shows direct relationships between self-enhancement/self-transcendence value index, volunteering attitude, volunteering subjective norm, and volunteering behavior index.

Hypothesis H_5, which predicted that higher order cognitions would mediate between anthropocentric/biocentric value orientation and volunteering behavior intention, was also tested in the same manner as hypothesis H_4. Two separate mediation tests were used: one used volunteering attitude as the mediator (Test 3, Table 16), the other used subjective norm as the mediator (Test 4, Table 16). In both cases, anthropocentric/biocentric value orientation was the predictor variable and volunteering behavior intention was the criterion variable. The direct relationship between value orientation and behavior intention was significant (ß = .26, p <.001) prior to adding either of the mediation variables. In mediation test 3 (Table 16), when attitude was added to the regression model, the relationship between value orientation and behavior intention was not significant (ß = .08, p = .079). This result supported the assumption that attitudes would mediate the relationship between value orientation and behavior intention. In mediation test 4 (Table 16), subjective norm was added to the regression model. In this test, although the beta for value orientation did not go to zero, it was reduced by more than half to .11 (p = .015) of behavior intention. Effect sizes for regression models used in these two mediation tests were medium to large with r values between .26 and .55 (Table 16). Based on these results, hypothesis H_5 is supported for partial mediation. In

the final model, however, the direct relationship between value orientation and behavior intention still goes to zero and is not statistically significant. Therefore, the final model does not show a direct relationship between anthropocentric/biocentric value orientation and volunteering behavior intention.

Table 17 *Mediation Tests of Attitude and Subjective Norm Effect on Value Relationship With Behavior Intention*

Test	DV	IV	*R*	Standardized Beta	*t*-test	*p*-value
#6: Test for mediation effect of attitude between value index and behavior intention.						
6A:	Vol. Behavior Intention	S-E/S-T Value Index	.26	.26	5.496	<.001
6B:	Volunteering Attitude	S-E/S-T Value Index	.33	.33	7.187	<.001
6C:	Vol. Behavior Intention	S-E/S-T Value Index	.52	.11	2.525	.012
		Volunteering Attitude		.47	10.661	<.001
#7: Test for mediation effect of subjective norm between value index and behavior intention.						
7A:	Vol. Behavior Intention	S-E/S-T Value Index	.26	.26	5.496	<.001
7B:	Vol. Subjective Norm	S-E/S-T Value Index	.24	.24	5.095	<.001
7C:	Vol. Behavior Intention	S-E/S-T Value Index	.55	.14	3.356	.001
		Vol. Subjective Norm		.50	11.790	<.001

Additional mediation tests were added based on the results for hypothesis H_4, in which anthropocentric/biocentric value orientation did not mediate the relationship between self-enhancement/self-transcendence value index and higher order cognitions. These added tests determined if volunteering attitude and volunteering subjective norm mediated the relationship between self-enhancement/self-transcendence value index and volunteering behavior intention (Table 17). In both mediation tests, self-enhancement/self-transcendence value index was the predictor variable and volunteering

behavior intention was the criterion variable. In both cases, the beta for value index was significantly reduced; but it did not go to zero and it remained significant. Effect sizes for these mediation tests were between medium and large with *r* values ranging between .24 and .55 (Table 17). Based on these results, attitude and subjective norm only partially mediate the relationship between value index and behavior intention with value index still having a small (ß = .08), but significant relationship ($p = .044$) with behavior intention. In both models, both attitude and subjective norm were also significant at the $p < .001$ level, with betas of .24 or greater. As a result, self-enhancement/self-transcendence value index is not only a direct predictor of volunteering attitude and subjective norm, but also predicted volunteering behavior intention as well.

Combining the results from the previous mediation tests, the model of students' cognitive functions related to volunteering to set up a construction waste recycling program was developed (Figure 7). For each variable in the model, the coefficient of determination (R^2) indicates how much of the variation in a criterion variable can be explained by the predictor variables. In this model, both self-enhancement/self-transcendence value index and anthropocentric/biocentric value orientation are shown as direct predictors of both volunteering attitude and subjective norm. The higher order cognitions are shown fully mediating the relationship between anthropocentric/biocentric value orientations and volunteering behavior intention, but only partially mediating the relationship between self-enhancement/self-transcendent value index and volunteering behavior intention. Additionally, value index is shown to be a direct predictor of behavior intention. Strength of the relationships between variables in the model were then tested using a series of regression analyses (Table 18).

Table 18 *Regression Models Based on Mediation Results*

	DV	IV	*R*	Standardized Beta	*t*-test	*p*-value
Model 18	Vol. Behavior Intention	Volunteering Attitude	.62	.31	6.659	<.001
		Vol. Subjective Norm		.37	8.283	<.001
		S-E/S-T Value Index		.08	2.023	.044
Model 19	Volunteering Attitude	Anthro/Bio V.O.	.45	.31	6.634	<.001
		S-E/S-T Value Index		.23	4.813	<.001
Model 20	Vol. Subjective Norm	Anthro/Bio V.O.	.35	.27	5.373	<.001
		S-E/S-T Value Index		.15	2.944	.003

Effect sizes for this model ranged from medium to very large with *r* values between .35 and .62. In the full model, as presented in Figure 7, the effect of value index (ß = .11) on behavior intention is relatively small when compared to general attitude (ß = .31) and subjective norm (ß = .37) but still significant at the $p < .05$ level.

Follow-up Group Discussions and Interviews

As a follow-up to the survey, discussions groups and interviews were conducted with students on a voluntary basis. Students were invited to participate in follow-up discussions or to volunteer to be interviewed in the debriefing materials handed out as they left class (see Appendix C for a copy of the debriefing materials). Ten students signed up for the interviews. Of those, only seven provided legible contact information. Four were successfully contacted by phone. Additionally, the instructor for MC 562, invited the researcher back to discuss details of the study with the graduate students enrolled in that class.

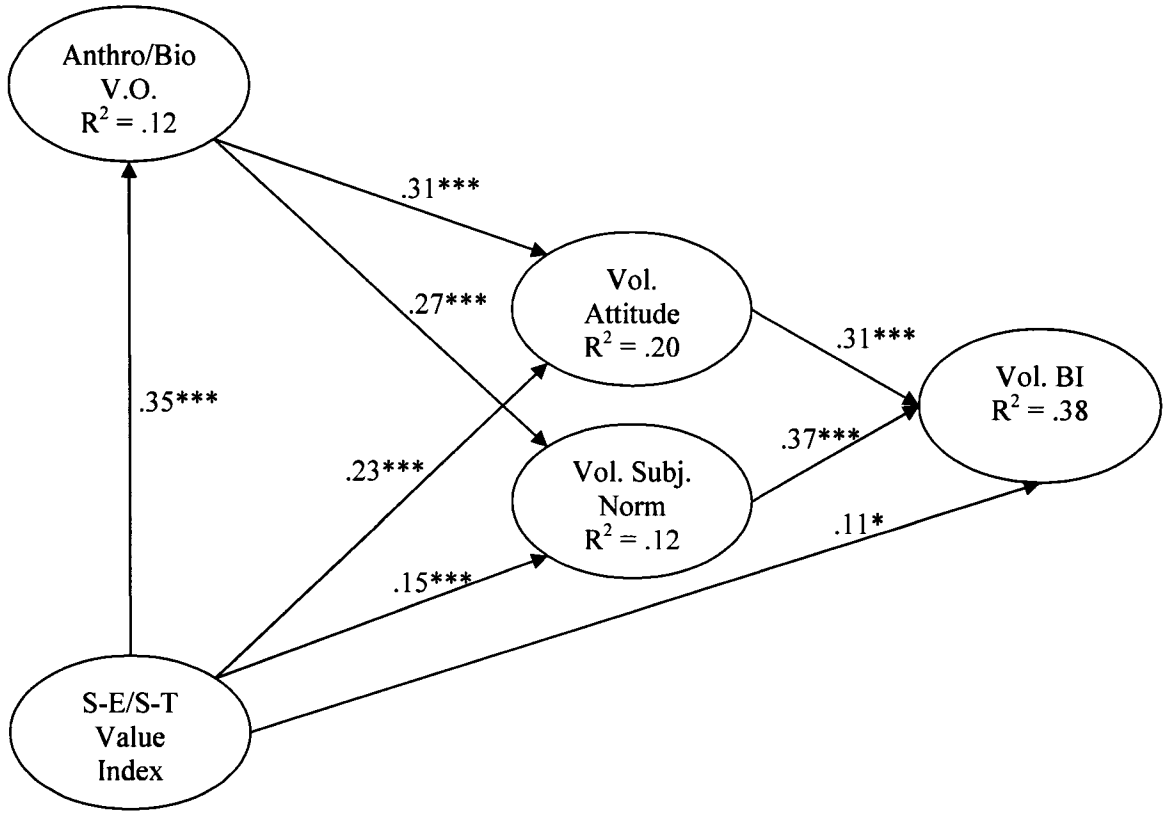

Figure 7. A value, value orientation, attitude, subjective norm model for predicting volunteering behavior intentions.
Note: Only statistically significant relationships are shown.
* $p < .05$, ** $p < .01$, *** $p < .001$

During the follow-up discussion, students were asked for their perceptions of the survey instrument (see Appendix C for questions used to guide this discussion). Many commented on the length and detailed nature of the instrument. Several recommended creating a more concise instrument which would take less time and effort to fill out. Others recommended administering the survey via the Internet. Several students commented that they felt several of the questions were redundant, specifically noting the outcome belief and evaluation questions. When the differences between the questions were pointed out, some students admitted that they had missed the subtle difference between related questions and had either skipped the questions they thought redundant or

answered them the same as the related questions. Questions affected by this were not included in this analysis.

Responses from the telephone interviews were closely related to those of students in the group discussion. The main difference was that all of the students contacted by phone expressed a strong interest in either the environment or the need for construction waste recycling. As in the follow up discussion session, students were asked about their perceptions of the survey instrument (see Appendix C for script used in phone interviews). All of the students contacted by phone did state the questions seemed very similar and repetitive. Two, however, noted that they assumed there was a purpose to the question format used and question organization. One student in particular stated that he had to reread the questions several times to understand what was being asked. He also stated that he assumed the survey purpose required the detailed level of questions. Because of his assumption, he was willing to take the time to answer the questions thoughtfully. He did not feel, however, that other students took time to read the questions carefully. Students participating in the interview were also asked about their perception of the presentation prior to the survey. Specifically, they were asked if they felt that the presentation impacted their responses. All said "no," stating that the presentation was balanced and informative without arguing for or against construction waste recycling. One student in particular noted that, although she was "already an avid supporter of the environment," that the presentation and survey made a big difference in her career because they opened her eyes up to a new focus. She did not feel, however, that it impacted her responses to the survey questions.

All students participating in the interviews did comment that they were either already supporters of the environment or had experience with construction waste recycling. Based on these disclosures, it is likely they were more willing to answer the survey thoughtfully because it pertained to a topic they were either concerned about or had experience with. The group discussion held conducted with the MC 562 students elicited a wider variety of responses because it took place during the regular class period. Almost all of the students who took the survey were present for the discussion. In this discussion, it was obvious that there was less understanding for the survey design as evidenced by requests to make the instrument shorter and easier to fill out (i.e. place on Internet).

Based on the qualitative responses made during the group discussion and follow-up interviews, it is clear that not all students took the survey seriously or took enough time to carefully read all questions. This does not appear to have impacted the results since the specific questions identified in the group discussion were not used in testing the hypotheses.

Chapter 5: Discussion and Conclusions

Results from this study suggest both empirically based theoretical conclusions related to the hierarchal structure of human cognitions and more tentative conclusions based on construction management students' demographics. Each of these is discussed in the following section. Following the Conclusions section is a discussion of the implications of the results from this study, which include implications for both cognitive theory and construction management education. The last two sections of this chapter address limitations of the study and recommendations for future research.

Conclusions

Overall, the findings of this study provide supporting evidence of the relationships between cognitive determinants of environmental behaviors with a few exceptions.

First, results from this study are consistent with prior research by Schultz and his associates on values and value orientations (Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999). As in their studies, this study found that higher endorsement of self-transcendence values (as reflected by a higher value index score) correlated positively with value orientation index scores (indicating a more biocentric value orientation). Results from this study also support cognitive theory, which states that values will have a direct relationship to value orientations (Fulton, 1997; Fulton et al., 1996; Rokeach, 1973; Vaske & Donnelly, 1999). The positive correlation between self-enhancement/self-

transcendent value index and volunteering behavior intention found in this study is also consistent with prior research (Schultz et al., 2005; Stern & Dietz, 1994) in which self-transcendence values and positively correlated with self-reported environmental behavior.

Second, results from this study were consistent with prior research conducted by Fulton et al. (1996) and Vaske and Donnelly (1999) in which attitudes fully mediated the relationship between value orientations and behavior intentions. This finding provides additional empirical support for the hierarchal relationship between value orientations → attitudes → behavior. In this study, however, attitudes did not fully mediate the relationship between values and behavior intention as expected based on prior research by Homer and Kahle (1988). One possible reason for the difference in results is that Homer and Kahle (1998) used structural equation modeling, which takes into account measurement error of model variables. It is possible that had structural equation modeling been used in the present study that the direct relationship between values and behavior intention would have been reduced to zero.

Another possible reason for the discrepancy between this study's results and those of Homer and Kahle's (1988) study is validity of the instrument measurement of latent variables used in the analysis. Measurement validity concerns related to the value items and basic belief statements used in the survey instrument to construct the value orientations are of less concern since these items have been used in numerous studies (Dietz et al., 2005; Donnelly et al., 2001; Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999; Schwartz, 1992, 1994; Stern & Dietz, 1994; Vaske & Donnelly, 1999; Vaske et al., 2001). It is more probable that the attitude and subjective norm questions

included in the survey were lacking in validity because the behavior variable in this study involved *volunteering* to set up a construction waste recycling program. It is possible that volunteering may have evoked strong attitudinal and normative responses and that students responded to the attitude and subjective norms questions based on their evaluation and acceptance of *volunteering* behaviors as opposed to their role in such programs. It is impossible, however, to assess volunteering behavior outside of a context. The volunteering to set up a construction waste recycling program behavior intention was chosen for this study because this behavior implies some form of personal sacrifice (i.e time) and deeper evidence of commitment to construction waste recycling. Additionally, this behavior was perceived to be primarily under the volitional control of construction managers and because it was expected to elicit a broader range of responses from respondents.

Third, the findings of this study add empirical evidence to the role of subjective norms in determining environmental behaviors. As noted earlier, the hierarchal role of norms within the context of cognitive theory has received little attention although there is evidence that norms can be direct predictors of environmental behaviors (Nordlund & Garvill, 2002; Oom Do Valle et al., 2005; Teo & Loosemore, 2001). Results from the present study highlight the role of subjective norms in determining behavior intentions. In this study, volunteering subjective norm (ß = .37, $p < .001$) was a slightly stronger predictor than volunteering attitude (ß = .31, $p < .001$) of the volunteering behavior intention. These findings are consistent with Ajzen and Fishbein's (1980) theory of subjective norm that states people are unfamiliar with a behavior they will look to others for direction. These findings are also consistent with Oom Do Valle et al.'s (2005)

conclusion that subjective norms are strong predictors of recycling behaviors. Findings of the present study were also consistent with both Nordlund and Garvill (2002) findings, in which norms mediated the relationship between more central cognitions (values and value orientations) and behaviors. In Nordlund and Garvill's (2002) study, norms were also shown to mediate between attitude and behavior. The present study did not test for this mediation effect.

