COMMUNITY COLLEGE STUDENTS' PRO-ENVIRONMENTAL BEHAVIORS AND THEIR RELATIONSHIP TO AWARENESS OF COLLEGE SUSTAINABILITY STRATEGY IMPLEMENTATION

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By

James David Hutcherson

Director: Dr. Meagan Karvonen
Associate Professor
Department of Human Services

Committee Members:
Dr. Patricia Bricker, School of Teaching and Learning
Dr. Marianne Hollis, School of Health Sciences

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LIST OF ABBREVIATIONS

Abbreviation	Meaning	Page Number
AASHE	Association for Advancement of Sustainability in Higher Education	12
CFA	Confirmatory Factor Analyses	65
CFI	Comparative Fit Index	72
CGR	Code Green/Sustainability Representatives	27
DSP	Dominant Social Paradigm	20
ESA	Endangered Species Act	54
GFI	Goodness-Of-Fit Index	65
INT	Intention	27
IRB	Institutional Review Board	68
LEED	Leadership in Energy and Environmental Design	19
LM	Lagrange Multiplier	73
NAM	Norm-Activation Model	36
NCCCS	North Carolina Community College System	13
NEP	New Environmental Paradigm; New Ecological Paradigm Scale	20
NFI	Normed Fit Index	72
PBC	Perceived Behavioral Control	21
PEB	Pro-environmental Behaviors	9
RMSEA	The Root Mean Square Error of Approximation	65
SEM	Structural Equation Modeling	37
SN	Subjective Norm	21
SPSS	Statistical Package for the Social Sciences	66
SSI	Sustainability Strategy Implementation	14
STARS	Sustainability Tracking and Rating System	59
SuperCIP	Super Curriculum Improvement Project	13
TBL	Triple bottom line	30
TPB	Theory of Planned Behavior	9
TRA	Theory of Reasoned Action	23
VBN	Value-Belief-Norm Theory of Environmentalism	36

ABSTRACT

COMMUNITY COLLEGE STUDENTS' PRO-ENVIRONMENTAL BEHAVIORS AND THEIR RELATIONSHOP TO AWARENESS OF COLLEGE SUSTAINABILITY STRATEGY IMPLEMENTATION

James David Hutcherson, Ed. D.

Western Carolina University (May 2013)

Director: Dr. Meagan Karvonen

The impact of humans on the environment has caused a need to evaluate why individuals act in non-sustainable ways. How to change current non-sustainable behaviors is a focus in current social research. Authors have written about the use of varied strategies to change specific non-sustainable behaviors, but few have actually evaluated how such strategies influence general pro-environmental behaviors (PEBs). Higher education institutions have been called upon to increase knowledge and awareness of environmental issues in order to change these behaviors, not only through curricula but through modeling of sustainable practices. Many articles have been written describing such initiatives. However, few studies have actually evaluated how these initiatives have their impact on college students' behaviors. One of the ways to study such behaviors and antecedents of those behaviors is through the Theory of Planned Behavior (TPB). This theory states that behavior is predicted by intention which is in turn predicted by attitudes, subjective norm and perceived behavioral control. The purposes of this study

were to determine whether the TPB could be used to predict general environmental behavior of students on community college campuses, to determine how aware students were of sustainable strategy implementation by those colleges, and to evaluate whether there was a relationship between student awareness of such initiatives and the constructs of TPB. Study participants included 724 curriculum students at four different community colleges in NC purposefully selected for differences in sustainability strategy implementation. Three of the colleges were considered high implementation colleges and one was considered low implementation. Variations on scales previously used by other researchers studying such relationships were used to collect data. Scales were built using confirmatory factor analysis. The reduced sets of items were combined for each construct and first used to test the model of the TPB using path analysis. Antecedents of intention did predict intention with subjective norm and perceived behavioral control having the most influence. Intention also predicted PEB. None of the other constructs had a direct influence on PEB. Next, respecifications of the models were created based on the influence of low awareness and high awareness on the constructs in order to compare influence of awareness levels, and were found to be different for the two groups. General awareness of sustainable strategy implementation of the community college students was also assessed. Overall, students were not very aware of the strategies occurring on their campuses and they sometimes reported being aware of activities that did not exist. It did appear that students enrolled in the college that instituted many sustainable practices and activities, and promoted these initiatives, did have higher awareness. Implications from this study include the need for social marketing strategies which highlight initiatives on campuses and make PEB easier. In addition, this study highlights the need for similar

studies that not only include students but faculty and staff, and the need for an instrument that measures awareness of initiatives.

CHAPTER ONE: INTRODUCTION

Environmental conservation and sustainability are concepts that have crept into many facets of the average American's life whether it has been through newspapers, magazines, books or television shows. The impact of humans on the environment in terms of pollution, natural resource depletion, and potential climate change has spurred the international community into large awareness campaigns and environmental policy changes. Sustainability efforts ramped up after the World Commission on Environment and Development published *The Brundtland report, our common future* in 1987. The issue was brought into the psyche of the average American consumer in 2006 by Al Gore in his documentary film, *An Inconvenient Truth*.

Many organizations, both businesses and institutions of higher education, are taking responsibility by changing policies and practices to meet the environmental challenges of the future (Orr, 2004; Rogers & Hudson, 2011). Many educational institutions have made the move to more environmentally sustainable campuses independently and under the guidance of organizations such as the Association for Advancement of Sustainability in Higher Education (AASHE). These initiatives have included the "greening" of campuses and curricula (Calder & Datremont-Smith, 2009). Several authors have written about how these institutions have accomplished their pursuits to be more sustainable (Bartlett and Chase, 2004; Keniry, 1995; M'Gonigle & Starke, 2006; Sharp, 2002). Many studies have analyzed the impacts of integrating sustainability-focused exercises within curriculum courses on pro-environmental attitudes (e.g., Bradley, Waliczek, & Zajicek, 1999; Bright & Tarrant, 2002; McMillan, Wright, &

Beazley, 2004; Meyer & Munson, 2005; Pe'er, Goldman, & Yavetz, 2007; Rideout, 2005), and influence of curriculum course integration and campus greening influences on pro-environmental behavior (PEB) of college students (e.g., Eagan, Erickson, & Keniry, 2009; Halfacre-Hithcock & Owens, 2006; Kaiser, Hubner, & Bogner, 2005; Lamoreaux et al., 2003; Marcel, Agymen, & Rappaport, 2004). However, few studies have sought to understand the antecedents of student PEB or how the antecedents are influenced (e.g., Bamberg, 2003; Robertson & Walkington, 2009). All of these studies have been conducted at four-year institutions.

In 2009, the North Carolina Community College System (NCCCS) created an initiative called Code Green. Under this program, representatives from all 58 community colleges were appointed to participate in a network and teleconference calls were scheduled in which community colleges shared their best practices in terms of sustainability initiatives. A Super Curriculum Improvement Project (SuperCIP) soon followed in 2010 to reorganize applied technology programs, reduce redundancy of courses, and integrate sustainability into all applied technology programs. The SuperCIP reorganization is coming to a close and campuses will begin implementation within the 2013-2014 year. In terms of campus greening initiatives, no consistent framework has been used or mandates established as in the SuperCIP, therefore campuses are in many different phases of implementing such programs. Because some campuses are at different levels of sustainability strategy implementation, this creates an ideal environment and time to investigate how campuses at different stages of implementation influence student pro-environmental attitudes and behavior.

Using the Theory of Planned Behavior (TPB) as a framework, this quantitative study compared campuses at the higher end of campus sustainability initiative implementation (SII) with campuses at the lower end on the antecedents of PEB and self-reported PEB. It is hoped that this study will give further support for TPB use in studying PEB and will contribute to the knowledge base by exploring what antecedents predict PEB on community college campuses and whether high levels of SSI influence student awareness levels and in turn impact antecedents of PEB.

Significance of the Problem

Concerns about the environment have existed for several decades, ever since environmental degradation was first brought to the attention of the public in the 1960s (Rideout, Hushen, McGinty, Perking, & Tate, 2005). While great strides have been made since that time in changing environmental policy and reversing the course of much environmental degradation, there is still a significant amount of work to be done in reaching the goals of a healthy environment and true sustainability (Rideout et al., 2005).

The World Commission on Environment and Development (1987) is credited with the modern definition of the term "sustainability." In this report, sustainable development was defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (para. 1).

Writers (Daly & Cobb, 1994; Frankel, 1998; Hawken, 1993) have made the case for sustainable management practices in corporations. To many of these companies, sustainability goes to the bottom line and makes good business sense as waste reduction and energy efficiency, which are cornerstones of environmental sustainability, decrease business costs and enhance reputation. Educators have made the case for the role of

higher education in creating a sustainable society as well (Bowers, 1995; Corcoran & Wals, 2004; Orr, 2004; Uhl & Anderson, 2001). For example, Corcoran and Wals described higher education as "vested by society with the mission of discerning truth, imparting knowledge, skill and values and preparing responsible citizens and competent workers who will contribute to an improving world" (2004, p. ix).

Education has been the key to changing attitudes on many issues. In turn, changing attitudes may affect a tangible result. Gigliotti (1994) proposed that positive environmental attitudes are expected to result in voluntary favorable actions. "Because our actions depend on knowledge of the workings of nature, on positive attitudes toward nature and its problems, and on external regulation, education is seen as the key to "saving the world" (Schindler, 1999, p. 12).

Encouraging Sustainability in Higher Education Institutions

The implied goal of environmental education at the primary and secondary education levels has been to create a future electorate that understands environmental issues and therefore will be able to make better decisions in regard to their ecology (Rideout, 2005). But, the young student population being educated will not be a part of the electorate for years and some of the environmental challenges are in immediate need of policy change. Although children may be able to influence environmental behaviors of their parents (Uzzell, 1999), it may be better to influence the current population that may make changes in the present. As stated by Belanger (2003, p. 80) "Since adults operate in real-life settings with real-life implications, they also have the capacity to experience their environments and to learn from them. They have the capacity to reconstruct the

ecologies in which they live and grow." The community colleges, four-year colleges, and universities all play a role in educating adults.

There are many ways in which institutions of higher education may impart ideals of sustainability upon students and the community. One of these ways is by modeling "green" practices as an institution within the community (Bartlett & Chase, 2004; Creighton, 1998). A more obvious mechanism is the integration of sustainability information in interdisciplinary curricula and community outreach programs (Calder & Clugston, 2003; Wright, 2007).

Theoretical Framework

Applying various initiatives to change behavior is not new and has been studied widely. Educational strategies, in particular, have been applied in many situations focusing on different determinants of behavior (De Young, 1993; Gardner & Stern, 2002; Geller, 2002; Vlek, 2000). These strategies can be categorized as either antecedent or consequence, and informational or structural (Steg & Vlek, 2009). Antecedent strategies focus on changing factors that occur before the behavior. These strategies raise awareness of problems, help with making choices, and state possible consequences. They include environmental design, modeling, prompting, behavioral commitments, education and information. Consequence strategies, of course, focus on changing what happens afterwards and may include rewards, feedback, and penalties. Informational strategies focus on changing norms, knowledge, motivations, and perceptions. They do not change the context external to the options chosen. Structural strategies focus on changing the context within which the option is chosen, for example making an option more available,

easier, more affordable or more attractive. Each of these categories of strategies have been used to target sustainability-related behaviors.

Informational strategies. Using informational strategies may increase a person's knowledge and thus increase awareness of environmental problems and impacts as well as alternatives to behavior (Steg & Vlek, 2009). This knowledge would hopefully change environmental attitudes which would result in a change in behavior. Behavior has not been found to change as a result of general knowledge campaigns, but the use of reminders, also called prompts, has been found to be effective (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Lehman & Geller, 2004; Schultz, Oskamp, & Mainieri, 1995).

Information may be used for the purpose of persuasion as well. This might affect a person's attitude or strengthen certain values that are altruistic or ecological in nature (Steg & Vlek, 2009). Some persuasion strategies ask for individuals to make certain pro-environmental commitments and appear to be successful (Abrahamse, et al., 2005; Lehman & Geller, 2004; Schultz et al., 1995). Interventions which are meant to elicit implementation intention, in which individuals are asked to describe how they intend to make environmental behavior changes, have also been effective (Bamberg, 2002; Garling & Schuitema, 2007; Jakobsson, Fuijii, & Garling, 2002). The use of social marketing, in which several strategies are used to provide specific information based on needs, wants, and perceived barriers, has also showed promise in changing environmental behaviors (Abrahamse, Steg, Vleck, & Rothengatter, 2007; Daamen, Staats, Wilke, & Engelen, 2001; Thogersen, 2007).

Information strategies can also come in the form of social support (providing information about others) or role models which influence social norms and inform

individuals about behaviors, efficacy and perceptions of others (Steg and Vlek, 2009). In this case, the information provided is based on descriptive norms. This strategy has been found to influence several PEBs (Schultz, Nolan, Cialdinin, Goldstein, & Griskevicius, 2007; Abrahamse et al., 2005; Lehman & Geller, 2004).

Informational strategies will be more successful when the PEB is convenient and less costly, and no external constraints are placed on the behavior (Steg and Vlek, 2009). Using a participatory approach will also help to gain perspective of the actors, get attention, gain commitments, build support, and gain more involvement (Gardener & Stern, 2002).

Structural strategies. Since PEBs that are costly or more difficult to act upon may form an external barrier, changes that make these activities more affordable and more convenient will increase the opportunities to act more environmentally (Olander & Thogersen, 1995; Rotschild, 1999; Stern, 1999; Thogersen, 2005; van Raaij, 2002). These contextual factors may be changed through structural strategies.

There are three types of structural strategies (Steg & Vlek, 2009). One such structural strategy focuses on making certain products or services more available, or increasing the quality of them. Another strategy makes the less environment-friendly behavior illegal. This often includes some type of punishment if the law/policy is not followed. Lastly, pricing policies can either make the PEB less costly or make the less environment-friendly option more expensive.

The structural strategies ultimately punish behaviors that are bad or reward those that are good. Rewards are considered preferable since they focus on positives (Geller, 2002), but PEBs may then be related more to the rewards and not real convictions, and

disappear once the reward disappears (Steg & Vlek, 2009). Other criticisms of these strategies are that they may not always make PEBs more attractive than harmful behaviors, they may not affect people's goals to act differently, and they may not assist with goal implementation (Garling & Loukopoulus, 2007; Garling & Schuitema, 2007).

Which strategy is chosen will depend on the particular PEB to be encouraged and the particular barriers that may be encountered. According to Gardner & Stern (2002) a combination of the strategies will work best since there is often more than one challenge or barrier to overcome. Also, each target group has different circumstances, capacities and motivations (Steg & Vleck, 2009). This is one of the strategies of social marketing as well.

College campus strategies to encourage PEB. While education for sustainability within curriculum courses is certainly important, "campus greening," which refers to sustainable campus operations, has been the centerpiece of much of the movement for sustainability in higher education (Calder & Dautremont-Smith, 2009). These campus operations include green building, transportation initiatives, green purchasing, water conservation, sustainable landscaping, energy conservation, waste minimization and recycling. Studies such as the 2008 *Campus Sustainability Report Card* published by the Sustainable Endowments Institute show good progress over the last several years especially for recycling, sustainable food systems, green building projects like Leadership in Energy and Environmental Design (LEED), green purchasing, and, within institutional mission, policy and planning. Most of these measures have focused on initiatives that save money. Nevertheless, a goal, whether implicit or explicit, by many institutions in their greening efforts is to serve as a pro-environmental model, creating a

"green" culture which helps transform the students in hopes that they will carry this culture into their lives off campus.

Using Steg and Vlek's (2009) organization of strategies, colleges use of informational strategies, whether they be bulletin boards, signage, workshops, club activities, components of courses, or modeling PEBs, or use of structural strategies, such as making PEB activities more convenient or attractive, like placing recycling bins everywhere, would be expected to change attitudes and help create a new social norm. These changes may occur through building social capital (Putnam, 1993) which is developed through trust, norms, and networks.

Predicting sustainable behaviors. In order to understand why people act with a certain behavior, their attitude about the subject must be understood. According to Dunlap, van Liere, Mertig, and Jones (2000), world views about humankind's place in the environment can be measured on a continuum from having a dominant social paradigm (DSP) to exhibiting the new environmental paradigm (NEP). In the former, individuals believe in "abundance and progress, growth and prosperity, faith in science and technology, and commitment to a laissez-faire economy, limited governmental planning and private property rights" (Dunlap & van Liere, 1978, p. 10). It is important to point out that this reliance on science and technology refers to a belief that any potential challenges will always be remedied, but these strategies often refer to after-the-fact fixes as opposed to prevention. Someone with an NEP belief feels that the Earth's ecology is being threatened and therefore quick action is necessary to protect the environment, a belief more akin to the precautionary principle based on scientific evidence. For example, a person with DSP would state that if we do not know definitively that global warming is

occurring, we should not rush into any policy and regulation changes since technology would be developed to adapt to any such changes should they occur. The individual with high NEP would respond that there is enough evidence to make changes to prevent any possible detriment to the Earth.

Indeed, research does show that individuals with high DSP tend to have less concern for environmental matters (Dunlap & van Liere, 1984; Kilbourne & Polonsky, 2005; Pierce, Dalton, & Zaitsev, 1999; Widegren, 1998) and also exhibit fewer sustainable behaviors (Pahl, Harris, Todd, & Rutter, 2005). But, the relationship between attitude and behavior is only a moderate one (Kaiser & Schultz, 2009). Therefore, researchers have been using additional theories that go beyond attitude to help explain why some individuals practice sustainable behaviors and others do not.

The Theory of Planned Behavior (TPB) has been used to predict the antecedents of various behaviors including sustainable behaviors (Davis, O'Callaghan, & Knox, 2009). TPB hypothesizes that the major determinant of behavior is the intention to perform or not perform a particular behavior. Influential to intentions are:

(1) *Attitude*: the favorableness or unfavorableness of performing a particular action;

(2) *The subjective norm* (SN): the perception by an individual of social pressure to perform or not to perform an activity.

(3) *Perceived behavioral control* (PBC): the perception of a person's ability to perform or not perform (see Figure 1).

The TPB has been used successfully to explore many environmental behaviors (Davies, Foxhall, & Pallister, 2002; Davis, Phillips, Read, & Iida, 2006; Davis et al.,

2009). For example, Tonglet, Phillips, and Read (2004) found that the major contributor to recycling behavior was pro-recycling attitude. Those attitudes were mostly influenced by recycling knowledge, recycling opportunities and available facilities. Attitudes were also influenced by lack of deterrents to recycling. Recycling consequences, community concern, and experience with recycling also helped predict recycling behavior.

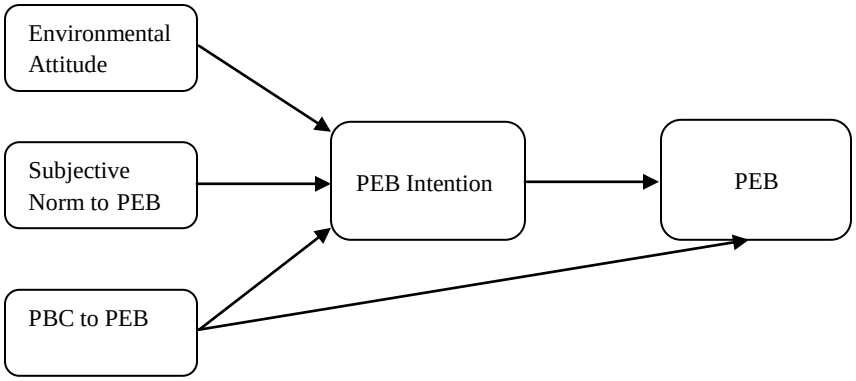

Figure 1.The theory of planned behavior (Ajzen, 1991).

Using TPB as a theoretical framework, it stands to reason that individuals who have pro-environmental attitudes, and in turn act with environmental behaviors, will participate in encouraging sustainable behaviors of others and further the goals of sustainability for a community. Since TBP is well supported in the literature to predict environmental behavior of the average consumer (Davis et al., 2009) it appears to be the ideal model to be used to study the effects of sustainability movements on the community college campus.

Studies concerning pro-environmental attitudes and intentions. While environmental attitudes in relation to demographics have been studied at length in many settings (Arcury & Christianson, 1990; Casey and Scott, 2006; Dietz, Stern, & Guagnano, 1998; Dunlap, et al., 2000; Greely, 1993; Schultz, Zelezny, & Dalrymple, 2000; Tranter, 1996), as have interventions that have effected a change in attitudes in higher education institutions (Bradley et al.,1999; Bright & Tarrant, 2002; McMillan et al., 2004; Meyer & Munson, 2005; Pe'er et al., 2007; Rideout, 2005), the effects of pro-environmental educational and institutional initiatives in higher educational settings on behavior and antecedents of that behavior have just begun to be studied.

Only a few studies using TPB as a framework have been found in higher education literature. Davis et al. (2009) studied sustainable attitudes and behaviors of non-academic staff in an information services department at Griffith University, Queensland and found that TPB was predictive of sustainable behaviors such as "green purchasing," water conservation, energy efficiency, waste minimization, and recycling. These authors also found that knowledge of consequences of recycling was of predictive value. Chen, Gregoire, Arendt, and Shelley (2011) sought to understand predictors of university dining services administrators' intentions to adopt sustainable practices. Again, TPB was predictive of sustainable practices with social pressures from other university administrators and students found to be the most influential. Bamberg (2003) found that TPB could be used to predict whether university students would request a green electricity products brochure, with attitude having the strongest impact. Using the environmental behavior framework of Barr, Ford, and Gilg (2003) based on the Theory of Reasoned Action (TRA, a precursor to TPB), Robertson and Walkington (2009)

studied recycling behaviors of university students in Oxford, UK and found that situational factors like the convenience of a recycling box and whether friends and family recycled, along with psychological factors like environmental concern, influenced them.

The relationship of campus greening initiatives to TPB. Many assumptions have been made by college campus sustainability leaders that changes in policies; integration of sustainability into curricula; procedural changes such as increased recycling, visibly increased use of alternative energy generations such as solar arrays, publicity about energy efficient infrastructure and LEED buildings, informational/educational displays and presentations, and leading as a green model of an environmentally sustainable organization; will change student PEB. Based on past research studying PEB-based interventions, it does seem plausible that such initiatives should affect the antecedents of TPB. Figure 2 expands on the original diagram by incorporating awareness strategies and student awareness.

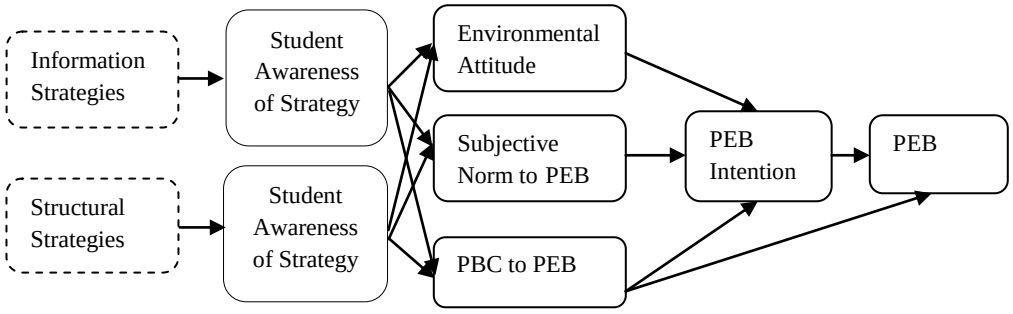

Figure 2. The relationship of PEB change strategies to PEB (Dashed boxes represent constructs not directly measured in this study).

