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Impact of communication appeals on recycling behaviors among undergraduate students

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**PURDUE UNIVERSITY
GRADUATE SCHOOL
Thesis/Dissertation Acceptance**

This is to certify that the thesis/dissertation prepared

By Ning Zhu

Entitled

IMPACT OF COMMUNICATION APPEALS ON RECYCLING BEHAVIORS AMONG UNDERGRADUATE STUDENTS

For the degree of Master of Science

Is approved by the final examining committee:

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6/14/2016

Date

IMPACT OF COMMUNICATION APPEALS ON RECYCLING
BEHAVIORS AMONG UNDERGRADUATE STUDENTS

A Thesis

Submitted to the Faculty

of

Purdue University

by Ning Zhu

In partial fulfillment of the

Requirements for the Degree

of

Master of Science

August 2016

Purdue University

West Lafayette, Indiana

To my family and all my friends.

ACKNOWLEDGMENTS

First and foremost, I would like to express my sincere gratitude to my committee chair, Dr. G. Jonathon Day, for his consistent and strong support of my M.S. research. Dr. G. Jonathon Day's wide vision, prompt inspirations, and professional knowledge in academic research motivated me in developing my academic research. Especially, his guidance and suggestions with kindness, enthusiasm and overwhelming attitude to help his students have enabled me to overcome all the difficulties and finally complete my thesis.

I would like to give my deep sense of thanks to my co-Chair Dr. Liping A. Cai, for his guidance and encouragement on my research. His patience and care also helped me to go through the most difficult time period of my life and to focus on my research. I am also very thankful to Dr. Xinran Lehto, for her positive impacts on my view of academic research methodology. Her rigorous attitude in academic research set an example for me.

I would like to thank Ms. Judy A. Rechberger and Ms. Elizabeth C. Hagerman, for their assistance in polishing the thesis document. I also want to thank Mr. Zachary J. Hass and Mr. Hao Zhang from Department of Statistics, for their useful suggestions with the data processing progress. I want to thank my friends in HTM at Purdue University and in China, and my relatives as well, for their care, support and help all the time.

Finally, I owe my loving thanks to my father, Jianping Zhu, for his endless love, which would give me strength and hope to conquer all the fear and frustration in my life;

and my mother, Jing Zhang, for her companion and support, which would keep me making progress. Also, I would like to express my appreciation to my beloved Rui Li, for his unconditional help and support in my life.

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ABSTRACT

Ning Zhu. MS, Purdue University, August 2016. Impact of Communication Appeals on Recycling Behaviors Among Undergraduate Students. Major Professor: G. Jonathon Day.

The present thesis aims to understand factors influencing student recycling behaviors, and to investigate effective communication approaches to increase such behaviors. An online survey was conducted to examine the relationships between student recycling frequency in different contexts, students' attitudes toward the environment, barriers to their recycling, students' perceptions of communication messages, and communication media they think to be effective. Descriptive statistics, ANOVAs, *t*-test, simple linear regressions, categorical multinomial logistic regression, and a chi-square test were conducted, and the data was collected from a large land-grant university in the Midwestern United States. A total of 537 questionnaires were answered.

The main results of the present study are as follows: First, context as well as recycling barriers were factors that influenced student recycling behaviors. Most students who were likely to recycle at home would also recycle on campus, but students recycled more at home than on vacation. The main recycling barriers on campus were attitude barriers and knowledge barriers, while on vacation the main barriers were situational. Second, students thought positive messages were most effective in increasing recycling behavior, while students with less pro-environmental attitudes preferred neutral messages

“Clear, informative, and consistent bin infrastructure and bin labels” and “promotions such as recycling contests [and] competitions between departments or colleges” were found to be effective forms of communication. Additionally, when there were more significant factors such as the accessibility of recycling, student environmental attitudes did not play an important role in recycling behaviors on campus and on vacation. The study offers two practical recommendations. They are to increase recycling facilities and accessibility, and providing informative, clear recycling signs and labels with positive messages. Two suggestions are made for future research on the topic. They are to find factors that are more determinant than attitudes of environment about student recycling and to do more research on the usage of positive messages about student recycling behaviors.

CHAPTER 1. INTRODUCTION

University student recycling behaviors have been overlooked in studies although there has been a substantial amount of research on recycling behaviors in a variety of populations (Robertson & Walkington, 2009). Universities carry out recycling programs all over the world, but whether these programs have a real understanding of students' attitudes and recycling behaviors remains a question (Kodama, 2011). A university provides recycling infrastructures on campus for students, but to encourage students to increase their recycling behaviors it is necessary to understand students' recycling behaviors.

Understanding the factors that contribute to students participating in recycling is helpful to increase students' recycling behaviors (Lopeman et al., 2014). Many researchers have used students as subjects when studying individual recycling behaviors, but a few studies have directly focused on students' recycling behaviors (Goldenhar & Connell, 1992; Katzev & Mishima, 1992; Austin et al., 1993). Thus, the results of these individual recycling behavior studies can be used infer student recycling behaviors. Among the results of individual recycling behavior studies, there are three important factors that impact recycling behaviors. The first one is context. Researchers find that individual recycling behaviors vary in different contexts (Moore & Moore, 2001). Many studies focus on household, campus, and vacation recycling, but few studies have researched the influences of contexts on student recycling behaviors (Gonnerman et al., 2000; Recyclemania, 2009;

Erdogan & Baris, 2007). Studies on individual recycling behaviors find that recycling behaviors in household contexts correlate to recycling behaviors in other contexts (Peters & Kok, 2012), and individuals conduct less recycling compared to when at home (Dolnicar, 2010; Miao & Wei, 2013). The second factor is attitude toward the environment. Among the factors influencing recycling behaviors, attitude toward the environment is widely considered to be able to predict recycling behavior (Tonglet et al., 2004; Mannetti et al., 2004; Dunlap et al., 2000). It is also suggested to be an indicator of student recycling behaviors (Larsen, 1995). On the contrary, there is a study focused on predicting recycling behavior of student participants which shows that attitudes are not the most significant determinant (Chaisamrej & Zimmerman, 2007). To weigh attitudes toward the environment, the New Environmental Paradigm (NEP) Scale (Dunlap et al., 2000) is considered to be a valid measurement (Ogunbode, 2013), and the present study uses it to measure students' attitudes to environment. The third factor is barriers. To study the factors influencing recycling behaviors, many researchers have studied individual recycling motivations and a few have studied individual recycling barriers (Viscusi et al., 2011; Vining & Ebreo, 1990; McKenzie-Mohr, 2000). At the same time, researchers contended that there are no systematic barrier classifications for student recycling barriers (McCarty & Shrum, 1994; Robertson & Walkington, 2009; Lang, 2011). To understand student recycling barriers and overcome the lack of systematic barrier classifications for students, the present study adopts a systematic recycling barrier classification (WRAP, 2014) to detect student recycling barriers.