Last, this study sought to clarify the hierarchal role of value orientations within cognitive theory. In previous studies (Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999) on values and environmental behavior it was unclear if values function as direct or indirect predictors of higher order cognitions (attitudes and norms) and behaviors. A rigid interpretation of cognitive theory places values at the bottom of the cognitive hierarchy, with no direct relationship to higher order cognitions or behavior intentions. Results from this study showed that the self-enhancement/self-transcendence value index was not only a direct predictor of anthropocentric/biocentric value orientation, but also was a direct predicator of volunteering attitude (ß = .23, $p < .001$) and subjective norm (ß = .15, $p < .001$), as well as volunteering behavior intention (ß = .11, $p < .05$) as shown in Figure 7. These results suggest that in some cases, values may have a direct relationship with higher order cognitions and behaviors. This finding suggests that a more fluid interpretation of hierarchal relationships among cognitive determinants of environmental behaviors may be more appropriate, with cognitions varying in their method (i.e. direct or indirect) of influencing behaviors.

One possible explanation for the unexpected relationship between self-enhancement/self-transcendence value index and behavior intention is that respondents

did not have well developed environmental value orientations, implying that they have not given much thought to the environment. Another possible explanation is that participants in this study have had few, if any, opportunities to form attitudes and subjective norms relative to construction waste recycling due to their limited construction related work experience and their relatively low level of knowledge related to construction waste recycling. Although an effort was made to increase the saliency of construction waste recycling issues through the Construction Waste Recycling (CWR) presentation, it is likely that this presentation was not long enough to really impact their attitude or subjective norm. As a result, they fell back onto their values when responding to the survey items.

In the final model, as shown in Figure 7, all correlations between variables were positive. The positive beta coefficients between model variables (value index, value orientation index, attitude, subjective norm, and behavior intention) imply that individuals with a higher value index and value orientation index will hold more favorable attitudes and subjective norms for volunteering to setup construction waste recycling programs. For example, if a student rates self-transcendence values higher than they rate self-enhancement values, they will have a higher value index score. Based on this score, it would be expected that they would also hold a more biocentric value orientation, which would increase the chances that they would have a more positive attitude and norm toward construction waste recycling. The end result would be a stronger behavior intention to volunteer to setup a construction waste recycling program.

Beyond the empirical support for cognitive theory, comparison of respondents' demographics provided the basis for speculative conclusions about construction

management students' cognitive determinants of their environmental behavior intentions. These findings, however, are not statistically significant but do provide a justification for further research in this area. First, comparison of construction management (CM) majors to non CM majors revealed that the CM majors tended to hold more self-enhancing values and anthropocentric environmental beliefs than non-CM majors. These findings, combined with communications theories proposed by Schultz and Zelezny (2003) and others (Kaplan, 2000; Kuhn, 2000; Stern et al., 1999) suggest that CM majors are less likely to be receptive to environmental messages. Second, CM students within MC 465 tended to have lower scores for the self-enhancing/self-transcendent value index, the anthropocentric/biocentric value orientation, as well as the attitude and subjective norm related to volunteering to set up a construction waste recycling program. Additionally, the mean subjective norm score for students in MC 465 was negative, indicating that they perceived others as not supporting their volunteering to set up a construction waste recycling program. By comparison, the mean subjective norm for all other courses was positive. Although there are potentially many reasons for these differences, further examination of differences between students' demographics revealed that students enrolled in MC 465 tended to have more construction related work experience, suggesting that industry related experience may have a negative impact on students' cognitive determinants of their environmental behavior.

Implications

Findings of the present study have implications for both construction management education and social psychology research on cognitive determinates of environmental behavior. Each of these is discussed separately below.

Implications for Research on Environmental Behavior

To date, the majority of research based on cognitive theory has focused on the hierarchal between values, value orientations, attitude, and behavior (Fulton, 1997; Fulton et al., 1996; Homer & Kahle, 1988; Vaske & Donnelly, 1999). In contrast, values and norms have received little attention although they have been theoretically linked to the cognitive hierarchy (Fulton, 1997; Fulton et al., 1996; Rokeach, 1973; Vaske & Donnelly, 1999). In the broader field of social psychological research on environmental behavior, value have received significant attention (Nordlund & Garvill, 2002; Oom Do Valle et al., 2005; Schultz, 2001; Schultz et al., 2005; Schultz & Zelezny, 1999; Stern, 2000; Stern & Dietz, 1994; Stern et al., 1999). This study combines prior research from the broader field of social psychology on values with research on value orientations, confirming the relationship between values and value orientations. This study's findings, however, do not support the hierarchal relationship between values and value orientations as value orientations did not mediate the relationship between values and either attitudes or norms. This finding offers support to Whittaker's (2000) recommendation that cognitive theory not be viewed a rigid framework.

This study shows that subjective norms can play significant roles in the determination of behavior intentions and that they should not be overlooked. Consistent

with Ajzen and Fishbein (1980) and more recent studies (Oom Do Valle et al., 2005; Teo & Loosemore, 2001) subjective norms played a significant role in determination of behavior intention.

The combined results of this study provide additional empirical support for cognitive theory and the hierarchal relations between cognitive components with a few exceptions, specifically the direct path between values and behavior intention. Use of advanced statistical analysis such as structural equation modeling, however, would likely reveal that when measurement errors are taken into account that the direct relationship between values and behavior intention would be significantly decreased and lose statistical significance.

Additionally, the results of this study extend the application of the cognitive theory into the field of construction management education. To date, much of the research on the hierarchal relationship between cognitive components has been conducted in the study of human dimensions of wildlife and natural resource management (Fulton, 1997; Fulton et al., 1996; Vaske & Donnelly, 1999; Whittaker, 2000; Whittaker, Vaske, & Manfredo, 2006). Findings from this study, however, provide support for the application of the cognitive hierarchy to understanding cognitive determinants of behaviors of construction management students' construction waste recycling related behavior intentions. It is expected that additional research on other environmental behaviors of construction management students would have similar results.

It is important to note that individuals' behaviors are also impacted by the social, political, and economic climate in which they live. As a result, path coefficients of any cognitive model seeking to predict individual behaviors are not static. Additionally the

strength of individual path coefficients are contingent upon time, people, economics, social, and political contexts in which the study is conducted. Continued research into how study contexts impact relationships between cognitive determinants will further strengthen cognitive theory and its application to the enhancement of environmental education.

Implications for Construction Management Education

Direct predictors of behavior intentions of students participating in this study were their basic values, attitudes and subjective norm. Together, these three items explained 38% of the variance in their intention to volunteer to set up construction waste management/recycling programs on future jobs. Between these three items, subjective norm was the strongest predictor, followed by attitude, and then value index. It is anticipated that as students gain more knowledge and experience with CWR, their value orientations will fully mediate the relationship between their values and attitudes/norms. As a result, the direct influence of the value on behavior intentions would likely disappear. It is anticipated that additional studies in this area will find similar relationships between students' cognitions and their behavior intentions for other areas of sustainable construction.

As seen in this study, construction management students are not likely to have well developed environmental value orientations. Therefore, the results of this study suggest that construction management education has an opportunity to impact the sustainability of the building industry through its influence on students' value orientations. Because students' value orientations are still forming, educators have a unique opportunity to influence the development of students' environmental value

orientations, possibly resulting in long-term effects on their behaviors related to construction waste recycling. Additionally, because students in programs like the one at Colorado State University are being prepared for management positions, their environmental behaviors have the potential to effect positive large scale changes due to their influence on construction operatives' environmental behaviors (Teo & Loosemore, 2001, 2003).

Although the literature review along with the findings of this study suggest that construction management programs have the potential to influence the industry's impact on the environment, due to the enormous resource demands of the industry, it is evident that educators have not been aggressive taking advantage of this opportunity (Tinker & Burt, 2003). As noted by Tinker and Burt in 2003, few construction management programs had incorporated sustainability and/or green building concepts into their required curricula. Unfortunately, this is also true of the broader context of higher education according to Payne (2006) who notes that "by and large, the development of environmental education curricula has not kept pace with the issues generated in the more fertile discourse of environmental education research..." (p. 26). Payne goes on to clarify that environmental education should be seen as an enabling process rather than mere knowledge acquisition suggesting that curricula in this area should seek to engage students by providing opportunities for them to live what they are learning. He points out that "learners require diverse experiences of different environments and versions of nature so as to better inquire into, reflect on, and understand how they themselves perceive, conceive, construct, compare, act, and relate to nature and the environment" (Payne, 2006, p. 28). To clarify that the purpose of environmental education is not to

dictate specific values or behaviors, but instead to provide students with "opportunities to apply valuing skills to issues and problems and in the process define, clarify, and develop [their] personal value system" (Knapp, 1983, p. 25).

Limitations

The results of this study were limited by both the survey method and statistical analysis methods used. According to respondents participating in follow up discussions and interviews, the instrument used in this study was lengthy and appeared redundant. Although listwise deletion was used in all analyses, it is likely that students' attitudes toward the survey instrument were impacted by the survey length. In turn, it is likely that students did not read all questions thoroughly in consideration of the amount of class time available to fill out the survey. Additionally, it is also possible that students repeated patterns of answers to questions they perceived as similar. In future studies of this nature, the results would most likely be enhanced by allowing the students to return the survey at a latter date. This approach, would likely result in a response bias with those students who are more concerned about environmental issues being more likely to return the survey.

An additional limitation arises from the behavior intention measured. Different results may have resulted if different behaviors (i.e. site protection, material procurement and storage, management of threats to indoor air quality) had been used in place of setting up a construction waste recycling program. Most other construction management behaviors related to green building, however, either require some level of support from the project owner (i.e financial) or are mandated by government regulations (i.e. erosion

control). Therefore, behavior was chosen because it is potentially under the volitional control of the construction manager, which was a condition of using subjective norms.

Other limitations stem from the analysis method incorporated. All path analyses were conducted using ordinary least squares regression. While this approach results in conservative estimates of the relationship between variables, it does not take into account measurement error of model variables. As a result, weaker relationships may appear to be statistically significant when in fact they are not.

Directions for Future Research

While this study added to the support and understanding of human cognitions with respect to environmental behaviors, the results of this study could be enhanced through application of more sophistical statistical analysis methods. Structural equation modeling, which acknowledges measurement error in model variables, would enhance the empirical value of the findings of this study.

Further research is also needed on the demographic differences between construction management and non-construction management majors' cognitive components. Additional research in this area could provide a better understanding of the construction managers' acceptance of green building goals and objectives. Based on the speculative demographics results presented in this study, there is a need to further research on (a) why construction management majors (especially seniors) tend to have less favorable cognitions related to environmental behaviors than non-construction management majors and (b) what role construction experience (specifically required

internships) play in determinations of students' support for green building goals and principles. Other demographic variables of interest would include age and unbanicity.

This study has helped to clarify the role that values play in determining behaviors when value orientations are not well formed. It is likely, however, that as construction management students are exposed to more sustainability concepts related to green building that their related value orientations will fully mediate the relationship between values and higher order cognitions. As a result, an opportunity exists to study the impact of construction management education on the development of students' value orientation through the use of a longitudinal study tracking changes in their value orientations. As a part of this study, student values, value orientations, attitudes and norms related to green building would be tracked over the course of their college career. A longitudinal study of this nature would also provide an opportunity to test Shultz and Zelezny's (2003) theory that individual's values and/or value orientations can act as filters of environmental messages, possibly shedding some light on why the construction industry has been relatively slow to embrace sustainability.

The potential educational impacts of this research are not limited to higher education programs. As organizations like the U.S. Green Building Council seek broader market penetration of green building design and construction practices through education campaigns within industry, the results of this study and subsequent studies can inform design of education campaigns to make them more effective. Just as the cognitive hierarchy can provide a framework for understanding how construction management students view the environment, it can also assist in understanding industry professionals'

cognitive dynamics as they pertain to their environmental behaviors within the construction industry.

Final recommendations for future studies utilizing the survey instrument used in this study, or a similar instrument, would be (a) to allow more time for students to complete the survey in class, (b) to provide more instruction on how to respond to survey items, and (c) to point out the differences between groups of questions. Instruction methods could even include example questions and answers that also highlight the differences between groups of questions.

Construction Waste Recycling

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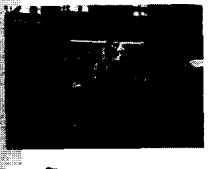
970-491-5215

What is Construction Waste Recycling?

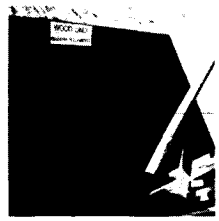


- CWR is the separation of construction waste materials for remanufacturing or reprocessing into usable or marketable materials.
- CWR Purpose is to reduce amount of building materials in landfills.
- Component of Sustainable Construction
  - Many sustainable projects are recycling 50-75% of CW

What can be recycled?

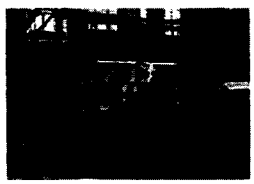
- Wood
- Metal
- Cardboard
- Gypsum
- Aggregate materials
  - Concrete, blocks, bricks, and rocks



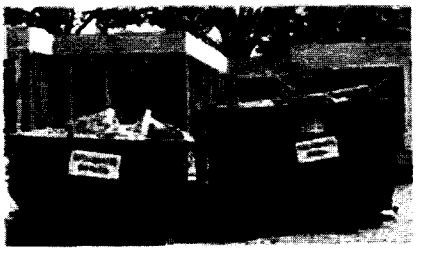
Types of CWR Systems:

Co-mingled vs. On-site



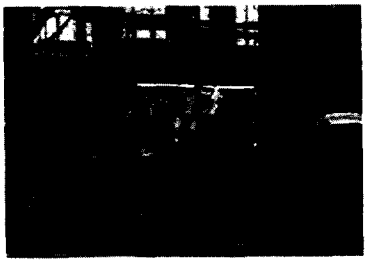

On-site (or source separated) Recycling

- Construction crews put recyclables in separate containers as they are generated.
- A recycling hauler then takes the materials *directly* to a recycler or transfer site.



Co-mingled Recycling

- Construction crews put recyclables in one container.
- A recycling hauler then takes the materials to a *sorting facility* where the materials are separated for recycling.



Co-mingled Pros & Cons

- **Co-mingled** recycling can cost less than garbage disposal.
- **On-site** recycling can cost less than co-mingled recycling.
- **On-site** recycling yields an average facility recycling rate of 90+%.
- **Co-mingled** recycling rates *can vary* from 15% to 93%.
  - Many materials that have recycle potential are disposed of as garbage.