Overview of the Study

Gaps in community college studies and PEB. An implied mission in educational institutions is to effect a change in the citizenry so that they contribute in positive ways to society (Corcoran & Wals, 2004). So why has actual behavior change as a result of higher education initiatives such as "campus greening" not been gauged? Should community college administrators not want to know if their initiatives (in general) are effective so they know how to spend their money appropriately? In addition, when the literature is canvassed, higher education studies of environmental attitudes or behavior or antecedents of that behavior are lacking. They are nearly absent on community college campuses.

The few studies in the university setting may not be transferable to initiatives and students of the community colleges either. Community college students are different than students going to universities (Kane & Rouse, 1999). Community college students may have different goals than four-year college and university students. Many of the community college programs that students enter are designed to prepare adults for the workforce and are therefore more applied in nature. In addition, the students entering these programs are older, on average, work more hours, and often have families to support. Demographic diversity has been shown to have a great impact on attitude towards the environment (Dunlap, 2008). Lastly, community college students are less connected to their campuses than their four year counterparts since their colleges are not residential and they often attend part-time and therefore spend less time there (Kane & Rouse, 1999).

The North Carolina Community College System began a major initiative in 2008 called "Code Green." Among other goals, the program sought to create "green campuses" and integrate sustainability into all educational programs. The majority of NC community colleges named a representative to the program and this individual was tasked with creating sustainable initiatives on campus. As a result of such initiatives, the "hidden curriculum" of campus greening should impact all stakeholders at the campus, especially students, to become more environmentally aware and transform individuals into practicing more sustainable behaviors (Hopkinson, Hughes, and Layer, 2008). But research has not been published on this topic.

Purpose and research questions. The purposes of this study were to determine how well the TPB explained PEBs among North Carolina community college students, and to determine whether implementation of campus sustainability initiatives positively influenced students' attitudes, subjective norms, perceived behavioral control, intentions, and behaviors. The main research questions were:

1. Is community college student PEB predicted by TPB?
2. To what extent are students aware of their colleges' strategy implementation?
3. Is there a relationship between student awareness of campus initiatives and their (a) Environmental Attitudes, (b) Perceived Behavioral Control to PEB, (c) Subjective Norm to PEB, (d) PEB Intention and (e) Self-reported PEB?

Overview of methods and analysis. Six NC community colleges were initially chosen based on high and low levels of sustainability implementation in order to get a diverse sample. The representative of one of the schools became unresponsive after initially agreeing to participate and one college was very late in finally approving the

survey to be conducted. Therefore, only four community colleges ended up in the final data set. The schools chosen were similar in size and had enrollments of approximately 1500-4300 students each, yielding approximately 10,500 students in the sampling frame. The Code Green/Sustainability representatives (CGR) at each school were then interviewed to verify the level of implementation at each school and to discuss specific strategies they used. The number, types, and frequency of PEB change strategies were then assessed.

With endorsement of the CGR at each school, an on-line survey was made available to all current curriculum students through e-mail. The survey included questions on (1) respondent demographics, (2) awareness of campus initiatives and college participation in curriculum on sustainability, (3) environmental attitudes, (4) subjective norms to PEB, and (5) PBC to PEB, (6) INT to perform PEB, and (6) PEB.

The instrument used to measure environmental attitude was the New Ecological Paradigm Scale (NEP; Dunlap et al., 2000), which is a revised version of the original New Environmental Paradigm Scale (Dunlap & van Liere, 1978). The questionnaire used to assess subjective norm, PBC, and behavior intention was originally developed by Kaiser and Scheuthle (2003) and adapted for this study.

Delimitations. This study only sought to understand whether strategy implementation was associated with awareness of those initiatives and whether antecedents of PEB and self-reported PEB were affected by that awareness. The study did not determine which specific strategies worked best. This study also did not delve into how the strategies affected activators of the antecedents. Effect of personal background variables on PEB was also not studied. Finally, while most studies using TPB have

focused on specific initiatives, this study tried to understand a more general effect from several strategies and therefore used a more generalized model that has not been used as much in the literature.

CHAPTER TWO: REVIEW OF THE LITERATURE

This chapter will provide a survey of the literature explaining the current emphasis on sustainability in organizations starting with the importance within businesses then translating these same goals to higher education institutions. Theories that explain PEB will then be assessed, with a detailed analysis of TPB, its applications, and its relevance to the study of PEB on college campuses expounded upon. The role of social marketing in changing PEB will be explained and its relevance to TPB will be discussed. A brief description of behavioral sciences and the antecedents of behavior will then be given. Finally, the specific theoretical framework will be given, explaining how TPB can be used to understand how campus sustainability initiatives may influence student PEB on community college campuses.

Sustainability Initiatives in Organizations

The concept of sustainability is appearing in many documents and literature from general publications to research. On the business end, organizations are realizing that there are opportunities to be more efficient and profitable. In some cases, sustainable behavior is being required by mandates and regulations. In still other areas, individuals are simply more aware of the global threats and are therefore more concerned about possible impacts.

Recently, some major business publications have begun championing sustainability. The *Harvard Business Review* reports on "green business strategies" regularly in articles about corporate social responsibility (Nidumolu, Prahalad, & Rangaswami, 2009; Rogers & Hudson, 2011). Massachusetts Institute of Technology has

published articles about sustainable leadership in business (Lueneburger & Goleman, 2010). While sustainability is just one of the organizational challenges that businesses have to deal with, what makes it different is that it requires all levels of an organization to change their thinking and practices, and requires that every individual be involved (Rogers & Hudson, 2011). It builds on practices in addition to theories and cuts across all sectors of organizations, the economy, and indeed, geographies. "Sustainability is a key issue for organizations in the twenty-first century as they increasingly acknowledge that their policies and practices have social and/or environmental consequences" (Stubbs & Cocklin, 2008, p. 206).

American colleges and universities have become vehicles of the sustainability movement recently as well. These efforts are found in policy, management and operations, research, curriculum/education, and other programs and services, and are believed to impact students, faculty, staff, and the surrounding communities. Many believe that one of the major roles of higher education is to help create sustainable futures. A statement issued by the Association of University Leaders for a Sustainable Future in 1990 suggested that institutions of higher education must have a strong sustainable strategy and have the environment as a central focus in its curricula. Orr (2004) has stated that higher education institutions have the responsibility for sustainability education of the public and that colleges should set an example showing how institutions and people can become more sustainable.

Sustainability has been described as having three components called the triple bottom line (TBL): social, environmental and economic (Elkington, 1998; Savitz & Weber, 2006). Regardless, when individuals and institutions use the term, they usually

are referring to the environmental and economic components. Indeed, by far the majority of literature describes environmental conservation initiatives when referring to sustainability. One of the reasons for this focus is that it is the one aspect that leads to financial gains since energy, waste minimization and water conservation result in some immediate paybacks (Rogers & Hudson, 2011).

For this same reason, the most dramatic sustainability movements in higher education have been seen within sustainable campus operations, also referred to as "campus greening" (Calder & Dautremont-Smith, 2009, p. 96). There is an assumption within educational institutions that such modeling will have an impact on the students who observe these behaviors. According to Calder & Dautremont-Smith (2009), "A university fully committed to sustainability emphasizes an interdisciplinary and holistic approach to fostering the knowledge, skills, and attitudes needed to build a more sustainable world for present and future generations" (p. 93). It is implied that through the sustainability initiatives of the colleges, student PEB will be influenced to the extent that they will go beyond the walls of the institution and impact the entire world. Colleges are certainly in the position to intervene with initiatives that make students more aware of the greening efforts.

These campus greening initiatives make sustainability real to the students in that they can see for themselves that the goals are attainable. Environmental challenges are overcome. There is evidence that PEB can be influenced by whether individuals believe their actions can mitigate threats to the environment (Joireman, van Lange, & van Vugt, 2004; Stern, 2000). Indeed, the view that attitude change and/or intentions can, by themselves, change behavior is well documented in psychological literature (Abraham,

Sheeran, & Johnston, 1998; Austin & Vancouver, 1996; Dahlstrand & Biel, 1997; Eagly & Chaiken, 1993). However, a meta-analysis conducted by Webb and Sheeran (2006) found that interventions are more strongly associated with changes in intention than with changes in behavior. In other words, intention does not always translate to behavior.

Because change in behavior does not always follow attitude or intention change, other behavioral factors needed to be addressed as well (Stern, 2000). Factors that have been studied relating intention to behavior include intention specificity, physical and social contexts that may inhibit the action, and perception of control over the action and possible consequences (Arbuthnott, 2009). Stern (2000) stated that these factors are associated with attitude and context, the two general causes of behavior. Models have been created and tested which have helped researchers understand the relationships among the factors that influence behavior. One of the theories that has much support in predicting PEB specifically is The Theory of Planned Behavior.

Predicting PEB

The development of TPB. The Theory of Planned behavior is an extension of the Theory of Reasoned Acton (TRA), developed by Fishbein and Ajzen (1975) and Ajzen (1991). TRA proved a valuable framework when focused on the gap between intention and action (Barr & Gilg, 2007). This gap has been identified in a considerable amount of research (e.g., Christie & Jarvis, 2001; Dunlap, 2002). Fishbein and Ajzen hoped to use attitudes to predict behavior and explain how the two are linked.

According to the theory, there is a relationship among behavioral and normative (approval by others) beliefs, attitudes, intentions, and behavior (Ajzen, 1991). Previous studies had found little correlation between attitudes and behavior and some theorists

wanted to eliminate this parameter (Fishbein, 1993). But, Fishbein recognized a distinction in regard to whether attitude was toward an object or a behavior with regard to an object. Indeed, he found that as a predictor of behavior, attitude toward a behavior was better as a measure than attitude toward the target of the behavior (Fishbein & Ajzen, 1975).

TRA asserts that the main antecedent to behavior is *behavioral intention* (Fishbein & Ajzen, 1975; Montano & Kasprzyk, 2002). In turn, antecedents of intention are *attitude* in regards to performance of the behavior and the *subjective norm* in relationship to the behavior. *Behavioral beliefs,* which are related to opinions about outcomes or aspects of performing the behavior, taking into account evaluations of outcomes or aspects, determine attitudes. For example, if the possible outcomes are valued, a positive attitude about the behavior will result. *Subjective norm* is a reflection of *normative beliefs*, which are determined by the approval or disapproval of a behavior by individuals important to the subject. Motivation to acquiesce to the referents is also considered. Therefore, if a person believes that those important to him or her approve of the performance of a behavior and the subject is motivated to comply with the referents, a positive subjective norm results.

According to the TRA, the main direct determinant of a behavior is the intention to act on it (Montano & Kasprzyk, 2002). Therefore, the theory's success depends on degree of volitional control of the behavior. When there is a high level of volitional control, motivation using intention, attitude, and normative measures primarily determines the behavior. When volitional control decreases, TRA may not be sufficient to predict behaviors. Environmental conditions may mediate the behavior. Therefore, the

Theory of Planned Behavior was developed to take into account involuntary control when predicting behavior (Ajzen, 1991; Ajzen & Driver, 1991; Ajzen & Madden, 1986). This new theory added *perceived behavioral control* (PBC) as a construct to take into account those factors that a subject may not control. Figure 3 represents the theory of planned behavior constructs including activators of the antecedents.

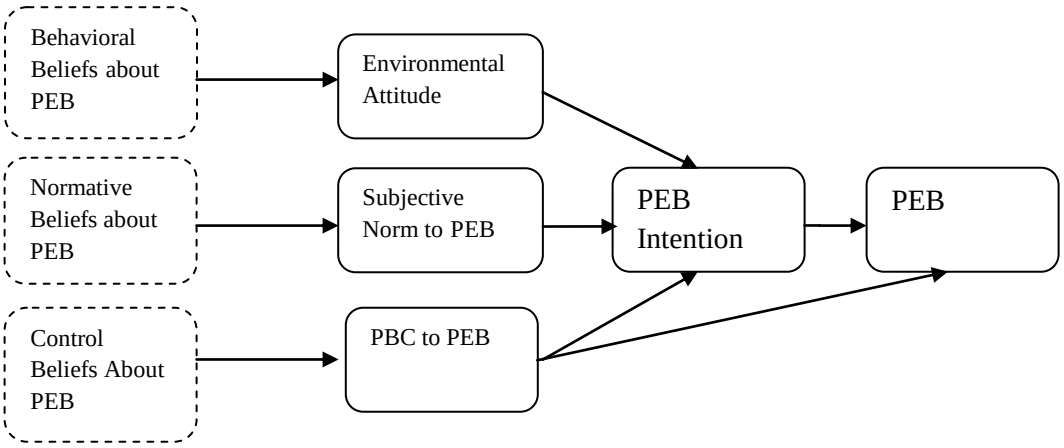

Figure 3. The theory of planned behavior including activators (Ajzen, 1991). (Dashed boxes represent items not directly measured in this study)

Ajzen believed that a subject would increase effort if the perception of control was high. When perception of control and intention were considered together, a direct impact on behavior was expected. This prediction was stronger when actual control of the behavior was assessed accurately and voluntary control was lower. When volitional control of the behavior was higher, perceived control was not as effective in predicting behavior (Madden, Ellen, & Ajzen, 1992).

TPB also asserts perceived control independently determines intention in addition to attitude in reference to the behavior and the subjective norm. Perception of the difficulty of a performance will affect intention when attitude and subjective norm are held constant. Different populations and behaviors may vary in relationship to the relative weights of the measured variables (Montano & Kasprzyk, 2002).

Control beliefs about the existence of barriers and facilitators of behavioral performance determines perceived control when *perceived power* of the barrier or facilitator is taken into consideration (Montano & Kasprzyk, 2002). If the subject has high control beliefs that facilitators of the behavior exist, perceived control will be high. Strong control beliefs about the existence of barriers to the behavior would result in low perceived control.

TPB as a predictor of behavior is supported in the literature. Armitage and Conner (2001) conducted a meta-analysis on 185 independent studies that were published through 1997. The efficacy of the TPB was supported as both a predictor of intentions and behavior. It must be pointed out that the predictability is strongest in self-reported behaviors rather than observed, although 20% of the variance of observed behavior can be predicted. They found that PBC, in many different domains, was able to independently predict intentions and behavior. In addition, the authors believe that discriminant validity was revealed for measures of desire, self-prediction and intention.

Uses of TBP to predict environmental behavior. TPB has been used successfully to explain many different types of environmental behavior. These behaviors include general pro-environmental behavior (Kaiser, Wolfing, & Fuhrer, 1999), water use, meat consumption, use of unbleached paper, purchasing energy-efficient light bulbs

(Harland, Staats, & Wilke, 1999), waste composting (Mannetti, Pierro, & Livi, 2004; Taylor & Todd, 1995), household recycling (Kaiser & Gutscher, 2003), and choice of travel mode (Bamberg & Shmidt, 2003; Harland et al., 1999; Heath & Gifford, 2002; Verplanken, Aarts, van Knippenberg, & Moonen, 1998).

A few studies are noted which demonstrate the value of the TPB in predicting environmental behaviors. Boldero (1995) demonstrated that attitude toward recycling was a predictor of intentions to recycle newspapers and, subsequently, intentions to recycle directly predicted recycling behavior. Sparks and Shepherd (1992) found that perceived control and subjective norm significantly affected intentions of organic vegetable consumption in a green consumer attitude study. Congruent to TPB, Taylor and Todd's (1995) findings showed that attitude and perceived behavioral control impacted intentions to compost and recycle. In a study by Cheung, Chan, and Wong (1999), attitudes, norms, and perceived behavioral control positively predicted wastepaper recycling and, indeed, intentions to recycle predicted recycling behavior.

More recently, another model has been used to study environmental behavior. This model focuses on moral obligations to exhibit pro-environmental behavior and is referred to as the norm-activation model (NAM; Schwartz, 1977; Schwartz & Howard, 1981) or the value-belief-norm theory of environmentalism (VBN; Stern, 2000; Stern, Dietz, Abel, Guagnano, & Kalof, 1999). The theory has been successful when relating low-cost environmental behavior and intentions. Some of the studies have demonstrated its use when predicting behavior for acceptance of policy (De Groot & Steg, 2009; Steg, Dreijerink, & Abrahamse, 2006), environmental citizenship (Stern, Dietz, Abel, Guagnano, & Kalof, 1999), political behavior (Garling, Fujii, Garling, & Jakobsson,

2003), and willingness to change behavior (Nordlund & Garvill, 2002; Stern et al., 1999). The down side of NAM/VBN is that it does not have as much explanatory power when high behavioral costs are involved or there are major constraints to behavior, like reducing the usage of a car (Bamberg & Schmidt, 2003; Guagnano, Stern & Dietz, 1995; Hunecke, Blobaum, Matthies, & Hoger, 2001). TPB has more power to explain environmental behavior in such instances (Bamberg & Schmidt, 2003). This may be because TPB can consider a wide range of factors including PBC and motivations that are non-environmental (Steg & Vlek, 2009).

In one of the few papers considering such theories in light of the college environment, Kaiser et al. (2005) compared the VBN model with the TPB model. Survey data were gathered from 468 university students and data analysis was performed using structural equation modeling (SEM). Both theoretical models demonstrated good explanatory power with TPBs intention accounting for 95% of individuals' conservation behavior and VBN's personal norms accounting for 64% of the behavior. The researchers believed that the TPB "covered its concepts more fully in terms of proportions of explained variance. More importantly, the fit statistics revealed that only the TPB depicts the relations among its concepts appropriately, whereas the VBN model does not" (p. 2150). For this reason, TPB has been chosen for this study.

Environmental attitude. Exploring why certain individuals have pro-environmental attitudes, of a more ecocentric (ecology centered) nature, versus why the human-centered, or anthropocentric attitude, is predominant in others has been studied extensively (Dunlap, 2008). A variety of human characteristics have been correlated with these attitudes. Changing environmental attitudes of individuals so as to effect a positive

behavior towards sustainability, which is the ultimate goal of education for sustainability, is yet another growing area of research in higher education.

If intentions are more specific and personal, they are more likely to influence behavior. Vining and Ebreo (1992) found that specific attitudes towards recycling were a better predictor of recycling activity than general attitudes about the environment. Similarly, Joireman et al. (2004) found that attitudes of the environmental impact of cars were a good predictor of public transportation use where attitudes of social values were not.

If intentions are tied to "implementation intentions" or real planning, the action is even more likely to be performed (Gollwitzer, 1999; Sheeran, 2002). The implementation plan is responsible for cuing the memory (Webb & Sheeran, 2007). In addition, Arbuthnott (2009) believed that because of the attention to detail during planning, the problem-solving aspects of the process make a clear link between attitude and behavior.

What these findings suggest is that targeting a specific behavior is more likely to lead to action than a broader education effort about global environmental problems (Arbuthnott, 2009). "Knowledge of ecological processes and situations can influence hearts and minds, but concrete change plans are more effective at changing muscles, and it is changed actions as well as attitudes that are necessary to accomplish sustainability" (p. 155).

Subjective norm. To better understand subjective norm one must first understand social psychology. Social psychology refers to the field of study concerned with the influence of society on individuals' feelings, thoughts and behaviors (Koger & Winter, 2010). Social influence is far reaching and in fact internalized such that this influence is

carried throughout the day and impacts a person's attitudes and behaviors, even though a person may think she/he is acting by logical analysis of evidence. Individuals understanding and behavior in reference to environmental matters tend to be social phenomena as well (Clayton & Brooks, 2005; Clayton & Myers, 2009).

This influence of others which corresponds to an expected behavior is referred to as a norm (Koger & Winter, 2010). Norms can be further divided into social or personal norms. Social norms reference other people's behaviors and personal norms refer to the obligation a person feels to behave in a certain way. Cialdini, Reno, & Kallgren (1991) further subcategorize each of these terms. Social norms are either descriptive, what a person believes others might do in a certain instance, or injunctive, what a person believes about societal approval or disapproval of specific behaviors.

PEB can be affected positively or negatively by descriptive social norms (Cialdini, 2003). Cialdini, Kallgren, and Reno (1990) observed that individuals were more likely to remove handbills from their windshields and throw them on the ground in already littered parking garages compared to clean garages. In another example, researchers informed a community about their average community energy use (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). This caused households that were above the average to decrease their usage. However, households that realized they were below the community average actually increased theirs.

Injunctive norms have been found to influence such behaviors as recycling and littering (Cialdini, 2003). Signs asking that people not litter or recycle do have an impact. But such signs are also more likely to be ignored if individuals see others ignoring the signs by littering or not recycling (descriptive norm). For example, Cialdini (2003)

demonstrated that signs asking individuals to discard cigarette butts were ignored when individuals observed others throwing the butts on the ground. Schultz, Khazian, and Zaleski (2008) demonstrated that hotel guests reused towels more often when the hotel placed signs in the bathrooms showing that other guests had requested these types of conservation practices, reflecting the injunctive norm, and also giving information on how many guests practice this behavior, reflecting the descriptive norm.

Simply by hearing what other people are doing can transmit social norms (Koger & Winter, 2010). When behavior is changed to conform to others, this is referred to as social diffusion. Leonard-Barton (1981) demonstrated that the number of acquaintances a person had who owned solar equipment was the best predictor of purchasing solar equipment. Oskamp et al. (1991) found that people who have neighbors and friends that recycle are more likely to recycle. Several studies have demonstrated that social networking is influential in conserving energy (Darley & Beniger, 1981; Stern et al., 1986; Weenig, 1993). Studies have also shown that people are more likely to switch to less toxic cleaners if they discuss the issue in groups (Werner, 2003; Werner, Byerly, & Sansone, 2004). Finally, if people see friends, family or neighbors change their behaviors, they often change theirs (Rogers, 1995).

Neighbors or friends to which individuals conform are called a reference group (Koger & Winter, 2010). These are usually people who are liked or respected. Other people who are not acquaintances may also influence behavior and these individuals serve as models (Bandura & Walters, 1963). In follow-up to the research previously mentioned pertaining to handbills placed on cars in the parking garage, Kallgren, Reno,

& Cialdini (2000) found that when individuals observed others picking up handbills from the littered garage, littering decreased. These individuals served as models.

As previously mentioned, in addition to social norms there are personal norms. This refers to the obligation a person feels to act (Koger & Winter, 2010). These norms are acted upon to avoid guilt and are considered more influential than social norms. This is an intrinsic motivation which makes a person more committed and consistent compared to individuals acting based on external rewards (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998; Ryan & Deci, 2000). In a German study, Bamberg, Hunecke, and Blobaum (2007) showed that the decision to choose public transportation was related to feelings of personal obligation in addition to injunctive social norms. Many PEBs have been found to be under the influence of personal norm such as composting, buying energy efficient light bulbs, and buying organic foods (Thogersen, 2006).