To know how to increase student recycling, one must understand student recycling behaviors, but one must also find out effective approaches for encouraging student

recycling. Researchers have studied how to increase recycling behaviors and given different suggestions (Luyben & Bailey, 1979; Oskamp et al., 1995; Viscusi et al., 2011). Among these suggestions, communication is a proven method to change or increase behaviors (Kotler et al., 2010). Effective communication process includes strategic messaging and using communication media (Kotler et al., 2006). To know the effective communication approaches that can increase recycling behaviors, strategic messaging and communication media are the focuses of this thesis. First, in strategic messaging, emotional appeals are often used as a communication method to increase individual recycling behaviors (Kim & Kim, 2013; Goldstein et al., 2007; Lee & Oh, 2013). However, the effectiveness of positive and negative emotional appeals varies in different studies (Leshner et al., 2010; Alhabash et al., 2013). Therefore, there is need to see which type of emotional appeal will increase student recycling behaviors. Second, students' attitudes of environment can influence their choices of effective emotional appeals, since the message processing procedures are different in their minds depending on their perspectives (Liebermann & Flint-Goor, 1996; Zajonc, 1984). Thus, students with different attitudes of environment may respond differently when asked which type of emotional message is more effective to increase their recycling behaviors. Third, communication media is found to be as important as the message in order to improve recycling behaviors (Lyer & Kashyap, 2007). Studies give different opinions on which communication media is the most effective in enhancing recycling behaviors (Chan, 1998; McKenzie-Mohr, 2000; Barber et al., 2014). A study conducted by Kaplowitz et al. (2009) at a university adapted communication media to campus situations, and found that "promotions such as recycling contests [and] competitions between departments or colleges" and "personal contact from mentors and

building staff to explain programs” are what students find to be the most effective communication media.

The purpose of the present research is to study student recycling behaviors and to help the University understand student recycling better. To be specific, first, the present study aims to understand factors influencing student recycling behaviors. Second, it aims to increase student recycling through finding out the effective communication approaches that students think can increase their recycling behaviors. To reach these aims, the present study proposes the following six research questions:

1. What factors contribute to recycling behavior?
 - a. Does context impact recycling behavior?
 - b. Does environmental attitude impact recycling behavior?
 - c. Do barriers impact recycling behavior?
2. What effective communication approaches encourage student recycling?
 - a. What type of emotional appeals do students consider to be most effective in increasing their recycling behavior?
 - b. Does environmental attitude impact the expected effectiveness of communication?
 - c. What are the most effective communication media according to students' opinions?

The present study offers an overview of undergraduate students' recycling behaviors and attitudes. It provides practical and effective methods for increasing student recycling in various contexts for university. It also fills research gaps in literature, enriching

student recycling studies through the use of systematic barrier classification to measure student recycling barriers, and providing examples of how to increase student recycling through communication.

CHAPTER 2. LITERATURE REVIEW

2.1 Recycling

2.1.1 Importance of recycling

Waste management became a public health priority in the early 1970s. By the end of the decade, it was reported that a typical American generated garbage that amounted to 600 times that of his or her adult weight (Hayes, 1978). There has been an increasing trend in trash production over the past 40 years. In the 1980s, Americans generated “over 150 million tons of trash per year at an average annual cost of \$4 billion” (Burn & Oskamp, 1986). The problem has continued to worsen. Waste production increased to 250 million tons per year in 2012 (United States Environmental Protection Agency, 2014). Using landfills is the most widespread solution for disposing of waste. Yet the number of landfill sites and their capacities are limited. Moreover, daily operation in some areas are not standard that related disposal practices are harmful to the environment, because landfill maintenance and operation regulations are restrictive (Otegbeye & Abdel-Malet, 2009).

A better alternative to landfills for disposal of trash is recycling. The importance of recycling and its benefits are clear and include saving energy and money, creating more jobs, and decreasing pollution (Ackerman, 1997). Burn & Oskamp (1986) identified two additional benefits of recycling: first, recycling saves land for more desirable use than that of landfills; second, recycling saves money and energy at a time when minerals and other raw materials are scarce and expensive. In the case of aluminum, for instance, Hill (1977)

declared that aluminum recycling saves over 95% of the energy necessary to produce aluminum. Recycling the metal also uses less water and creates less air pollution.

To increase recycling and its significant benefits, it is necessary to study individual recycling behaviors. When analyzing individual recycling behaviors, both internal variables (i.e., attitude, beliefs, and intentions) and external variables (i.e., physical environment, social and financial forces) need to be taken into consideration (Guagnano et al., 1995). In previous literature, many studies focused on the development of internal variables, such as attitudes or motivations, rather than external variables, such as environmental conduct (Berger, 1997; Dunlap & Van Liere, 1980). Most studies of recycling behaviors have been conducted for a particular product, tool, or specific material, such as paper or glass (Gonzalo Diaz & Asuncion Beerli, 2005). However, apart from these, external variables (such as physical location) appear to effect recycling behaviors as well (Moore & Moore, 2001). Thus, understanding individual recycling behaviors in different contexts and situations is important.

2.2 Factors Contributing to Recycling

Previous studies focused on individual recycling behaviors involving various factors. First, recycling behaviors are influenced by context (Moore & Moore, 2001). Certain contexts and their effects on behaviors are related, and it would be helpful to see the effects of context (Moore & Moore, 2001). The current study examines specific issues associated with recycling at home, on the University campus, and while on vacation. Second, environmental attitude is one of the factors widely thought to influence recycling behavior (Tonglet et al., 2004). Researchers contend that people who tend to exhibit

positive environmental behaviors are more likely to recycle (Oskamp et al., 1995). Third, a variety of motivations (i.e., monetary rewards), social norms, and community pressures encourage individuals to increase recycling behaviors (Viscusi et al., 2007; Robertson & Walkington, 2009). Fourth, there are barriers such as inconvenience and lack of access to recycling (McCarty & Shrum, 1994) and lack of knowledge and information (Burn, 1991) that prevent people from recycling. Individuals would be more likely to recycle if there were easier access to recycling facilities (Robertson & Walkington, 2009).

2.2.1 Recycling: Context and Situation

Given the importance of recycling and in order to know more about individual recycling behaviors, such behaviors in different contexts need to be taken into consideration. The present thesis will examine recycling behavior in the home as an important focus for current research. In addition, it will examine recycling behaviors on the University campus and will look at recycling behaviors while travelers are on vacation. In previous literature, individual recycling behaviors have been studied by many researchers in the household context; they thought “the social coordination of life, caring responsibilities, and time pressure are likely to dictate what people can and cannot do in terms of pro-environmental behaviors” while “such constraints may have a larger impact on some household members than others” (Longhi, 2013). Individual recycling behaviors are also studied by an increasing number of researchers in the context of campus recycling. Researchers realize that recycling on campus “protects resources necessary for health of the public and cultivates a healthy campus community with education beyond the classroom in mind” (Largo-Wight et al., 2012). Furthermore, vacationing is thought to be

an important context for individual recycling behavior as well, since its individual recycling behaviors differ significantly from those of the household context (Bratt, 2015). Therefore, household recycling behaviors, student recycling behaviors on campus, and tourist recycling behaviors on vacation are important contexts taken into consideration by the present study.