Components of CWR Plan

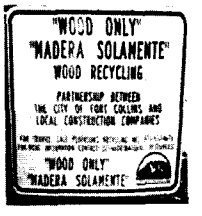
- Designate a CW Management (CWM) Coordinator
- Establish CW Recycling Goals
- Analysis of Project Waste
  - Walk job site to identify wastes
    - estimate quantities
  - Review plans for CW
    - estimate quantities
- Determine Disposal Methods & Mtrl. Handling Procedures
- Instructions for Crews and Subs
- Contacting salvage companies, recyclers, and haulers
- Use CWM Plan & Reporting forms

Implementing a CWR Plan

- Contracts
- Progress Meetings
- Proper Signage
- Construction Waste Manager
- CW Management Plan

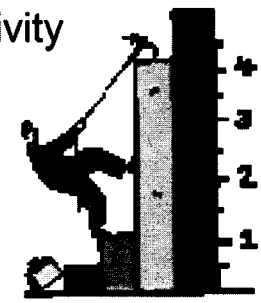
Communication Plan

- Distribute copies of CWM Plan to subcontractors
- Discuss at safety meetings and subcontractor's meeting
- Label all recycling containers
- Post lists and pictures of acceptable/unacceptable materials in bins
- Establish job-site notification for recycling and trash container pick-up
- Document quantities and types of materials reused, salvaged, recycled, and disposed
- Communicate results of CWM Plan



Challenges of CWR Programs

- Lack of Familiarity with Concept
- Requires Extra Planning and Work
- Chance the CWR Program won't work
- Potential Initial Costs Associated with CWR programs
- Concerns about Jobsite Productivity



Review: *Keys* to a Successful CWR Program

- Manage Your Program
- Involve Subcontractors
- Find Appropriate Space
- Promote and Educate
- Prevent Contamination

Additional Resources:

Handouts Available:

- Burt, R., Graham, C., and Dye, J. D. (2006) **Case Studies Analyzing Enforcement of a Construction Waste Management Plan.** http://www.asceditor.usm.edu/archives/2006/CPRT01_Burt06_1100.htm
- **Construction Waste Recycling at Bacon Elementary** http://www.psdschools.org/documentlibrary/downloads/Operations/Facilities/EPA_Recycling_Grant.pdf#search=%22EPA%20Final%20Technical%20Report%20for%20construction%20recycling%20at%20bacon%20elementary%22
- **Construction Waste Management Guide** www.ga.wa.gov/eas.cwm
- Kibert, C. J. (2005) **Sustainable Construction**: Green Building Design and Delivery. John Wiley & Sons, Inc. New York, N.Y.
- **King County Construction Waste Recycling** (CWR Specifications) http://www.metrokc.gov/dnrp/swd/construction-recycling/
- **LEED Information** http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
- **Summary of LEED v2.2 Reference Manual** (80 page document) https://www.usgbc.org/ShowFile.aspx?DocumentID=1095
- **Resource Venture** http://www.resourceventure.org/rv/issues/building/get-started/cons-wste-mgmt/index.php
- **USGBC Website** www.usgbc.org

CM Students and CWR Study

CM Students and CWR Study

- **Purpose:** to better understand how students ***think*** about Construction Waste Recycling (CWR)
- Your Participation is *Critical* to the Study Results
  - To participate in this study, please take the next 15 – 20 minutes to fill out the survey.
  - It is important to answer all questions because they all tie together to give a picture of how you think about Waste Recycling.
- Participation is Voluntary
- More information about this study will be available as you leave.
  - There will be a discussion session to discuss this study further. You may also volunteer to participate in an interview related to this study by contacting Mary Nobe.

Appendix B: Survey Instrument

A Survey of Construction Management Students' Values, Attitudes and Norms

This survey is being conducted in conjunction with the following study:

Project Title: Values and Construction Waste Recycling: An Application of the Cognitive Hierarchy to Construction Management Education.

This study is being conducted to learn more about the values and attitudes of students enrolled in construction management courses like the one you are currently enrolled in.

This study is being conducted by:

Principal Investigator:
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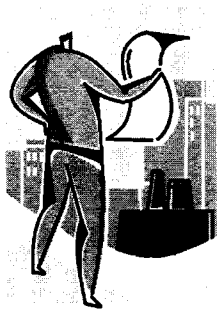
Results for this study will help to improve construction education by helping educators in construction programs to better understand how construction management students think about the environment in relation to construction practices.

You are being asked to participate in this study by filling out the attached survey. Your participation in this study is completely voluntary. Your responses on the questionnaire will in no way impact evaluation of your performance in this course.

The results from this study will be distributed to the scientific community through professional presentations and publications. The questionnaire should take about 20 minutes to complete.



Please answer every question as carefully as you can. The questions are tied together so that our picture of your values, attitudes and what you consider acceptable comes from the whole pattern of your answers. You are urged to answer every question since each missing answer will decrease the value of all your answers. Answer what you feel to be true for you. The best answer is the one that is closest to your own feelings.

There are no known risks to you for participating in this study. However, it is not possible to identify all potential risks in an experimental procedure, but the researchers have taken reasonable safeguards to minimize any known and potential, but unknown, risks. If you have any questions about your rights as a volunteer in this research, contact Janell Meldrem, Human Research Administrator, at 970-491-1655.

Construction Management Student Survey

1. Research has shown that Americans predominately hold the same values. How these values are ranked; however, is unique to each individual. Following is a list of personal values arranged in alphabetical order.

After studying the list, select the value that is most important to YOU as a guiding principle in YOUR life. Give that value a rating of 7.

Next, select the value that is least important to YOU and give it a rating of 1.

Rate the remaining values on a scale from 1-7 based on how important each is to YOU as a guiding principle in YOUR life. Please use 'high' and 'low' ratings sparingly.

	Low Importance			Medium Importance			High Importance
A WORLD OF BEAUTY (beauty of nature and the arts)	1	2	3	4	5	6	7
AMBITIOUS (hard-working, aspiring)	1	2	3	4	5	6	7
AUTHORITY (the right to lead or command)	1	2	3	4	5	6	7
BROAD-MINDED (tolerant of ideas and beliefs)	1	2	3	4	5	6	7
CAPABLE (competent, effective)	1	2	3	4	5	6	7
FORGIVING (willing to pardon others)	1	2	3	4	5	6	7
HELPFUL (working for the welfare of others)	1	2	3	4	5	6	7
HONEST (genuine, sincere)	1	2	3	4	5	6	7
INFLUENTIAL (having an impact)	1	2	3	4	5	6	7
LOYAL (faithful to my friends, group)	1	2	3	4	5	6	7
PRESERVING MY PUBLIC IMAGE (saving face)	1	2	3	4	5	6	7
PROTECTING THE ENVIRONMENT	1	2	3	4	5	6	7
SOCIAL POWER (control over others)	1	2	3	4	5	6	7
SUCCESSFUL (achieving goals)	1	2	3	4	5	6	7
UNITY WITH NATURE (fitting into nature)	1	2	3	4	5	6	7
WEALTH (material possession, money)	1	2	3	4	5	6	7

2. For *each* of the following statements, think about how *you personally* feel about the statement, and then indicate how strongly you agree or disagree with the statement. Some of the statements have only slight differences and might sound the same. Please indicate how you feel about *each* statement by putting a circle around the response that is the closet to the way you feel.

	Strongly Agree	Moderately Agree	Slightly Agree	Neutral	Slightly Disagree	Moderately Disagree	Strongly Disagree
The primary value of forests is to generate money and economic self-reliance for communities.	1	2	3	4	5	6	7
The primary value of forests is to provide timber, and grazing land for people who depend on them for their way of life.	1	2	3	4	5	6	7
Forests are valuable only if they produce jobs and income for people.	1	2	3	4	5	6	7
Nature's primary value is to provide products useful to people.	1	2	3	4	5	6	7
The value of forests exists only in the human mind. Without people forests have no value.	1	2	3	4	5	6	7
Forests have as much right to exist as people.	1	2	3	4	5	6	7
Nature has as much right to exist as people.	1	2	3	4	5	6	7
Wildlife, plants and people have equal rights to live and develop.	1	2	3	4	5	6	7
Forests have value, whether people are present or not.	1	2	3	4	5	6	7
Forests should be preserved so that future generations can enjoy them.	1	2	3	4	5	6	7
The opportunity for spiritual renewal is the most important value of forests.	1	2	3	4	5	6	7
The opportunity for spiritual renewal is the most important value of nature.	1	2	3	4	5	6	7

3. Overall, how do you feel about construction waste recycling?

Construction waste recycling is:

Unnecessary for the Environment	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Necessary for the Environment**
Personally Punishing	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Personally Rewarding**
Harmful to the Environment	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Beneficial to the Environment**
Bad for the Environment	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Good for the Environment**

4. Individuals have different reasons for thinking that construction waste recycling (CWR) might be important based on their perceptions of its costs and benefits. For *each* of the following statements, please indicate how likely or unlikely you think each statement would result from construction waste recycling.

	Extremely Unlikely	Moderately Unlikely	Slightly Unlikely	Neutral	Slightly Likely	Moderately Likely	Extremely Likely
Construction waste recycling will result in significantly less construction materials going to landfills.	-3	-2	-1	0	1	2	3
Construction waste recycling is good for the environment.	-3	-2	-1	0	1	2	3
Recycling construction materials will cost a lot more than just throwing them away.	-3	-2	-1	0	1	2	3
It will take significantly more time to separate materials than throwing them in a dumpster.	-3	-2	-1	0	1	2	3
Recycling materials will lead to much cheaper materials in the future.	-3	-2	-1	0	1	2	3
Recycling materials will result in an abundance of re-usable materials.	-3	-2	-1	0	1	2	3
Wide spread construction waste recycling will greatly enhance the construction industry's image.	-3	-2	-1	0	1	2	3
Recycling materials will greatly increase the sustainability of the construction industry.	-3	-2	-1	0	1	2	3
Recycling materials will significantly reduce long-term construction costs.	-3	-2	-1	0	1	2	3
Incorporation of a recycling program will significantly reduce the amount of construction materials needed for new construction.	-3	-2	-1	0	1	2	3

5. For each of the possible outcomes of construction waste recycling mentioned in the previous question, please indicate whether *you* consider it a good or bad outcome, and to what degree.

	Extremely Bad	Moderately Bad	Slightly Bad	Neutral	Slightly Good	Moderately Good	Extremely Good
Construction waste recycling will result in significantly less construction materials going to landfills.	-3	-2	-1	0	1	2	3
Construction waste recycling is good for the environment.	-3	-2	-1	0	1	2	3
Recycling construction materials will cost a lot more than just throwing them away.	-3	-2	-1	0	1	2	3
It will take significantly more time to separate materials than throwing them in a dumpster.	-3	-2	-1	0	1	2	3
Recycling materials will lead to much cheaper materials in the future.	-3	-2	-1	0	1	2	3
Recycling materials will result in an abundance of re-usable materials.	-3	-2	-1	0	1	2	3
Wide spread construction waste recycling will greatly enhance the construction industry's image.	-3	-2	-1	0	1	2	3
Recycling materials will greatly increase the sustainability of the construction industry.	-3	-2	-1	0	1	2	3
Recycling materials will significantly reduce long-term construction costs.	-3	-2	-1	0	1	2	3
Incorporation of a recycling program will significantly reduce the amount of construction materials needed for new construction.	-3	-2	-1	0	1	2	3

6. In your professional career, how likely are you to engage in each of the following activities pertaining to construction waste recycling?

If you were starting a new job next month, how likely is it that you would do each of the following?	Extremely Unlikely	Moderately Unlikely	Slightly Unlikely	Neutral	Slightly Likely	Moderately Likely	Extremely Likely
I intend to verbally support construction waste recycling program efforts (i.e. reminding people that they should recycle construction materials).	-3	-2	-1	0	1	2	3
I intend to support construction waste recycling program efforts through my actions (i.e. picking up materials that have discarded and placing them in the appropriate recycle bin).	-3	-2	-1	0	1	2	3
I intend to go out of my way to insure that all materials that can be recycled are being recycled.	-3	-2	-1	0	1	2	3
I intend to volunteer to organize an on-site construction waste recycling program	-3	-2	-1	0	1	2	3
I intend to be a strong advocate for construction waste recycling programs.	-3	-2	-1	0	1	2	3
If given the chance, I would vote for mandatory construction waste recycling programs.	-3	-2	-1	0	1	2	3

7. Assuming that your were starting a new job next month, how would you feel about being a *strong advocate* for construction waste recycling?

Being a strong advocate of construction waste recycling is :

Bad	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Good**
Foolish	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Wise**
Harmful to the Environment	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Beneficial to the Environment**
Personally Punishing	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Personally Rewarding**

8. Assuming that your were starting a new job next month, how would you feel about *volunteering* to setup a construction waste recycling program?

Volunteering to setup a construction waste recycling program is :

Bad	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Good**
Foolish	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Wise**
Harmful to the Environment	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Beneficial to the Environment**
Personally Punishing	Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely	**Personally Rewarding**

9. For *each* of the following statements, please indicate how likely (or unlikely) you think each statement would result from your actions.

A. By *strongly* advocating for construction waste recycling,	**Extremely Unlikely**	**Moderately Unlikely**	**Slightly Unlikely**	**Neutral**	**Slightly Likely**	**Moderately Likely**	**Extremely Likely**
I would significantly decrease the amount of construction materials going to landfills.	-3	-2	-1	0	1	2	3
I would decrease overall job site productivity.	-3	-2	-1	0	1	2	3
I would significantly increase jobsite overhead costs.	-3	-2	-1	0	1	2	3
I would greatly enhance my company's public image.	-3	-2	-1	0	1	2	3
I would significantly reduce the amount of construction materials needed for this job.	-3	-2	-1	0	1	2	3

B. By *volunteering* to setup a construction waste recycling program,	**Extremely Unlikely**	**Moderately Unlikely**	**Slightly Unlikely**	**Neutral**	**Slightly Likely**	**Moderately Likely**	**Extremely Likely**
I would significantly decrease the amount of construction materials going to landfills.	-3	-2	-1	0	1	2	3
I would decrease overall job site productivity.	-3	-2	-1	0	1	2	3
I would significantly increase jobsite overhead costs.	-3	-2	-1	0	1	2	3
I would greatly enhance my company's public image.	-3	-2	-1	0	1	2	3
I would significantly reduce the amount of construction materials needed for this job.	-3	-2	-1	0	1	2	3

10. For each of the possible outcomes mentioned in the previous question, please indicate whether *you* consider it a good or bad outcome, and to what degree.

A. By *strongly advocating* for construction waste recycling,	Extremely Bad	Moderately Bad	Slightly Bad	Neutral	Slightly Good	Moderately Good	Extremely Good
I would significantly decrease the amount of construction materials going to landfills.	-3	-2	-1	0	1	2	3
I would decrease overall job site productivity.	-3	-2	-1	0	1	2	3
I would significantly increase jobsite overhead costs.	-3	-2	-1	0	1	2	3
I would greatly enhance my company's public image.	-3	-2	-1	0	1	2	3
I would significantly reduce the amount of construction materials needed for this job.	-3	-2	-1	0	1	2	3

B. By *volunteering* to setup a construction waste recycling program,	Extremely Bad	Moderately Bad	Slightly Bad	Neutral	Slightly Good	Moderately Good	Extremely Good
I would significantly decrease the amount of construction materials going to landfills.	-3	-2	-1	0	1	2	3
I would decrease overall job site productivity.	-3	-2	-1	0	1	2	3
I would significantly increase jobsite overhead costs.	-3	-2	-1	0	1	2	3
I would greatly enhance my company's public image.	-3	-2	-1	0	1	2	3
I would significantly reduce the amount of construction materials needed for this job.	-3	-2	-1	0	1	2	3

11. Most people who are important to me think I should volunteer to setup construction waste recycling programs on all projects that I work on.

Unlikely _____ Extremely : _____ Quite : _____ Slightly : _____ Neither : _____ Slightly : _____ Quite : _____ Extremely **Likely**

12. Most people who are important to me think I should be a strong advocate for construction waste recycling programs on all projects that I work on.

Unlikely _____ Extremely : _____ Quite : _____ Slightly : _____ Neither : _____ Slightly : _____ Quite : _____ Extremely **Likely**

13. Most people who are important to me think I should vote for mandatory construction waste recycling.

Unlikely _____ Extremely : _____ Quite : _____ Slightly : _____ Neither : _____ Slightly : _____ Quite : _____ Extremely **Likely**

14. Please indicate the likelihood that each of the people (or groups of people) listed below would expect you to be a *strong advocate* for construction waste recycling programs.

	Extremely Unlikely	Moderately Unlikely	Slightly Unlikely	Neutral	Slightly Likely	Moderately Likely	Extremely Likely
Peer members of professional CM student organizations	-3	-2	-1	0	1	2	3
Material suppliers	-3	-2	-1	0	1	2	3
Construction laborers	-3	-2	-1	0	1	2	3
Construction companies	-3	-2	-1	0	1	2	3
Your Future Employer	-3	-2	-1	0	1	2	3
Local Politicians	-3	-2	-1	0	1	2	3
Waste management companies	-3	-2	-1	0	1	2	3
Your Teachers	-3	-2	-1	0	1	2	3
Your Close Friends	-3	-2	-1	0	1	2	3
Your Parents	-3	-2	-1	0	1	2	3
Your Family (children, spouse, siblings, etc.)	-3	-2	-1	0	1	2	3

15. Please indicate the likelihood that each of the people (or groups of people) listed below would expect you to *volunteer* to setup a construction waste recycling program.