Perceived behavioral control. Pro-environmental actions are influenced by perceptions of individuals' abilities to lessen environmental threats (Stern, 2000). If we believe a particular behavior cannot be controlled, we are more likely not to try (Arbuthnott, 2009). In addition, we may not try to change behavior if we do not believe the effort will lead to a real outcome. This is especially true if the action takes much effort, is costly, or is inconvenient to the person.

Brucks and van Lange (2007) performed an experiment to show how individuals react in a commons dilemma. Resources that are shared such as air, water, and forests may create some conflict upon the users as they determine what is in their self-interest versus the common good. The simulation involved a common pool of resources which participants were to harvest over several trials. Participants were to maximize their

personal score, but still try to maintain the pool in a sustainable fashion. Participants were previously classified as pro-social or pro-self based on a questionnaire. The results showed that pro-social individuals did exhibit more cooperative harvesting behavior while pro-self individuals maximized their scores as much as possible. But, once a random factor was inserted into choices by participants which depleted the pool, there were no differences in harvesting behavior. Everyone tried to maximize personal scores. The authors hypothesized that the random depletion factor reduced the sense of control of the participants and pro-social individuals had less motivation to act altruistically.

These types of findings have led to the notion that "Direct attention to individuals' perceived control in education programs can thus improve the link between intentions and behavior" (Arbuthnott, 2009, p.156). This is why it is important to provide positive examples to the public. Additionally, it has been shown that giving individual feedback about certain behaviors can increase positive behavior in conservation (Abrahamse et al., 2007). Thus, in the pursuit of sustainability, individuals should be made aware how their own actions are having a direct impact thereby creating the positive motivational loop.

Much research in the social sciences shows that the immediate physical and social context greatly influences human behavior (Arbuthnott, 2009). These contextual factors can be manipulated on a campus so that intended behaviors can be facilitated. Sometimes what is needed is the removal of certain challenges. "When there are barriers to an intended behavior, such as inconvenience or cost, behavior change is less likely regardless of intention" (p. 156). In studies focusing on recycling programs, it was found that curbside programs, which are more convenient, have more participation than drop-

off recycling programs (Guagnano et al., 1995; Schultz & Oskamp, 1996). When cost is a barrier, individuals that have the greater financial resources are the only ones that participate (Arbuthnott, 2009). Therefore, regulations or policies are necessary to ensure the behavior that is environmentally irresponsible is more difficult to act upon.

The Use of Social Marketing to Change Sustainability Behaviors

Social context must be considered when studying college students since much behavior is contingent upon what other students and friends do. Proximity does help determine influence and since many students study and work together, this must be considered. Senge (2008) states that some people are more influential than others and referred to these individuals as "animateurs" which is a French word for others who create change through role-modeling. In addition, students can be quite sensitive to the physical environment surrounding them on a college campus. Students are being sent a message when they see how wastes are disposed of on a college campus. Orr (2004) describes this message as a part of the "hidden curriculum" at a college.

According to Putnam (1993, p. 167), social capital includes "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions." This can be used to gain support both personally and for the community (Leahy & Anderson, 2010). Adjer (1999) states that this concept underscores how important connectedness is and how it involves networks and the part institutions play.

Colleges are composed of communities that have many social supports and this increased social capital can influence behaviors that support the common good (Teranishi & Briscoe, 2006). According to Pretty (2003) and Jones (2006) when there is trust, social

norms, and entrenched social networks in a community, people are more likely to act for the common good and protect natural resources by practicing PEBs.

Social capital can be broken down into four categories: social networks, social trust, social norms, and institutional trust (Jones, Malesios, Iosifides, & Sophoulis, 2008). Because institutional trust is not relevant to this study, it will not be covered here.

According to Coleman (1990), social networks would be the most basic component of social capital. This would include connections within the community that would be formal or informal (Narayan & Cassidy, 2001). Groups of friends or communities within certain departments or majors might be examples. Stanton-Salazar (2001) states that these support networks are what lead to acceptance and involvement with goals and norms for an institution.

Social trust, according to Grootaert and Bastelaer (2002), is cognitive in nature and refers to the perception of trust an individual has towards others in the community. A person who has social trust will act in a pro-environmental way because he or she trusts that others will act in a similar manner (Goddard, 2003; Pretty, 2003). Evangelinos and Jones (2009) have found that community members will recycle if they trust that other community members will do so as well. Over time the behaviors will become habits.

Social norms compose social capital's third component. This is a component of Ajzen and Fishbein's (1975) attitude-behavior model. Such norms help define what is acceptable in a community (Goddard, 2003) and influence attitudes and behavior.

There are two forms that can exist within the four components: structural social capital and cognitive social capital (Grootaert & Bastelaer, 2002). The former is more easily observable and objective. This form includes policies of the institution and student

groups. Cognitive social capital is more subjective and includes behavioral norms and attitudes.

The realm of social marketing has been entered when applying marketing techniques or concepts for the purpose of attaining particular behavioral objectives to achieve societal good (Lazer & Kelley, 1973). It has been used to describe many projects and programs to change pro-social behavior, particularly with health issues (Hastings, 2007). According to Maio et al. (2007) these concepts and techniques started to be used because it was clear that only providing information about behaviors was ineffective in changing those behaviors. In addition, even if a person had strong intentions, influences that were contextual or external could prohibit the behavior (Gollwitzer, 1999; Verplanken and Wood, 2006).

Corner and Randall (2011) describe seven social marketing principles derived from the British National Marketing Centre. First, the audience needs to be understood. Second, the behavioral goals need to be clear. Third, the developers should have insight into the individuals whose behaviors need to be changed, meaning understanding why people behave in a particular way. The fourth principle states that incentives should be increased and barriers removed for the positive behavior to occur. Fifth, factors must be considered that might compete with the attention and willingness of a person toward the behavior. Sixth, interventions should consider people's needs and motivations. Lastly, multiple interventions of different types should be used since single interventions are less effective.

Many examples of the effectiveness of campaigns using these principles have been shown to affect health behavior such as exercise, reduction of alcohol use, smoking

cessation, and drug elimination (Gordon, McDermott, Stead, & Angus, 2006; Hastings, 2007; National Social Marketing Centre, 2006). Larger campaigns to achieve particular pro-environmental behaviors have been demonstrated (Australian Department for Transport, Energy & Infrastructure, 2009; Sustrans, 2009) as well as more specific community-based social marketing efforts (McKenzie-Mohr, 2000; McKenzie-Mohr and Smith, 1999). Additionally, several studies have shown the effectiveness of social marketing with encouraging PEB in relationship to climate change (Peattie & Peattie, 2009) and to encourage other general PEBs (Monroe, Day, & Greiser, 2000).

Social marketing is really not a theory as some may refer to it (Hastings, 2007). Darnton (2008) calls the concept 'explicitly transtheoretical.' This means that it is a framework to design programs for behavior change based on what has worked in previous studies. Such programs have included many strategies such as providing information, obtaining commitments, supporting social norms, reducing barriers, increasing motives, and increasing intentions to act in a particular way (Monroe et al., 2000). According to McKenzie-Mohr & Smith (1999) programs are much more effective when they use a combination of tools.

McKenzie-Mohr and Smith (1999) noted that a person's social network is one of the most powerful influences, an underpinning of Community Based Social Marketing. Health campaigns have often targeted certain peer groups or social networks since positive behaviors can spread more quickly with groups of people who have trust in one another and also who are more likely to pay attention to how others act (Corner & Randall, 2011).

Although little direct evidence exists to demonstrate that social networks may be utilized to influence PEB (Corner & Randall, 2011), behavior in general has been found to be influenced by social networks (Haythornthwaite, 1996; Valente & Pumpuang, 2007; Fell, Austin, Kirvinen, & Wilkins, 2009). According to Rabinovich, Morton, and Duke (2010) social networks can help create a social identity that is pro-environmental. Based on studies by Rowson, Broom and Jones (2010) if social networks are targeted, social capital is enhanced. Group-based program effectiveness in encouraging PEB change that is long lasting has been demonstrated also (Capstick & Lewis, 2008; Nye & Burgess, 2008).

While social capital has been found to help facilitate PEB by helping establish particular norms for collective decision making (Thoyre, 2011), and social marketing can focus strategies on social norm changes, Corner & Randall (2011) question whether building social capital may be out of reach for a social marketing campaign that may be more individualized.

According to Monroe et al. (2000) some social marketing techniques which influence specific actions may operate under TPB. In an attempt to change PEB, many organizations have used persuasive communication within social marketing campaigns by providing information specific to a particular behavior and describing consequences of the behavior as well as benefits. These campaigns use examples, case studies, and models that influence social norms as they describe acceptable community behaviors and applaud these behaviors. In addition, providing feedback of actions influences perceptions of the ability to perform these actions and a perception of the ability to

control them (Monroe et al., 2000). According to McKenzie-Mohr and Smith (1999) these types of tools within the campaigns do facilitate change in behavior.

Sustainability in Higher Education

When reviewing literature on sustainability initiatives, it becomes apparent that the two major categories of implementation are mostly referenced, either campus operations or course integration. Most of these articles are descriptive only.

Student characteristics. There have been many studies comparing environmental attitudes with sociodemographic characteristics. A number of studies suggested that younger people tend to have a more pro-environmental view than older people (e.g., Arcury & Christianson; 1990; Dunlap et al., 2000; Howell & Laska, 1992). This may be because younger people may not be a part of the dominant social order (van Liere & Dunlap, 1980). However, in a recent Australian study, Casey and Scott (2006) found the opposite to be true.

Studies exploring level of education have mostly demonstrated that the more educated people are, the more proenvironmental they will be (e.g., Arcury & Christianson, 1990; Casey & Scott, 2006; Dunlap et al., 2000; Howell & Laska, 1992). This may be related to the fact that individuals from the middle and upper classes happen to be better educated, experience better home lives, and are involved in more outdoor recreational activities (Casey & Scott, 2006). When gender is studied in relation to environmental concern, females tend to be more proenvironmental (e.g., Casey & Scott, 2006; Tranter, 1996). Casey & Scott (2006) reason that girls and women have

traditionally been in caregiver roles. However, van Liere and Dunlap (1980) found no gender differences.

Studies which consider religion have shown contrasting results. The studies' findings range from Christians being more concerned with the environment (e.g., Dietz et al., 1998; Greely, 1993) to being least concerned (e.g., Schultz et al., 2000; Tranter, 1996).

In regard to political ideologies, again results vary. Van Liere and Dunlap (1980) found no differences in environmental concern comparing people with liberal ideologies to people with conservative ideologies. But Dunlap et al. (2000) found people with liberal ideologies to be more concerned with the environment than conservatives.

Sherburn and Devlin (2004) used the Environmental Preference Questionnaire, the Environmental Concern Scale, and the revised NEP scale to investigate the relationships between academic major, concern for the environment, and the use of a campus arboretum. Their findings include higher scores on all measures of pro-environmental concern and preferences as well as higher scores for value and use of the arboretum by environmental studies students. This study supports most findings that students majoring in biology or environmental studies are more concerned about the environment than students majoring in economics, commerce, or business-related fields (Hodgkinson & Innes, 2001; Synodinos, 1990; Tikka, Kuitunen, & Tynys, 2000). Pe'er, et al. (2007) found that students majoring in environmentally related fields had more positive environmental attitudes than other majors as well, possibly because they were more knowledgeable about environmental issues.

Quimby, Seyala, and Wolfson (2007) sought to examine how social cognitive variables influenced a student's interest in environmental science careers. They also assessed differences in White and ethnic minorities in relationship to career-related variables. By administering cognitive measures (self-efficacy, outcome expectations, environmental attitudes), environmental role model (influence, social supports, and barriers), and outcome (interest in environmental science) variables to science majors, predictors of interest in environmental science were determined. Unique predictors that emerged included perceived outcomes/rewards of a career in environmental science, social support for pursuing an environmental career, and attitude toward environmental problems. Ethnic minorities exhibited less concern about environmental problems, perceived greater barriers to pursuing a career in environmental science, and were less interested in environmental science.

Initiatives.

Campus operations. Campus operations tend to be written about more than any other subject when researching college sustainability initiatives. Blackburn (2007) describes college campuses as similar to small cities. This is because these institutions are responsible for much of the same infrastructure such as building maintenance, construction, transportation, landscaping, solid waste management, general business management and energy and water use, and natural resource consumption. According to Edwards (2010) and M'Gonigle and Stark (2006), by managing the activities in a sustainable way they conserve resources, save money, and serve as transformation models.

Very few studies have looked at the impact of sustainable campus operations on attitudes or behaviors of those that come into contact with the activities. Of those that have, the research has focused on the need to educate campus stakeholders on these activities and have usually utilized social marketing techniques. Quite often the focus of such educational initiatives is on recycling programs and other such sustainability initiatives. These studies often emphasize the students role in the implementation of the programs (Eagan et al., 2009).

One such research study used a mixed-method approach to explore the experiences of students while converting a campus building to a green building (Halfacre-Hitchcock & Owens, 2006). In assessing attitudes, information levels, and behaviors both before and after the project, no significant impacts on PEB in relationship to the project were observed.

In another study Lamoreaux et al. (2003) investigated if there was a relationship between recycling education and recycling rates in student housing at Francis Marion University. Some students were supplied with recycling bins, some with recycling bins and education, and some with neither. Students receiving bins and education did significantly reduce their waste stream but the statistics did not allow the authors to conclude a relationship between education and increased recycling.

Marcel et al. (2004) utilized a community-based social marketing campaign to reduce electricity use by students and decrease greenhouse emissions. Some students participated in an educational program describing how their electricity and computer use contributed to climate change by increasing greenhouse gases. Another group, in addition to the program, was exposed to a social marketing campaign which encouraged them to

switch off their computers when not used. The social marketing campaign was effective in increasing environmental attitudes, knowledge and behaviors over the program used by itself.

Even though certain campaigns have been found to change behaviors, sustaining the behaviors may be difficult to do. Reminders or prompts have been shown to help maintain certain behaviors on campuses as well. In one study, Katzev and Mishima (1992) demonstrated that paper recycling in a college mail room increased after recycling signs were posted near waste bins. Similarly, in another study, water usage by students declined after signage which promoted water conservation was placed near showers (Aronson and O'Leary, 1982-1983). Ayotte et al. (2006) found that energy conservation on a college campus was encouraged by small prompts on computers and light switches. Finally, simply by making sure signs were instructionally clearer, larger and more strategically placed, Werner, Rhodes, and Partain (1998) were able to increase recycling of polystyrene in a university cafeteria.

Making certain behaviors easier also has been found to have positive impacts on sustainability behavior in academic settings. Simply by moving aluminum can recycling containers to classroom from hallways increased collection of recyclable cans at one institution (Ludwig, Gray, & Rowell, 1998).

Feedback also holds promise as an intervention to promote PEB in academia. Larson, Houlihan, and Goernert (1995) posted information about trends in recycling aluminum cans over a time period on a university campus and increased the recycling rate 65% over the baseline.

Curricular initiatives. Much research exists which focuses on classroom interventions and environmental knowledge, attitudes and values. Very few studies relate classroom intervention to PEB, however.

McMillan et al. (2004) studied the impact of an introductory-level environmental studies class on students' environmental values. Using pretest and posttest questionnaires and three stage unstructured interviews, an evaluation was performed. An analysis of the results was then conducted to determine if students' environmental values had changed or developed as a result of the class. The results revealed that students' environmental values had deepened. They had transformed from being more homocentric (self-centered) to more ecocentric. In addition, answers on the final posttest and interviews showed a greater sophistication. Other studies that investigated the effects of environmentally related classes on environmental values have shown mixed results (e.g., Benton, 1993; Carpenter, 1981; Leeming, Dwyer, Porter, & Cobern, 1993; Mangas, Martinez, & Pedauye, 1997).

Pe'er et al. (2007) examined the relationship between environmental knowledge and environmental attitudes in first-year students in teacher-training programs using the revised NEP scale and questionnaires measuring knowledge of basic environmental and ecological issues. The authors found a positive relationship between environmental knowledge and attitudes about the environment. Similar results have also been found in other studies by Bradley et al. (1999) and McMillan et al. (2004).

One way to get students to become more knowledgeable about their impacts on the environment and thus influence their attitudes is to simply have them write about it, getting them to think more critically placing themselves as a responsible party in the

degradation of the environment. Meyer and Munson (2005) explored the effects of environmental expressive writing on students in a public university science and society education course. For the study they used a modified phenomenological method. The students were asked to compose multigenre compositions that described their personal impacts on the environment. They were then asked to provide their written reactions to the assignment and were later interviewed to investigate their attitudes, backgrounds, and experiences related to the assignment. The analysis indicated that students felt more empowered to act responsibly and felt a heightened awareness and knowledge of their impacts on the environment.

Bright and Tarrant (2002) studied the effects of an environment-based writing course on student thinking in regard to the Endangered Species Act (ESA). Self-report questionnaires were used in a pretest-posttest design and attitudes were examined in terms of direction, extremity, ambivalence, and importance. Results showed a significantly greater integratively complex thinking in terms of the ESA compared to student enrolled in a nonenvironment-based writing course.

Rideout (2005) created a brief 2- to 3- week environmental problem solving module as a part of a research methods course which included reading, discussion, and writing with emphasis on global warming/climate change and energy issues. After the module, students' attitudes were assessed with the revised NEP scale. These scores were compared to those of a control group. Students from the module group showed significantly higher scores for environmental concern.

Theoretical Framework for the Study

Much of the current literature on sustainability change in higher education has focused on descriptive, institutional-based actions that are top down. Yet research in communities and other organizations have shown that creating a norm or ethic of conservation with members of a community may influence behavior change that is long lasting. According to Friedman (2008) a large group of people must demonstrate an "ethic of conservation" which is a habit of minimizing negative environmental impacts that become ingrained. When the community accepts this as the norm, it acts voluntarily and negative actions are stigmatized while positive actions are looked upon favorably. This process occurs in college campus communities as well.

Astin (1993) performed studies on 20,000 students from 200 colleges trying to answer the question of how college affects students. Attitudes about many subjects did change as a result of college experiences. Of the changes, commitment to participate in environmental cleanup programs was one of the most significant positive changes. However, as other researchers have noted, changes in attitudes are not significant without changes in behavior.

Astin (1993) also noted how important experiences with peer groups were as student views about social issues tended to move towards the dominant beliefs of the peer group. He stated that these relationships were "the single most important environmental influence on student development" (p. xiv).

Many of the sustainability initiatives that colleges are employing have, as either an implied or explicit goal, to change sustainability behavior of students. What the coordinators of the initiatives may not know specifically is that these activities, whether

they are informational strategies or structural strategies, are all forms of social marketing and that what they are trying to build is social capital. This social capital would then influence attitudes, social norms, and perceived behavioral control, antecedents of intention as described by the TPB (Figure 4).

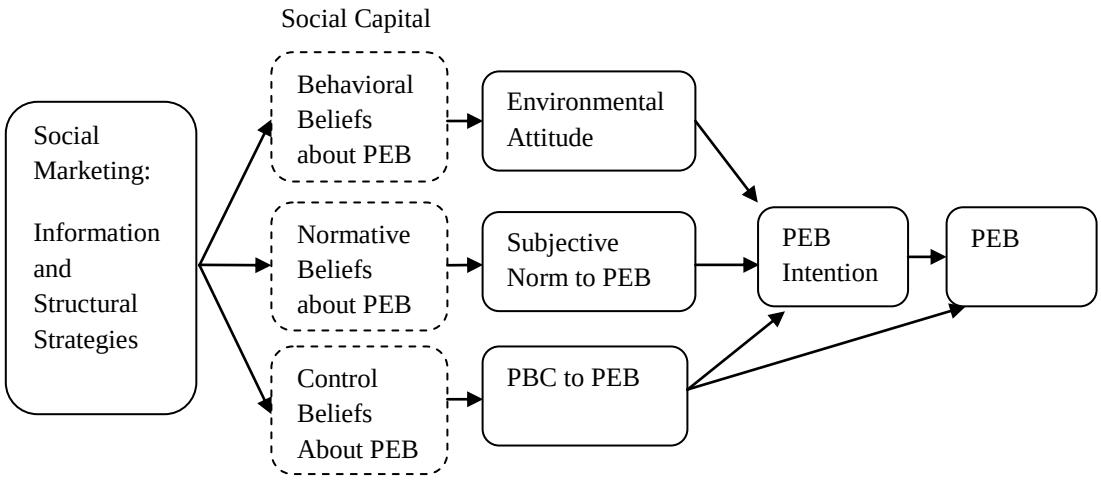

Figure 4. Proposed model relating social marketing strategies to antecedents of PEB in TPB. (Dashed boxes are non-measured constructs)

Trust, norms, and networks as described by Putnam (1993) are a part of the social capital of an organization like colleges. Antecedent strategies as described by Steg and Vlek (2009) such as information, consequence and structural strategies can all be used to influence social capital. As McKenzie-Mohr and Smith (1999) have purported, a wide-

array of strategies should be used to encourage sustainability behavior to be most successful.

Within the NCCCS, as a result of Code Green and independent initiatives, schools are using a wide array of strategies to build sustainable campuses. The level of support, initiative implementation, and priority is very different from school to school however. When one enters a college that has prioritized sustainability as a major goal, examples of these initiatives can be seen everywhere whether it be signs, informational displays, design features, or students and employees acting in sustainable ways and talking about sustainability. Based on previous research and the TPB, schools with higher levels of sustainability program implementation should also be seeing higher levels of pro-environmental attitude, subjective norm, PBC, intentions and PEB. But students must first be made aware of the activities that are occurring. This is where social marketing comes in. If institutions make use of the various social marketing strategies, both informational and structural, the antecedents of PEB and PEB itself should be influenced positively.

Summary

Changing attitudes is just the first step in leading individuals towards sustainable intentions. As this literature review has shown, there are many ways to accomplish these changes. However, translating intentions into actions is often more of a challenge. As the community colleges in North Carolina are challenged through the Code Green initiative of the system President, each institution will decide for itself the best way to create sustainable campuses, integrate sustainability into academic programs, and produce students equipped to operate in "green workplaces" and within a broader sustainable

society. This initiative will create a ready-made research ground available for studying the effects of the various strategies that will be implemented by each school. Therefore, current practice will be informed through this research. This study will also potentially develop a model and instrumentation that may be used by all community colleges to analyze the impact that similar initiatives have on environmental behavior.

CHAPTER THREE: METHODS

The purposes of this study were to determine how well the TPB explains PEBs among NC community college students, and to determine whether implementation of campus sustainability initiatives influences students' attitudes, subjective norms, perceived behavioral control, intentions, and behaviors. The main research questions are:

1. Is community college student PEB predicted by TPB?
2. To what extent are students aware of their colleges' strategy implementation?
3. Is there a relationship between student awareness of campus initiatives and their (a) Environmental Attitudes, (b) Perceived Behavioral Control to PEB, (c) Subjective Norm to PEB, (d) PEB Intention and (e) Self-reported PEB?