2.2.1.1 Household recycling

The current study includes recycling at home as a context for two reasons. First, individual recycling behaviors in this context are strongly correlated with recycling behaviors in other contexts (Peters & Kok, 2012). Second, there is the need to analyze household recycling behaviors because the great amount of household wastes calls for individuals to assess their recycling behaviors. The majority of municipal solid waste is from households and uses most of the municipal waste management resources (Karak et al., 2011). More than half of these solid wastes are recyclable, but a considerable amount of them are dumped into the trash (Mancini et al., 2007). Encouraging people to share the process of household recycling design is one of the most cost-effective methods to reduce household waste (Feo & Gisi, 2010). People's household recycling behaviors play an important role in household recycling programs. The success of household recycling programs is strongly affected by people's participation (Keramitsoglou & Tsagarakis, 2013).

Presently in the United States, large amounts of household wastes are recycled and go back to the consumption cycle (Jarnshidi et al., 2011). According to literature related to household recycling in the United States, nearly half of the population takes part in

community recycling programs (Glenn, 1998). A wide variety of research from different parts of the United States shows similar results. In Georgia, for example, 45% of citizens participate in recycling (Owens et al., 2000). Other literature presents household recycling behaviors from the perspective of recycling specific materials. As reported by Jenkins et al. (2003), in the United States 74.6% of households recycled newspapers, 66.5% of households recycled glass bottles, 63.2% of households recycled aluminum, and 54.2% of households recycled plastic bottles. A questionnaire in Iowa found that 83% of households knew of recycling programs and 51.7% of households recycled containers (Gonnerman et al., 2000).

To achieve the goal of making household recycling programs more effective, various researchers have focused on this concept by detecting the relationship between recycling participation and demographic variables (Pakpour et al., 2014). Factors such as higher household income, higher education levels, and smaller family size influence household recycling behaviors positively. Yet home ownership and shopping habits also influence household recycling behaviors (Domina & Koch, 2002; Owen et al., 2002). Other factors also affect household recycling, such as convenience; for example, the storage and transportation of separated household waste at home and in dorms (Jenkins et al., 2000). In addition, studies have shown that household recycling behavior is complex. Knowledge and attitudes are either not related or only minimally related to household recycling behaviors (Steininger & Voegtlin, 1976; Geller, 1981; McGuire, 1984; Finger, 1994).

2.2.1.2 Students and recycling at college

Recycling on campus is also important. First, although there has been a substantial amount of research about recycling behaviors and attitudes of environment in a variety of populations, college students as a population have been overlooked (Robertson & Walkington, 2009). Second, students are a large transient group, but they occupy a significant segment of the population and are worth investigating (Robertson & Wallington, 2009). Robertson & Walkington (2009) pointed out that “the environmental attitudes and behaviors of university students need to be investigated further in order to understand how to maximize the success of recycling and waste minimization schemes.”

For student recycling on college campuses, previous researchers have contended that recycling at universities and colleges is necessary. These locations are much like small cities that consume considerable amounts of resources and generate tremendous amounts of tangible waste (Recyclemania, 2009). Campuses generally recycle one third of the garbage that can be recycled and send to landfills or incinerate 60% of the rest of waste, a statistic that could reflect national figures (Creighton, 1998). Because “colleges have the potential to significantly contribute to a community’s waste stream,” on-campus recycling has a significant impact on public health (Largo-Wight et al., 2012).

On-campus recycling has become a mainstay for colleges and universities. Nearly all universities and colleges realize the significance of recycling on campus and provide the necessary recycling facilities and infrastructure for students, faculty, and staff (Mason et al., 2003). This helps promote recycling behaviors on campus. For example, universities and colleges offer receptacles to recycle paper, plastic, glass, and cardboard (Lounsbury, 2001). In particular, American university and college students have been “the leading

crusaders in the modern environment movement” (Thapa, 2001). Research has shown that a college education equates to higher environmental priorities (Dunlap et al., 2000; Casey & Scott, 2006). Such a priority has been determined to be a pro-environmental ethical imperative (Gigliotti, 1992). Moreover, previous literature revealed that students who recycle at home are likely to recycle on campus (Philippsen, 2015). At the same time, research pointed out that home is one of the resources that helps student receive information about recycling (Rainay, 1997). Hence, undergraduate students’ recycling behaviors on campus are worthy of investigation. There exists a relationship between household recycling and on-campus recycling, and in order to influence students’ recycling on campus, the present study examines current recycling barriers.

2.2.1.3 Recycling on vacation

The tourism industry uses a massive amount of resources and generates a substantial amount of waste (Jin, 2006; Metin, 2003; Trung & Kumar, 2005; Troschinetz, 2009; Hockett, 1995). This waste—solid waste, water waste and energy waste—affects the tourism industry’s operations by making tourism not sustainable (Shanklin, 1993). At the same time, tourism struggles to address energy efficiency, responsible waste management, water conservation, and communication (Erdogan & Tosun, 2009). To solve these problems, recycling could be a very efficient way—through sorting and recycling wastes, and encouraging tourists to increase recycling behaviors (i.e., to buy recyclables and to reuse goods)—to help decrease overall waste (Erdogan & Baris, 2007). However, little previous literature has focused on recycling behaviors particularly; instead, they have focused on “responsible tourism,” which includes “a broad set of tourist interactions that

engage with and benefit local communities and minimize negative social and environmental impacts” (Caruana et.al., 2014). Recycling behaviors (i.e., buying recyclable products and conducting waste sorting and recycling) (Nordlund & Garvill, 1999; Yu, 2010; Lee, 2011) during vacations is considered responsible tourism behavior. Recycling is recognized as one aspect of responsible tourism behavior.

2.2.1.4 Responsible Tourism and Recycling Behavior

Responsible tourism is defined as “tourism that recognizes the impacts of tourism on a destination and seeks to maximize the positive impacts and minimize the negative impacts” (Demaine & Warburton, 2006). The concept can be applied to green tourism, ecotourism, sustainable tourism, fair trade tourism, alternative tourism, and others. Its importance lies in its pursuit of environmental, social, and economic benefits (Responsible Tourism Partnership and Western Cape Tourism, 2002). Tourism providers have taken various steps toward realizing responsible tourism (Goodwin & Font, 2012; Jessen, 2013; Goodwin et al., 2012). Guidelines and books give instructions about cooperating and taking responsibility for one’s actions (Global Travel & Tourism Partnership South Africa, 2003; Spenceley, 2010; Association of Independent Tourism Operators, 2011).