	Extremely Unlikely	Moderately Unlikely	Slightly Unlikely	Neutral	Slightly Likely	Moderately Likely	Extremely Likely
Peer members of professional CM student organizations	-3	-2	-1	0	1	2	3
Material suppliers	-3	-2	-1	0	1	2	3
Construction laborers	-3	-2	-1	0	1	2	3
Construction companies	-3	-2	-1	0	1	2	3
Your Future Employer	-3	-2	-1	0	1	2	3
Local Politicians	-3	-2	-1	0	1	2	3
Waste management companies	-3	-2	-1	0	1	2	3
Your Teachers	-3	-2	-1	0	1	2	3
Your Close Friends	-3	-2	-1	0	1	2	3
Your Parents	-3	-2	-1	0	1	2	3
Your Family (children, spouse, siblings, etc.)	-3	-2	-1	0	1	2	3

16. Generally speaking, please indicate to what extent you are *motivated* to do what each of the following people (or groups of people) think you *should do.*

	Not at All						Extremely
Peer members of professional CM student organizations	1	2	3	4	5	6	7
Material suppliers	1	2	3	4	5	6	7
Construction laborers	1	2	3	4	5	6	7
Construction companies	1	2	3	4	5	6	7
Your Future Employer	1	2	3	4	5	6	7
Local Politicians	1	2	3	4	5	6	7
Waste management companies	1	2	3	4	5	6	7
Your Teachers	1	2	3	4	5	6	7
Your Close Friends	1	2	3	4	5	6	7
Your Parents	1	2	3	4	5	6	7
Your Family (children, spouse, siblings, etc.)	1	2	3	4	5	6	7

Please tell us a little about yourself.

1. Please rate your level of knowledge related to construction waste recycling by placing a checkmark on the scale below.

Thorough Knowledge	_____ : _____ : _____ : _____ : _____ : _____ : _____	**Never heard of**
	Neutral	

2. In courses dealing with construction waste recycling, what information would be most interesting to you? Please list the one or two items that would be important to you. Please select only your top two choices.

- □ Benefits to the Environment
- □ Cost of recycling program
- □ How to setup a recycling program
- □ Impacts to construction productivity
- □ What materials can be recycled
- □ Impact of construction materials on environment
- □ Other _____

3. □ Male □ Female

4. How old are you? _____

5. What is your major?

- □ Construction Management
- □ Interior Design
- □ Business or Finance
- □ Other _____

6. Are you a graduate student? □ Yes □ No

If yes, in what area was your Bachelor Degree? _____

7. Have you ever worked on a construction project? □ Yes □ No

If yes, for how long? □ 3 – 6 months □ 13 – 24 months □ 7 – 12 months □ More than 24 months

8. Approximately how large was the community in which you grew up?

□	□	□	□	□	□
A farm or rural area with less than 400 people.	A small town with 400 - 9,999 people.	A town with 10,000 to 49,999 people.	A small city with 50,000 to 99,999 people.	A city with 100,000 to 249,999 people.	A large city with 250,000 or more people.

Thank you for all of your answers and your time!
You participation will greatly enhance the results of this study.
Thank you!

Appendix C: Human Research Compliance Application and Approval

University Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX: (970) 491-2293

Notice of Approval for Human Research

Principal Investigator:	Brian Cobb, Education , 1588
Co-Principal Investigator:	MaryEllen Nobe, 102 Guggenheim , 1584
Title:	Values and Construction Waste Recycling: An Application of the Cognitive Hierarchy to Construction Management Education
Protocol #:	06-250H **Funding Source:** N/A
Number approved:	587 participants
Committee Action:	**Approval Date:** October 12, 2006 **Expires:** October 9, 2007
HRC Administrator:	Janell Meldrem Janell Meldrem

Consent Process:
Because of the nature of this research, it will not be necessary to obtain a signed consent form. However, all subjects must receive a copy of the approved cover letter printed on department letterhead. The requirement of documentation of a consent form is waived under § _ _.117(c)(2).

Investigator Responsibilities:

- It is the PI's responsibility to obtain consent from all subjects.
- It is the responsibility of the PI to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research.
- It is also the PI's responsibility to notify the Committee of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators must obtain PI approval for any changes prior to submitting the proposed changes to the HRC for review and approval.
- The PI is ultimately responsible for the conduct of the project.
- A status report of this project will be required within a 12-month period from the date of review. Renewal is the PI's responsibility, but as a courtesy, a reminder will be sent approximately two months before the protocol expires. The PI will be asked to report on the numbers of subjects who have participated this year and project-to-date, problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary continuation form (H-101) is available from the RCO web page www.research.colostate.edu/rcoweb/.
- Upon completion of the project, an H-101 should be submitted as a close-out report.
- If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice. This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647.
- **Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.**

Please direct any questions about the Committee's action on this project to me for routing to the Committee. Additional information is available from the Regulatory Compliance web site at http://www.research.colostate.edu/rcoweb/.

attachment Date of Correspondence: October 30, 2006

Script for Phone Interviews

The following script will be read at the beginning of the phone interviews.

Hello, this is Mary Nobe. I am calling you because you recently signed up to participate in a phone interview related to the survey you filled out recently in _____(Insert course name)_____.

This interview should take less than 10 minutes and your participation will in no way impact your course grade. Are you still willing to participate? _____

Thank you.

I first need to review the purpose of this interview.

The purpose of this discussion session is to get a better understanding of your perceptions of the survey instrument on construction waste recycling that you filled out in class. This is an informal interview and your participation is completely voluntary. If at any time you feel uncomfortable and wish to stop the interview, just let me know and we will end the conversation. I will take notes during this interview and may have to ask you to repeat statements occasionally; however, your name will not be included in those notes. Your participation and comments in this discussion will in no way impact your course grade.

Now that we have reviewed the purpose of this interview, do you have any questions?

Respond to questions.

For this interview, I have 4 questions that I would like to ask you.

6. Were there questions that you did not understand or that you felt you could not answer? Can you elaborate?
7. Did you feel that the questions were easy to understand?
8. Did you feel that the survey was a good use of your time?
9. Overall, how did you feel about the survey?

Thank you for taking time to answer these questions. Your responses will greatly enhance the results from the survey. Before we end this interview, do you have any other comments or questions pertaining to this study?

Answer questions.

Again, thank you for your time. Goodbye.

Guiding Questions for Group Discussion

1. Were there questions that you did not understand or that you felt you could not answer? Can you elaborate?
2. Did you feel that the questions were easy to understand?
3. Did you feel that the survey was a good use of your time?
4. Overall, how did you feel about the survey?
5. Are there any other comments or questions about the survey or the study that I can answer?

Appendix D: Frequency Tables for all Survey Items

A World of Beauty		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	9	2.1	2.1	2.1
	2	16	3.6	3.7	5.8
	3	33	7.5	7.7	13.5
	4 Medium Importance	80	18.2	18.6	32.2
	5	100	22.8	23.3	55.5
	6	112	25.5	26.1	81.6
	7 High Importance	79	18.0	18.4	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Ambitious		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	.7	.7	.7
	4 Medium Importance	27	6.2	6.3	6.9
	5	78	17.8	18.1	25.0
	6	166	37.8	38.4	63.4
	7 High Importance	158	36.0	36.6	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Authority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	8	1.8	1.9	1.9
	2	10	2.3	2.3	4.2
	3	43	9.8	10.0	14.2
	4 Medium Importance	89	20.3	20.7	34.9
	5	104	23.7	24.2	59.1
	6	135	30.8	31.4	90.5
	7 High Importance	41	9.3	9.5	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

Broad-Minded		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	3	.7	.7	.7
	2	2	.5	.5	1.2
	3	22	5.0	5.2	6.3
	4 Medium Importance	62	14.1	14.5	20.8
	5	111	25.3	26.0	46.8
	6	152	34.6	35.6	82.4
	7 High Importance	75	17.1	17.6	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

Capable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	1	.2	.2	.2
	2	3	.7	.7	.9
	3	8	1.8	1.9	2.8
	4 Medium Importance	29	6.6	6.8	9.6
	5	93	21.2	21.7	31.2
	6	181	41.2	42.2	73.4
	7 High Importance	114	26.0	26.6	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Forgiving		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	8	1.8	1.9	1.9
	2	6	1.4	1.4	3.3
	3	24	5.5	5.6	8.9
	4 Medium Importance	78	17.8	18.2	27.0
	5	119	27.1	27.7	54.8
	6	126	28.7	29.4	84.1
	7 High Importance	68	15.5	15.9	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Helpful		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	3	.7	.7	.7
	2	3	.7	.7	1.4
	3	13	3.0	3.1	4.5
	4 Medium Importance	49	11.2	11.5	16.0
	5	105	23.9	24.6	40.6
	6	160	36.4	37.6	78.2
	7 High Importance	93	21.2	21.8	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Honest		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	1	.2	.2	.2
	3	2	.5	.5	.7
	4 Medium Importance	15	3.4	3.5	4.2
	5	46	10.5	10.7	14.8
	6	160	36.4	37.1	52.0
	7 High Importance	207	47.2	48.0	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Influential		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	4	.9	.9	.9
	2	4	.9	.9	1.9
	3	23	5.2	5.4	7.2
	4 Medium Importance	64	14.6	14.9	22.1
	5	109	24.8	25.4	47.6
	6	159	36.2	37.1	84.6
	7 High Importance	66	15.0	15.4	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Loyal		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.2	.2	.2
	3	5	1.1	1.2	1.4
	4 Medium Importance	19	4.3	4.4	5.8
	5	58	13.2	13.5	19.3
	6	160	36.4	37.3	56.6
	7 High Importance	186	42.4	43.4	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Preserving My Public Image		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	39	8.9	9.0	9.0
	2	35	8.0	8.1	17.2
	3	48	10.9	11.1	28.3
	4 Medium Importance	102	23.2	23.7	52.0
	5	91	20.7	21.1	73.1
	6	75	17.1	17.4	90.5
	7 High Importance	41	9.3	9.5	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Protecting the Environment		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	4	.9	.9	.9
	2	8	1.8	1.9	2.8
	3	21	4.8	4.9	7.7
	4 Medium Importance	76	17.3	17.7	25.3
	5	129	29.4	30.0	55.3
	6	121	27.6	28.1	83.5
	7 High Importance	71	16.2	16.5	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

Social Power		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	65	14.8	15.3	15.3
	2	47	10.7	11.1	26.4
	3	85	19.4	20.0	46.5
	4 Medium Importance	87	19.8	20.5	67.0
	5	89	20.3	21.0	88.0
	6	40	9.1	9.4	97.4
	7 High Importance	11	2.5	2.6	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Successful		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	1	.2	.2	.2
	2	3	.7	.7	.9
	3	3	.7	.7	1.6
	4 Medium Importance	23	5.2	5.4	7.0
	5	61	13.9	14.3	21.3
	6	174	39.6	40.7	61.9
	7 High Importance	163	37.1	38.1	100.0
	Total	428	97.5	100.0	
Missing	9	11	2.5		
Total		439	100.0		

Unity With Nature		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	24	5.5	5.7	5.7
	2	17	3.9	4.0	9.7
	3	49	11.2	11.6	21.3
	4 Medium Importance	92	21.0	21.7	43.0
	5	102	23.2	24.1	67.1
	6	88	20.0	20.8	87.9
	7 High Importance	51	11.6	12.1	100.0
	Total	423	96.4	100.0	
Missing	9	16	3.6		
Total		439	100.0		

Wealth		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Low Importance	26	5.9	6.0	6.0
	2	25	5.7	5.8	11.8
	3	38	8.7	8.8	20.6
	4 Medium Importance	80	18.2	18.5	39.1
	5	116	26.4	26.9	66.0
	6	109	24.8	25.2	91.2
	7 High Importance	38	8.7	8.8	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

The primary value of forests is to generate money and economic self-reliance for communities.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	94	21.4	21.6	21.6
	2 Moderately Disagree	150	34.2	34.5	56.1
	3 Slightly Disagree	82	18.7	18.9	74.9
	4 Neutral	51	11.6	11.7	86.7
	5 Slightly Agree	49	11.2	11.3	97.9
	6 Moderately Agree	7	1.6	1.6	99.5
	7 Strongly Agree	2	.5	.5	100.0
	Total	435	99.1	100.0	
Missing	9	4	.9		
Total		439	100.0		

The primary value of forests is to provide timber, and grazing land for people who depend on them for their way of life.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	33	7.5	7.6	7.6
	2 Moderately Disagree	81	18.5	18.6	26.2
	3 Slightly Disagree	99	22.6	22.8	49.0
	4 Neutral	74	16.9	17.0	66.0
	5 Slightly Agree	101	23.0	23.2	89.2
	6 Moderately Agree	41	9.3	9.4	98.6
	7 Strongly Agree	6	1.4	1.4	100.0
	Total	435	99.1	100.0	
Missing	9	4	.9		
Total		439	100.0		

Forests are valuable only if the produce jobs and income for people.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	186	42.4	42.8	42.8
	2 Moderately Disagree	126	28.7	29.0	71.7
	3 Slightly Disagree	84	19.1	19.3	91.0
	4 Neutral	18	4.1	4.1	95.2
	5 Slightly Agree	12	2.7	2.8	97.9
	6 Moderately Agree	5	1.1	1.1	99.1
	7 Strongly Agree	4	.9	.9	100.0
	Total	435	99.1	100.0	
Missing	9	4	.9		
Total		439	100.0		

Nature's primary value is to provide products useful to people.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	78	17.8	18.0	18.0
	2 Moderately Disagree	114	26.0	26.3	44.2
	3 Slightly Disagree	103	23.5	23.7	68.0
	4 Neutral	62	14.1	14.3	82.3
	5 Slightly Agree	49	11.2	11.3	93.5
	6 Moderately Agree	23	5.2	5.3	98.8
	7 Strongly Agree	5	1.1	1.2	100.0
	Total	434	98.9	100.0	
Missing	9	5	1.1		
Total		439	100.0		

The value of forests exists only in the human mind.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	172	39.2	39.5	39.5
	2 Moderately Disagree	120	27.3	27.6	67.1
	3 Slightly Disagree	55	12.5	12.6	79.8
	4 Neutral	42	9.6	9.7	89.4
	5 Slightly Agree	22	5.0	5.1	94.5
	6 Moderately Agree	16	3.6	3.7	98.2
	7 Strongly Agree	8	1.8	1.8	100.0
	Total	435	99.1	100.0	
Missing	9	4	.9		
Total		439	100.0		

Forests have as much right to live as humans.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	23	5.2	5.3	5.3
	2 Moderately Disagree	29	6.6	6.7	12.0
	3 Slightly Disagree	40	9.1	9.2	21.2
	4 Neutral	52	11.8	12.0	33.2
	5 Slightly Agree	66	15.0	15.2	48.4
	6 Moderately Agree	103	23.5	23.7	72.1
	7 Strongly Agree	121	27.6	27.9	100.0
	Total	434	98.9	100.0	
Missing	9	5	1.1		
Total		439	100.0		

Nature has as much right to exist as people.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	17	3.9	3.9	3.9
	2 Moderately Disagree	14	3.2	3.2	7.1
	3 Slightly Disagree	26	5.9	6.0	13.1
	4 Neutral	42	9.6	9.7	22.8
	5 Slightly Agree	65	14.8	15.0	37.8
	6 Moderately Agree	111	25.3	25.6	63.4
	7 Strongly Agree	159	36.2	36.6	100.0
	Total	434	98.9	100.0	
Missing	9	5	1.1		
Total		439	100.0		