These question were answered using surveys which measured antecedents of PEB intention and PEB administered to students at four community colleges, one college at the lower end of implementation and three at the higher end of implementation.

This chapter will detail the criteria by which the settings and samples were chosen, describe the instrumentation used, explain the process by which surveys were administered, and give an overview of the analysis process.

Setting and Participants

Six community colleges were originally chosen based on their level of implementation of sustainability initiatives, as determined by their participation or non-participation in the American Association for Sustainability in Higher Education's

(AASHE) Sustainability Tracking and Rating System (STARS) program (3 participants with ratings, 3 non-participants) and their level of participation in Code Green. The STARS program (AASHE, 2012) is a self-reporting tool that helps colleges analyze their level of sustainability based on categories which include Education and Research; Operations; and Planning, Administration and Engagement. There are five different levels of awards based on the number of credits an institution can claim.

Three NC community colleges participate in the STARS program and have been rated Gold, Silver, or Bronze. These colleges served as the high implementation group. The other three NC community colleges were selected based on the advice of a NCCCS SuperCIP lead person, non-participation in sustainability associations, and their similar size to the other institutions, as well as their geographical representativeness. Unfortunately, one institution, after initially showing interest in participating in the study, became non-respondent. One other institution was late in getting full approval for the survey. Therefore, the lower implementation level data was only associated with one college.

College 1 was the smallest institution which participated (1,535 curriculum students). It is located in the southeastern, coastal plain of NC. This institution was the Bronze STARS recipient. It is represented by one main campus and two smaller campuses. College 2 was the silver STARS representative and was the largest institution with 4,300 students. The college has one main campus and two smaller campuses and is located in the central coastal plains of NC. College 3 was the gold STARS representative of the group with 2,108 curriculum students. It contains only one main campus located in the western part of the state in a mountainous area. College 4 was the low implementation

college with 2,497 students. It is composed of one main campus and three smaller ones located in the far western counties of NC.

All curriculum students (credit students seeking degrees, diplomas and certificates) enrolled in Spring 2013 at the community colleges were given the opportunity to participate in the survey. The sampling frame was approximately 11,000 students. The number of respondents was 724 or approximately 6.5% of the sampling frame. More information about the sample is provided in Chapter 4.

Instrumentation

Student survey. Instruments were created by searching the literature for similar studies that utilized TPB to study general PEB. Statements in the different scales were then evaluated for clarity and their relevance to the present study's participants. The resulting survey is found in Appendix A.

Student demographics/ academic data. At the beginning of the student survey (Appendix A), a few general questions were asked to determine the demographics of the students and their educational program areas in order to determine the representation of community college students and program areas. The information also helped to understand if students had been at the college long enough to be influenced by college sustainability initiatives.

Environmental attitudes. The instrument used to measure environmental attitude is called the New Ecological Paradigm Scale (Dunlap et al., 2000) found in the survey in Appendix A. This scale is a revised version of the original 1978 New Environmental Paradigm Scale, created by Dunlap and van Liere (1978). The scale consists of 15 questions constructed to measure five different aspects of worldview. The five aspects are

(a) nature is a limited resource (items 1, 6, 11); (b) antianthropocentrism (2 7, 12); (c) nature is in a delicate balance and humans interfere with the balance (3, 8, 13); (d) antiexemptionalism, the belief that humans are not exempt from ecological limits (4, 9, 14); and (e) an ecological crisis is likely (5, 10, 15). The items are scored according to a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The totals can range from 15 to 75. The odd numbered questions are phrased such that a proecological view is indicated with agreement. The even numbered questions are phrased such that a proecological view is indicated with disagreement. An NEP score of 45 or above indicates a proecological attitude (Rideout et al., 2005).

Dunlap et al. (2000) tested the internal consistency of the scale using Cronbach's alpha. The general public sample of 806 participants in Washington exhibited an alpha of .81. The alpha for an environmental organization sample of 407 in Washington was .76. Using factor analysis the scale was found to be unideminsional.

Hawcroft and Milfont (2010) conducted a meta-analysis and found over 300 articles which cited the NEP scale. Of these articles, they focused on 68 studies conducted in 36 nations on adults. When internal consistency, as reported by these studies, was analyzed the alpha averaged .71. According to Dunlap et al. (2000), studies show stronger alphas from developed nations than developing ones.

Many of the studies in the meta-analysis showed that the NEP has predictive ability, evidenced in the validity coefficient for studies such as personal environmental behaviors ($r = .24$, $p < .01$), support for environmental regulations ($r = .58$, $p < .01$), and funding environmental programs ($r = .47$, $p < .01$). Predictive and construct validity

evidence was demonstrated in many of the studies as well when correlated to age (r = .09, $p < .01$), education (r = .11, $p < .01$), and political ideology (r = .22, $p < .01$).

Cordano, Welcomer, & Scherer (2003) stated that the scale has demonstrated good validity evidence since environmental groups were found to consistently show higher pro-environmental scores than non-environmental groups. In addition, Dunlap et al. (2000) found sound predictive validity evidence when NEP was correlated with perception of the seriousness of ecological world problems (r = .61, $p < .05$), pro-environmental policy support (r = .57, $p < .05$), perception of the seriousness of regional pollution issues (r = .45, $p < .05$), and pro-environmental behaviors reported by individuals (r = .31, $p < .05$).

Subjective norm, PBC and intention. The questionnaire used to assess subjective norm, perceived behavioral control, and behavior intention (Appendix A) was originally developed by Kaiser et al. (2005). For TPB antecedents, three sets of the same ten behaviors were given with different endorsement probabilities based on the TPB component being assessed. Bipolar scales were used for each of the TPB components. These measures have been found to conform to common practice in this realm of research (e.g., Ajzen & Madden, 1986; Madden et al., 1992).

Subjective norm was measured by rating the ten behavior statements on a 5-point Likert scale: ‘‘Most people who are important to me think I should . . .’’ (agree–disagree). In the Kaiser et al. (2005) study the subjective norm items were internally consistent at $\alpha = .82$. Perceived behavioral control was measured by rating the ten behaviors on a 5-point bipolar scale (simple–complicated). The internal consistency of the behavioral control items exhibited an alpha of .58. Behavior intention was measured

by rating the ten behavior items on a 5-point bipolar scale ‘‘I intend to . . . (likely–unlikely). The internal consistency of the items showed $\alpha = .68$.

In the Kaiser et al. (2005) study, attitude ($\beta = .39$) using the NEP scale, subjective norm ($\beta = .14$), and perceived behavioral control ($\beta = .49$) was found to explain 76% of the variance in intention to act in a pro-environmental way. These determinants also correlated with each other between .42 and .62. Behavioral intention itself ($\beta = .98$) explained 95% of the variance in behavior.

Since this survey was originally developed for a large, urban, European city, some of the behaviors were changed for the current survey to reflect current United States culture in smaller urban or rural areas. The changed and added statements were made to align with statement from the PEB instrument also. The initial behavior statements used prior to the pilot were:

(a) recycle bottles, cans and paper (combined from the original Kaiser et al. survey statements, “collect and recycle used paper” and “bring empty bottles to a recycling bend”);

(b) turn down the thermostat in the winter when I leave for more than 4 hours (original survey statement was “in winter, turn down the heat when I leave my apartment for more than 4 hours”);

(c) try to find an alternative to driving my gasoline powered car (original survey statement was “drive my car in or into the city”);

(d) be a member of an environmental organization (unchanged from original survey) ;

(e) turn lights off when I leave a room (new statement);

(f) buy sustainable/energy conserving products (new statement);

(g) turn my computer off when I am done using it (new statement);

(h) vote based on environmental issues (new statement);

(i) buy organic foods (original survey statement was "I buy meat and produce with eco-labels");

(j) point out environmentally unfriendly behaviors to others (original survey statement was "point out unecological behavior to someone").

Statements deleted include "use a clothes dryer," "if offered a plastic bag in a store, I accept it," and "buy products in refillable packages."

Environmental behavior. Self-reported environmental behaviors were measured using Likert-type scale ratings of past behavior developed by Schultz et al. (2005). Behaviors (prior to pilot study) included:

(a) looked for ways to reuse things;

(b) recycled newspapers;

(c) recycled cans or bottles;

(d) encouraged friends or family to recycle;

(e) purchased products in reusable containers;

(f) picked up litter that was not your own;

(g) composted food scraps;

(h) conserved gasoline by walking or bicycling or combining multiple errands into one trip (original survey statement was "conserved gasoline by walking or bicycling");

(i) voted for a candidate who supported environmental issues;

(j) donated money to an environmental group.

The final version used in this study is found in Appendix A. Participants were asked to indicate "how often you have done each of the following in the past year." Response categories were *never*, *rarely*, *sometimes*, *often*, and *very often*.

Schultze et al. (2005) tested the fit of a single-factor structure for the 10 item scale with a multigroup confirmatory factor analyses (CFA). They tested the fit of the model across six samples, and allowed the factor loadings to vary. The model had a reasonable fit (χ^2 = 549.82; *df* = 210; χ^2 / *df* = 2.62; GFI = .89; RMSEA= .04). Constraining the model by fixing the factor loadings across the six samples showed a small reduction in fit (χ^2 = 691.79; *df* = 255; χ^2 / *df* = 2.71; GFI = .87; RMSEA = .04). When Cronbach alphas were calculated for the 10-item scale, only moderate consistency was revealed: .75 in Brazil, .66 in Germany, .65 in the Czech Republic, .71 in India, .74 in New Zealand, and .60 in Russia.

Student awareness of sustainability initiatives. In order to understand if campus initiatives impact students' environmental behavior and antecedents of that behavior, it was first necessary to determine whether students were aware of programs and events on their campus. This list (Awareness section in Appendix A) was created from the STARS credit sheets, which colleges fill out and submit to determine if they earned a star under the program. This list was determined to be comprehensive and representative of the types of initiatives that are being implemented at many schools.

Code green/ sustainability representative interviews. Interview questions for Code Green/ sustainability representative interviews were developed in order to verify the level of sustainability strategy implementation occurring within the last two years or

ongoing initiatives that may have begun earlier. Similarly to the initiative awareness section of the student survey, the list of initiatives was created based on items in the STARS credit sheets and considered comprehensive and representative of current programs.

Data Collection Procedures

Pilot study. A pilot study was performed at a non-participating college in order to verify that participants would be capable of completing the survey and understanding the questions. Some of the questions were changed from the original instruments and therefore the data were compiled, and reliability was estimated. Forty students from the college completed the survey online in early Spring 2013. They were asked to mark any problems they saw on the survey such as questions that were not clear or any of the given responses that did not make sense. The amount of time that it took to fill out the surveys was assessed also to see if this was excessive. Based on this feedback, I determined if anything needed to be changed before administering to the actual study participants.

Forty individuals participated in the pilot study. Not all students completed all sections of the instrument. Reliabilities were generated for each instrument in the form of Cronbach's alpha using SPSS. All instruments were shown to have acceptable reliabilities. For the NEP items, the (N = 29, α = 0.850) was higher than what Hawcroft and Milfont (2010) have reported in a meta-analysis of international research utilizing the NEP instrument. The subjective norm items demonstrated a higher reliability in this study (α = 0.914, N = 32) than Kaiser et al. (2005). The perceived behavioral control items in this study had a higher reliability (α = .789, N = 32) than reported in the same Kaiser et al. study. Similarly, the intention items exhibited a higher reliability (α = .889, N = 31)

than the Kaiser et al. study. Finally, the pro-environmental behavior items used in this study indicated higher levels of reliability ($\alpha = 0.861$, $N = 30$) compared to the research conducted by Schultze et al. (2005). Overall, reliabilities would still be considered moderate, but still reasonable to move forward with the survey.

Comments from students were generally positive in relationship to clarity of questions and answers. As a result of some responses, the following changes were made:

1. For statements in the scales measuring antecedents of PEB (NEP, SN, PBC, and INT):
    a. item (a) was changed from "recycle bottles, cans and paper" to "recycle materials such as bottles, can, and paper."
    b. item (b) was changed from "turn down the thermostat in the winter and/or turn up the thermostat in the summer when I leave for more than 4 hours" to "keep the thermostat higher in the summer so the air conditioner does not come on as much."
2. For statements in the PEB scale:
    a. item (h) was changed from "conserved gasoline by walking or bicycling or combining multiple errands into one trip" to "Conserved gasoline by walking, bicycling, or combining multiple errands into one trip."
    b. item (k) "turn lights off when I leave a room" was added.
    c. Item (l) "turn my computer off when I am done using it" was added.

Changes were also made to the scale to measure awareness. To reduce and simplify data from those questions, items were collapsed into categories and examples were placed in parentheses. The ultimate instrument used is found in Appendix A.

Institutional permission. After gaining Institutional Review Board (IRB) approval from Western Carolina University, the Institutional Advancement Office (or other applicable office) at each of the six community colleges was contacted to determine whether they had an Institutional Review Board (IRB) and/or to determine their requirements to conduct student research. Then a letter was written describing the study including how students would be chosen and how issues of respect for person, beneficence, and justice would be addressed (See Appendix B for an example letter). A copy of the Informed Consent forms for the Code Green/Sustainability representative (Appendix C) and for students (Appendix D) was attached as well as instruments to be used for the study.

Code green/ sustainablity representative interviews. The Code Green/ sustainability representative at each participating college was contacted to request their participation in the study. Once participants agreed, a letter of consent (Appendix C) was sent explaining the research purposes, protocol and confidentiality. Once the participants signed the informed consent form, an interview was scheduled.

The representatives then participated in semi-structured interviews to assess which strategies were being implemented and to determine how schools were making students aware of such strategies (See Appendix E for Interview Questions). The Code Green/ sustainability representative then assisted in gaining access to the internet resources or to an individual with access to student emails to administer the surveys.

Student surveys. All curriculum students at the colleges were given the opportunity to participate in an online survey (Appendix A) via a link through their school's email. The description with the survey link was emailed to all curriculum students and the survey was kept open for two weeks in early Spring 2013. At the beginning of the second week a reminder was sent to all students over email. When students chose to take the survey, they received a screen giving details of the study with a notation that stated that submittal of the survey implied consent to use the data.

All responses were anonymous but separate surveys were given at each school so the data could be linked to the specific schools. I hoped that increased response rates would be attained with motivation from the school implementers, emails to instructors, a link with a description of the research on the front page of the online platform, and the chance to win an iPad from a drawing of all participants. Response rates were 6.6%, 2.5%, 11.2%, and 9.3% respectively for Colleges 1 through 4. Only College 2 inserted a link on their online platform and sent emails to instructors. After students finished the survey, a link was given for them to enter their names in the drawing. This link had no connection to their actual survey answers and therefore survey results remained anonymous. It was hoped that information gathered from this study would assist each college in their pursuit of a sustainable campus and therefore they would want to make this a priority.

Data Analysis

SPSS and EQS statistical software was used to analyze data. Descriptive statistics were calculated for each question. Next, assumptions were tested. Data were reduced into scales for each construct as a preliminary step and the measurement models tested.

Structural equation modeling (SEM) was used to test the relationships between constructs in TPB and to determine which model fit best. Then the impact of awareness of initiatives on the models was assessed.

In reference to the research questions:

1. Is community college student PEB predicted by TPB?
2. To what extent are students aware of their colleges' strategy implementation?
3. Is there a relationship between student awareness of campus initiatives and their (a) Environmental Attitudes, (b) Perceived Behavioral Control to PEB, (c) Subjective Norm to PEB, (d) PEB Intention and (e) Self-reported PEB?;

Research Question (RQ) 1 was answered with SEM. RQ2 was answered with descriptive statistics. RQ3 was answered with path analysis.

Initial data cleaning and recoding. The raw data collected from the students reflected missing data within certain scales. When this was the case, an individual might have been excluded from the analysis. Missing values were not replaced. But the scales were still included in the analysis.

Data recoding occurred within data which gave the option of "Other - Explain or Specify" such as in demographic questions pertaining to college program and program area, and within awareness questions about festivals, events, and practices or programs. Most of these data was easily recoded back into specific activities or events. Items in each survey were assigned labels which identified both the instrument and the item number within the instrument (item numbers are sequential relative to the order they were

presented to by the subjects). For example, PBCQ1 is the first item in the perceived behavioral control questionnaire. Since environmental attitude was measured by the New Ecological Paradigm Scale these items are labeled as NEP. In addition to the individual items from each instrument, a variable was included representing either the sum of those item responses within an instrument or their mean (e.g., NEP is the sum of the items of the New Ecological Paradigm Instrument and SN, PBC, INT and PEB are the mean of items in those scales).

Answering question 1. The first level analysis performed on the data included basic descriptive statistics generated from the individual items across all five measured constructs (i.e., environmental attitude, subjective norm, perceived behavioral control, intention, and pro-environmental behavior). Next tables were generated which displayed the mean, variance, skewness and kurtosis for each item and item sums and averages.

Reliabilities were generated for each original scale in the form of Cronbach's alpha using SPSS. The inter-scale correlation matrix for the constructs was then created based on the summed and averaged scores from the instruments. According to Kaplan (2008) in order for the fit of the measurement model to be predicted accurately the data distribution should exhibit continuous and multivariate normality. This was evaluated by inspecting frequency distributions, histograms and skewness and kurtosis calculations. Sample size is another important component to consider prior to doing SEM. An underlying assumption of SEM is that sample size be sufficient so that there is maintenance of estimate accuracy. Schumaker and Lomax (1996) came to the conclusion that a sample size should be between 250 and 500 cases to use SEM effectively. The first

two analyses contained 479 cases and the last analysis contained 499 cases, which were acceptable sample sizes for SEM analysis.

The SEM analysis was composed of two stages. First, the measurement models, including latent variables, related disturbances, survey items measuring the latent variable, and measurement error terms for survey items, were analyzed. As described by Schumacker and Lomax (1996) a five step process was used for each construct: (1) model specification, (2) identification, (3) estimation, (4) testing the fit, and (5) respecification . Each of the latent variables was then analyzed individually using EQS version 6.2.

In order to test the identification and estimation of the models, each construct was specified with a measurement model and confirmatory factor analysis was used. A rule of thumb for factor loading in the social sciences tends to set a cut-off value at 0.35 (Garson, 2006). Loadings are considered strong if greater than 0.6. Another rule-of-thumb in interpreting CFAs, at least in the humanities, is keeping enough factors to account for 50 to 60% of the variance (Williams, Brown, & Onsman, 2012).

Goodness-of-fit measures were selected to determine fit of the latent constructs. These indices were chosen based on descriptions in the literature of their application and criteria which this study met. The goodness-of-fit index (GFI) measures the relative amount of variances taken into account for the estimated model (Anderson & Gerbing, 1988; Marsh, Balla, & McDonald, 1988).This is an absolute fit measure and is independent of sample size (Hair, Anderson, Tatham & Black , 1992). A ‘good fit’ is considered any value above 0.9. The comparative fit index (CFI) is a discrepancy index. This measure is based on noncentrality of the model, degrees of freedom and the null model. It is considered a good fit if the values are near 1.0 (Marsh et al., 1988). NFI is

the normed fit index and is concerned with the model position on a continuum between the saturated model or "perfect fit" of 1 and the independence model which is "zero fit" (Marsh et al., 1988). Values near 1.0 (above 0.9 in practice) represent a "good fit." The root mean square error of approximation (RMSEA) measures the difference between the estimated and actual covariance matrices for each degree of freedom (Marsh et al., 1988). The RMSEA is actually a test of the null hypothesis and should be less than 0.10 and not significant ($p > .05$).

After applying the goodness-of-fit analysis and indices, the components were respecified if indices did not reveal optimum values. This was repeated for each construct.

Initial factor analysis sought to eliminate survey items that did not sample the unique construct. This confirmatory factor analysis was conducted with EQS. All original items were included in the first analysis. Based on fit indices, r-square values, item loadings, Lagrange multipliers (LM) and Wald test results, individual items were left out of subsequent analyses and fit indices reevaluated. Once fit indices were optimized, the scale was redefined to exclude items that did not fit. The subjects' responses to the items which survived data reduction through factor analysis were summed or averaged as appropriate to the original instrument. The resultant goodness-of-fit indices for the revised scales were then evaluated.

The redefined scale was then used in the path analysis. Prior to path analysis, the reduced scales were used to generate a correlation matrix. The correlation matrix using the reduced item inventory was then generated. Using the revised scales the full TPB model was tested.

Model respecification was the next step. This starts with running path analyses then trimming any paths that have nonsignificant path coefficients or building paths. Then Wald and LM tests were run to see if any paths or covariances were recommended to be added or deleted. The original model was evaluated first. The structural model with corresponding standardized regression estimates was then created. Lastly, modified models were evaluated based on path significance, fit indices, LM and Wald test results and theoretical appropriateness.

Answering question 2. The survey instrument for awareness was a simple checklist of events and activities which students were asked to check off. Within these categories, examples of possible activities were given to the students to clarify the category.

A table was created which revealed the frequency and percentage of respondents who indicated that the particular activity/event had occurred or was occurring on their campuses. Data were presented from each individual college and all colleges collectively. These items were then evaluated for the most frequently reported to least frequently reported. A histogram was then created along with a table of descriptive statistics. These results were compared at face value. Because the data were not normally distributed and transformations did not resolve the non-normality, statistical inferences were limited.

Answering question 3. One of the challenges in defining the awareness variable for awareness was that students sometimes reported activities and events that were not occurring on their campus as reported by the CGR. This variable was going to be necessary to answer research question 3. A table showing actual events and activities as reported by the CGR was created in order to create such a variable. Results for activities

that students reported as occurring that corresponded with those reported by the CGR were identified and presented in a table. This correspondence was then used to create the awareness variable by dividing the corresponding student-CGR activity by the number of activities identified by the CGR, then multiplying by one-hundred. This created a variable which was percent awareness of CGR-reported initiatives.

Because the awareness data were quite skewed and did not meet the SEM requirements of normality even after transformation, these data were split into three segments of high, medium, and low mean awareness (upper one-third, middle one-third and lower one-third, respectively), then the middle data was removed and two groups of data were created, high awareness and low awareness. A table was then created comparing descriptive statistics of student awareness by high and low awareness groups and scales.

As described by Tabachnick and Fidell (2013), comparing two separate paths requires multi-group analysis. This type of analysis begins with creation of separate models with good fit developed in two separate runs for the new data sets (high awareness and low awareness). Path analyses were conducted and model trimming for each model, as determined by fit indices and Wald and LM tests, ensued. The final models were then created and presented with standardized path coefficients and accompanying tables showing path parameters and unstandardized path coefficients.

Ultimately, these analyses only used a separate path analyses for a high awareness group model and a low awareness group model and did not use an SEM model that combined the measurements and structural models. According to Kline (2010), the first step was to estimate the same structural regression models which applied no cross-group

constraints on equality. If that hypothesis was rejected, the invariance would not hold. In this study the models did not have similar significant paths and thus the hypothesis was rejected. Further analysis was limited.