Apart from the efforts of tourism providers, tourists need to behave responsibly while traveling (Karim, 2015). Researchers sometimes measure tourists’ responsible behavior by how much money tourists are willing to pay for responsible tourism (Weeden, 2002; Goodwin & Francis, 2003). Although responsible tourism has no standardized expectations, responsible tourism calls for recycling behaviors. Chan (1998) indicated that the roots of environmental problems are caused by human behavior rather than technical

issues. Tourists' recycling behaviors would be helpful in beginning to mitigate environmental problems. The Center for Sustainable Tourism (2012) also included recycling in United States travel care codes as guidelines: "Don't leave your good habits at home—while travelling, continue to recycle; use water wisely and turn off lights as you would at home."

However, a few previous studies show that individuals exhibit less pro-environmental behaviors while on vacation than when at home (Dolnicar & Grun, 2009; Dolnicar, 2010; Miao & Wei, 2013). "When households become tourists, their waste generation behavior changes, especially if they take package holidays" (Coggins, 1994); for example, in hotels, tourists bought snacks and drinks while hotels provided meals. "The hotel, thus, became the focus of large scale generation of food waste and packaging" (Coggins, 1994). Another example, according to a study related to sport event tourism, which collected 514 surveys, indicated that people's recycling behaviors decrease at sport tourism destinations in comparison to at their homes (Han et al., 2015). Previous literature explained the lower individual recycling behaviors on vacation as the conflicts between immediate individual and long-term collective interests (Nordlund & Garvill, 2002). Individuals not exhibiting recycling tourism behavior are motivated by immediate interest (i.e., saves time, and is comfortable and flexible.) Conversely, the positive environmental effects of recycling behavior come in the future (Nordlund & Garvill, 2002). Thus, analysis of students' recycling behavior on vacation is valuable to consider. Since the average tourist may not recycle as he or she does at home, it is important to compare student recycling frequency at home and on vacation.

2.2.2 Personal Factors Impact Environmental Behaviors

2.2.2.1 Worldview as an indicator of recycling behaviors

Considering the necessity for and benefits of recycling, scholars highlight factors contributing to recycling behaviors. Among these factors, environmental attitude is widely believed to be a significant factor in recycling. Researchers suggest a series of factors that might indicate the frequency of and willingness involved in people's recycling behaviors. There is one commonality: many researchers believe that a particular recycling behavior is related to a particular environmental attitude (Tonglet et al., 2004; Mannetti et al., 2004). Oskamp et al. (1995) summarized previous literature and described what type of people recycle: people who hold pro-environment attitudes, have environmental concerns, and have recycling knowledge; individuals who are younger, female, and more educated are more likely to recycle. A study conducted by Corral-Verdugo (2003) in northern Mexico showed that "some psychological variables—especially conservation motives—significantly indicated the recycling and reusing behaviors, although most of these are situational." Barr (2007) sorted factors that affect recycling behaviors as environmental values, situational variables, or psychological influence. Psychological factors, including underlying attitudes held by individuals toward the environment, individual characteristics, individual experiences, specific situations, and mind-sets were also related to recycling behaviors. According to Barr's research, people with positive attitudes of environment are more likely to recycle.

Environmental attitude is an indicator of recycling behavior. Measuring attitudes of environment is necessary when doing research about how to increase recycling. The New Environmental Paradigm (NEP) Scale (Dunlap & Van Liere, 1978) is an effective as

a method for measuring people's attitudes of environment for several reasons. First, it uses a quantitative score for measurement, so one's environmental attitude can be compared to another (Dunlap et al., 2000). Second, many studies show that the NEP scale is related to behavioral intentions and observed and self-reported pro-environmental behaviors (Ebreo et al., 1999; Moore & Rauwald 2002; Scott & Casey 2006). Studies indicate that the NEP scale has group validity; it can distinguish between members of the public and members of environmental groups (e.g., Mobley et al., 2010).

The attempt to measure people's attitudes of environment dates back to the 1970s. Researchers contend that people with pro-environmental beliefs take environmental action (Stern et al., 1995; Dunlap et al., 2000). After realizing the threat of environmental issues, Dunlap and Van Liere (1978) established a New Environmental Paradigm (NEP) Scale to measure the "fundamental view about nature and human's relationship to it." Dunlap et al. (2000) revised the NEP Scale to incorporate a more comprehensive ecological worldview and balanced measurement for pro-environmental orientation. The revised NEP scale contained 15 items from both consensus and debatable pro-ecological views. It measured "the endorsement of an ecological worldview" through three aspects: "humanity's ability to upset the balance of nature," "the existence of limits to growth for human societies," and "humanity's right to rule over the rest of nature" (Dunlap et al., 2000). The NEP Scale is accepted as valid and has been widely used (Dunlap et al., 2000). It provides statistical analysis via examining attitudes of environment and has been used for nearly 30 years (Lundmark, 2007).

The NEP Scale is considered a useful indicator of recycling behavior because it is a valid measurement of environment attitude (Ogunbode, 2013). There are many instances

of the NEP scales successfully indicating recycling behaviors. Chung and Poon (2001) used it in a survey to measure people's pro-environmental attitudes, successfully predicting their waste recycling behavior. Kennedy et al. (2009) concluded in their research that studies showed NEP scores positively affected support for environmental supportive behaviors, including recycling. Vining and Ebreo (1992) found NEP Scores of recyclers were lower than non-recyclers. Therefore, the NEP Scale can be effective to measure attitudes of environment and examine the relationship between such attitudes and subjects' recycling behavior.

2.2.2.2 Motivations and barriers to increase recycling behaviors

Separate from determining indicators of recycling behaviors, scholars have focused on finding incentives to increase individual recycling behaviors and reveal barriers that decrease individual recycling. To increase individual recycling behaviors, previous researchers have conducted many studies to discover motivations that promote recycling. They found numerous motivators that could increase recycling behaviors, including promotions, rewards, or monetary incentives (Luyben & Bailey, 1979; Oskamp et al., 1995; Viscusi et al., 2011). States with recycling laws (Bell et al., 2010) had a higher recycling rate as well. Social norms or community pressure encouraged people to recycle as well (Granzin & Olsen, 1991; Taylor & Todd, 1995). Communication, knowledge and information, and altruism and environmental concerns (Jacobs et al., 1984; Burn, 1991; Vining & Ebreo, 1990) also contributed to recycling behaviors. Ebreo et al. (1999) contended that arousing an obligation to protect the environment motivates people to recycle.