Wildlife, plants and people have equal rights to live and develop.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	20	4.6	4.6	4.6
	2 Moderately Disagree	32	7.3	7.4	12.0
	3 Slightly Disagree	47	10.7	10.9	22.9
	4 Neutral	61	13.9	14.1	37.0
	5 Slightly Agree	65	14.8	15.0	52.0
	6 Moderately Agree	97	22.1	22.4	74.4
	7 Strongly Agree	111	25.3	25.6	100.0
	Total	433	98.6	100.0	
Missing	9	6	1.4		
Total		439	100.0		

Forests have value, whether people are present or not.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	10	2.3	2.3	2.3
	2 Moderately Disagree	13	3.0	3.0	5.3
	3 Slightly Disagree	17	3.9	3.9	9.2
	4 Neutral	26	5.9	6.0	15.2
	5 Slightly Agree	60	13.7	13.9	29.1
	6 Moderately Agree	139	31.7	32.1	61.2
	7 Strongly Agree	168	38.3	38.8	100.0
	Total	433	98.6	100.0	
Missing	9	6	1.4		
Total		439	100.0		

Forests should be preserved so that future generations can enjoy them.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	6	1.4	1.4	1.4
	2 Moderately Disagree	2	.5	.5	1.8
	3 Slightly Disagree	11	2.5	2.5	4.4
	4 Neutral	23	5.2	5.3	9.7
	5 Slightly Agree	37	8.4	8.5	18.2
	6 Moderately Agree	127	28.9	29.3	47.5
	7 Strongly Agree	228	51.9	52.5	100.0
	Total	434	98.9	100.0	
Missing	9	5	1.1		
Total		439	100.0		

The opportunity for spiritual renewal is the most important value of forests.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	38	8.7	8.8	8.8
	2 Moderately Disagree	58	13.2	13.4	22.2
	3 Slightly Disagree	34	7.7	7.9	30.0
	4 Neutral	195	44.4	45.0	75.1
	5 Slightly Agree	57	13.0	13.2	88.2
	6 Moderately Agree	33	7.5	7.6	95.8
	7 Strongly Agree	18	4.1	4.2	100.0
	Total	433	98.6	100.0	
Missing	9	6	1.4		
Total		439	100.0		

The opportunity for spiritual renewal is the most important value of nature.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Strongly Disagree	46	10.5	10.6	10.6
	2 Moderately Disagree	51	11.6	11.8	22.4
	3 Slightly Disagree	38	8.7	8.8	31.2
	4 Neutral	188	42.8	43.4	74.6
	5 Slightly Agree	63	14.4	14.5	89.1
	6 Moderately Agree	28	6.4	6.5	95.6
	7 Strongly Agree	19	4.3	4.4	100.0
	Total	433	98.6	100.0	
Missing	9	6	1.4		
Total		439	100.0		

Construction waste recycling is unnecessary/necessary for the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	2	.5	.5	.5
	-2 Quite Unnecessary	8	1.8	1.9	2.3
	-1 Slightly Unnecessary	6	1.4	1.4	3.7
	0 Neither	3	.7	.7	4.4
	1 Slightly Necessary	56	12.8	13.0	17.4
	2 Quite Necessary	216	49.2	50.2	67.7
	3 Extremely Necessary	139	31.7	32.3	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

Construction waste recycling is personally punishing/rewarding.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Quite Unnecessary	10	2.3	2.3	2.3
	-1 Slightly Unnecessary	15	3.4	3.5	5.8
	0 Neither	52	11.8	12.1	17.9
	1 Slightly Necessary	119	27.1	27.7	45.7
	2 Quite Necessary	186	42.4	43.4	89.0
	3 Extremely Necessary	47	10.7	11.0	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Construction waste recycling is harmful/beneficial to the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	1	.2	.2	.2
	-2 Quite Unnecessary	6	1.4	1.4	1.6
	-1 Slightly Unnecessary	6	1.4	1.4	3.0
	0 Neither	5	1.1	1.2	4.2
	1 Slightly Necessary	32	7.3	7.4	11.6
	2 Quite Necessary	175	39.9	40.7	52.3
	3 Extremely Necessary	205	46.7	47.7	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

Construction waste recycling is bad/good for the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	4	.9	.9	.9
	-2 Quite Unnecessary	7	1.6	1.6	2.6
	-1 Slightly Unnecessary	3	.7	.7	3.2
	0 Neither	8	1.8	1.9	5.1
	1 Slightly Necessary	36	8.2	8.4	13.5
	2 Quite Necessary	162	36.9	37.6	51.0
	3 Extremely Necessary	211	48.1	49.0	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Construction waste recycling will result in significantly less construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	4	.9	.9	.9
	-2 Moderately Unlikely	5	1.1	1.2	2.1
	-1 Slightly Unlikely	7	1.6	1.6	3.7
	0 Neutral	9	2.1	2.1	5.8
	1 Slightly Likely	49	11.2	11.3	17.1
	2 Moderately Likely	190	43.3	44.0	61.1
	3 Extremely Likely	168	38.3	38.9	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Construction waste recycling is good for the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Unlikely	3	.7	.7	.7
	-1 Slightly Unlikely	1	.2	.2	.9
	0 Neutral	3	.7	.7	1.6
	1 Slightly Likely	45	10.3	10.4	12.0
	2 Moderately Likely	164	37.4	38.0	50.0
	3 Extremely Likely	216	49.2	50.0	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Recycling construction materials will cost a lot more than just throwing them away.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	14	3.2	3.2	3.2
	-2 Moderately Unlikely	60	13.7	13.9	17.2
	-1 Slightly Unlikely	60	13.7	13.9	31.1
	0 Neutral	82	18.7	19.0	50.1
	1 Slightly Likely	116	26.4	26.9	77.0
	2 Moderately Likely	69	15.7	16.0	93.0
	3 Extremely Likely	30	6.8	7.0	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

It will take significantly more time to separate materials than throwing them in a dumpster.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	9	2.1	2.1	2.1
	-2 Moderately Unlikely	31	7.1	7.2	9.3
	-1 Slightly Unlikely	38	8.7	8.8	18.1
	0 Neutral	26	5.9	6.0	24.1
	1 Slightly Likely	148	33.7	34.3	58.3
	2 Moderately Likely	120	27.3	27.8	86.1
	3 Extremely Likely	60	13.7	13.9	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Recycling materials will lead to much cheaper materials in the future.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	15	3.4	3.5	3.5
	-2 Moderately Unlikely	35	8.0	8.1	11.6
	-1 Slightly Unlikely	41	9.3	9.5	21.1
	0 Neutral	69	15.7	16.0	37.0
	1 Slightly Likely	129	29.4	29.9	66.9
	2 Moderately Likely	109	24.8	25.2	92.1
	3 Extremely Likely	34	7.7	7.9	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Recycling materials will result in an abundance of re-usable materials.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	5	1.1	1.2	1.2
	-2 Moderately Unlikely	18	4.1	4.2	5.3
	-1 Slightly Unlikely	33	7.5	7.7	13.0
	0 Neutral	46	10.5	10.7	23.7
	1 Slightly Likely	133	30.3	30.9	54.5
	2 Moderately Likely	142	32.3	32.9	87.5
	3 Extremely Likely	54	12.3	12.5	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Wide spread waste recycling will greatly enhance the construction industry's image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	1	.2	.2	.2
	-2 Moderately Unlikely	6	1.4	1.4	1.6
	-1 Slightly Unlikely	12	2.7	2.8	4.4
	0 Neutral	24	5.5	5.6	10.0
	1 Slightly Likely	89	20.3	20.6	30.6
	2 Moderately Likely	178	40.5	41.3	71.9
	3 Extremely Likely	121	27.6	28.1	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Recycling materials will greatly increase the sustainability of the construction industry.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	3	.7	.7	.7
	-2 Moderately Unlikely	7	1.6	1.6	2.3
	-1 Slightly Unlikely	24	5.5	5.6	7.9
	0 Neutral	43	9.8	10.0	17.8
	1 Slightly Likely	122	27.8	28.2	46.1
	2 Moderately Likely	142	32.3	32.9	78.9
	3 Extremely Likely	91	20.7	21.1	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Recycling materials will significantly reduce long-term construction costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	13	3.0	3.0	3.0
	-2 Moderately Unlikely	20	4.6	4.6	7.7
	-1 Slightly Unlikely	46	10.5	10.7	18.3
	0 Neutral	95	21.6	22.0	40.4
	1 Slightly Likely	119	27.1	27.6	68.0
	2 Moderately Likely	102	23.2	23.7	91.6
	3 Extremely Likely	36	8.2	8.4	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

Incorporation of a recycling program will significantly reduce the amount of construction materials needed for new construction.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	12	2.7	2.8	2.8
	-2 Moderately Unlikely	33	7.5	7.7	10.5
	-1 Slightly Unlikely	52	11.8	12.1	22.6
	0 Neutral	73	16.6	17.0	39.5
	1 Slightly Likely	144	32.8	33.5	73.0
	2 Moderately Likely	81	18.5	18.8	91.9
	3 Extremely Likely	35	8.0	8.1	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

Construction waste recycling will result in significantly less construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-1 Slightly Bad	1	.2	.2	.5
	0 Neutral	12	2.7	2.8	3.3
	1 Slightly Good	34	7.7	7.9	11.2
	2 Moderately Good	167	38.0	39.0	50.2
	3 Extremely Good	213	48.5	49.8	100.0
	Total	428	97.5	100.0	
Missing	9	11	2.5		
Total		439	100.0		

Construction waste recycling is good for the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 Neutral	3	.7	.7	.7
	1 Slightly Good	40	9.1	9.3	10.0
	2 Moderately Good	159	36.2	37.1	47.2
	3 Extremely Good	226	51.5	52.8	100.0
	Total	428	97.5	100.0	
Missing	9	11	2.5		
Total		439	100.0		

Recycling construction materials will cost a lot more than just throwing them away.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	24	5.5	5.7	5.7
	-2 Moderately Bad	93	21.2	21.9	27.6
	-1 Slightly Bad	137	31.2	32.3	59.9
	0 Neutral	84	19.1	19.8	79.7
	1 Slightly Good	49	11.2	11.6	91.3
	2 Moderately Good	28	6.4	6.6	97.9
	3 Extremely Good	9	2.1	2.1	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

It will take significantly more time to separate materials than throwing them in a dumpster.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	25	5.7	5.9	5.9
	-2 Moderately Bad	80	18.2	18.8	24.7
	-1 Slightly Bad	166	37.8	39.1	63.8
	0 Neutral	60	13.7	14.1	77.9
	1 Slightly Good	57	13.0	13.4	91.3
	2 Moderately Good	21	4.8	4.9	96.2
	3 Extremely Good	16	3.6	3.8	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

Recycling materials will lead to much cheaper materials in the future.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-2 Moderately Bad	3	.7	.7	.9
	-1 Slightly Bad	9	2.1	2.1	3.1
	0 Neutral	47	10.7	11.1	14.2
	1 Slightly Good	114	26.0	27.0	41.2
	2 Moderately Good	148	33.7	35.1	76.3
	3 Extremely Good	100	22.8	23.7	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

Recycling materials will result in an abundance of re-usable materials.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Bad	3	.7	.7	.7
	-1 Slightly Bad	8	1.8	1.9	2.6
	0 Neutral	33	7.5	7.8	10.4
	1 Slightly Good	92	21.0	21.7	32.2
	2 Moderately Good	170	38.7	40.2	72.3
	3 Extremely Good	117	26.7	27.7	100.0
	Total	423	96.4	100.0	
Missing	9	16	3.6		
Total		439	100.0		

Wide spread waste recycling will greatly enhance the construction industry's image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Bad	1	.2	.2	.2
	-1 Slightly Bad	1	.2	.2	.5
	0 Neutral	34	7.7	8.0	8.5
	1 Slightly Good	82	18.7	19.2	27.7
	2 Moderately Good	174	39.6	40.8	68.5
	3 Extremely Good	134	30.5	31.5	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Recycling materials will greatly increase the sustainability of the construction industry.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Bad	1	.2	.2	.2
	-1 Slightly Bad	3	.7	.7	.9
	0 Neutral	30	6.8	7.0	8.0
	1 Slightly Good	91	20.7	21.4	29.3
	2 Moderately Good	166	37.8	39.0	68.3
	3 Extremely Good	135	30.8	31.7	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Recycling materials will significantly reduce long-term construction costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	2	.5	.5	.5
	-2 Moderately Bad	1	.2	.2	.7
	-1 Slightly Bad	10	2.3	2.3	3.1
	0 Neutral	39	8.9	9.2	12.2
	1 Slightly Good	83	18.9	19.5	31.7
	2 Moderately Good	148	33.7	34.7	66.4
	3 Extremely Good	143	32.6	33.6	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Incorporation of a recycling program will significantly reduce the amount of construction materials needed for new construction.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-2 Moderately Bad	2	.5	.5	.7
	-1 Slightly Bad	14	3.2	3.3	4.0
	0 Neutral	45	10.3	10.6	14.6
	1 Slightly Good	91	20.7	21.4	35.9
	2 Moderately Good	160	36.4	37.6	73.5
	3 Extremely Good	113	25.7	26.5	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

I intend to verbally support construction waste recycling program efforts.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	12	2.7	2.8	2.8
	-2 Moderately Unlikely	20	4.6	4.6	7.4
	-1 Slightly Unlikely	29	6.6	6.7	14.1
	0 Neutral	35	8.0	8.1	22.2
	1 Slightly Likely	123	28.0	28.5	50.7
	2 Moderately Likely	142	32.3	32.9	83.6
	3 Extremely Likely	71	16.2	16.4	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

I intend to support construction waste recycling program efforts through my actions.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	6	1.4	1.4	1.4
	-2 Moderately Unlikely	11	2.5	2.5	3.9
	-1 Slightly Unlikely	14	3.2	3.2	7.2
	0 Neutral	18	4.1	4.2	11.3
	1 Slightly Likely	113	25.7	26.2	37.5
	2 Moderately Likely	156	35.5	36.1	73.6
	3 Extremely Likely	114	26.0	26.4	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

I intend to go out of my way to insure that all materials that can be recycled are being recycled.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	13	3.0	3.0	3.0
	-2 Moderately Unlikely	27	6.2	6.3	9.3
	-1 Slightly Unlikely	39	8.9	9.1	18.4
	0 Neutral	64	14.6	14.9	33.3
	1 Slightly Likely	138	31.4	32.1	65.3
	2 Moderately Likely	113	25.7	26.3	91.6
	3 Extremely Likely	36	8.2	8.4	100.0
	Total	430	97.9	100.0	
Missing	9	9	2.1		
Total		439	100.0		

I intend to volunteer to organize an on-site construction waste recycling program.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	35	8.0	8.1	8.1
	-2 Moderately Unlikely	38	8.7	8.8	16.9
	-1 Slightly Unlikely	69	15.7	16.0	32.9
	0 Neutral	89	20.3	20.6	53.6
	1 Slightly Likely	105	23.9	24.4	78.0
	2 Moderately Likely	67	15.3	15.5	93.5
	3 Extremely Likely	28	6.4	6.5	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

I intend to be a strong advocate for construction waste recycling.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	23	5.2	5.3	5.3
	-2 Moderately Unlikely	22	5.0	5.1	10.4
	-1 Slightly Unlikely	49	11.2	11.4	21.8
	0 Neutral	74	16.9	17.2	39.0
	1 Slightly Likely	113	25.7	26.2	65.2
	2 Moderately Likely	92	21.0	21.3	86.5
	3 Extremely Likely	58	13.2	13.5	100.0
	Total	431	98.2	100.0	
Missing	9	8	1.8		
Total		439	100.0		