CHAPTER FOUR: RESULTS

The purposes of this study were to determine how well the Theory of Planned Behavior (TPB) explained Pro-environmental Behaviors (PEBs) among NC community college students, and to determine whether implementation of campus sustainability initiatives positively influenced students' attitudes, subjective norms, perceived behavioral control, intentions, and behaviors. The main research questions were:

1. Is community college student PEB predicted by TPB?
2. To what extent are students aware of their colleges' strategy implementation?
3. Is there a relationship between student awareness of campus initiatives and their (a) Environmental Attitudes, (b) Perceived Behavioral Control to PEB, (c) Subjective Norm to PEB, (d) PEB Intention and (e) Self-reported PEB?

Data for this study were collected by administering surveys which measured antecedents of PEB intention and PEB to students at four community colleges, one college at the low end of implementation and three at the higher end of implementation based on the advice of a NC Community College Sustainability Super Curriculum Improvement Project (SuperCIP) lead person and whether the colleges participated in American Association for Sustainability in Higher Education's (AASHE) Sustainability Tracking and Reporting System (STARS).

This chapter will detail the results of this study by first describing the chosen sites and presenting a summary student demographics, educational experience at the

college, and degrees and program areas of the students. Then, a summary of student awareness strategies will be presented based on Sustainability/Code Green representative (CGR) interviews. The results of testing the TPB model on student PEB will then be presented. The process behind creating an awareness variable is described. Then, strategies most frequently and least frequently reported by students as occurring is presented. Finally, the results of the analysis evaluating possible relationships between awareness and TPB constructs is given. Analysis of the data was conducted using SPSS (version 21) and EQS (version 6.2).

Sites and Student Participants

In order to understand the types and levels of sustainability strategy implementation (SSI) at the participating colleges, it was necessary to interview representatives of the colleges. These representatives were asked about their duties, types of initiatives and practices implemented, their frequency, and whether these initiatives had been implemented within the past year (See survey questions in Appendix E). The results are summarized in Table 1.

Table 1

Sustainability Initiatives/Activities by College As Indicated by CGR

	College			
Initiative/Activity	1	2	3	4
Earth Day Festival	X	X	X	X
Other Festivals	X	X	X	X
Lectures		X	X	X
Contests		X	X	X
Other Events	X	X	X	X
Recycling	X	X	X	X
Purchasing		X	X	
Policies		X	X	
Procedures	X		X	
Planning	X	X	X	X
Food Practices	X	X	X	X
Website		X	X	
Committee	X	X	X	
Curriculum		X	X	X
Continuing Education	X	X	X	
Construction	X	X	X	X
Vehicles	X	X	X	
Grants	X	X	X	
Shortened Class Week		X		
Energy Conservation	X	X	X	X
Landscaping	X	X	X	X
Greenhouse Gas Inventory		X	X	
Environmental Assessment	X	X	X	X
Waste Minimization		X		
Water Conservation	X	X	X	X
Club		X	X	X
Other				
Activity/Event Total	16	25	24	15

College 1 was the smallest institution that participated (1,535 curriculum students). The CGR had the official duties of coordinating green events, providing green information, and overseeing the sustainable training center. While this school was given a

bronze rating for STARS, their activity/event score was close to college 4 which was a non-participant in STARS. It should be noted that STARS credits are related to certain intensities of initiatives as well as numbers of initiatives. This study did not evaluate the depth of the activities but only the existence or non-existence of them, and only in general categories. The school held several different events and contests related to sustainability. But, the school does not advertise their initiatives widely other than a few mentions in newspapers and on the school website.

College 2 was the silver STARS representative and was the largest institution with 4,300 students. The rating was based on one of their campuses that had the most sustainable activities/initiatives in place, although all students were targeted in awareness campaigns. This CGR had the title of Sustainability Coordinator. In her position she planned several regularly scheduled events such as festivals and a monthly lecture series. The school also had a commitment to sustainability that was institutionalized in planning and procedures. According to the CGR, regular advertisements were distributed and signage was found everywhere.

College 3 was the gold STARS representative of the group with 2,108 curriculum students. The representative had the title of Sustainability Analyst. Based on comparisons of CGR interviews, this school appeared to give the highest priority to sustainability initiatives and made them a part of policies and procedures on a regular basis. Not only did the college implement many initiatives, they focused much energy on advertising their events and activities, regularly reminded people with signage and prompts, and integrated sustainability into most programs, both continuing education and curriculum.

College 4 was the low implementation college with 2,497 students. The representative was the Human Resources Director. It was made clear during the interview that sustainability was not institutionalized on the campus, as it was not a part of priorities in planning or policy. But the school did have certain conservation and waste minimization processes in place as mandated by the NC Community College System. They had recently built a building that was very "green," using many energy conserving strategies and geothermal energy use. The school had very little purposeful advertising of sustainability initiatives or signage.

Descriptive statistics for demographics, educational experience, and educational programs enrolled of student participants are presented in Table 2. The total number of valid responses was 676 or 6.5% of the sampling frame. As is typical in community colleges, females were overrepresented in the sample (68.1%). The 18-25 year-old age group was the largest in the sample (38.4%). The number of semesters enrolled was relatively split between 1-3 semesters and 4-6. Approximately 90% of the respondents were in an Associate Degree program. Approximately 40% of the students were in traditional arts and sciences programs. Allied Health represented 24.4% of the respondents. Another 18.9% of the student were business or computer science and 13.5% were vocational/technical students.

Table 2

Demographic Characteristics of Participants by College (%)

	College				
Characteristic	1 (n=102)	2 (n=107)	3 (n=236)	4 (n=231)	All (n=676)
Female	82.4	66.7	70.5	73.6	68.1
Age					
18-25	42.2	41.7	30.9	43.1	38.4
26-35	18.6	23.4	22.9	25.9	23.3
36-45	18.6	17.8	21.2	17.7	19.1
46-55	12.7	13.1	19.9	10.3	14.5
≥56	7.8	4.7	5.1	3.0	4.7
# Semester Enrolled					
1	9.8	27.1	17.6	8.6	14.9
2	22.5	19.6	24.8	21.1	22.4
3	16.7	13.1	13.9	13.4	14.0
4	29.4	16.8	21.0	29.7	24.6
5	11.8	14.0	13.4	15.9	14.1
6	9.8	9.3	9.2	11.2	10.0
Program					
Associate–Freshman	39.2	36.1	39.5	32.8	36.6
Associate-Sophomore	55.9	48.1	48.3	56.0	52.1
Diploma	2.0	4.6	5.5	5.6	4.9
Certificate	0	3.7	4.2	3.0	3.1
Early College/Dual Enroll	2.9	7.4	1.7	2.2	2.9
Other	0	0	0.8	0.4	0.4
Program Area					
Sciences	22.8	20.4	13.4	14.7	16.3
Allied Health	25.7	23.1	19.3	34.5	24.4
Arts	25.7	12.3	29.4	18.5	22.7
Fine Arts	1.0	1.9	1.7	2.2	1.8
Business	11.9	11.5	13.4	15.1	13.7
Applied Tech/Vocational	7.9	17.6	19.3	8.2	13.5
Computer Science	5.0	9.3	2.1	6.5	5.2
Other	0	0.9	1.3	0.4	0.7

Note. Colleges 1-3 are high implementation colleges and College 4 is low implementation.

Testing The TPB Model on Community College Students' PEB

SPSS statistical software and EQS were used to analyze data. Descriptive statistics were calculated for each question on each scale. Next, assumptions were tested. Data were reduced into scales for each construct as a preliminary step and the measurement models were tested and refined. Path analysis was used to test the relationships between constructs in TPB and to determine which model fit best.

The first level analysis performed on the data included basic descriptive statistics generated from the individual items across all five measured constructs (i.e. environmental attitude, subjective norm, perceived behavioral control, intention, and pro-environmental behavior). Items in each survey were assigned labels which identify both the instrument and the item number within the instrument (item numbers are sequential relative to the order they were responded to by the subjects). For example, PBCQ1 is the first item in the perceived behavioral control questionnaire. Since environmental attitude was measured by the New Ecological Paradigm Scale these items are labeled as NEP. In addition to the individual items from each instrument, a variable is included representing either the sum of those item responses (NEP) or their mean (SN, PBC, INT and PEB). Care should be taken in considering the scale statistics, since items were removed from scales following factor analysis. Tables 3 and 4 report the mean, variance, skewness and kurtosis for each item, and sums and averages.

Table 3

NEP Item Inventory Descriptive Statistics

Instrument and Item Number	*M*	S^2	Skewness	Kurtosis
NEPQ1	3.27	1.15	-0.30	-0.69
NEPQ2	3.35	1.16	-0.28	-0.99
NEPQ3	3.75	1.12	-0.83	-0.11
NEPQ4	3.02	1.03	0.03	-0.46
NEPQ5	3.91	1.08	-1.07	0.40
NEPQ6	2.16	1.15	0.92	-0.09
NEPQ7	4.27	1.04	-1.68	2.29
NEPQ8	3.58	1.08	-0.57	-0.32
NEPQ9	4.28	0.83	-1.45	2.80
NEPQ10	3.41	1.15	-0.30	-0.72
NEPQ11	3.30	1.20	-0.32	-0.92
NEPQ12	3.36	1.32	-0.35	-1.07
NEPQ13	3.79	1.04	-0.79	-0.05
NEPQ14	3.60	1.11	-0.44	-0.60
NEPQ15	3.66	1.10	-0.56	-0.39
NEP (Sum)	52.70	8.65	-0.19	0.48

Table 4

SN, PBC, INT and PEB Item Inventory Descriptive Statistics

Instrument and Item Number	*M*	S^2	Skewness	Kurtosis
SNQ1	4.11	0.94	-0.98	0.50
SNQ2	3.70	1.09	-0.71	-0.17
SNQ3	3.34	1.20	-0.32	-0.78
SNQ4	3.03	1.12	-0.09	-0.51
SNQ5	4.45	0.80	-1.92	4.59
SNQ6	3.87	1.02	-0.93	0.57
SNQ7	3.98	1.07	-0.92	0.06
SNQ8	3.15	1.10	-0.15	-0.40
SNQ9	3.29	1.14	-0.25	-0.66
SNQ10	3.34	1.12	-0.36	-0.45
SN (Mean)	3.63	0.75	-0.45	0.24
PBCQ1	4.33	0.96	-1.42	1.20
PBCQ2	4.39	0.89	-1.42	1.35
PBCQ3	2.35	1.17	0.79	-0.25
PBCQ4	3.37	1.09	0.09	-0.61
PBCQ5	4.80	0.62	-3.76	15.71
PBCQ6	3.78	1.11	-0.59	-0.69
PBCQ7	4.65	0.76	-2.52	6.62

Table 4 (continued)

SN, PBC, INT and PEB Item Inventory Descriptive Statistics

Instrument and Item Number	*M*	S^2	Skewness	Kurtosis
PBCQ8	3.16	1.21	0.01	-0.85
PBCQ9	3.41	1.23	-0.27	-1.10
PBCQ10	3.44	1.27	-0.29	-1.02
PBC (Mean)	3.77	0.60	-0.29	0.46
INTQ1	4.35	0.93	-1.63	2.43
INTQ2	4.15	1.09	-1.31	0.97
INTQ3	2.86	1.27	0.15	-1.00
INTQ4	2.76	1.27	0.22	-0.89
INTQ5	4.78	0.55	-3.49	16.47
INTQ6	4.02	1.02	-1.01	0.63
INTQ7	4.41	1.02	-1.84	2.64
INTQ8	3.17	1.26	-0.21	-0.86
INTQ9	3.66	1.21	-0.69	-0.47
INTQ10	3.32	1.34	-0.37	-0.99
INT (Mean)	3.75	0.70	-0.36	0.06
PEBQ1	4.13	0.90	-0.72	-0.21
PEBQ2	3.66	1.36	-0.66	-0.82

Table 4 (continued)

SN, PBC, INT and PEB Item Inventory Descriptive Statistics

Instrument and Item Number	*M*	S^2	Skewness	Kurtosis
PEBQ3	4.09	1.11	-1.01	0.09
PEBQ4	3.63	1.32	-0.55	-0.91
PEBQ5	3.90	1.03	-0.64	-0.27
PEBQ6	3.96	1.03	-0.73	-0.13
PEBQ7	2.79	1.54	0.20	-1.45
PEBQ8	3.45	1.24	-0.39	-0.83
PEBQ9	2.79	1.35	0.11	-1.11
PEBQ10	2.08	1.24	0.87	-0.37
PEBQ11	4.79	0.53	-2.99	10.37
PEBQ12	4.34	1.01	-1.49	1.34
PEB (Mean)	3.63	0.72	-0.07	-0.72

A review of the values for averaged scales reveals a relatively moderate average for SN, PBC, INT and PEB. The mean value for NEP is relatively high compared to a cutoff point of 45, which reveals a very pro-environmental sample (Dunlap et al., 2000). According to Kaplan (2008), in order for the fit of the measurement model to be predicted accurately the data distribution should exhibit continuous and multivariate

normality. With a few exceptions, the skewness and kurtosis statistics did not raise concerns related to the normality of the underlying distributions.

Prior to the generation of a correlation matrix based on the scale scores, reliabilities were generated in the form of Cronbach's alpha using SPSS. All scales were shown to have acceptable reliabilities, although relatively low to moderate in absolute value. For the NEP scale, the reliability (α = 0.807) was higher than what Hawcroft and Milfont (2010) have reported in a meta-analysis of international research utilizing the NEP scale. The subjective norm scale demonstrated a similar reliability in this study (α = 0.886) to Kaiser et al. (2005). The perceived behavioral control scale in this study had a higher reliability (α = .773) than reported in the same Kaiser et al. study. Similarly, the intention scale exhibited a much higher reliability (α = .828) than the Kaiser et al. study. Finally, the pro-environmental behavior scale used in this study indicated high levels of reliability (α = 0.853) compared to the research conducted by Schultze et al. (2005).

The inter-scale correlation matrix for the original constructs is presented in Table 5. The correlations ranged from r = 0.251 (NEP, PBC) to r = 0.730 (INT, PEB) showing moderate to strong relationships among all of the scales. All correlations were significant at the $p < .001$ level.

Table 5

Correlation Matrix for Original Scales

Subscale	NEP	SN	PBC	INT	PEB
NEP	-	0.374**	0.251**	0.408**	0.343**
SN	-	-	0.487**	0.683**	0.545**
PBC	-	-	-	0.695**	0.537**
INT	-	-	-	-	0.730**
PEB	-	-	-	-	-

**$p < .001$

An underlying assumption of SEM is that sample size be sufficient so that there is maintenance of estimate accuracy. Schumaker and Lomax (1996) came to the conclusion that a sample size should be between 250 and 500 cases to use SEM effectively. In this study the sample contained 724 cases, which is well within these sample parameters. There were missing data for each analysis but the number of complete, valid cases was still within this acceptable range.

The SEM analysis was composed of two stages. First, the measurement models, including latent variables, related disturbances, survey items measuring the latent variable, and measurement error terms for survey items, was analyzed. As described by Schumacker and Lomax (1996) a five step process was used for each construct: (1) model specification, (2) identification, (3) estimation, (4) testing the fit, and (5) respecification . Each of the latent variables was then analyzed individually using EQS version 6.2.

In order to test the identification and estimation of the models, each construct was specified with a measurement model and confirmatory factor analysis was used.

Goodness-of-fit measures were selected to determine fit of the latent constructs. These indices were chosen based on descriptions in the literature of their application and criteria which this study met (Table 6).

Table 6

Acceptable Cutoff Values for Goodness-of-Fit Indices

Index	Acceptable Values	Reference
GFI	> 0.9	Hair et al., 1992
CFI	≥ 0.9	Marsh et al., 1988
NFI	> 0.9	Marsh et al., 1988
RMSEA	< 0.1	Marsh et al., 1988

After applying the goodness-of-fit analysis and indices, the components were respecified if indices did not reveal optimum values. This was repeated for each construct.

Initial factor analysis sought to eliminate survey items that did not sample the unique construct. This confirmatory factor analysis was conducted with EQS. All original items were included in the first analysis. Based on fit indices, r-square values, item loadings and Lagrange multipliers (LM) and Wald test results, individual items were left out of subsequent analyses and fit indices reevaluated. Once fit indices were optimized, the scale was redefined to exclude items that did not fit. The redefined scale was then used in the path analysis.

The subjects' responses to the items which survived data reduction through factor analysis were summed or averaged as appropriate to the original instrument. The resultant goodness-of-fit indices for the revised scales were then evaluated.

Prior to path analysis, the reduced scales were used to generate a correlation matrix. The correlation matrix using the reduced item inventory was then generated. Using the revised scales the full TPB model was tested.

Model respecification was the next step. This starts with running path analyses then trimming any paths that have nonsignificant path coefficients or building paths. Then Wald and LM tests were run to see if any paths or covariances were recommended to be added or deleted. The original model was evaluated first. The structural model with corresponding standardized regression estimates was then created. Lastly, modified models were tested based on path significance, fit indices, LM and Wald test results and theoretical appropriateness.

Confirmatory factor analyses. Initial factor analysis sought to eliminate survey items that did not sample the unique construct. Confirmatory factor analyses were conducted with EQS for each construct. All instrument items were included in the first analysis. Based on fit indices, r-square values, item loadings, LM, and Wald test results, individual items were left out of subsequent analyses and fit indices reevaluated. Once fit indices were optimized, the scale was redefined to exclude items that did not fit. The redefined scale was then used in the path analysis.

NEP Scale. The factor analysis for the initial NEP scale including all fifteen items is shown in Table 7. This table presents each scale item with its factor loading value, r^2 and percent of variance accounted for by that scale item.

Table 7

Factor Analysis Results for Initial NEP Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
NEPQ1	0.825	0.319	28.763
NEPQ2	0.935	0.126	13.209
NEPQ3	0.860	0.260	8.017
NEPQ4	0.975	0.049	6.730
NEPQ5	0.777	0.397	5.405
NEPQ6	0.990	0.020	5.119
NEPQ7	0.850	0.277	4.788
NEPQ8	0.847	0.283	4.686
NEPQ9	0.930	0.135	4.452
NEPQ10	0.784	0.385	3.794
NEPQ11	0.850	0.278	3.654
NEPQ12	0.924	0.146	3.270
NEPQ13	0.788	0.379	3.064
NEPQ14	0.973	0.054	2.762
NEPQ15	0.696	0.515	2.315

Different iterations of the analysis were run and the resulting fit indices are shown in Table 8. Fit indices prior to removing any items in the first model analysis were CFI = 0.693, GFI = 0.820, RMSEA = 0.1110 and NFI = 0.667. All paths were significant at the $p < 0.05$ level. Based on factor loading, r^2 values, Wald, and LM tests I determined that

items NEPQ4, Q6, and Q14 should be stripped out. These scale items exhibited high loading values and low r^2 values. Wald and LM tests did not yield any recommended adjustments. Therefore subsequent analyses were run with different variations of these items stripped out. The second model eliminated Q6, the third model eliminated Q4 and Q6 and the fourth model eliminated Q4, Q6 and Q14. The fourth model had the most optimal fit indices with CFI = 0.793, GFI = 0.886, RMSEA = 0.108, and NFI = 0.771, and the Wald and LM tests did not suggest any further modifications. Therefore, this version of the scale was chosen to represent the NEP construct in path analysis.

Table 8

Fit Indices for NEP Scale Analyses

Model	α	CFI	GFI	RMSEA	NFI
1	0.807	0.693	0.820	0.111	0.667
2	0.813	0.730	0.844	0.110	0.705
3	0.813	0.763	0.868	0.108	0.739
4 (Final)	0.818	0.793	0.886	0.108	0.771

Table 9 shows the resultant factor analysis results for the final NEP scale. It is important to point out that the quality of the final model showed only marginal improvement in internal consistency. It did not quite reach the thresholds for the fit indices. The total percent of variance accounted for in the final model was only 32%. Factor loadings ranged from 0.393 to 0.719.

Table 9

Factor Analysis Results for Final NEP Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
NEPQ1	0.564	0.318	32.068
NEPQ2	0.320	0.102	12.858
NEPQ3	0.528	0.279	9.301
NEPQ5	0.650	0.423	7.900
NEPQ7	0.548	0.301	6.464
NEPQ8	0.487	0.237	5.847
NEPQ9	0.393	0.154	5.633
NEPQ10	0.581	0.338	4.956
NEPQ11	0.523	0.274	4.116
NEPQ12	0.366	0.134	3.968
NEPQ14	0.626	0.392	3.681
NEPQ15	0.719	0.517	3.209

SN Scale. The confirmatory factor analysis for the SN scale including all ten items is shown in Table 10. Total percent variance accounted for my SN was 50%. Factor loadings ranged from 0.625 to 0.885.

Table 10

Factor Analysis Results for SN Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
SNQ1	0.709	0.497	50.179
SNQ2	0.885	0.216	10.566
SNQ3	0.659	0.565	8.003
SNQ4	0.660	0.564	6.488
SNQ5	0.844	0.287	5.218
SNQ6	0.625	0.610	5.074
SNQ7	0.775	0.399	4.338
SNQ8	0.723	0.477	3.805
SNQ9	0.816	0.334	3.267
SNQ10	0.673	0.547	3.063

Two analyses were run and the resulting fit indices are shown in Table 11. Fit indices prior to removing any items in the first model analysis were CFI = 0.897, GFI = 0.900, RMSEA = 0.113 and NFI = 0.886. All paths were significant (p = .05). Observation of item factor loading and r^2 values revealed that only item SNQ 2 had a high loading value and low r^2 value and therefore another analysis was run with this item stripped. Fit indices in the second model analysis did not improve and the Wald and LM tests did not suggest any further modifications. Therefore, all items were used to

represent the subjective norm construct in the path analysis. As in the NEP scale results, the final version did not reach the optimal fit index values except for GFI.

Table 11

Fit Indices for SN Scale Analyses

Model	α	CFI	GFI	RMSEA	NFI
1 (Final)	0.886	0.897	0.900	0.113	0.886
2	0.887	0.900	0.900	0.123	0.890

PBC Scale. The EQS factor analysis for the PBC scale including all ten items is shown in Table 12. Total percent variance accounted for by PBC was 34%. Factor loadings ranged from 0.757 to 0.912.

Table 12

Factor Analysis Results for PBC Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
PBCQ1	0.893	0.203	33.550
PBCQ2	0.910	0.172	17.001
PBCQ3	0.912	0.168	8.504
PBCQ4	0.851	0.277	7.678
PBCQ5	0.912	0.168	6.776
PBCQ6	0.787	0.381	6.273
PBCQ7	0.867	0.248	5.927
PBCQ8	0.851	0.276	5.487
PBCQ9	0.826	0.317	5.407
PBCQ10	0.757	0.427	3.397

Different variations of the analysis were run and the resulting fit indices are shown in Table 13. Fit indices prior to removing any items in the first model analysis were CFI = 0.679, GFI = 0.838, RMSEA = 0.145 and NFI = 0.664. Factor loading and r^2 values indicated that items PBCQ1 and Q2 had higher loading values and lower r^2 values and therefore subsequent analyses were run with different variations of these items stripped out. The second model eliminated Q2, the third model eliminated Q1, the third model eliminated Q1 and Q2, and the fourth model eliminated Q1. Fit indices did not improve with subsequent analyses (Table 13) and the Wald and LM tests did not suggest

any further modifications. The first model containing all original items was chosen to represent the PBC construct in path analysis. Final goodness-of-fit indices for PBC were not optimal.