Many studies used students as subjects (Katzev & Mishima, 1992; Austin et al., 1993; Wright & Floyd, 1992; Robertson & Walkington, 2009; Largo et al., 2012), and the findings concerning students were threefold. First, the positive correlation of environmental attitude with recycling behavior applies to college students as well. Wright & Floyd (1992) found that college students with environmental concerns chose to recycle. Largo et al. (2012) also found that moral obligations and attitude toward recycling were most likely to be predictors of recycling behavior. Such feelings of obligation and positive recycling attitudes are important motivators of recycling. Second, social norms and community pressure enhanced students' recycling behaviors. The research of Robertson and Walkington (2009) revealed that influences from a student's family, friends, and housemates may increase students' recycling behaviors. Third, rewards increased student recycling behaviors. Studies conducted on students living in residence halls indicated that incentives created more participation compared to prompts and control scenarios. However, those studies found that recycling behaviors reverted to original levels once the rewards were removed (Katzev & Mishima, 1992; Austin et al., 1993).

Researchers identified barriers to recycling, paying attention to individual recycling. Tabanico and Schultz (2007) stated in their research that "it is surprising that so little attention is paid to the 'people' aspect of recycling programs." Many writers (Worrell & Reuter, 2014; Bluhdorn & Ingolfur, 1995; Ayres & Ayres, 2002; Limbachiya, 2004; Schlesinger, 2007) comment on the general phenomenon for all recycling stakeholders rather than the individual level. In determining barriers from all stakeholders' perspectives, it is arguable that several of these barriers can be overcome by individuals, such as "the low market place of recycled materials" (Worrell & Reuter, 2014). Other authors have

focused on a specific place and determined the recycling barriers on a macro level. For instance, Bluhdorn & Ingolfur (1995) used London as a case study and had a broad view of the barriers existing in the whole society. Other authors have focused on specific contexts, such as industry recycling (Ayres & Ayres, 2002), company recycling (Brown, 2005), or recycling of one specific material, such as glass (Limbachiya, 2004) or aluminum (Schlesinger, 2007).

For individual recycling barriers, some researchers have categorized barriers into external and internal barriers (Corbett, 2006; Schmuck, 2002). Such classifications stem from psychological research rather than social marketing (McKenzie-Mohr, 2000). Overall, there were few systematic categorizations in the extant academic literature for individual recycling barriers. However, the Waste & Resources Action Programme (WRAP), a registered charity in England, engaged in enhancing global sustainability by using resources more efficiently, classified barriers to recycling for individual and community recycling. After researching British recycling from 2008 to 2013, barriers were divided into four categories: “situational barriers, including inadequate containers, lack of space, unreliable collections, [and] no access to bring sites;” “behavioral barriers, including household disorganisation, too busy with other things, no established household routine and forgetting to sort waste or put it out;” “knowledge barriers, including not knowing what to put in each container and understanding the basic mechanics of how the scheme works;” and “attitude barriers, such as not believing there was an environmental benefit, viewing it as the council’s job not theirs, and not getting personal reward or recognition for their efforts” (WRAP, 2014). The investigation adopted such a classification to detect students’ recycling barriers for two reasons. First, the categorization

is concluded from both individual and community recycling research, comparing other recycling barriers research mentioned above. Thus, the categorization could fit individual recycling situations. Second, the research was conducted very recently. Therefore, the categorization is up to date and relevant the present research.

Many barriers mentioned in previous literature fit the WRAP model. First, one barrier often mentioned is the lack knowledge, termed “knowledge barriers,” according to WRAP. In the handbook by Worrell and Reuter (2014) about recycling, the researchers concluded that recycling barriers from all stakeholders’ views result from “technical origin, lack of knowledge.” Vining and Ebreo (1990) conducted a study that focused on individual recyclers and non-recyclers in Illinois. They found that a lack knowledge is one of the main barriers that prevented non-recyclers from recycling. Second, many researchers found inconvenience to be a significant barrier to students’ recycling (McCarty & Shrum, 1994; McCarty & Shrum, 1994); such cases are recognized as “situational barriers” in WRAP. Lacking of facilities, access, and environmental priority were also main barriers that prevented non-recyclers from recycling (Vining & Ebreo, 1990). For example, lack of a storage place was a reason for not recycling in one case (Williams, 1991). Robertson and Walkington (2009) revealed that the ease of throwing away waste and the distance to recycling facilities were main barriers reported by students that prevented them from recycling. In addition, Viscusi et al. (2011) found that the lack of recycling laws was a barrier to recycling after studying recycling rates in 14 states with mandatory recycling, 15 states requiring the development of a recycling plan, 6 states with a specific recycling goal, and 15 states with no recycling laws. A few other studies also mentioned that individual characteristics such as personal attitudes, levels of income, and levels of education are

potential barriers to recycling behaviors (Lakhan & Lavalle, 2002; Schaninger, 1981; Stern et al., 1993).

2.3 Impact of Persuasive Communication on Recycling Behaviors

2.3.1 Communication to Increase Recycling Behaviors

Among the methods discussed above to increase motivation for individual recycling, communication was an effective way to provide information and knowledge about recycling to help form positive social norms and persuade individuals to have positive attitudes toward recycling (Burn & Oskamp, 1986). Also, non-monetary methods such as persuasive communication were more important than monetary methods (Bergmund, 2006). Behaviors were difficult to maintain through incentives; people completely reverted back to old habits when incentives such as money, materials, or raffles were taken away (Luyben & Bailey, 1979). Communication was a better method for increasing recycling behaviors in the long term than providing incentives (Burn, 1991).

2.3.1.1 Definition of persuasive communication and its role in changing consumers' behavior

Understanding the role of persuasive communication to increase recycling behavior requires a review of existing issues about the concept. Persuasive communication is defined as “any message that is intended to shape, reinforce, or change the responses of another, or others” (Miller, 1980). Persuasive communication is “an attempt to change a person’s behavior, belief or feeling towards something or someone” (Mohammadi et al., 2013), playing a crucial role in changing attitude (Reardon, 1991). Persuasive communication to

change behavior is effective and widely used in hospitality and tourism marketing (Gossling & Buckley, 2016). For example, in previous literature, researchers used carbon labels, since a persuasive communication exercise found that carbon labels affect consumers' choices (Hartikainen et al., 2014). Carbon labels with sufficient persuasive communication and information let tourists make more climatically sustainable choices in tourism (Gossling & Buckley, 2016). Persuasive communications convey the right things to the right people in the appropriate ways (Delozier, 1976). The source and content of the message used to communicate—the media used to convey the message—is important in the persuasive communication process (Sparks et al., 2013).

2.3.1.2 Modified communication model to change consumer behavior

To help understand persuasive communication's impact on increasing student recycling behaviors, the present research will modify a previous persuasive communication model used to change consumer behavior. Alfred Korzybski (1958) published the initial persuasive communication model in 1933, the first linear model to transfer verbal description into a dynamic approach. This linear model describes that the source generates the message and sends the message to the receiver. This one-way model revealed that during the communication process, the source produced a message which was then sent to a receiver. Consumers are receivers, receiving messages and being persuaded or stimulated to adjust their behaviors. The present research is similar to the previous persuasive communication model. It emphasizes the influence of messages to change students' recycling behavior. However, different from the previous persuasive communication model, the present study attempts to examine how students consider the effectiveness of

positive appeal messages and negative appeal messages to change vacation recycling behavior. The study also contends that messages sent by preferred media may convince receivers to overcome recycling barriers and enhance recycling behaviors. Therefore, to better fit the present research purpose, modifications to the persuasive communication model were implemented to help generate a new model (Figure 2.1). Instead of the message in the initial persuasive communication model, positive appeal and negative appeal messages were adopted in the new model; the received negative appeal messages and positive appeal messages were stimulated and responded to respectively. Such an approach ensures that recycling behavior changes resulting from positive appeal messages and negative messages are distinguishable. Such modifications help show the difference between the two kinds of messaging and which one is more suitable to the present research.