If given the chance, I would vote for mandatory construction waste recycling programs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	26	5.9	6.0	6.0
	-2 Moderately Unlikely	21	4.8	4.9	10.9
	-1 Slightly Unlikely	23	5.2	5.3	16.2
	0 Neutral	63	14.4	14.6	30.8
	1 Slightly Likely	75	17.1	17.4	48.1
	2 Moderately Likely	112	25.5	25.9	74.1
	3 Extremely Likely	112	25.5	25.9	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Being a strong advocate of construction waste recycling is bad/good.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	1	.2	.2	.2
	-2 Quite Unnecessary	6	1.4	1.4	1.6
	-1 Slightly Unnecessary	8	1.8	1.9	3.5
	0 Neither	44	10.0	10.2	13.7
	1 Slightly Necessary	85	19.4	19.7	33.3
	2 Quite Necessary	190	43.3	44.0	77.3
	3 Extremely Necessary	98	22.3	22.7	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Being a strong advocate of construction waste recycling is foolish/wise.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	2	.5	.5	.5
	-2 Quite Unnecessary	5	1.1	1.2	1.6
	-1 Slightly Unnecessary	13	3.0	3.0	4.6
	0 Neither	41	9.3	9.5	14.1
	1 Slightly Necessary	91	20.7	21.1	35.2
	2 Quite Necessary	162	36.9	37.5	72.7
	3 Extremely Necessary	118	26.9	27.3	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Being a strong advocate of construction waste recycling is harmful/beneficial to the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Quite Unnecessary	1	.2	.2	.2
	-1 Slightly Unnecessary	1	.2	.2	.5
	0 Neither	12	2.7	2.8	3.2
	1 Slightly Necessary	60	13.7	13.9	17.1
	2 Quite Necessary	164	37.4	38.0	55.1
	3 Extremely Necessary	194	44.2	44.9	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Being a strong advocate of construction waste recycling is personally punishing/rewarding.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	2	.5	.5	.5
	-2 Quite Unnecessary	9	2.1	2.1	2.5
	-1 Slightly Unnecessary	14	3.2	3.2	5.8
	0 Neither	61	13.9	14.1	19.9
	1 Slightly Necessary	96	21.9	22.2	42.1
	2 Quite Necessary	153	34.9	35.4	77.5
	3 Extremely Necessary	97	22.1	22.5	100.0
	Total	432	98.4	100.0	
Missing	9	7	1.6		
Total		439	100.0		

Volunteering to setup a construction waste recycling program is bad/good.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	5	1.1	1.2	1.2
	-2 Quite Unnecessary	5	1.1	1.2	2.3
	-1 Slightly Unnecessary	12	2.7	2.8	5.1
	0 Neither	57	13.0	13.3	18.4
	1 Slightly Necessary	96	21.9	22.4	40.8
	2 Quite Necessary	177	40.3	41.3	82.1
	3 Extremely Necessary	77	17.5	17.9	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Volunteering to setup a construction waste recycling program is foolish/wise.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	7	1.6	1.6	1.6
	-2 Quite Unnecessary	5	1.1	1.2	2.8
	-1 Slightly Unnecessary	18	4.1	4.2	7.0
	0 Neither	50	11.4	11.7	18.7
	1 Slightly Necessary	102	23.2	23.9	42.6
	2 Quite Necessary	168	38.3	39.3	82.0
	3 Extremely Necessary	77	17.5	18.0	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

Volunteering to setup a construction waste recycling program is harmful/beneficial to the environment.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	1	.2	.2	.2
	-2 Quite Unnecessary	1	.2	.2	.5
	-1 Slightly Unnecessary	1	.2	.2	.7
	0 Neither	15	3.4	3.5	4.2
	1 Slightly Necessary	67	15.3	15.6	19.8
	2 Quite Necessary	182	41.5	42.4	62.2
	3 Extremely Necessary	162	36.9	37.8	100.0
	Total	429	97.7	100.0	
Missing	9	10	2.3		
Total		439	100.0		

Volunteering to setup a construction waste recycling program is personally punishing/rewarding.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unnecessary	8	1.8	1.9	1.9
	-2 Quite Unnecessary	8	1.8	1.9	3.7
	-1 Slightly Unnecessary	18	4.1	4.2	7.9
	0 Neither	43	9.8	10.0	18.0
	1 Slightly Necessary	100	22.8	23.4	41.4
	2 Quite Necessary	155	35.3	36.2	77.6
	3 Extremely Necessary	96	21.9	22.4	100.0
	Total	428	97.5	100.0	
Missing	9	11	2.5		
Total		439	100.0		

By strongly advocating for CWR, I would significantly decrease the amount of construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	6	1.4	1.4	1.4
	-2 Moderately Unlikely	15	3.4	3.5	4.9
	-1 Slightly Unlikely	25	5.7	5.9	10.8
	0 Neutral	25	5.7	5.9	16.6
	1 Slightly Likely	132	30.1	30.9	47.5
	2 Moderately Likely	156	35.5	36.5	84.1
	3 Extremely Likely	68	15.5	15.9	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

By strongly advocating for CWR, I would decrease overall job site productivity.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	17	3.9	4.0	4.0
	-2 Moderately Unlikely	47	10.7	11.1	15.1
	-1 Slightly Unlikely	95	21.6	22.4	37.4
	0 Neutral	73	16.6	17.2	54.6
	1 Slightly Likely	128	29.2	30.1	84.7
	2 Moderately Likely	47	10.7	11.1	95.8
	3 Extremely Likely	18	4.1	4.2	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

By strongly advocating for CWR, I would significantly increase jobsite overhead costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	7	1.6	1.6	1.6
	-2 Moderately Unlikely	32	7.3	7.5	9.1
	-1 Slightly Unlikely	90	20.5	21.1	30.2
	0 Neutral	88	20.0	20.6	50.8
	1 Slightly Likely	145	33.0	34.0	84.8
	2 Moderately Likely	49	11.2	11.5	96.3
	3 Extremely Likely	16	3.6	3.7	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

By strongly advocating for CWR, I would greatly enhance my company's public image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Unlikely	5	1.1	1.2	1.2
	-1 Slightly Unlikely	11	2.5	2.6	3.8
	0 Neutral	24	5.5	5.6	9.4
	1 Slightly Likely	109	24.8	25.6	35.1
	2 Moderately Likely	175	39.9	41.2	76.2
	3 Extremely Likely	101	23.0	23.8	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

By strongly advocating for CWR, I would significantly reduce the amount of construction materials needed for this job.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	9	2.1	2.1	2.1
	-2 Moderately Unlikely	29	6.6	6.8	8.9
	-1 Slightly Unlikely	57	13.0	13.3	22.2
	0 Neutral	79	18.0	18.5	40.7
	1 Slightly Likely	149	33.9	34.9	75.6
	2 Moderately Likely	84	19.1	19.7	95.3
	3 Extremely Likely	20	4.6	4.7	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

By volunteering to setup a CWR program, I would significantly decrease the amount of construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	1	.2	.2	.2
	-2 Moderately Unlikely	13	3.0	3.1	3.3
	-1 Slightly Unlikely	23	5.2	5.4	8.7
	0 Neutral	33	7.5	7.7	16.4
	1 Slightly Likely	142	32.3	33.3	49.8
	2 Moderately Likely	138	31.4	32.4	82.2
	3 Extremely Likely	76	17.3	17.8	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would decrease overall job site productivity.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	15	3.4	3.5	3.5
	-2 Moderately Unlikely	46	10.5	10.8	14.3
	-1 Slightly Unlikely	81	18.5	19.0	33.3
	0 Neutral	86	19.6	20.2	53.5
	1 Slightly Likely	135	30.8	31.7	85.2
	2 Moderately Likely	47	10.7	11.0	96.2
	3 Extremely Likely	16	3.6	3.8	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would significantly increase jobsite overhead costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	12	2.7	2.8	2.8
	-2 Moderately Unlikely	35	8.0	8.3	11.1
	-1 Slightly Unlikely	72	16.4	17.1	28.2
	0 Neutral	95	21.6	22.5	50.7
	1 Slightly Likely	149	33.9	35.3	86.0
	2 Moderately Likely	47	10.7	11.1	97.2
	3 Extremely Likely	12	2.7	2.8	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

By volunteering to setup a CWR program, I would greatly enhance my company's public image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Unlikely	6	1.4	1.4	1.4
	-1 Slightly Unlikely	12	2.7	2.8	4.2
	0 Neutral	33	7.5	7.8	12.0
	1 Slightly Likely	108	24.6	25.5	37.5
	2 Moderately Likely	166	37.8	39.2	76.7
	3 Extremely Likely	99	22.6	23.3	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

By volunteering to setup a CWR program. I would significantly reduce the amount of construction materials needed for this job.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	8	1.8	1.9	1.9
	-2 Moderately Unlikely	29	6.6	6.8	8.7
	-1 Slightly Unlikely	59	13.4	13.8	22.5
	0 Neutral	85	19.4	20.0	42.5
	1 Slightly Likely	137	31.2	32.2	74.6
	2 Moderately Likely	77	17.5	18.1	92.7
	3 Extremely Likely	31	7.1	7.3	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By strongly advocating for CWR, I would significantly decrease the amount of construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Bad	3	.7	.7	.7
	-1 Slightly Bad	4	.9	.9	1.6
	0 Neutral	22	5.0	5.2	6.8
	1 Slightly Good	81	18.5	19.0	25.8
	2 Moderately Good	167	38.0	39.2	65.0
	3 Extremely Good	149	33.9	35.0	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By strongly advocating for CWR, I would decrease overall job site productivity.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	61	13.9	14.3	14.3
	-2 Moderately Bad	103	23.5	24.2	38.5
	-1 Slightly Bad	111	25.3	26.1	64.6
	0 Neutral	55	12.5	12.9	77.5
	1 Slightly Good	56	12.8	13.1	90.6
	2 Moderately Good	29	6.6	6.8	97.4
	3 Extremely Good	11	2.5	2.6	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By strongly advocating for CWR, I would significantly increase jobsite overhead costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	50	11.4	11.8	11.8
	-2 Moderately Bad	86	19.6	20.2	32.0
	-1 Slightly Bad	121	27.6	28.5	60.5
	0 Neutral	68	15.5	16.0	76.5
	1 Slightly Good	65	14.8	15.3	91.8
	2 Moderately Good	25	5.7	5.9	97.6
	3 Extremely Good	10	2.3	2.4	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

By strongly advocating for CWR, I would greatly enhance my company's public image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-1 Slightly Bad	8	1.8	1.9	2.1
	0 Neutral	26	5.9	6.1	8.2
	1 Slightly Good	88	20.0	20.7	28.9
	2 Moderately Good	169	38.5	39.7	68.5
	3 Extremely Good	134	30.5	31.5	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By strongly advocating for CWR, I would significantly reduce the amount of construction materials needed for this job.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-2 Moderately Bad	4	.9	.9	1.2
	-1 Slightly Bad	17	3.9	4.0	5.2
	0 Neutral	65	14.8	15.2	20.4
	1 Slightly Good	109	24.8	25.5	45.9
	2 Moderately Good	132	30.1	30.9	76.8
	3 Extremely Good	99	22.6	23.2	100.0
	Total	427	97.3	100.0	
Missing	9	12	2.7		
Total		439	100.0		

By volunteering to setup a CWR program, I would significantly decrease the amount of construction materials going to landfills.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2 Moderately Bad	2	.5	.5	.5
	-1 Slightly Bad	7	1.6	1.6	2.1
	0 Neutral	28	6.4	6.6	8.7
	1 Slightly Good	83	18.9	19.5	28.2
	2 Moderately Good	161	36.7	37.8	66.0
	3 Extremely Good	145	33.0	34.0	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would decrease overall job site productivity.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	55	12.5	12.9	12.9
	-2 Moderately Bad	93	21.2	21.8	34.7
	-1 Slightly Bad	121	27.6	28.4	63.1
	0 Neutral	65	14.8	15.3	78.4
	1 Slightly Good	50	11.4	11.7	90.1
	2 Moderately Good	32	7.3	7.5	97.7
	3 Extremely Good	10	2.3	2.3	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would significantly increase jobsite overhead costs.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	49	11.2	11.5	11.5
	-2 Moderately Bad	77	17.5	18.1	29.6
	-1 Slightly Bad	125	28.5	29.3	58.9
	0 Neutral	69	15.7	16.2	75.1
	1 Slightly Good	67	15.3	15.7	90.8
	2 Moderately Good	25	5.7	5.9	96.7
	3 Extremely Good	14	3.2	3.3	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would greatly enhance my company's public image.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-2 Moderately Bad	2	.5	.5	.7
	-1 Slightly Bad	10	2.3	2.3	3.1
	0 Neutral	35	8.0	8.2	11.3
	1 Slightly Good	90	20.5	21.1	32.4
	2 Moderately Good	157	35.8	36.9	69.2
	3 Extremely Good	131	29.8	30.8	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

By volunteering to setup a CWR program, I would significantly reduce the amount of construction materials needed for this job.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Bad	1	.2	.2	.2
	-2 Moderately Bad	6	1.4	1.4	1.6
	-1 Slightly Bad	14	3.2	3.3	4.9
	0 Neutral	64	14.6	15.0	20.0
	1 Slightly Good	114	26.0	26.8	46.7
	2 Moderately Good	129	29.4	30.3	77.0
	3 Extremely Good	98	22.3	23.0	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Most people who are important to me think I should volunteer to setup construction waste recycling programs on all projects that I work on.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	22	5.0	5.2	5.2
	-2 Moderately Unlikely	46	10.5	10.8	16.0
	-1 Slightly Unlikely	38	8.7	9.0	25.0
	0 Neutral	100	22.8	23.6	48.6
	1 Slightly Likely	111	25.3	26.2	74.8
	2 Moderately Likely	88	20.0	20.8	95.5
	3 Extremely Likely	19	4.3	4.5	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Most people who are important to me think I should be a strong advocate for construction waste recycling programs on all projects that I work on.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	22	5.0	5.2	5.2
	-2 Moderately Unlikely	39	8.9	9.2	14.4
	-1 Slightly Unlikely	29	6.6	6.8	21.2
	0 Neutral	108	24.6	25.4	46.6
	1 Slightly Likely	112	25.5	26.4	72.9
	2 Moderately Likely	91	20.7	21.4	94.4
	3 Extremely Likely	24	5.5	5.6	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

Most people who are important to me think I should vote for mandatory construction waste recycling.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	26	5.9	6.1	6.1
	-2 Moderately Unlikely	36	8.2	8.5	14.6
	-1 Slightly Unlikely	22	5.0	5.2	19.8
	0 Neutral	115	26.2	27.1	46.8
	1 Slightly Likely	112	25.5	26.4	73.2
	2 Moderately Likely	73	16.6	17.2	90.4
	3 Extremely Likely	41	9.3	9.6	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