Table 13

Fit Indices for PBC Scale Analyses

Model	α	CFI	GFI	RMSEA	NFI
1 (Final)	0.773	0.679	0.838	0.145	0.664
2	0.764	0.706	0.874	0.148	0.692
3	0.753	0.709	0.886	0.162	0.699
4	0.760	0.672	0.848	0.159	0.660

INT Scale. The EQS factor analysis for the initial INT scale including all ten items is shown in Table 14. Total percent variance accounted for by INT was approximately 40%. Factor loadings ranged from 0.626 to 0.953.

Table 14

Factor Analysis Results for Initial INT Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
INTQ1	0.852	0.273	39.904
INTQ2	0.897	0.196	14.252
INTQ3	0.793	0.371	8.305
INTQ4	0.626	0.608	7.576
INTQ5	0.953	0.092	6.927
INTQ6	0.762	0.420	5.755
INTQ7	0.914	0.165	5.165
INTQ8	0.720	0.482	4.778
INTQ9	0.856	0.268	4.173
INTQ10	0.722	0.479	3.166

Different variations of the analysis were run and the resulting fit indices are shown in Table 15. Fit indices prior to removing any items in the first model analysis were NFI = 0.793, CFI = 0.808, GFI = 0.869 and RMSEA = 0.128. Factor loading and r^2 values indicated that items INTQ5 and Q7 had higher loading values and lower r^2 values than other items and therefore subsequent analyses were run with variations of these items stripped out. In the second model, Q5 was removed and for the third model Q5 and Q7 were removed. Fit indices were optimized in the second model with NFI = 0.892, CFI = 0.907, GFI = 0.932 and RMSEA = 0.094. The Wald and LM tests did not suggest

any further modifications and therefore, the second model was chosen to represent the INT construct in path analysis. All goodness-of fit-indices reached the optimal criteria for acceptable fit except for NFI.

Table 15

Fit Indices for INT Scale Analyses

Model	α	CFI	GFI	RMSEA	NFI
1	0.828	0.808	0.869	0.128	0.793
2 (Final)	0.828	0.907	0.932	0.094	0.892
3	0.829	0.910	0.933	0.105	0.898

Confirmatory analysis results for the final INT scale are shown in Table 16. The percent of variance accounted for by NT improved slightly from 39.9% to 42.7%. Factor loadings ranged from 0.598 to 0.924.

Table 16

Factor Analysis Results for Final INT Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
INTQ1	0.869	0.245	42.739
INTQ2	0.906	0.179	11.709
INTQ3	0.781	0.390	9.068
INTQ4	0.598	0.643	8.295
INTQ6	0.776	0.399	7.682
INTQ7	0.924	0.147	6.298
INTQ8	0.708	0.498	5.635
INTQ9	0.863	0.255	5.039
INTQ10	0.716	0.487	3.535

PEB Scale. EQS factor analysis for the initial PEB scale including all twelve items is shown in Table 17. Total percent of variance accounted for by PEB was approximately 40%.

Table 17

Factor Analysis Results for Initial PEB Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
PEBQ1	0.793	0.371	39.453
PEBQ2	0.658	0.567	11.835
PEBQ3	0.679	0.539	8.753
PEBQ4	0.564	0.682	7.655
PEBQ5	0.754	0.431	6.153
PEBQ6	0.827	0.316	5.250
PEBQ7	0.837	0.299	4.840
PEBQ8	0.873	0.238	3.906
PEBQ9	0.848	0.281	3.810
PEBQ10	0.866	0.250	3.360
PEBQ11	0.969	0.060	2.848
PEBQ12	0.956	0.087	2.138

Different variations of the analysis were run and the resulting fit indices are shown in Table 18. Fit indices prior to removing any items in the first model analysis were NFI = 0.777, CFI = 0.794, GFI = 0.849 and RMSEA = 0.127. Factor loading and r^2 values indicated that items PEB Q10, Q11 and Q12 had higher loading values and lower r^2 values than other items and therefore subsequent analyses were run with variations of these items stripped out. For the second model Q11 was removed, the third model Q11

and Q12, and the fourth model, Q12. Fit indices were optimized in the second model with NFI = 0.822, CFI = 0.838, GFI = 0.871 and RMSEA = 0.120. No further suggestions for modification were given by the Wald or LM tests. The second model was chosen to represent the PEB construct in path analysis. Values for the goodness-of-fit indices for the final version of the PEB scale were not optimal.

Table 18

Fit Indices for PEB Scale Analyses

Model	α	CFI	GFI	RMSEA	NFI
1	0.853	0.794	0.849	0.127	0.777
2 (Final)	0.856	0.838	0.871	0.120	0.822
3	0.861	0.834	0.863	0.135	0.821
4	0.855	0.815	0.856	0.129	0.801

Table 19 contains the results of confirmatory analysis for the final PEB scale. Percent of variance accounted for in the final scale only improved slightly from 39.5% to 42.4%. Factor loadings ranged from 0.563 to 0.959.

Table 19

Factor Analysis Results for the Final PEB Scale

Item	Factor Loading	r^2	% Variance Acct'ed For
PEBQ1	0.798	0.798	42.423
PEBQ2	0.656	0.569	10.463
PEBQ3	0.681	0.536	8.505
PEBQ4	0.563	0.683	8.238
PEBQ5	0.754	0.431	6.642
PEBQ6	0.828	0.314	5.687
PEBQ7	0.834	0.304	4.387
PEBQ8	0.875	0.235	4.261
PEBQ9	0.845	0.286	3.945
PEBQ10	0.861	0.259	3.115
PEBQ12	0.959	0.081	2.335

The subjects' responses to the items which survived data reduction through factor analysis within each scale were summed or averaged as appropriate to the scale. The goodness-of-fit indices for the final scales are shown in Table 20.

Table 20

Model Goodness-Of-Fit for Final Measurement Models

Index	NEP	SN	PBC	INT	PEB
χ^2	1854.99	301.15	467.02	165.91	402.27
P	< .001	< .001	< .001	< .001	< .001
Df	54	35	35	27	44
χ^2/df	34.35	8.60	13.34	6.14	9.14
GFI	0.886	0.90	0.84	0.93	0.87
CFI	0.77	0.90	0.68	0.91	0.84
NFI	0.77	0.89	0.66	0.89	0.82
RMSEA	0.11	0.11	0.15	0.09	0.12

Prior to path analysis, the reduced summed and averaged data were used to generate a correlation matrix which was already presented in Table 5. The correlation matrix using the reduced item inventory is shown in Table 21. All relationships were significant at the $p < .001$ level.

Table 21

Correlation Matrix Using Final Scales

Subscale	NEP	SN	PBC	INT	PEB
NEP	-	0.430**	0.296**	0.456**	0.346**
SN	-	-	0.487**	0.682**	0.544**
PBC	-	-	-	0.689**	0.528**
INT	-	-	-	-	0.726**
PEB	-	-	-	-	-

***p*<.001

Path analysis. Using EQS and the reduced item inventory prepared through factor analysis, the model shown in Figure 5 was analyzed through path analysis. Because the fit indices and reliability values for the measurement models were not as high as might be preferred, the path model was built using the scaled variables, rather than a combination of measurement and structural models.

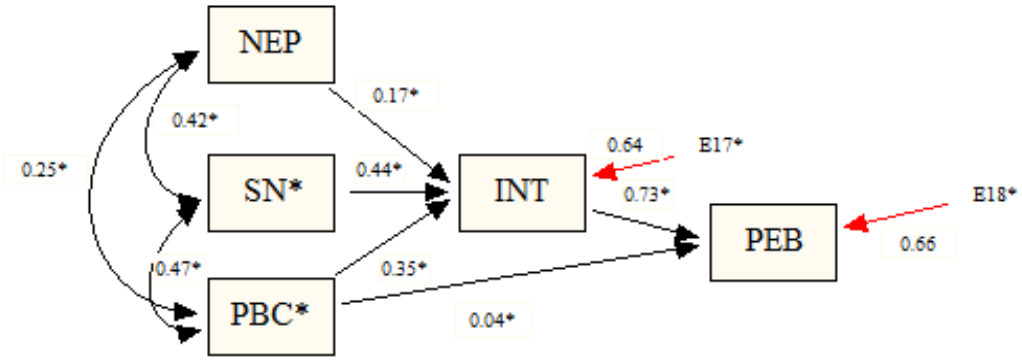

Figure 5. Model 1 path analytic model with standardized path coefficients

Model respecification was the next step. This started with running path analyses then trimming any paths that had nonsignificant path coefficients or building paths. Then Wald and LM tests were run to see if any paths or covariances were recommended to be added or deleted. Lastly, modified models were tested based on path significance, fit indices, LM and Wald test results and theoretical appropriateness.

The model in Figure 5 (Model 1) was evaluated first. This structural model with corresponding standardized regression estimates are shown in Figure 5.

Path parameters and coefficients of determination for Model 1 are found in Table 22. The path from PBC to PEB was not significant and therefore this path was left out of the next respecification. The fit indices for the first analysis were NFI = 0.990, CFI = 0.992, GFI = 0.992, and RMSEA = 0.092. The goodness-of-fit was reasonably good.

Table 22

Path Parameters and Coefficients of Determination for Model 1

Variable	Unstandardized path parameter	*SE*	R^2
INT			0.624
NEP	0.013	0.003	
SN	0.404	0.034	
PBC	0.587	0.042	
PEB			0.527
INT	0.729	0.044	
PBC	0.035	0.604	

Following the removal of the path from PBC to PEB, the model was re-run (Model 2). All paths were found to be significant. The first three fit indices improved very little (NFI = 0.990, CFI = .993 and GFI = 0.991). However, RMSEA improved to 0.072. Following this analysis, it was decided to test one more model leaving out the path from NEP to INT since this path, while significant, had the lowest coefficient, and the possibility of improved goodness-of-fit values might occur. All paths remained significant. The following goodness-of-fit values were found: NFI = 0.989, CFI = 0.991, GFI = 0.990, and RMSEA = 0.091.

A comparison of goodness-of-fit indices by all models is found in Table 23. In Model 3, RMSEA moved further away from an optimal fit. The second model was retained as the final structural model.

Table 23

Goodness-of-fit Comparisons by Model

Index	Model 1	Model 2 (Final)	Model 3
χ^2	10.13	1045.40	979.11
P	0.006	0.015	0.006
Df	2	3	2
χ^2/df	5.06	348.47	489.56
GFI	0.992	0.991	0.990
CFI	0.992	0.993	0.991
NFI	0.990	0.990	0.989
RMSEA	0.092	0.072	0.091

Table 24 shows resultant path parameters and coefficients of determination for the final model (Model 2).

Table 24

Path Parameters and Coefficients of Determination for Model 2

Variable	Unstandardized path parameter	*SE*	R^2
INT			0.624
NEP	0.013	0.003	
SN	0.404	0.034	
PBC	0.587	0.042	
PEB			0.527
INT	0.747	0.032	

Figure 6 depicts the final model with standardized coefficients. Interpretation of this model reveals that INT was predicted directly by SN, PBC and NEP explaining 62% of the variance, with SN and PBC having stronger coefficients than NEP (β = 0.40 and 0.45 respectively vs. 0.13). PEB was also predicted directly by INT explaining 53% of the variance (β = 0.73). Covariances were also signficant in all antecedents of INT with *r* ranging from 0.28 to 0.47. Antecedents of INT also indirectly influence PEB. Indirect path coefficients are calculated by finding the product of coefficients in a path. For example the indirect effect of SN on PEB is calculated as 0.40 (SN → INT) x 0.73 (INT → PEB) = 0.292. The indirect effect of SN, PBC and NEP on PEB individually are β = 0.292, 0.329 and 0.095 respectively.

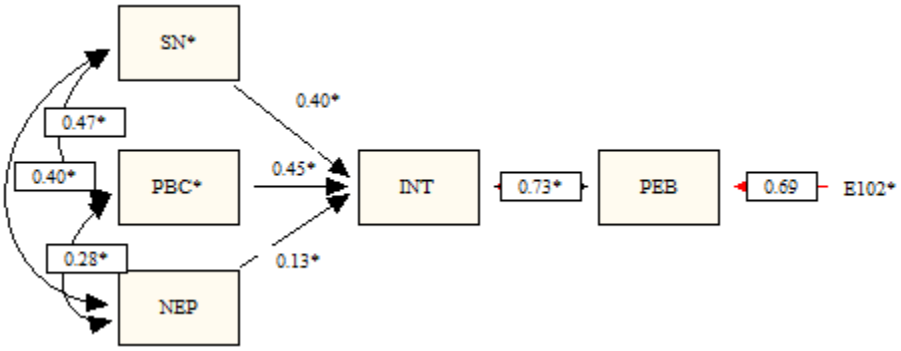

Figure 6. Model 2 path analytic model with standardized path coefficients.

Student Awareness of College Sustainability Strategy Implementation

Student awareness of sustainability strategy implementation (SSI) was measured on the survey by having students mark which activities and initiatives they knew were occurring on their campus (Appendix D, Awareness of Environmental/Sustainability Initiatives on Campus).

Table 25 shows response frequency to listed initiatives from the student survey. It is important to note that these statistics include everything students said they were aware of, regardless of whether it existed at their college or not. Review of the tables reveals that community college students in this study were most aware of recycling (71.3%), Earth Day festivals (42.1%), sustainable landscaping practices (34.1%), Energy Conservation (29.0%), and waste minimization (28.6%). It is noteworthy that waste minimization ranked as highly considering only one of the colleges CGR's identified that activity. The first four activities were most consistently high across all colleges compared to other initiatives. Sustainable purchasing and procedures ranked sixth and eighth

respectively overall and relatively highly at two colleges where the activities were not noted by the CGR.

Table 25

Percent of Students Aware of Activity by College

Initiative	College1		College 2		College 3		College 4		All Colleges	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Recycling	84	78.5	76	62.3	182	70.5	174	73.4	516	71.3
Earth Day Festival	41	38.3	63	29.5	118	45.7	110	46.4	305	42.1
Landscaping	31	29.0	27	22.1	121	46.9	68	28.7	247	34.1
Energy Conservation	26	24.3	31	25.4	83	32.2	70	30.0	210	29.0
Waste Minimization	***27***	***25.2***	31	25.4	***89***	***34.5***	***60***	***25.3***	207	28.6
Purchasing	***17***	***15.9***	25	20.5	104	40.3	***41***	***17.7***	188	26.0
Club	***1***	***0.9***	21	17.2	112	43.4	28	11.8	162	22.4
Procedures	10	9.3	***16***	***13.1***	99	38.4	***27***	***11.4***	152	21.0
Curriculum	***11***	***10.3***	21	17.2	82	31.8	28	11.8	142	19.6
Policies	***6***	***5.6***	20	16.4	102	39.5	***14***	***5.9***	142	19.6
Water Conservation	14	13.1	32	26.2	63	24.4	32	13.5	141	19.5
Construction	8	7.5	21	17.2	87	33.7	21	8.9	137	18.9
Planning	6	5.6	22	18.0	86	33.3	14	5.9	128	17.7
Shortened Class Weeks	***27***	***25.2***	13	10.7	***7***	***2.7***	***79***	***33.3***	126	17.4

Table 25 (continued)

Percent of Students Aware of Activity by College

Initiative	College1		College 2		College 3		College 4		All Colleges	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Food Practices	9	8.4	23	8.9	71	27.5	12	5.1	115	15.9
Continuing Education	6	5.6	22	18.0	62	24.0	***18***	***7.6***	108	14.9
Website	***9***	***8.4***	10	8.2	65	25.2	***22***	***9.3***	106	14.6
Vehicles	3	2.8	18	14.8	79	30.6	***5***	***2.1***	105	14.5
Contests	***12***	***11.2***	16	13.1	40	15.5	25	10.5	93	12.8
Grants	5	4.7	12	9.8	56	21.7	***19***	***8.0***	92	12.7
Environmental Assessment	8	7.5	9	7.4	60	23.3	9	3.8	86	11.9
Greenhouse Gas Inventory	***4***	***3.7***	8	6.6	44	17.1	***4***	***1.7***	60	8.3
Lectures	***5***	***4.7***	16	13.1	21	8.1	12	5.1	54	7.5
Other Events	0	0.0	6	4.9	20	7.8	16	6.8	42	5.8
Other Festivals	1	0.9	6	4.9	6	2.3	4	1.7	17	2.3
Other Activity	***1***	***0.9***	1	0.8	***8***	***3.1***	***4***	***1.7***	14	1.9

Note. Bold, italicized values represent responses for activities the CGR did not report as occurring for this college. Shaded rows are activities all colleges have in common. College 4 is the low implementation college.

The lowest initiative awareness levels were for environmental assessment (11.9%), greenhouse gas inventory (8.3%), lectures (7.5%), other events (5.8%), other festivals (2.3%), and other activities (1.9%). Environmental assessments, other festivals

and other events were most consistently low across all colleges. The seventeen lowest ranking items garnered awareness frequencies of no greater than 20% overall. College 3 was a real exception with only four of the initiatives exhibiting awareness frequencies of less than 20%. College 1 had twenty-one activities with awareness frequencies less than 20%, College 2 had twenty, and college 4 had twenty-one.

If awareness is simply defined as the number of initiatives on the list that students are aware of regardless of whether the initiative exists, the distribution of responses are as seen in Figure 7.

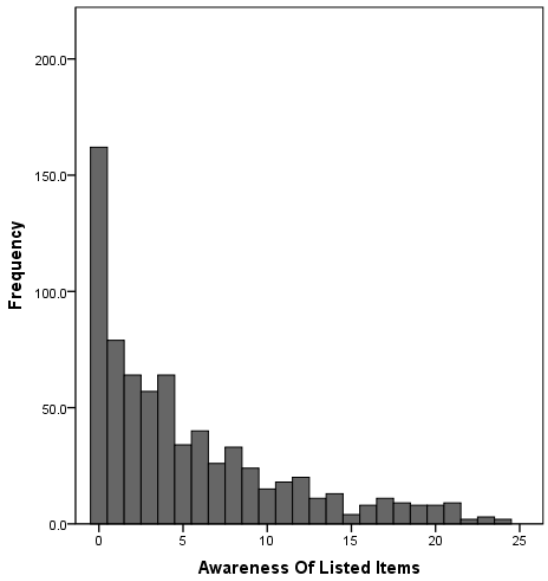

Figure 7. Frequency distribution for "Awareness of Listed Items" variable (All colleges).

Descriptive statistics of these data are found in Table 26. The statistics show that, for individual colleges and in whole, the data are not normally distributed. Most students are not very aware of sustainability initiatives on their campus.

Table 26

Descriptive Statistics for Student Awareness of Listed Items Variable by College

College	*M*	*n*	*SD*	Skewness	Kurtosis
1	3.53	107	3.42	1.06	0.35
2	4.54	122	6.11	1.60	1.55
3	7.59	258	6.97	0.54	-0.94
4	3.92	237	3.38	0.98	0.84
All	5.27	724	5.66	1.26	0.86

One of the challenges of interpreting this data and creating an awareness variable was the fact that not all college CGRs reported the same initiatives occurring on their campuses. In addition, students often reported being aware of particular initiatives even if the CGR did not note this activity. Colleges 1 and 4 had the most responses to non-existent initiatives. These were also the two colleges that had the fewest CGR-reported activities. Most of these responses garnered less than 15% of the respondents at each of the schools.

Relationship Between Student Awareness and TPB Constructs

In order to have one variable that could be used to measure impacts of awareness on the antecedents of INT and PEB for the third research question, I created a variable that represented percent of actual awareness calculated by dividing the awareness of actual variable by the number of activities reported by the CGR at each college.

Because the awareness data were highly skewed and the variable departed so far from normality, it could not be salvaged as a continuous variable. This data had to be

defined by creating three sets of data proportioned by one-third, each designated as high, medium, or low awareness. Only the high (0 to 7% awareness) and low (27 to 100% awareness) groups were included in this analysis. Table 27 presents descriptive statistics for these data. Observation of this table reveals that the high awareness group had higher average values for all construct scales compared to the low awareness group.

Table 27

Descriptive Statistics for High and Low Awareness Groups by Scale

	Awareness Level			
	High (N = 163)		Low (N = 122)	
Scale	*M*	*SD*	*M*	*SD*
NEP	46.36	7.33	41.72	8.08
SN	3.84	0.71	3.32	0.74
PBC	3.89	0.52	3.64	0.57
INT	3.80	0.73	3.33	0.69
PEB	3.81	0.72	3.19	0.72

Path analysis was then performed for each group with appropriate trimming based on goodness-of-fit indices. Once the respecified models were chosen for the high and low data, the the models were compared to determine if there was invariance across the groups (i.e. were the same paths significant, was there similar significance in variances, and were the fit indices reasonably similar?).

High awareness group. The final solution TPB model from RQ1 was evaluated first. The table of path parameters and coefficients of determination for the first model is

found in Table 28. All paths were significant. The fit indices for this analysis were NFI = 0.971, CFI = 0.978, GFI = 0.973, and RMSEA = 0.133.

Table 28

Path Parameters and Coefficients of Determination for Model 1

Variable and parameter	Unstandardized path parameter	*SE*	R^2
INT			0.634
NEP	0.015	0.005	
SN	0.505	0.062	
PBC	0.472	0.080	
PEB			0.581
INT	0.745	0.050	

The next respecification added a direct path from SN to PEB as a result of Wald and LM test results. This model (Model 2) was re-run. The resulting path parameters and coefficients of determination are found in Table 29. All paths were significant. All fit indices improved with NFI = 0.997, CFI = 1.000, GFI = 0.997 and RMSEA = 0.000.

Following this analysis, the direct path from SN to PEB was removed and a direct path from PBC to PEB was added (Model 3) as in the original TPB. However, all goodness of fit indices were less optimum (NFI = 0.971, CFI = 0.976, GFI = 0.973, and RMSEA = 0.171).

One more analysis was made substituting NEP for SN in the direct path to PEB (Model 4). Goodness-of-fit indicies improved with GFI = 0.999, CFI = 1.000, NFI = 0.999, and RMSEA = 0.000, but the path from NEP to PEB was not significant. Model 2

had the most significant path coefficients and most optimal fit indices compared to the other respecifications and therefore this model was chosen as the final version. In addition, this decision is also affected by balancing theory appropriateness and model fit while not overtrimming and deviating too far from the original model. Table 29 gives path parameters and coefficients of determination for Model 2.