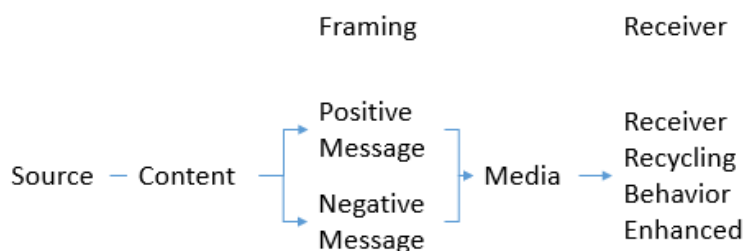


Figure 2.1 Modified persuasive communication model.

2.3.2 Persuasive Communication Strategies

Strategies exist to enhance the effectiveness of persuasive communication. Kotler et al. (2006) contended that “a company's total marketing communications program consists of a specific blend of advertising, sales promotion, public relations, and personal selling” to achieve advertising and marketing objectives. According to previous studies, persuasive communication strategies are plans, containing a series of steps to communicate

specific issues and information to the audience (Klein, 1996; Lee & O'Connor, 2003; Chen & Xie, 2008). Kotler et al. (2006) included steps in effective persuasive communication strategies from previous studies and provided six steps for marketing communicators to follow: “(1) identify the target audience, (2) determine the communication objectives, (3) design the message, (4) select the communication channels, (5) select the message source, and (6) measure the communications’ results process.” To communicate to students about increasing their recycling behaviors, messages and selections of communication media are important strategies in the process.

2.3.2.1 Persuasive communication strategies in public service announcements

The effectiveness of communication strategies is not only studied by researchers in laboratories but also used to change consumers’ daily lives. Using emotional message appeals in public service announcements, for example, successfully draws public attention to security information. To more effectively change public behaviors, public services choose to communicate with people. Communication strategies are commonly used as basic mechanisms in the composition of messages that influence beliefs. Individuals hold a variety of beliefs, attitudes, and behaviors. Public communication campaigns include topics that cover personal, health, and social issues—such as equal opportunity, energy conservation, and environmental protection. Such a strategy is understood as “...influence behaviors of large audiences within a specified time period using an organized set of communication activities and featuring an array of mediated messages in multiple channels generally to produce non-commercial benefits to individuals and society” (Atkin & Rice, 2012). The researchers communicate with the public and educate people to act in more

appropriate ways by using emotional appeals. For instance, Metro Trains in Melbourne made a short video advertisement called “Dumb Ways to Die” to promote rail safety. The plot and lyrics relied on positive (humorous) and negative (fear) appeals. The audience did not want to hear any kind of safety message, but this approach successfully communicated to the public. It received over 28 million views within two weeks and generated \$50 million worth of global media (Moses, 2012). By using communication strategies, they achieved their objectives: to communicate with the public and encourage the individuals to think about rail safety. From this example, one can see that by using messages and media, consumer behavior can be influenced. The effectiveness of emotional appeals to change consumer behavior is evident in the case study. The method needs to be analyzed by models.

2.3.3.2 Message strategy

Message strategy has two components: creative strategy and message appeal. Frazer (1983) proposed creative strategy as a policy or guideline that decided the nature and character of the message by choosing the creative tools that were expected to generate desired reactions by target audiences. Taylor (1999) explained the message strategy to be “what to say” while the creative strategy combined both “what to say” and “how to say it.” According to researchers, message strategy and creative strategy are not the same (Taylor, 1999). However, many scholars considered the message strategy as a term to convey the nature of message appeals (Liebermann & Flint-Goor, 1996; Lee & O’Connor, 2003; Swani, Milne & Brown, 2013). Furthermore, scholars agree to divide appeals into two categories: rational and emotional. Rational appeals are informative messages that provide

relevant details, facts, and figures; emotional appeals tend to make connections between purchase decisions and psychographic needs of people (Liebermann & Flint-Goor, 1996).

Appropriate message framing could affect consumers' buying behaviors. Researchers believe framing of message appeals can affect human psychology and behaviors. Some studies used recycling as the content of experimental materials for subjects to read. For example, Bessarabova (2010) used anger-framed messages versus messages without appeals to test the reactions of subjects. The angry message appeals were successful in that case. Prior researchers in environmental communication asked, "How can we structure environmental communications to motivate individuals to more consistently act on their beliefs, thereby increasing their participation in environmentally-responsible behaviors?" (Davis, 1995). Davis tested subjects by framing messages with the feeling of achievement and gain versus loss (giving more versus taking less). He focused on current versus future generations in the first segment of the study to examine the effect on green shopping, conservation, and recycling. The second segment of study focused on future generations and showed that messages with appeals of gain were the most effective to influence subjects' conservation, green shopping, and recycling behaviors. Consumer behaviors were improved by this gain-oriented message appeal. People reading emotional message appeals think more about the environment and generate feelings of environmental protection. Therefore, messages with emotional appeals could affect their related behaviors.

2.3.2.3 Emotional message appeals

Most researchers have agreed that appeals originate in human emotions and have analyzed the effects of the messages. These messages exist in different activities, brand

images, and markets. Some of the research found specific message appeals increased message effectiveness. According to O’Keefe (2002), persuasive messages deliberately involve emotions (i.e., fear, hope, shame, guilt, and fear) and “... have a common underlying idea, namely, that one avenue to persuasion involves the arousal of an emotional state (such as fear or guilt), with the advocated action providing a means for the receiver to deal with those aroused feelings.” There are diverse explanations and classifications of emotions, as researchers have chosen different ways to study the appeals of emotional messages. Psychologists have not reached a consensus on the meaning of emotion. They have used the same definition to express different meanings, processes, and functions; however, such an approach results in a variety of theories. Generally, there are two main approaches to designing emotion models: a categorical approach and a dimensional approach. The categorical approach is an adaptive response to the stimuli during the individual evolution process, suggesting that complex emotions were formed from basic emotions—happy, sad, angry, fear, disgust, and surprise—or elementary emotions, which are innate in human beings and animals. Complex emotions are the result of interactions between basic emotions and cognitive evaluations (Ekman & Friesen, 1971). The emotion dimension is ambiguous to describe the emotional experience.