Peer member on professional CM students organization Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	3	.7	.7	.7
	-2 Moderately Unlikely	17	3.9	4.0	4.7
	-1 Slightly Unlikely	23	5.2	5.4	10.1
	0 Neutral	53	12.1	12.5	22.6
	1 Slightly Likely	131	29.8	30.9	53.5
	2 Moderately Likely	136	31.0	32.1	85.6
	3 Extremely Likely	61	13.9	14.4	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Material Suppliers Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	45	10.3	10.6	10.6
	-2 Moderately Unlikely	53	12.1	12.5	23.1
	-1 Slightly Unlikely	60	13.7	14.2	37.3
	0 Neutral	62	14.1	14.6	51.9
	1 Slightly Likely	97	22.1	22.9	74.8
	2 Moderately Likely	80	18.2	18.9	93.6
	3 Extremely Likely	27	6.2	6.4	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Construction Laborers Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	63	14.4	14.9	14.9
	-2 Moderately Unlikely	82	18.7	19.3	34.2
	-1 Slightly Unlikely	94	21.4	22.2	56.4
	0 Neutral	79	18.0	18.6	75.0
	1 Slightly Likely	65	14.8	15.3	90.3
	2 Moderately Likely	31	7.1	7.3	97.6
	3 Extremely Likely	10	2.3	2.4	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Construction Companies Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	9	2.1	2.1	2.1
	-2 Moderately Unlikely	22	5.0	5.2	7.3
	-1 Slightly Unlikely	46	10.5	10.8	18.2
	0 Neutral	74	16.9	17.5	35.6
	1 Slightly Likely	96	21.9	22.6	58.3
	2 Moderately Likely	125	28.5	29.5	87.7
	3 Extremely Likely	52	11.8	12.3	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Future Employer Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	5	1.1	1.2	1.2
	-2 Moderately Unlikely	11	2.5	2.6	3.8
	-1 Slightly Unlikely	22	5.0	5.2	9.0
	0 Neutral	60	13.7	14.2	23.1
	1 Slightly Likely	127	28.9	30.0	53.1
	2 Moderately Likely	135	30.8	31.8	84.9
	3 Extremely Likely	64	14.6	15.1	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Local Politicians Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	8	1.8	1.9	1.9
	-2 Moderately Unlikely	5	1.1	1.2	3.1
	-1 Slightly Unlikely	17	3.9	4.0	7.1
	0 Neutral	67	15.3	15.8	22.9
	1 Slightly Likely	88	20.0	20.8	43.7
	2 Moderately Likely	125	28.5	29.6	73.3
	3 Extremely Likely	113	25.7	26.7	100.0
	Total	423	96.4	100.0	
Missing	9	16	3.6		
Total		439	100.0		

Waste Management Companies Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	12	2.7	2.8	2.8
	-2 Moderately Unlikely	21	4.8	5.0	7.8
	-1 Slightly Unlikely	23	5.2	5.4	13.2
	0 Neutral	41	9.3	9.7	22.9
	1 Slightly Likely	58	13.2	13.7	36.6
	2 Moderately Likely	111	25.3	26.2	62.9
	3 Extremely Likely	157	35.8	37.1	100.0
	Total	423	96.4	100.0	
Missing	9	16	3.6		
Total		439	100.0		

Your Teachers Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	1	.2	.2	.2
	-2 Moderately Unlikely	5	1.1	1.2	1.4
	-1 Slightly Unlikely	4	.9	.9	2.4
	0 Neutral	46	10.5	10.9	13.3
	1 Slightly Likely	80	18.2	19.0	32.2
	2 Moderately Likely	148	33.7	35.1	67.3
	3 Extremely Likely	138	31.4	32.7	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

You Close Friends Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	20	4.6	4.8	4.8
	-2 Moderately Unlikely	31	7.1	7.4	12.1
	-1 Slightly Unlikely	30	6.8	7.1	19.2
	0 Neutral	120	27.3	28.5	47.7
	1 Slightly Likely	94	21.4	22.3	70.1
	2 Moderately Likely	85	19.4	20.2	90.3
	3 Extremely Likely	41	9.3	9.7	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Your Parents Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	15	3.4	3.5	3.5
	-2 Moderately Unlikely	21	4.8	5.0	8.5
	-1 Slightly Unlikely	25	5.7	5.9	14.4
	0 Neutral	113	25.7	26.7	41.0
	1 Slightly Likely	83	18.9	19.6	60.6
	2 Moderately Likely	103	23.5	24.3	84.9
	3 Extremely Likely	64	14.6	15.1	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Your Family (children, spouse, siblings, etc.) Advocate		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	15	3.4	3.5	3.5
	-2 Moderately Unlikely	19	4.3	4.5	8.0
	-1 Slightly Unlikely	22	5.0	5.2	13.2
	0 Neutral	128	29.2	30.2	43.4
	1 Slightly Likely	82	18.7	19.3	62.7
	2 Moderately Likely	91	20.7	21.5	84.2
	3 Extremely Likely	67	15.3	15.8	100.0
	Total	424	96.6	100.0	
Missing	9	15	3.4		
Total		439	100.0		

Peer member on professional CM students organization Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	9	2.1	2.1	2.1
	-2 Moderately Unlikely	15	3.4	3.6	5.7
	-1 Slightly Unlikely	33	7.5	7.8	13.5
	0 Neutral	66	15.0	15.6	29.1
	1 Slightly Likely	151	34.4	35.8	64.9
	2 Moderately Likely	99	22.6	23.5	88.4
	3 Extremely Likely	49	11.2	11.6	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

Material Suppliers Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	48	10.9	11.4	11.4
	-2 Moderately Unlikely	41	9.3	9.7	21.1
	-1 Slightly Unlikely	67	15.3	15.9	37.1
	0 Neutral	95	21.6	22.6	59.6
	1 Slightly Likely	89	20.3	21.1	80.8
	2 Moderately Likely	57	13.0	13.5	94.3
	3 Extremely Likely	24	5.5	5.7	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Construction Laborers Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	68	15.5	16.2	16.2
	-2 Moderately Unlikely	52	11.8	12.4	28.6
	-1 Slightly Unlikely	70	15.9	16.7	45.2
	0 Neutral	109	24.8	26.0	71.2
	1 Slightly Likely	75	17.1	17.9	89.0
	2 Moderately Likely	31	7.1	7.4	96.4
	3 Extremely Likely	15	3.4	3.6	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Construction Companies Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	21	4.8	5.0	5.0
	-2 Moderately Unlikely	25	5.7	5.9	10.9
	-1 Slightly Unlikely	28	6.4	6.7	17.6
	0 Neutral	74	16.9	17.6	35.2
	1 Slightly Likely	115	26.2	27.3	62.5
	2 Moderately Likely	105	23.9	24.9	87.4
	3 Extremely Likely	53	12.1	12.6	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Future Employer Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	11	2.5	2.6	2.6
	-2 Moderately Unlikely	16	3.6	3.8	6.4
	-1 Slightly Unlikely	23	5.2	5.5	11.9
	0 Neutral	66	15.0	15.7	27.6
	1 Slightly Likely	118	26.9	28.0	55.6
	2 Moderately Likely	118	26.9	28.0	83.6
	3 Extremely Likely	69	15.7	16.4	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Local Politicians Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	21	4.8	5.0	5.0
	-2 Moderately Unlikely	11	2.5	2.6	7.6
	-1 Slightly Unlikely	19	4.3	4.5	12.1
	0 Neutral	85	19.4	20.2	32.3
	1 Slightly Likely	94	21.4	22.3	54.6
	2 Moderately Likely	113	25.7	26.8	81.5
	3 Extremely Likely	78	17.8	18.5	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Waste Management Companies Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	18	4.1	4.3	4.3
	-2 Moderately Unlikely	21	4.8	5.0	9.3
	-1 Slightly Unlikely	33	7.5	7.9	17.1
	0 Neutral	71	16.2	16.9	34.0
	1 Slightly Likely	80	18.2	19.0	53.1
	2 Moderately Likely	97	22.1	23.1	76.2
	3 Extremely Likely	100	22.8	23.8	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Your Teachers Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	7	1.6	1.7	1.7
	-2 Moderately Unlikely	8	1.8	1.9	3.6
	-1 Slightly Unlikely	11	2.5	2.6	6.2
	0 Neutral	49	11.2	11.7	17.9
	1 Slightly Likely	111	25.3	26.6	44.5
	2 Moderately Likely	133	30.3	31.8	76.3
	3 Extremely Likely	99	22.6	23.7	100.0
	Total	418	95.2	100.0	
Missing	9	21	4.8		
Total		439	100.0		

You Close Friends Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	24	5.5	5.7	5.7
	-2 Moderately Unlikely	28	6.4	6.7	12.4
	-1 Slightly Unlikely	36	8.2	8.6	20.9
	0 Neutral	125	28.5	29.7	50.6
	1 Slightly Likely	93	21.2	22.1	72.7
	2 Moderately Likely	75	17.1	17.8	90.5
	3 Extremely Likely	40	9.1	9.5	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Your Parents Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	22	5.0	5.2	5.2
	-2 Moderately Unlikely	24	5.5	5.7	10.9
	-1 Slightly Unlikely	30	6.8	7.1	18.0
	0 Neutral	118	26.9	28.0	46.0
	1 Slightly Likely	87	19.8	20.6	66.6
	2 Moderately Likely	85	19.4	20.1	86.7
	3 Extremely Likely	56	12.8	13.3	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

Your Family (children, spouse, siblings, etc.) Volunteer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-3 Extremely Unlikely	23	5.2	5.5	5.5
	-2 Moderately Unlikely	21	4.8	5.0	10.4
	-1 Slightly Unlikely	29	6.6	6.9	17.3
	0 Neutral	131	29.8	31.0	48.3
	1 Slightly Likely	82	18.7	19.4	67.8
	2 Moderately Likely	85	19.4	20.1	87.9
	3 Extremely Likely	51	11.6	12.1	100.0
	Total	422	96.1	100.0	
Missing	9	17	3.9		
Total		439	100.0		

Peer member on professional CM students organization		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	45	10.3	10.7	10.7
	2	40	9.1	9.5	20.2
	3	58	13.2	13.8	34.0
	4	94	21.4	22.3	56.3
	5	101	23.0	24.0	80.3
	6	55	12.5	13.1	93.3
	7 Extremely	28	6.4	6.7	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Material Suppliers		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	82	18.7	19.5	19.5
	2	68	15.5	16.2	35.6
	3	70	15.9	16.6	52.3
	4	98	22.3	23.3	75.5
	5	58	13.2	13.8	89.3
	6	27	6.2	6.4	95.7
	7 Extremely	18	4.1	4.3	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Construction Laborers		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	79	18.0	19.0	19.0
	2	65	14.8	15.6	34.6
	3	67	15.3	16.1	50.7
	4	81	18.5	19.5	70.2
	5	73	16.6	17.5	87.7
	6	34	7.7	8.2	95.9
	7 Extremely	17	3.9	4.1	100.0
	Total	416	94.8	100.0	
Missing	9	23	5.2		
Total		439	100.0		

Construction Companies		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	31	7.1	7.4	7.4
	2	18	4.1	4.3	11.7
	3	40	9.1	9.6	21.3
	4	88	20.0	21.1	42.3
	5	95	21.6	22.7	65.1
	6	97	22.1	23.2	88.3
	7 Extremely	49	11.2	11.7	100.0
	Total	418	95.2	100.0	
Missing	9	21	4.8		
Total		439	100.0		

Future Employer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	19	4.3	4.5	4.5
	2	8	1.8	1.9	6.4
	3	14	3.2	3.3	9.8
	4	57	13.0	13.6	23.3
	5	61	13.9	14.5	37.9
	6	116	26.4	27.6	65.5
	7 Extremely	145	33.0	34.5	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Local Politicians		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	85	19.4	20.4	20.4
	2	58	13.2	13.9	34.3
	3	54	12.3	12.9	47.2
	4	89	20.3	21.3	68.6
	5	60	13.7	14.4	83.0
	6	42	9.6	10.1	93.0
	7 Extremely	29	6.6	7.0	100.0
	Total	417	95.0	100.0	
Missing	9	22	5.0		
Total		439	100.0		

Waste Management Companies		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	63	14.4	15.0	15.0
	2	51	11.6	12.1	27.1
	3	49	11.2	11.7	38.8
	4	88	20.0	21.0	59.8
	5	76	17.3	18.1	77.9
	6	50	11.4	11.9	89.8
	7 Extremely	43	9.8	10.2	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Your Teachers		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	40	9.1	9.5	9.5
	2	21	4.8	5.0	14.5
	3	42	9.6	10.0	24.5
	4	90	20.5	21.4	45.8
	5	101	23.0	24.0	69.8
	6	84	19.1	20.0	89.8
	7 Extremely	43	9.8	10.2	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Your Close Friends		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	37	8.4	8.8	8.8
	2	30	6.8	7.1	16.0
	3	44	10.0	10.5	26.4
	4	79	18.0	18.8	45.2
	5	94	21.4	22.4	67.6
	6	88	20.0	21.0	88.6
	7 Extremely	48	10.9	11.4	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Your Parents		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	30	6.8	7.1	7.1
	2	24	5.5	5.7	12.9
	3	27	6.2	6.4	19.3
	4	76	17.3	18.1	37.4
	5	70	15.9	16.7	54.0
	6	101	23.0	24.0	78.1
	7 Extremely	92	21.0	21.9	100.0
	Total	420	95.7	100.0	
Missing	9	19	4.3		
Total		439	100.0		

Your Family (children, spouse, siblings, etc.)		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at All	32	7.3	7.6	7.6
	2	18	4.1	4.3	11.9
	3	27	6.2	6.4	18.4
	4	75	17.1	17.9	36.3
	5	69	15.7	16.5	52.7
	6	88	20.0	21.0	73.7
	7 Extremely	110	25.1	26.3	100.0
	Total	419	95.4	100.0	
Missing	9	20	4.6		
Total		439	100.0		

Please rate your level of knowledge related to construction waste recycling by placing a checkmark on the scale below.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Never Heard Of	6	1.4	1.4	1.4
	2	29	6.6	6.8	8.2
	3	48	10.9	11.3	19.5
	4 Neutral	89	20.3	20.9	40.4
	5	151	34.4	35.4	75.8
	6	87	19.8	20.4	96.5
	7 Thorough Knowledge	15	3.4	3.5	100.0
	Total	426	97.0	100.0	
Missing	9	14	3.0		
Total		439	100.0		

In future courses dealing with construction waste recycling, what other information would you like presented relative to this issue? #1		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Benefits to the Environment	145	33.0	34.9	34.9
	2 Cost of Recycling Program	143	32.6	34.5	69.4
	3 How to Setup CWR Program	32	7.3	7.7	77.1
	4 Impacts to Construction Productivity	37	8.4	8.9	86.0
	5 What Materials Can be Recycled	11	2.5	2.7	88.7
	6 Impact of Construction Materials on Environment	3	.7	.7	89.4
	8 Marked more than 3 of the options	44	10.0	10.6	100.0
	Total	415	94.5	100.0	
Missing	9 Missing	24	5.5		
Total		439	100.0		

In future courses dealing with construction waste recycling, what other information would you like presented relative to this issue? #2		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2 Cost of Recycling Program	48	10.9	12.9	12.9
	3 How to Setup CWR Program	35	8.0	9.4	22.3
	4 Impacts to Construction Productivity	105	23.9	28.2	50.4
	5 What Materials Can be Recycled	61	13.9	16.4	66.8
	6 Impact of Construction Materials on Environment	78	17.8	20.9	87.7
	7 Other	1	.2	.3	87.9
	8 Marked more than 3 of the options	45	10.3	12.1	100.0
	Total	373	85.0	100.0	
Missing	9 Missing	66	15.0		
Total		439	100.0		

Sex		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 Male	356	81.1	83.8	83.8
	1 Female	69	15.7	16.2	100.0
	Total	425	96.8	100.0	
Missing	9	14	3.2		
Total		439	100.0		

Age		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18	52	11.8	12.4	12.4
	19	55	12.5	13.1	25.4
	20	50	11.4	11.9	37.3
	21	70	15.9	16.6	53.9
	22	59	13.4	14.0	67.9
	23	42	9.6	10.0	77.9
	24	21	4.8	5.0	82.9
	25	15	3.4	3.6	86.5
	26	6	1.4	1.4	87.9
	27	14	3.2	3.3	91.2
	28	6	1.4	1.4	92.6
	29	4	.9	1.0	93.6
	30	8	1.8	1.9	95.5
	31	3	.7	.7	96.2
	32	2	.5	.5	96.7
	33	3	.7	.7	97.4
	34	2	.5	.5	97.9
	35	2	.5	.5	98.3
	38	1	.2	.2	98.6
	47	2	.5	.5	99.0
	50	1	.2	.2	99.3
	52	1	.2	.2	99.5
	57	1	.2	.2	99.8
	58	1	.2	.2	100.0
	Total	421	95.9	100.0	
Missing	9 Missing	18	4.1		
Total		439	100.0		