Table 29

Path Parameters and Coefficients of Determination for Model 2

Variable and parameter	Unstandardized path parameter	*SE*	R^2
INT			0.634
NEP	0.015	0.005	
SN	0.505	0.062	
PBC	0.472	0.080	
PEB			0.606
INT	0.577	0.070	
SN	0.238	0.073	

Figure 8 shows Model 2 with corresponding path parameters and coefficients of determination. All paths were significant. NEP, SN, and PBC accounted for 63.4% of the variance in intention. INT and SN accounted for 61% of variance in PEB. Total effect of SN using standardized coefficients is found by summing all direct and indirect effects from SN to PEB. This calculation is 0.24 + (0.49)(0.59) = 0.53, which means for every one standard deviation increase in SN, PEB is increased by 0.53 standard deviations. NEP has the lowest coefficients of the constructs.

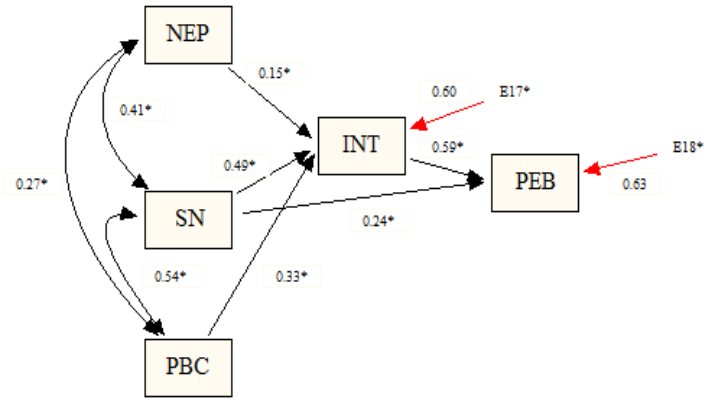

Figure 8. Model 2 path analytic model for high awareness with standardized path coefficients.

Low awareness group. Path analysis was conducted for the low awareness group next. Model 1 was identical to the Model 1 for the high awareness group. See Table 30 for path parameters and coefficients of determination. Goodness-of-fit indices were GFI = 0.997, CFI = 1.000, NFI = 0.994, and RMSEA = 0.000. The model fit the data well. All paths were significant.

Table 30

Path Parameters and Coefficients of Determination for Model 1

Variable and parameter	Unstandardized path parameter	*SE*	R^2
INT			0.432
NEP	0.015	0.006	
SN	0.343	0.070	
PBC	0.435	0.087	
PEB			0.446
INT	0.699	0.071	

Next, it was decided to replicate Model 2 as it was specified for the high awareness group. Table 31 reflects the path parameters and coefficients of determination for this model.

Table 31

Path Parameters and Coefficients of Determination for Model 2

Variable and parameter	Unstandardized path parameter	*SE*	R^2
INT			0.432
NEP	0.015	0.006	
SN	0.343	0.070	
PBC	0.434	0.087	
PEB			0.446
INT	0.714	0.084	
SN	0.026	0.078	

The only change in goodness-of-fit indices was a slight decrease in NFI to 0.995. Since models 3 and 4 for the high awareness group were not the optimal fit models or paths were not significant, I saw no need to continue repecifications since no comparison could be made to those models. Table 32 gives goodness-of-fit comparisons by model. All goodness-of-fit indices were optimal.

Table 32

Goodness-of-fit Comparisons by Model for the High and Low Awareness Groups.

	High				Low	
Index	Model 1	Model 2*	Model 3	Model 4	Model 1	Model 2*
GFI	0.973	0.997	0.973	0.999	0.997	0.997
CFI	0.978	1.000	0.976	1.000	1.000	1.000
NFI	0.971	0.997	0.971	0.999	0.994	0.995
RMSEA	0.133	0.000	0.171	0.000	0.000	0.000

* represents the final models.

Model 2 with path parameters and coefficients of determination are found in Figure 9. NEP, SN, and PBC accounted for 43% of the variance in PEB. INT and SN accounted for 45% of the variance in PEB. But the direct path from SN to PEB was not significant.

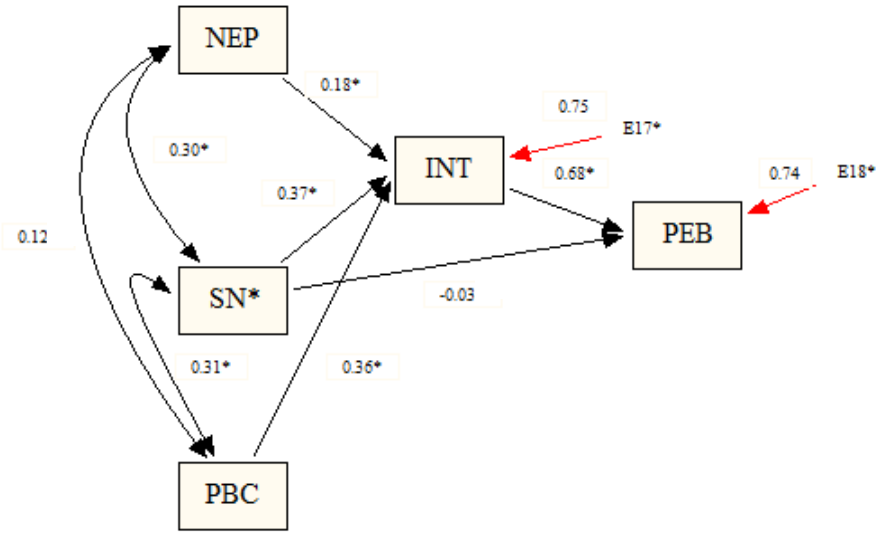

Figure 9. Model 2 path analytic model for low awareness with standardized path coefficients.

Comparison of the two groups. The final analysis was intended to answer the question of whether student awareness of SSI influenced antecedents of PEB and PEB itself. This analysis only used the separate path analyses for high awareness group Model 2 and low awareness group Model 2 and did not use an SEM model that combined the measurements and structural models. According to Kline (2010), the first step was to estimate the same structural regression models which applied no cross-group constraints on equality. If that hypothesis was rejected, the invariance would not hold. In this study, while the fit indices were similar for both models, the direct path from SN to PEB in the low model was not significant.

For the high awareness group, INT is predicted by SN, PBC and NEP explaining 63% of the variance, with SN and PBC having stronger coefficients than NEP ($\beta = 0.49$ and 0.33 respectively vs. 0.15). PEB is also predicted by INT explaining 59% of the variance ($\beta = 0.59$). Unlike the low awareness Model 2, the path from SN directly predicts PEB ($\beta = 0.24$). Covariances were also significant in all antecedents of intention with *r* ranging from 0.27 to 0.54. Antecedents of intention also indirectly influence PEB. The indirect effect of SN, PBC and NEP on PEB individually is $\beta = .289$, .195 and .089. respectively.

Interpretation of low awareness group Model 2 revealed that INT is predicted by SN, PBC and NEP explaining 43% of the variance, with SN and PBC having stronger coefficients than NEP ($\beta = 0.37$ and 0.36 respectively vs. 0.18). PEB was also predicted by INT explaining 45% of the variance ($\beta = 0.68$). Covariances were also signficant in all antecedents of intention with *r* ranging from 0.12 to 0.31. Antecedents of intention also

indirectly influenced PEB. The indirect effect of SN, PBC and NEP on PEB individually was $\beta = 0.252$, 0.245 and 0.122 respectively.

While multi-group comparisons could not be made since the two models were not similar in path significance and fit indices, some interpretations may be gleaned from the descriptive data and evaluating each model separately. It does appear that higher SSI awareness influences the antecedents of TPB. Specifically, SN is a direct predictor of PEB in the high awareness model and has a greater influence on INT than it does in the low awareness group. In addition, while all covariances are significant in the high awareness group, the covariance of NEP and PBC are not significantly related in the low awareness group. Finally, coefficients of covariance for the high awareness group exhibit higher values than those for the low awareness group indicating a greater influence of the antecedents on each other for the high awareness individuals.

CHAPTER FIVE: DISCUSSION

The purposes of this study were to determine how well the TPB explains PEBs among NC community college students, and to determine whether implementation of campus sustainability initiatives positively influences students' attitudes, subjective norms, perceived behavioral control, intentions, and behaviors. The main research questions were:

1. Is community college student PEB predicted by TPB?
2. To what extent are students aware of their colleges' strategy implementation?
3. Is there a relationship between student awareness of campus initiatives and their (a) Environmental Attitudes, (b) Perceived Behavioral Control to PEB, (c) Subjective Norm to PEB, (d) PEB Intention and (e) Self-reported PEB?

This was determined by administering surveys which measured antecedents of PEB intention and PEB to students at four community colleges, one college at the lower end of implementation and three at the higher end of implementation.

This chapter will discuss the outcomes of the path analysis for TPB constructs and PEB, evaluate the results of student awareness data, and draw conclusions from path analysis data comparing high awareness community college students to low awareness students and how this awareness difference may influence the constructs of TPB. Limitations of these findings will then be detailed followed by a discussion of implications for institutions trying to raise sustainability awareness of students and change PEB.

Is Community College Student PEB Predicted by TPB?

Based on the model used in the final analysis of this study, support is given for TPB's predictive ability of community college student PEB. All paths were found to be significant, including antecedents of INT and the path from INT to PEB. The antecedents of INT accounted for 62% of the variance in INT and INT accounted for 54% of the variance in PEB. All of the indices indicated good fit for this model.

It is important to point out that the TPB model used in the final path analysis answering question 1 is not the original model as developed by Ajzen (1991) since it lacks the direct path from PBC to PEB. This implies the necessity of influencing all antecedents of INT to change PEB and that simply making a behavior less complex will not significantly impact the behavior directly without considering the role of attitude and SN. INT must first be influenced.

This study provides further support for the predictive ability of TPB in relation to PEBs. Much support has already been provided in prediction of water use, meat consumption, use of unbleached paper, purchasing energy-efficient light bulbs (Harland et al., 1999), waste composting (Mannetti et al., 2004; Taylor & Todd, 1995), household recycling (Kaiser & Gutscher, 2003), and choice of travel mode (Bamberg & Shmidt, 2003; Harland et al., 1999; Heath & Gifford, 2002; Verplanken et al., 1998).

In addition, this study provides support for the use of a general PEB scale as opposed to focusing on a specific behavior as in the previous literature mentioned. Support for the use of TPB in predicting general pro-environmental behavior has been found in a few other studies (e.g., Kaiser et al., 1999). According to Kaiser and Gutscher's (2003) study, 43% of ecological behavior's variance could be predicted with

this type of scale. In yet another study showing the use of general PEB scale in the TPB in a college setting, Kaiser et al. (2005) stated that the General Ecological Behavior scale they used created measurement error because of unreliable aspects of the generalized scale and this attenuated the influence of the intention construct on PEB. The model used was the same model tested in the current study, and intention was found to account for 72% of the variance in PEB with a path coefficient of 0.85. The antecedents of intention, attitude ($\beta = .39$), SN ($\beta = .14$) and PBC ($\beta = .49$) explained 76% of the variance in INT.

The strength of the coefficients and variance accounted for in the present study were lower than in the Kaiser et al. (2005) study possibly because of the diversity of age, socio-demographics, and institutional connectivity of community college students versus university students. This difference in community college and university students has been discussed at length by Kane and Rouse (2009). Dunlap (2008) has shown that demographic diversity has a great impact on attitude towards the environment as well. Females generally have higher pro-environmental environmental attitudes as measured by the NEP. Since this study contained an overrepresentation of females, it may have led to the higher NEP scale averages. However, older individuals tend to have lower pro-environmental attitudes, and since community colleges and this sample had more diversity of older students (62% of the respondents were older than twenty-five years of age), this should have had some impact.

Even though Armitage and Conner (2001) found, in their meta-analysis of TPB use, that PBC independently predicted behavior in many domains, this present study did not. Kaiser and Gutscher (2003) did not find the path from PBC to PEB to be significant either. Again, this is related to the non-generalizable part of TPB and lack of

compatibility between antecedents of PEB and PEB. PBC "addresses a behavior's specific, rather than its person-related, substantive, cross-situationally generalizable , variance" (Kaiser & Gutscher, 2003, p. 600).

To What Extent Are Students Aware of Their Colleges' Strategy Implementation?

Although the colleges in this study had a range of levels of SSI, students tended to have low awareness of such initiatives. Although no studies were found that discuss university student SSI awareness, one might predict community college student SSI awareness to be less anyway. Community college students are generally not residential students of their campuses and have less time to devote to extra-curricular activities (Kane & Rouse, 2009) that might make them more aware of sustainability activities on their campus. In addition, community college students tend to be older and have a lower NEP score reflecting a lower pro-environmental attitude that might translate into less concern for environmental issues.

Although this study did not seek to compare individual colleges, it is instructive to point out that College 3, which was the gold STARS representative, exhibited the highest mean awareness score based on total listed items identified, awareness of actual events as identified by the CGR, and percent awareness. Not only did the CGR identify the most sustainable activities for this school, he also described a much larger effort to promote their initiatives. The CGR described efforts much more similar to social marketing strategies than the other schools' representatives described. Not only did College 3 employ the most strategies compared to the other colleges, they advertised them heavily with regular signage, prompts, flyers, interpretive advertisements, modeling of best practices, and obvious sustainable design features as described by McKenzie-Mohr and

Smith (1999). As Gardner and Stern (2002) have reported, a combination of strategies is best.

When the top four activities identified by students (Table 26) are evaluated, it seems plausible that these items tend to be more obvious since they are either everywhere around a student in a typical day or are a large advertised event. Recycling, which was the most frequently identified activity, is a very obvious activity since such containers are usually identifiable either by color and/or symbols. The symbols have been used for many years now and are found regularly on items students may come into contact with. Large recycling awareness campaigns occur on a regular basis and are found in all media sources.

Earth Day events ranked number two in student-identified activities. This may be because these are usually annual, large, well-publicized events and the surveys took place in March when such events were being planned and advertised.

The number three ranked activity was landscaping which was described on the survey as native plantings, non-gasoline mowers/equipment, organic pesticides, and wildlife habitats/nature trails. Again, these activities may be readily recognizable by any student venturing on campuses of any of these schools. All CGRs identified some type of wildlife habitat or nature trail that might be readily recognizable. However, students might also have chosen the term “landscaping” without thinking about whether it was sustainable, using native plantings.

Energy conservation was ranked number four as identified by students. This is another regularly advertised item outside of the school setting. It is also a mandated priority by the NCCCS, however. All new buildings or refurbishments must consider

energy conserving construction, and every CGR identified at least one new building on campus that had room sensors for lights and energy conserving construction materials such as double paned windows and energy conserving lights. Most institutions see this as priority anyway since energy conservation also saves money.

The fifth ranked activity most regularly reported was waste minimization. The reporting of this activity by some of the students brings up a particular issue of concern in reporting awareness, and that is students identifying activities that do not exist. In this case, it may be because, while the CGR did not identify the activity as institutionalized, many instructors may unilaterally choose to conserve paper by printing on both sides of pages or not printing out syllabi since these are available on online teaching platforms at each of these schools.

Some of the least reported activities may be no surprise since they are activities that most schools would not see a need to promote to students such as greenhouse gas inventories or environmental assessments. Again, it is notable to point out that 23.3% of students at College 3 knew that environmental assessments had been performed and 17.1% knew about the greenhouse gas inventory. Three "other" options were the least reported by all schools because either most of these were recoded or perhaps students did not want to fill in the "explain" blank.

When these findings are analyzed in reference to Steg and Vleck's (2009) categories of strategies, it seems clear that only the most obvious structural strategies may have an influence on awareness without also applying informational strategies. It may be clear that recycling is being done simply by seeing the containers in the hallways, or that energy conservation is being utilized by lights coming on automatically upon entering a

room. But, activities like planning, policies or greenhouse inventories would not be recognized without some type of purposeful informational campaign.

The criteria used to first distinguish high SSI schools from low SSI ones was their participation in STARS. However, in the end it was clear that awareness of SSI was not necessarily related to this participation. Awareness levels of students from College 1, a STARS participant, were not much different that levels of students from College 4, a non-STARS participant. As a matter of fact, the number of CGR-reported activities were not much different either. Just because a college participates in this particular program does not automatically make students more aware. It is up to the college to provide such information to the student body and community. The CGR from College 3 stated that their STARS participation was regularly advertised and this seems to be reflected in the survey results.

Is There a Relationship Between Student Awareness of Campus Initiatives, Constructs of TPB, and PEB?

The mean values for all construct scales of the high awareness group were higher than those for the low awareness group. This may be some indication that awareness of initiatives is important to increase behavior. However, because the awareness data do not exhibit normality, awareness as a matter of degree could not be examined. Each of the final models for low and high awareness exhibited significant paths from NEP, SN and PBC to INT and from INT to PEB. However, since the direct path from SN to PEB in the low model was not significant, the two models could not be compared to make a claim about the impacts of awareness on antecedents of INT and PEB. No other studies using TPB to study PEB were found where SN was a direct predictor of PEB. Influence of

awareness on antecedents of PEB was limited since non-normality of data kept awareness from being used in the model as an antecedent itself.

Keeping the previous discussion in mind, some information may be extracted from a general comparison of path significances and path coefficients. The direct path from SN to PEB was not significant for the low awareness group as it was in the high awareness group. The path coefficient for SN to INT was higher for the high awareness group than the low awareness one. For students with low awareness of initiatives, attitudes and perceived behavioral control were not significantly related. Among students with high awareness, social norms were significantly related to attitude and perceived behavioral control. Covariances for NEP and SN, and PBC and SN were greater for the high awareness group also. This information appears to imply that high awareness students tend to be positively influenced by the strategies occurring at their schools since most of the high awareness students are found at the college that institutes more strategies. The high awareness group is also more influenced by the people around them, as indicated by the significant SN to PEB path and stronger relationship of SN to INT.

College 3 has worked very hard to incorporate sustainability into the culture of the institution as communicated by the CGR. Colleges 1 and 4, which had the lowest awareness levels, had the least amount of information sharing with students as indicated by their CGRs and these low awareness students would be more represented by the low awareness group model which shows a lower influence of SN on INT and none on PEB. In other terms, College 3 has worked hard to build its social capital, which influences SN and PEB according to other researchers (Goddard, 2003; Jones et al., 2008; Teranishi & Briscoe, 2006). According to Grootaert & Bastelaer (2002) cognitive social capital,

which is more related to enculturation as opposed to the more observable structural social capital, also impacts attitudes. Indeed, the high awareness group had higher levels on the NEP scale than the low awareness group and all of the antecedents in this TPB model were significantly related.

Information strategies have been used to raise awareness (Steg and Vleck, 2009), but general knowledge campaigns have not resulted in significant changes to behavior. Information strategies in the form of social support or role models have been created to influence social norms and have been shown to influence PEBs (Abrahamse et al., 2005; Lehman & Geller, 2004; Schultz et al., 2007). The use of prompts has apparently been effective in changing behaviors (Abramse et al., 2005; Lehman & Geller, 2004; Schultz et al., 1995) but why these strategies were successful was not evaluated in detail.

Structural strategies which remove external barriers that make tasks more difficult or costly have been found to be somewhat successful in increasing certain PEBs (Olander& Thogersen, 1995; Rothschild, 1999; Stern, 1999; Thogersen, 2005; van Raaij, 2002). These strategies apparently act on PBC which would increase INT. Interventions that have acted directly on INT by asking individuals to make certain environmental commitments have also been successful (Abrahmse et al., 2005; Lehman & Geller, 2004; Schultz et al., 1995). Many intervention studies have focused on changing attitudes of college students towards environmental issues (e.g. Bradley et al., 1999; Bright & Tarrant, 2002; McMillan et al.., 2004; Meyer & Munson, 2005; Pe'er et al., 2007; Rideout, 2005) but changing attitude does not directly change behavior and only accounts for a limited influence on variance in INT, as seen in the present study.

Study Limitations

This study has limitations in its application and interpretation of the data. Care must be taken in generalizing these findings to all higher education institutions. As stated earlier, community college students are more diverse demographically and have different motivation than university students. While the results about the effect of awareness on antecedents of PEB and PEB itself are instructive, the lack of similar path significance between the high and low models limits interpretation.

The construction of the awareness variable leaves much to be desired as well. Because all activities did not match up among schools, and students reported activities not noted by the CGR, the awareness variable is not adequately comparable across all individuals and schools. The information gathered from the CGRs was also very descriptive rather than quantitative. In some cases, the CGR was not certain about some events and had to check with others on order to answer the interview questions. In addition, depending on the CGR's role, he or she may have not understood all questions. In many cases, while the CGR might have indicated some activity by a few individuals such as use of double-sided printing, they could not indicate that it was a college-wide policy and therefore the school was not given a credit for waste minimization. Conversely, a student may have been aware that an instructor used double-sided printing and so reported that waste minimization occurred on the campus. Standardization by gathering data on fewer behaviors would not have reflected the prevalence of practices in community colleges as documented in this study, however.

Another challenge that the awareness variable posed was its lack of normality. Because of this non-normality this variable could not be included in the path analysis to

answer the question of the influence of student awareness on TPB constructs. Ultimately, the data was separated into high and low awareness groups and the data compared in this way. However, the ranges for each of these groups were drastically different with the high awareness group range being much larger than that of the lower group. This implies that the low awareness individuals are more similar to each other than those in the high awareness group. This creates some issues in the final analysis and potentially less variance in the low awareness group data.

Self-reported PEB has come under some scrutiny by researchers as well because it is affected by the participants' inclination to meet researchers' expectations and some have stated that self-reported behavior is not a reliable indicator of behavior that is overt (Kaiser & Gutscher, 2003). But, studies evaluating the effect of social desirability on general ecological behavior have been shown to be marginal (Kaiser et al., 1999). Kaiser, Frick, and Stoll-Kleeman (2001) found that self-reported behaviors using the General Ecological Behavior scale were an accurate indicator of overt performances ($\kappa = 0.78$).

Using a general behavior scale may be an issue also because the compatibility rule is violated since specific behaviors in all items in the construct scales did not match specifically. But as Kaiser and Gutscher (2003) indicated in their study, 43% of ecological behavior's variance could still be predicted with this type of scale. Still, using such a scale makes it more difficult to hone in on what specific interventions might impact specific actions. Others may argue as to what constitutes sustainable behavior as well. Many behaviors could have been chosen to represent this construct. However, previous scales were evaluated to make the decision for this study.

Another area of concern in interpreting findings in this study were the CFAs that were conducted to create the final scales for constructs. A rule of thumb for factor loading in the social sciences tends to set a cut-off value at 0.35 (Garson, 2006). Loadings are considered strong if greater than 0.6. Another rule-of-thumb in interpreting CFAs, at least in the humanities, is keeping enough factors to account for 50 to 60% of the variance (Williams, Brown, & Onsman, 2012). While factor loadings were between 0.32 and 0.72 on the final NEP scale, only 32.1% of the variance was accounted for. The model was also not a good fit as indicated by fit indices. While factor loadings and percent variance accounted for by items in the SN scale met the criteria, the model did not have an optimal fit. While items in the final PBC scale has strong factor loadings the percent variance accounted for was only 33.6%. The model fit was also poor. The INT scale items met CFA criteria and had good model fit. While items of the PEB scale had strong factor loadings, the items only accounted for 42.4% of the variance and the model had poor fit.