The Positive Affect and Negative Affect (PANA) model differs from these approaches. Watson and Tellegen (1985) proposed the PANA model, which suggested two independent dimensions: positive affect (PA) and negative affect (NA). For example, the positive affect included the following adjectives: attentiveness, interested, alert, excitement, enthusiastic, inspired, pride, determination, strength, and activity; while the negative affect included distressed, upsettedness, hostility, irritability, fear, shame, guilt, and nervousness

(Watson, Clark, & Tellegen, 1988). The present study adopts the emotional appeals of the PANA model, dividing emotion into two categories and examining messages conveyed by different emotions. In addition, the effectiveness of emotional appeals can be explained by the Elaboration Likelihood Model (ELM) developed by Petty and Cacioppo (1986). The ELM of persuasion is to study consumers' information processing. This model allows one to understand how attitudes are formed or changed. The ELM explains how a persuasive communication message works when individual motivation and capacity to understand the message is strong and weak respectively. According to the ELM, there are two extreme information processing routes; one is a central route and the other peripheral. When processing any message, the central route works when a consumer has strong motivations and capacity to understand the message. The route involves internal and external searching and focuses on analyzing the message content to draw conclusions. The peripheral route is utilized when a consumer has weak motivations and capacity to understand the message; therefore, he or she is unable to cognitively process the message content. The model also uses peripheral cues, such as credibility and attractiveness of the message (Petty & Cacioppo, 1979). Peripheral routes apparently play roles in changing attitudes. Attitudes can be influenced by peripheral cues, providing implications and guidance for consumers to draw a conclusion and believe in his or her own decision (Griffin, 2012). Considering the nature of the aforementioned rational message appeals and emotional message appeals, "central processing procedures would be activated in order to cope with a rationally oriented message, whereas peripheral processing procedures were expected to be put into operation for treating an emotionally oriented message" (Liebermann & Flint-Goor, 1996; Pallak et al., 1983). Thus, emotional message appeals, which can arouse the peripheral

route, play a critical role. In the Elaboration Likelihood Model, many approaches are available for emotional message appeals to influence central processing over peripheral processing (Donohew et al., 1988).

As discussed for the ELM model, differences among people influence the effectiveness of message appeals on their behaviors; different message appeals have varying effectiveness on changing a range of consumer behaviors. Studies have suggested that people with different attitudes or characteristics respond to positively and negatively framed messages differently. For instance, one study suggested people with a low need for cognition tended to be persuaded by negative messages (Buda & Chamov, 2003). Another study showed that people with strong self-esteem were more persuaded by a positively framed message, and people lacking high self-esteem were easier to convince with negatively framed messages (Aaker & Lee, 2001). Customers of a credit card company who had not used (or lost) their cards in the past three months found negatively framed messages more powerful than positively framed messages (Ganzach & Karsahi, 1995). Accordingly, the ELM may explain how emotional message appeals work on different people, especially concerning recycling behaviors. This finding relates to the relationship between students' initial attitudes of environment and the type of message students thought would most encourage recycling.

2.3.2.4 Positive message appeals for changing recycling behavior

Previous studies have revealed that two different message types were effective with consumers. There have been studies on the references of persuasive communication resources indicating that positive message appeals are more effective. For example, a study

found people are found to be more likely to get involved in anti-cyberbullying after reviewing comments with positive message appeals on Facebook (Alhabash et. al., 2013). Another example is that researchers suggested doctors use positive message appeals when designing health messages with the aim of changing public health behaviors (Monahan,1995). Positive messages have been found to be more effective to change public health behaviors. Many kinds of positive message appeals have proven to be effective for changing behaviors. For example, humorous message appeal is effective in promoting cancer self-examination behavior (Nabi, 2005); hope message appeal is suggested to change consumer behavior by constructing the hope that products will allow consumers to achieve their goals (MacInnis et al., 2004). Another example is altruistic message appeal.

Researchers discovered that altruistic message appeal stimulated the response rate of monetary reward marketing surveys (Schneider & Johnson, 1995). They also found that mail surveys with altruistic message appeals receive larger return rates (Kerin & Harvey, 1976). Others noticed that altruistic message appeal "...causes individuals to think more about the implication of their behavior," thereby increasing response and completion rate (Webster, 1997). Existing literature about altruistic behavior shows that empathic concerns produce results. Skumanich & Kintsfather wrote:

The bystander is motivated to reduce the victim's distress and behaviorally engages in altruistic helping, regardless of the opportunity for escape. Thus, altruistic behavior has as its end goal the welfare of the victim. Although such altruistic helping may produce feelings of personal satisfaction or relief, personal gain is regarded as a by-product of the behavior rather than an end goal (1996).

Altruistic appeal may be consistent with people's motivations for many activities such as organ and blood donation or responding to a mail survey (Reinhart et al., 2007; Kerin & Harvey, 1976). Altruistic feelings stimulate people to think about victim welfare and respond positively (Skumanich & Kintsfather, 1996). Such altruism also could be consistent with consumers' motivations for protecting the environment and recycling. Those consumers stimulated by altruistic feelings think of the public (victim) welfare and respond to the altruistic message with a desire to engage in protecting the environment and recycling. Therefore, altruistic message appeal is a positive option that may encourage students to recycle.

2.3.2.5 Negative message appeals for changing recycling behavior

A substantial number of other studies support that negatively framed messages are more effective than positively framed ones. For example, research concerning the advertisement of a product that enables early detection of a disease reveal that negatively framed messages are more persuasive than positively framed ones (Cox & Cox, 2001). In another example, Leshner et al. (2010) found that negative messages (fear and disgust) are most effective in anti-tobacco campaigns. Some other studies indicated that negatively framed messages were more effective when respondents had less of an opportunity to process the information in the message. Inversely, they were less effective when respondents had more opportunity to process message content (Shiv, Britton & Payne, 2004). In addition, the intensity of the negative appeal language matters. To be specific, researchers paid particular attention to overused negatively framed messages. They concluded that overuse of a negative emotional appeal can involve negative consequences.

Turner and Underhill (2012) chose guilt as an appeal to encourage emergency preparedness behaviors. They concluded that a moderate use of guilt appeal can bring about positive effects, while its overuse is negative. Some other researchers mentioned overused negatively framed messages were less effective compared to positively framed messages. Brennan and Binney (2010) specialized in fear, guilt, and shame appeals used in social marketing; they suggested that negative emotional appeals are overused. Additionally, negative messages were found to be less effective than positive messages when they were overused (Robberson & Rogers, 1988; Siegel & Lotenberg, 2007). Different impacts for positive message appeals and negative message appeals may be related to the different information procedures. Negative emotions are processed earlier and more rapidly, while positive emotions are processed later and more thoroughly (Zajonc, 1984; Lazarus, 1984).