What is your major?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Construction Management	381	86.8	89.4	89.4
	2 Interior Design	29	6.6	6.8	96.2
	3 Business or Finance	8	1.8	1.9	98.1
	4 Other	8	1.8	1.9	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Are you a graduate student?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 No	401	91.3	94.1	94.1
	1 Yes	25	5.7	5.9	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

Have you ever worked on a construction project?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 No	83	18.9	19.5	19.5
	1 Yes	342	77.9	80.3	99.8
	4	1	.2	.2	100.0
	Total	426	97.0	100.0	
Missing	9	13	3.0		
Total		439	100.0		

If yes, for how long?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 None or Not Applicable	83	18.9	19.6	19.6
	1 3-6 Months	142	32.3	33.6	53.2
	2 7-12 Months	57	13.0	13.5	66.7
	3 13-24 Months	30	6.8	7.1	73.8
	4 More than 24 Months	111	25.3	26.2	100.0
	Total	423	96.4	100.0	
Missing	9	16	3.6		
Total		439	100.0		

Approximately how large was the community in which you grew up?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 A farm or rural area with less than < 400 people.	10	2.3	2.4	2.4
	2 A small town with 400 - 9,999 people.	66	15.0	15.7	18.1
	3 A town with 10,000 - 49,999 people.	59	13.4	14.0	32.1
	4 A small city with 50,000 to 99,999 people.	73	16.6	17.3	49.4
	5 A city with 100,000 to 249,999 people.	99	22.6	23.5	72.9
	6 A large city with 250,000 or more people.	114	26.0	27.1	100.0
	Total	421	95.9	100.0	
Missing	9	18	4.1		
Total		439	100.0		

Course Section		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 MC 151 Sec. 1	44	10.0	10.0	10.0
	2 MC 151 Sec. 2	50	11.4	11.4	21.4
	3 MC 151 Sec. 3	46	10.5	10.5	31.9
	4 MC 151 Sec. 4	51	11.6	11.6	43.5
	5 MC 465 Sec. 5	11	2.5	2.5	46.0
	6 MC 562	23	5.2	5.2	51.3
	7 MC 365 Sec. 1	50	11.4	11.4	62.6
	8 MC 365 Sec. 2	13	3.0	3.0	65.6
	9 MC 365 Sec. 3	27	6.2	6.2	71.8
	10 MC 465 Sec. 1	14	3.2	3.2	74.9
	11 MC 465 Sec. 2	13	3.0	3.0	77.9
	12 MC 465 Sec. 3	17	3.9	3.9	81.8
	13 MC 465 Sec. 4	10	2.3	2.3	84.1
	14 MC 364 Sec. 1	32	7.3	7.3	91.3
	15 MC 364 Sec. 2	38	8.7	8.7	100.0
	Total	439	100.0	100.0	

Appendix E: SPSS Syntax

This syntax was used to construct variables used in the analysis of this studies hypothesies.

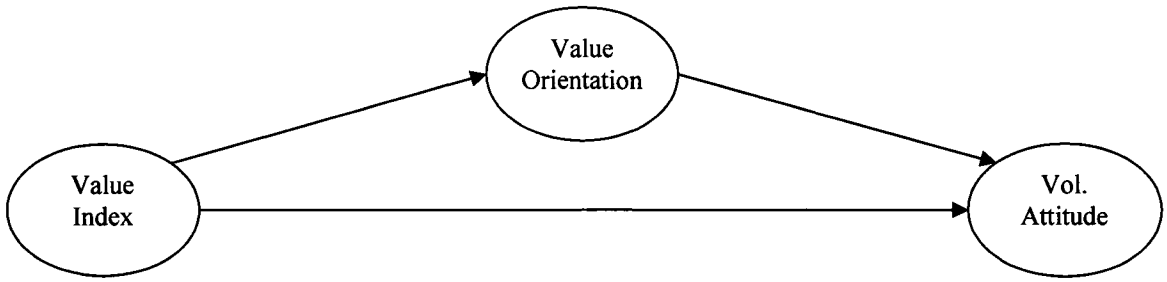
```
* Self-Transcendence Items

RELIABILITY
  /VARIABLES= ForGivT HelpfulT HonestT WorldbeauT ProtEnvirT UnityT
   LoyalT  BrodMindT
  /SCALE('ALL VARIABLES')  ALL/MODEL=ALPHA
  /STATISTICS=CORR
  /SUMMARY=TOTAL .

* Self-Tran Scale

COMPUTE STScale = mean.4(ForGivT,HelpfulT,HonestT,LoyalT, WorldbeauT, ProtEnvirT,
UnityT, BrodMindT) .
EXECUTE .
FREQUENCIES
  VARIABLES=STScale
  /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
  /ORDER=  ANALYSIS .

*Self-Enhancing Items

RELIABILITY
  /VARIABLES= AmbitiousE AuthorityE  CapableE
  InfluenE PubImagE SocPowerE SuccessE WealthE
  /SCALE('ALL VARIABLES')  ALL/MODEL=ALPHA
  /STATISTICS=CORR
  /SUMMARY=TOTAL .

*Self-Enhancing Scale

COMPUTE SEScale = mean.4(AmbitiousE,AuthorityE,CapableE,
InfluenE,PubImagE,SocPowerE,SuccessE,WealthE ) .
EXECUTE .
FREQUENCIES
  VARIABLES=SEScale
  /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
  /ORDER=  ANALYSIS .

*Self-Enhacn/Self-Tran Value Scale

RECODE
```

```
  AmbitiousE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into AmbitiousRC.
EXECUTE .
RECODE
  AuthorityE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into AuthorityRC.
EXECUTE .
RECODE
  CapableE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into CapableRC.
EXECUTE .
RECODE
  InfluenE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into InfluenRC.
EXECUTE .
RECODE
  PubImagE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into PubImagRC.
EXECUTE .
RECODE
  SocPowerE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into SocPowerRC.
EXECUTE .
RECODE
  SuccessE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into SuccessRC.
EXECUTE .
RECODE
  WealthE (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) into WealthRC.
EXECUTE .

FREQUENCIES
  VARIABLES=AmbitiousRC AuthorityRC CapableRC
  InfluenRC PubImagRC SocPowerRC SuccessRC WealthRC
  /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
  /ORDER= ANALYSIS .

COMPUTE ValueIndex = mean.10(WorldBeauT,AmbitiousRC,AuthorityRC,BrodMindT
 ,CapableRC,ForGivT,HelpfulT,HonestT,InfluenRC,LoyalT,PubImagRC,ProtEnvirT
 ,SocPowerRC,SuccessRC,UnityT,WealthRC) .
EXECUTE .

FREQUENCIES
  VARIABLES=ValueIndex
  /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
  /ORDER= ANALYSIS .

*Anthro Items

RELIABILITY
  /VARIABLES=ForValEconA ForValMtrlA ForValJobA ForValProdA
  /SCALE('ALL VARIABLES') ALL/MODEL=ALPHA
  /STATISTICS=CORR
  /SUMMARY=TOTAL .

*Anthro Scale

COMPUTE AnthroScale = mean.4(ForValEconA,ForValMtrlA,ForValJobA,ForValProdA) .
EXECUTE .

FREQUENCIES
  VARIABLES=AnthroScale
  /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
```

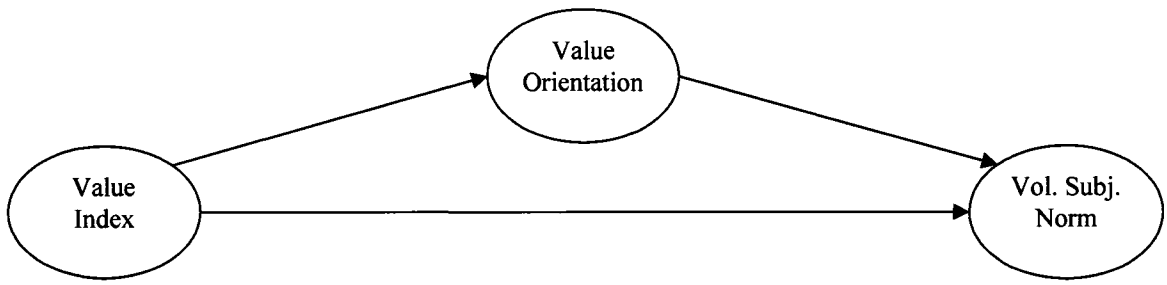
```
 /ORDER=  ANALYSIS .

*Bio Items

RELIABILITY
 /VARIABLES=ForRightB NatRightB EqualRightB ForValueB PreserForB SpiritRenForB
SpirtRenNatB
 /SCALE('ALL VARIABLES') ALL/MODEL=ALPHA
 /STATISTICS=CORR
 /SUMMARY=TOTAL .

* Bio Scale

COMPUTE BioScale =
mean.4(ForRightB,NatRightB,EqualRightB,ForValueB,PreserForB,SpiritRenForB
 ,SpirtRenNatB) .
EXECUTE .
FREQUENCIES
 VARIABLES=BioScale
 /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
 /ORDER=  ANALYSIS .

*BioAnthroScale

RECODE
 ForValEconA
 (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) INTO  ForValEconRC .
EXECUTE .
RECODE
 ForValMtrlA
 (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) INTO ForValMtrlRC .
EXECUTE .
RECODE
 ForValJobA
 (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) INTO ForValJobRC.
EXECUTE .
RECODE
 ForValProdA
 (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) INTO ForValProdRC .
EXECUTE .
RECODE
 ForValHumA
 (1=7) (2=6) (3=5) (4=4) (5=3) (6=2) (7=1) INTO  ForValHumRC .
EXECUTE .

FREQUENCIES
 VARIABLES=ForValEconRC ForValMtrlRC ForValJobRC ForValProdRC ForValHumRC
 /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
 /ORDER=  ANALYSIS .

COMPUTE BioAnthroIndex = mean.10(ForValEconRC,ForValMtrlRC
 ,ForValJobRC,ForValProdRC,ForRightB,NatRightB,EqualRightB,ForValueB
 ,PreserForB,SpiritRenForB,SpirtRenNatB) .
EXECUTE .

FREQUENCIES
```

```
 VARIABLES=BioAnthroIndex
 /STATISTICS=STDDEV VARIANCE RANGE MEAN MEDIAN MODE
 /ORDER=  ANALYSIS .

* Volunteering General Attitude

RELIABILITY
 /VARIABLES=VolGoodA VolWiseA VolBenefA VolRewardA
 /SCALE('ALL VARIABLES') ALL/MODEL=ALPHA
 /STATISTICS=CORR
 /SUMMARY=TOTAL .


COMPUTE VolGenAtt = sum.4(VolGoodA,VolWiseA,VolBenefA,VolRewardA) .
EXECUTE .

FREQUENCIES
 VARIABLES= VolGenAtt
 /STATISTICS=STDDEV RANGE MEAN MEDIAN MODE
 /ORDER=  ANALYSIS .
```

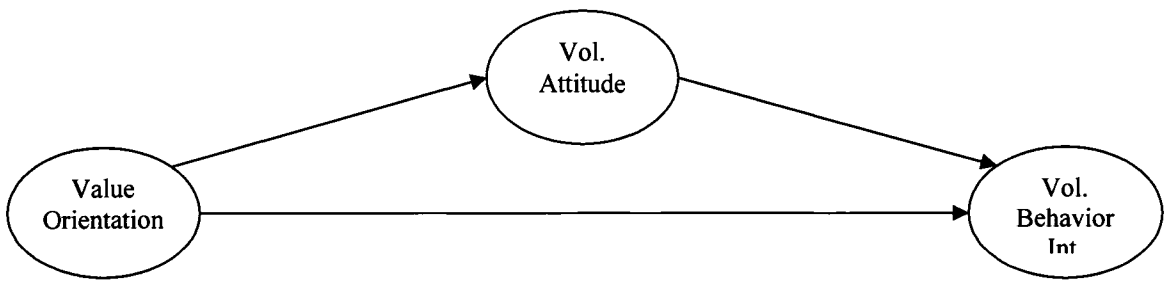
Appendix F: Mediation Models



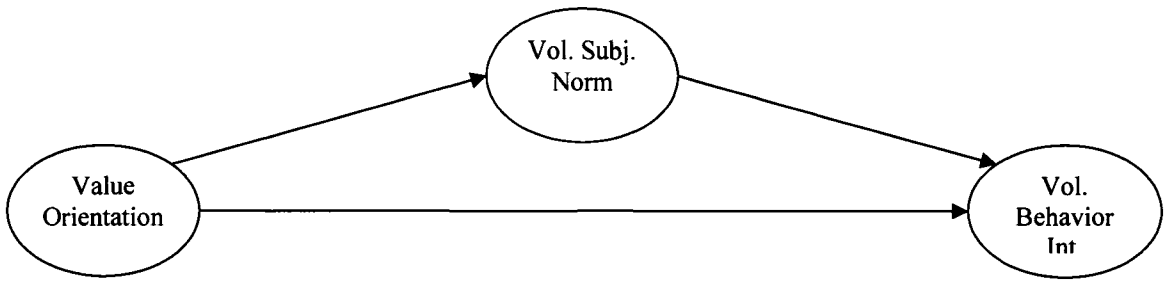
Test #1: Test for mediation effect of value orientation between value index and volunteering attitude.



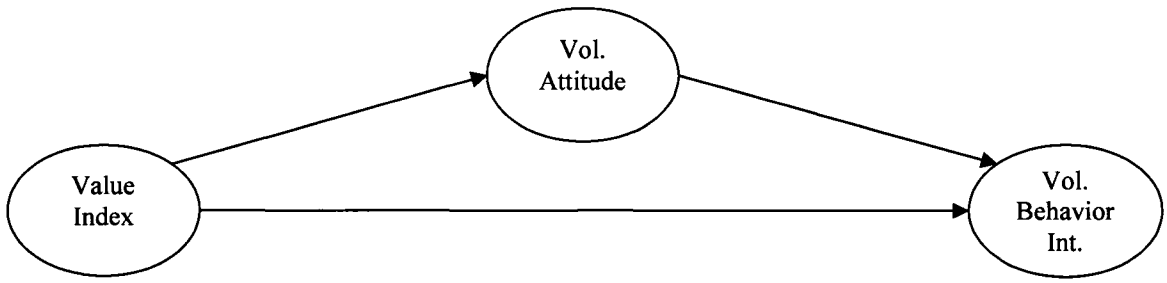
Test #2: Test for mediation effect of value orientation between value index and volunteering subjective norm.



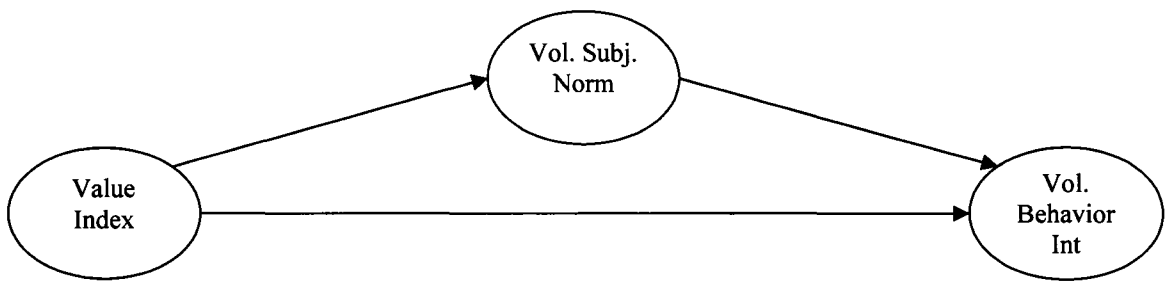
Test #3: Test for mediation effect of attitude between value orientation and behavior intention.



Test #4: Test for mediation effect of subjective norm between value orientation and behavior intention.



Test #4: Test for mediation effect of attitude between value index and behavior intention.



Test #5: Test for mediation effect of subjective between value orientation and behavior intention.

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