Missing data was an issue for many of the scales as well. Fortunately, the entire data set was large enough to meet the assumptions of SEM and other analyses. This does reflect concern however for the usefulness of the instrument for smaller colleges that may not get good participation. This poor survey completion rate would limit the interpretation of the data unless researchers chose to use techniques for replacing missing values.

The colleges chosen and those that ultimately agreed to be a part of the study also had much potential to influence the findings of this study. The two colleges that declined to participate were chosen based on their non-participation in STARS and information

from a state Super-CIP lead person. If these schools had participated in the study and their students reported low awareness levels, there might have been more discrepancy between high and low awareness groups.

This study did not delve into the details or intensities of certain strategies. The awareness questionnaire for both students and CGRs mostly asked if certain categories of initiatives existed. Just because it was noted that a college instituted energy conservation did not meet that implementation was even closely similar to implementation at another college. In some cases, these measures were only being implemented in a particular building as opposed to campus-wide. In addition, it is not known to what extent sustainability was integrated into coursework. Students were only asked if they were aware of curricula or courses pertaining to sustainability. While CGRs were not asked specifically about integration, some instructors are more likely to include information about sustainability than others and some schools may have programs more related to the subject than others. This could definitely influence the attitude of students at the corresponding schools.

Implications for Practice

Many of the recommendations that will be made here apply to a variety of educational leaders in a variety of roles. To increase sustainability levels requires many individuals at all levels including those creating policies and procedures, managing implementation, advertising initiatives, or simply modeling the behaviors. As in many initiatives, all individuals at the institution should be brought to the table in a participatory approach to understand the actors, build support, gain commitments, and get

better involvement (Gardener & Stern, 2002). These individuals include faculty, staff and students.

As noted earlier, although statistical analysis was not applied to compare each school's impacts on students' awareness, it appears that schools that not only apply many strategies, but actually expend time and energy in making students aware of the initiatives, have higher awareness by the student body.

This study showed that a larger percentage of variance accounted for in INT was from SN and PCB. This implies that organizations wishing to increase PEB should focus much more on strategies that create norms for the institutions and make such activities obvious, and on removing barriers to certain actions and making them less complex. Meeting the latter strategy may be as simple as placing recycling containers in many areas and clearly marking them. In addition, signage which implies that certain activities are valued by others and are what is expected, may have an impact. Again, it is important to point out that the TPB model used in this study lacked the direct path from PCB to PEB and thus implies the importance of strategies that influence all constructs.

Even though attitude might have less influence on INT and PEB, it should not be ignored. Indeed, attitude is one of the constructs most easily influenced by interventions as shown in much of the literature (e.g., Bright & Tarrant, 2002; MacMillan et al., 2004; Pe'er et al., 2007; Rideout, 2005). Both informational and structural strategies may be used to influence this construct since provision of persuasive knowledge about the environment and human impacts is the key here. Attitude also ultimately influences the other antecedents as well.

Social marketing shows promise for creating strategies that influence social capital. With proper planning and evidence-based strategy implementation, organizations can more efficiently target particular behaviors based on the specific characteristics of the individuals they want to influence. The leadership needs to first align its sustainability initiatives with priorities and values of the institution. Although Corner and Randall (2011) state that multiple interventions should be considered in social marketing campaigns, they should be planned carefully considering the audience and people's needs and motivations, keeping in mind the specific behavioral goals.

As described in the literature review, colleges play many roles in their pursuit of sustainability. One of these roles is to increase efficiency in the organization which leads to less waste and reduced energy usage. This goes to the bottom line and ultimately may save the institution a significant amount of money. The other role colleges play in sustainability is shaping students and helping them to become better prepared to make decisions that will make society better. It appears, from the findings of this study, that both roles may work together if students are made aware of what the colleges are doing either through overt modeling and/or awareness campaigns. The colleges that did both did appear to have higher awareness as well as higher scores on all construct scales indicating a positive influence on antecedents of PEB and behavior itself. College 1 is good example of an institution that may be very sustainable but, self-admittedly, does not utilize awareness campaigns to their fullest extent resulting in awareness levels no better than the lowest SSI school. Descriptive statistics comparing low awareness student survey scores to high awareness student scores implies that such awareness is imperative to influence antecedents of PEB and ultimately PEB.

Even the low SSI college instituted sustainable structural strategies such as energy conservation in new buildings because of mandates from NCCCS. Students were aware of these activities at those schools, but could be made more aware of them by simple signage. This would be an easy answer to bridge the gap between the activity, awareness and subsequently INT and PEB. Structural strategies such as energy conservation initiatives and recycling/waste minimization are what might be referred to as "low-hanging fruit" and making students more aware of these initiatives as well as why they are being done can even further decrease energy usage and waste, and save more money.

The so-called "hidden curriculum" as described by Orr (2004) does not have to be so hidden, and based on this study and others, should not be. Assumptions should not be made that students pick up on sustainable activities without being clearly made aware of them and why they are being done. Again, students need to think about the implications as shown in the interventions mentioned earlier. This is why prompts are necessary to continually remind individuals to think about what they are doing and how they impact the environment (Abramse et al., 2005; Lehman & Geller, 2004; Shultz et al, 1995).

One last point involves the ethics of influencing individuals' attitudes, norms and behaviors. Some individuals may consider the use of social marketing to be manipulative, and indeed many advertisements and commercials that are seen are created to convince individuals that particular actions are acceptable and therefore used to convince individuals of certain ideologies or to even sell certain products. The educational/informational strategies discussed earlier in this study present interventions that provide students information and then ask them to think critically about them. McMillan et al. (2004) and Pe'er et al. (2007) simply provided knowledge about ecology

and environmental issues to students and this significantly raised their NEP scores. Meyer and Munson (2005), Bright and Tarrant (2002) and Rideout (2005) had students write about environmental issues or work on problem-solving in relation to environmental issues and raised NEP scores as well. Information can be presented in a fair manner allowing for various viewpoints.

Future Research

Future studies should not only determine what strategies work to influence PEB, but also evaluate what antecedents of PEB are affected. These kinds of studies are lacking in the literature. If researchers can determine the impact of certain interventions on particular antecedents, then practitioners can focus their energies on using various strategies to influence the antecedents that appear to have the most influence on INT and PEB.

Creation of a true awareness variable should be given some priority as well. Perhaps strategies used by the CGRs should first be evaluated then a list of matching strategies by all schools could be used to have a more comparable variable to use in these studies. More specific strategies should be evaluated as well as opposed to the generalized categories used in this research.

Another area of research that would be similar to this study and helpful in understanding the impacts of SSI would be one with a focus on the faculty and staff at a college. Faculty and staff may be very important in conferring expectations and norms on students as well as providing information and knowledge that might help improve student pro-environmental attitude.

While studies have looked at subgroup/demographic differences in antecedents for PEB and self-reported PEB within communities and some universities, it would be instructive to evaluate these differences in community colleges. Community college students are more diverse in all aspects of demographics and are commuter students with less connection to their schools (Kane & Rouse, 2009).

Further studies should evaluate specific intention and behaviors at the community colleges to better understand the relationship of specific interventions to change a single behavior rather than a plethora of initiatives to impact all PEB. Sustainability managers should not assume that one sustainability initiative focused on a single issue will impact all PEB. As previously stated, particular goals need to be kept in mind and proper planning practiced.

Lastly, it would be preferable to study actual behavior as opposed to self-reported behavior. Armitage and Conner (2001) have pointed out that TPB is better at predicting self-reported behavior than predicting observed behavior. This implies some disconnect between self-reported and actual behavior. A more accurate picture could help managers better plan and implement appropriate interventions.

Conclusion

As environmental challenges continue to require attention, there will be a need to encourage behaviors that have less impact on the Earth. How to change current non-sustainable behaviors will be a continued focus in social research until environmental impacts start being mitigated. One of the ways to study such behaviors and antecedents of those behaviors that may be influenced is through the TPB. This study provides evidence that TPB is a good theoretical model in studying PEB of community college students. It

also provides evidence that the use of a general environmental behavior scale can be used in similar studies. It appears that community college students are not very aware of SSI at their colleges and that awareness campaigns may have the ability to increase awareness and thus influence antecedents of PEB.

Community college leaders and others responsible for creating sustainable environments need to understand the importance of the "hidden curriculum" and its impact on individuals. Through structural and information strategies, and awareness campaigns, individuals may be influenced and perhaps this pro-environmental social capital will be transferred to others outside the institution.

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Appendix A

Student Survey

Recruitment Message

Want a chance to win an iPad and provide valuable information to your college about sustainability? Are you at least 18 years old and a curriculum (degree, diploma or certificate-seeking) student? If so, you can assist in this endeavor and be entered in a drawing for the iPad for only 15 minutes or less of your time. This brief survey will be part of a research study assessing community college student attitudes and behaviors pertaining to environmental/sustainability issues, and awareness of campus sustainability initiatives. The survey data will be the only information collected in this study. This data will be anonymous and therefore your name will not be associated with the research findings in any way. A separate link will be given at the end of the survey so that you may enter for the chance to win the iPad. Your feedback is very valuable to us. Thanks for your time. Please select the following link to begin.

Demographic/Academic Data

1. What is your gender? (Male, Female)
2. What is your age? (18-25, 26-35, 36-45, 46-55, ≥56)
3. In the past two years, how many semesters have you been enrolled in this college? (1, 2, 3, 4, 5, 6)
4. In what type of program are you enrolled at this community college? (Associate Degree Program – Freshman or Sophomore; Diploma Program; Certificate program; Early College/Dual Enrollment; Other - Explain)
5. Which of the following best describes your program area? (Sciences, Arts, Fine Arts, Business, Applied Technical/Vocational, Allied Health, Computer Science, Other – Specify)
6. At which campus do you take most of your classes? (Varies based on the college)

Environmental Attitude

Directions: Use the scale provided to indicate your level of agreement with each statement: (Strongly Disagree, Mostly Disagree, Unsure, Mostly Agree, Strongly Agree)

1. We are approaching the limits of the number of people the earth can support.
2. Humans have the right to modify the natural environment to suit their needs.
3. When humans interfere wit nature it often produces disastrous consequences.
4. Human ingenuity will insure that we do NOT make the earth unlivable.
5. Humans are severely abusing the environment.
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities humans are still subject to the laws of nature.
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
11. The earth is like a spaceship with very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Subjective Norm

Directions: Use the scale provided to indicate your level of agreement with each statement which completes the sentence: ‘‘Most people who are important to me think I should . . .’’ (Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree)

(a) Recycle materials such as bottles, cans and paper.

(b) Keep the thermostat higher in the summer so the air conditioner does not come on as much.

(c) Try to find an alternative to driving my gasoline powered car.

(d) Be a member of an environmental organization.

(e) Turn lights off when I leave a room.

(f) Buy sustainable/energy conserving products.

(g) Turn my computer off when I am done using it.

(h) Vote based on environmental issues.

(i) Buy organic foods.

(j) Point out environmentally unfriendly behaviors to others.

Perceived Behavior Control

Directions: Use the scale provided to rate your opinion about the complexity of each activity. (Very Complicated, Somewhat Complicated, Neither Complicated nor Simple, Somewhat Simple, Very Simple)

(a) Recycle materials such as bottles, cans and paper.

(b) Keep the thermostat higher in the summer so the air conditioner does not come on as much.

(c) Try to find an alternative to driving my gasoline powered car.

(d) Be a member of an environmental organization.

(e) Turn lights off when I leave a room.

(f) Buy sustainable/energy conserving products.

(g) Turn my computer off when I am done using it.

(h) Vote based on environmental issues.

(i) Buy organic foods.

(j) Point out environmentally unfriendly behaviors to others.

Behavior Intention

Directions: Use the scale provided to indicate your level of agreement with each statement which completes the sentence, ‘‘I intend to . . .’’ (Very Unlikely, Unlikely, Undecided, Likely, Very Likely)

(a) Recycle materials such as bottles, cans and paper.
(b) Keep the thermostat higher in the summer so the air conditioner does not come on as much.
(c) Try to find an alternative to driving my gasoline powered car.
(d) Be a member of an environmental organization.
(e) Turn lights off when I leave a room.
(f) Buy sustainable/energy conserving products.
(g) Turn my computer off when I am done using it.
(h) Vote based on environmental issues.
(i) Buy organic foods.
(j) Point out environmentally unfriendly behaviors to others.

Environmental Behaviors

Directions: Use the scale provided to indicate how often you have done each of the following in the past year. (Never, Rarely, Sometimes, Often, Very Often)

1. Looked for ways to reuse things.
2. Recycled newspapers.
3. Recycled cans or bottles.
4. Encouraged friends or family to recycle.
5. Purchased products in reusable containers.
6. Picked up litter that was not your own.
7. Composted food scraps.
8. Conserved gasoline by walking or bicycling.
9. Voted for a candidate who supported environmental issues

10. Donated money to an environmental group.
11. Turned lights off when you left a room.
12. Turned your computer off when you were done using it.

Awareness of Environmental/Sustainability Initiatives on Campus

1. What environmental or sustainability awareness events have occurred on your campus? (Check all that apply)
    a. Earth Day
    b. Other Environmental/Sustainability-Related Festivals (Explain)
    c. Environmental/Sustainability-Related Lectures (Explain)
    d. Environmental/Sustainability-Related Contests
    e. Other Environmental/Sustainability-Related Events (Explain)

2. What environmental or sustainability practices or programs are you aware of on your campus? (Check all that apply)
    a. Recycling
    b. Purchasing Sustainable/Environmentally Friendly Products (e.g. Non-hazardous Cleaners, Recycled Content Paper)
    c. Sustainable Policies (e.g. Written Commitments to Become Sustainable, President's Climate Commitment)
    d. Sustainable Procedures (e.g. Specific Rules or Guidelines to be More Sustainable/Environmentally Friendly)
    e. Strategic Planning Which Includes Sustainability (e.g. Plans/Goals for Becoming More Sustainable)
    f. Sustainable Food Practices (e.g. Community Garden, Cafeteria Buys Local/Organic Foods, Composting)
    g. Sustainability Website
    h. Sustainability Committee
    i. Sustainability Curriculum Programs/Classes
    j. Sustainability-Related Continuing Education Programs/Classes
    k. Sustainable Construction Projects (e.g. LEED Buildings, Energy-Efficient Refurbishing of Buildings)
    l. Renewable Fuels Vehicles
    m. Sustainability Grants
    n. Shortened Class Week (School Open Less Than 5 Days Per Week)
    o. Energy Conservation (e.g. Energy Efficient Lighting, Automatic Light Turn Off, Thermostat Settings Strictly Controlled, Energy Efficient Windows, Energy Efficient Equipment)
    p. Landscaping (e.g. Native Plantings, Non-gasoline Mowers/Equipment, Organic Pesticides, Wildlife Habitats/Nature Trails)
    q. Campus Greenhouse Gas Inventory
    r. Campus Environmental Assessment
    s. Waste Minimization (e.g. Double-sided Printing, Paper-free Registration, Online Syllabi, Paperless Schedules)

t. Water Conservation (e.g. Low-flow Toilets and Sink Spigots, Automatic Water Turn-off)
u. Environmental/Sustainability Club
v. Other Environmental/Sustainability Practices or Programs (Explain)

Appendix B

Letter Requesting Permission to Conduct Study at the College

To Whom It May Concern:

The purpose of this letter is to request permission to conduct a research study on your campus entitled “Community College Students' Pro-Environmental Behaviors (PEB) and Their Relationship to College Sustainability Strategy Implementation” in partial fulfillment of requirements for the Educational Doctorate degree in Higher Education/Community College Leadership at Western Carolina University.

The purposes of this study are to assess community college student sustainable/environmental attitudes and behaviors, to determine whether students are aware of campus sustainability initiatives, and to understand the relationship of these initiatives and student sustainable/environmental behaviors and antecedents of those behaviors. The data may help you to determine which sustainability initiatives your students are aware of and help plan future initiatives that will have the most impact. Your colleges participation will consist of a one hour interview of your Code Green/Sustainability representative, and a 15 minute survey of curriculum, Spring 2013 students. Recruitment may occur through a variety of online messages (email, website, portal, etc.) as allowed by your college.

The results of the study may be beneficial to you by helping you determine if your college’s sustainability initiatives affect student pro-environmental behavior, and it may help the college decide the direction it should take in sustainability initiatives. A summary of the results will be provided to you.

Please advise me of the appropriate avenue to seek permission if there is other official documentation to make such a request. Please feel free to contact me at 828-699-5179.

Sincerely,

James D. Hutcherson

Appendix C

Informed Consent for Code Green Implementer

"Community College Students' Pro-Environmental Behaviors (PEB) and Their Relationship to College Sustainability Strategy Implementation""

The purposes of this study are to assess community college student sustainable/environmental attitudes and behaviors, to determine whether students are aware of campus sustainability initiatives, and to understand the relationship of these initiatives and student sustainable/environmental behaviors and antecedents of those behaviors. You have been purposefully chosen by the researcher to represent your college. This study will consist of a one hour interview which will take place at your office. This interview will seek to understand the types of sustainability initiatives your college has implemented and other details such as whether these programs have been promoted to the campus population.

The following information is provided to help you decide whether you wish to participate in this study. You should be aware that you are free to decide not to participate or to withdraw at any time without affecting your relationship with this department, the researcher, or the College. If, however, you decide not to participate, I would ask that you provide the name of another individual that might be willing to participate in your place.

Data will be collected with a one hour face-to-face interview which will be recorded. Your name will not be associated with the research findings in any way, however the colleges may be identifiable in the dissertation.

If you have any questions about how the data is to be used, you may contact James Hutcherson, (james.hutcherson@sccnc.edu) or Dr. Megan Karvonen (karvonen@email.wcu.edu). If you have any questions or concerns about your treatment as a participant in the study, you should contact the chair of WCU's Institutional Review Board at (828) 227-7212 or irb@wcu.edu . I will be happy to share the findings with you after the research is completed. If you would like to view these findings, please contact James Hutcherson, (james.hutcherson@sccnc.edu) and a copy will be sent to you upon request.

There are no known risks and/or discomforts associated with this study. The expected benefit associated with your participation is that the information gained about your sustainability initiatives can be used to help your community college determine if your initiatives are succesful. If the findings of this study are later shared publicly, (within the college, via publication or presentation, etc.), we will only be reporting group data and no individual identifying information will be disclosed.

Do not hesitate to ask questions about the study before participating or during the study.

If you agree to be interviewed please print your name, sign and date.

_____	_____	_____
Print Name	Signature	Date

If you agree to be recorded during your interview please print your name, sign and date.

_____	_____	_____
Print Name	Signature	Date

Appendix D

Informed Consent for Student Survey

"Community College Students' Pro-Environmental Behaviors (PEB) and Their Relationship to College Sustainability Strategy Implementation"

The purpose of this study is to assess students' attitudes and behaviors pertaining to environmental/sustainability issues, and awareness of campus sustainability initiatives. You have been purposefully chosen by the researcher to represent your college. This survey will take approximately 15 minutes to complete.

The following information is provided to help you decide whether you wish to participate in this study. You should be aware that you are free to decide not to participate or to withdraw at any time without affecting your relationship with the College. In addition, your decision to participate in this survey or not will have no bearing on your grade in any course.

Data will be collected using a brief online survey which will ask questions pertaining to your background, attitudes about environmental issues, environmental behaviors, and awareness of college campus sustainability initiatives. In return you will have the opportunity to be entered in a drawing for an iPad. A separate link to the drawing will be provided upon completion of the survey. This survey data will be the only information collected in this study. The survey will be anonymous and therefore your name will not be associated with the research findings in any way.

If you have any questions about the survey or how the data is be used, you may contact James Hutcherson, (james.hutcherson@sccnc.edu) or Dr. Megan Karvonen (karvonen@email.wcu.edu). If you have any questions or concerns about your treatment as participants in the study, you should contact the chair of WCU's Institutional Review Board at (828) 227-7212 or irb@wcu.edu .

We will be happy to share the findings with you after the research is completed. If you would like to view these findings, please contact James Hutcherson, (james.hutcherson@sccnc.edu) and a copy will be sent to you upon request.

There are no known risks and/or discomforts associated with this study. The expected benefit associated with your participation is that the information gained may help your community college determine the direction it should take in sustainability initiatives. If the findings of this study are later shared publicly, (within the college, via publication or presentation, etc.), we will only be reporting data for groups and no individual identifying information will be disclosed.

Do not hesitate to ask questions about the study before participating or during the study. The deadline for you to complete this survey is _____. Your completion of the survey will confirm you are at least 18 years of age and signify that you consent to participating in this study.

Appendix E

Code Green/Sustainability Representative Interview Questions

1. What is your position at this campus?

2. What is your role in sustainability initiatives?

3. How long have you been at the college? In this role?

4. What environmental or sustainability awareness events have you held on campus in the last two years?

    a. Earth Day
    b. Other Environmental/Sustainability-Related Festivals (Explain)
    c. Environmental/Sustainability-Related Lectures (Explain)
    d. Environmental/Sustainability-Related Contests
    e. Other Environmental/Sustainability-Related Events (Explain)

5. What environmental or sustainability practices or programs has your school implemented? Explain. To the best of your knowledge, when did this practice/program begin?

Practice/Program	**Start Date**	**Comments**
Recycling		
Purchasing Sustainable Products		
• Non-Hazardous Cleaners		
• Recycled Content Paper		
Sustainable Policies		
Sustainable Procedures		
Strategic Planning Which Includes Sustainability		
Community Garden		
Composting		

Sustainability Awards		
Sustainability Website		
Sustainability Committee		
Sustainability Curriculum Programs/ Classes		
Sustainability-Related Continuing Education Programs/Classes		
Sustainable Construction Projects		
Renewable Fuels Vehicles		
Seeking Sustainability Related Grants		
Energy Conservation		
• Energy Efficient Lighting		
• Energy Efficient Computers		
• Automatic Lights Off Systems		
• Thermostat Setting Strictly Controlled		
• Energy Efficient Windows		
Food Service Use of Organic or Local Food		
Landscaping		

• Wildlife Habitat/Nature Trail		
• Native Plantings		
• Use of Non-gasoline powered Mowers		
• Integrated Pest Management (Use of Non-Harmful Chemicals)		
Campus Greenhouse Gas Inventory		
Campus Environmental Assessment		
Waste Minimization		
• Double Sided Printing		
• Paper Free Registration		
• Online Syllabi Instead of Paper		
• Paperless Schedules		
Water Conservation		
• Low Flow Toilets		
• Low Flow Sink Spigots/Shower Heads		
• Automatic Water Turn Off		
Environmental/ Sustainability Club		

Other Environmental/Sustainability Practice/Program		

6. Do you make students aware of these environmental/sustainable practices? If so, how, with what frequency, and when was the last time?
    a. Signage
    b. Prompts/Reminders
    c. Website
    d. Campus meetings
    e. Advertisements
    f. Commercials
    g. Other publications
    h. Other