Fear, guilt, shame, and shock are commonly used emotions in negative message appeals. Different from altruistic appeals, which commonly emphasize how one's conduct can benefit others, such appeals can be especially persuasive. Guilt appeals often emphasize how one's conduct can harm others because having harmed another person is a common source of guilt feelings; these appeals may backfire however" (Reinhart et al., 2007). "Guilt appeal refers to messages that evoke guilt through attributions of responsibility for those negative consequences" (Block, 2005). Guilt appeal is a prevalent persuasion technique (Edmondson, 1986) used in advertisements, increasing purchase behaviors, and research related to changing behaviors, volunteerism, and charitable contributions (Brennan, & Binney, 2010; Robin, 1995). Guilt appeals are pervasive in advertising (Huhmann& Brotherton, 1997), and researchers have found that moderate guilt message appeals in advertising actually change consumers' purchasing behavior by

increasing their purchase intentions (Coulter & Pinto, 1995). Guilt appeal was also found to be helpful in increasing consumers' donor intention in charitable giving (Hibbert et al., 2007). Izard et al. (1977) proposed that one generates guilt feelings that can be described as torturous when one does wrong and wishes to amend the situation. Guilt can subside after the situation is modified. That could explain why guilt message appeals are effective under such circumstances. One may infer that guilt appeals also may be effective to increase students' recycling behavior. Consumers processing a message about recycling with guilt appeal might assuage their guilt feelings by increasing their recycling behavior.

In contrast to the wealth of studies concerning how positive and negative messages influence consumer behavior, studies are lacking about on how positive and negative messages influence recycling. Some studies have featured environmental issues or the use of environmental materials as content that focuses on the effectiveness of positively framed and negatively framed messages. As for recycling, a few researchers have chosen several specific appeals to represent positively or negatively framed messages. Others have examined specific appeals separately. For example, Bessarabova (2010) examined threat appeal. Some researchers used gain and loss to represent positively and negatively framed messages (e.g. Davis, 1995). Some of them adopted other classifications for message appeals (e.g. Loro, 2007). Scholars who research recycling behavior used fear and satisfaction as representatives of negative and positive appeal messages with household recycling rather than recycling in tourism (e.g. Lord, 1994).

Even though other studies have been conducted using persuasive communication with respect to different aspects of recycling related to tourism, most of them focused on recycling in green practices of hotels. Many researchers focused on message appeals

related to lodging. For example, Goldstein et al. (2007) chose messages geared toward environmental protection, social responsibility for future generations, environmental cooperation, and benefits for the hotel to implement linen-reuse programs. Research by Kim & Kim (2013) shed light on the effects of gain and loss message appeals to increase hotel recycling and other green behaviors. Lee and Oh (2013) studied effective communication strategies to encourage hotel guests' green behavior and summarized message framing and various theories. They proposed that "... a loss-framed, low level construal message may be effective, while a gain-framed, high level construal appeal may be more effective for promoting." Some studies focused on recycling garbage using bins provided at recycling facilities. For example, Thomas et al. (2003) conducted a study whereby the recycling facilities were sufficient to determine what makes people recycle. One of the most important results was awareness and information about recycling, indicating the significant effect of appropriate messaging. Other research focused on water recycling. Price et al. (2011), for instance, studied the effectiveness of complex one-sided and two-sided messages about recycling water.

2.3.3 Content of Communication Messages

Message content is as important as message appeals. Quality of information and recycling information contained in a message are crucial. Hansmann et al. (2009) cited the research of Schwartz (1977), which suggested that people behave responsibly when they are aware of relevant consequences. Hansmann et al. contended that, for the purpose of conducting recycling communication, "pro-recycling communication should promote social and personal norms and make people aware of the consequences of their behavior

and make them feel personally responsible for these consequences” (2009). In the following survey experiment and experiment in the virtual world, findings are similar: the most important characteristic of effective recycling communication was an informative, comprehensive message. Also, fact-based messages received better results, consistent with other research regarding recycling communications. Thomas et al. (2003) and Butterworth and McDowall (2012) determined that the key issues that prompted people to recycle included clear information. Butterworth and McDowall (2012) and Werner et al. (1998) proposed that making behaviors seem easy can enhance recycling behaviors. The present research takes into account thesis findings for its own methodology to increase the effectiveness of recycling communication. Content of the messages includes information related to recycling, sound argumentation that reflects the ease of recycling, leverages of the environmental impact of recycling, and the emotional benefits of such a course of action.

2.3.4 Communication Media

In addition to how the message is framed, both in terms of its content and emotional tone, the media can also play a role in the pursuit of effective communication. Effective communication media is an essential component of such a communication strategy. It is as important as the content and format of the recycling message to improve recycling behaviors successfully (Lyer & Kashyap, 2007). However, although many media have been used to study communication effects in recycling programs, they have been often chosen on the basis of project budgets or researchers’ preferences (Kaplowitz et al., 2009). To increase the effectiveness of communication, communication media should be designed and used to adapt to users (Cook, 2013). Thus, target audiences’ preferences for

communication media in recycling programs are worthy of study. The present study attempts to determine which media is best for changing student recycling behaviors.

In previous literature, opposing perspectives emerge concerning which media is most effective for recycling. Mass media such as television, newspapers, and magazines were found to have equal the influence as family members, friends, and neighbors in waste recycling research (Chan, 1998). In contrast, other researchers have found that mass media is effective in generating public awareness but limited in fostering behavioral changes (Edward et al., 1990; Costanzo et al., 1986). McKenzie-Mohr (2000) supported this negative viewpoint about mass media in relation to promoting pro-environmental recycling behaviors. Instead, social marketing, such as workshops and internet presence, designed by a psychologist for the target groups, worked more effectively.

Arguments exist for cheaper media channels, such as fliers, local press, and mailing. Read's (1999) study declared that unsolicited mailing is treated as junk mail, left unread, and discarded. He also found that leaflets and newspapers in a local council door-to-door promotional campaign are ineffective. However, in research by McDonald and Ball (1998), using leaflets increased recycling behaviors, while the local press did not reflect improved actions. Research published by Mee et al. (2004) found that using media mail shots, internet ads, and roadshows may increase recycling rates by nearly 40%. Some other studies suggest that the prevalent social media has become effective in promoting recycling. For example, Barber et al. (2014) studied the importance of recycling among American festival participants and proposed to engage local youth in social media to increase recycling assistance.

To choose the most effective media on recycling, specific target audiences need to be considered. Howenstine (1993) declared that public recycling programs need target audiences. The effectiveness of recycling communication depends on which channel is used for which group of people. The present research aims to identify the most effective communication channels for sharing recycling messages with students. The most effective media on improving recycling behavior for students is similar to a study conducted by Kaplowitz et al. (2009) at Michigan State University. In their study, “survey items were designed to measure respondents’ perceived effectiveness of a range of communication options as well as gauge respondents’ preferred media for receiving campus recycling information” (Kaplowitz et al., 2009). In their survey, communication media were chosen to adapt to campus situations, which considered features of current campus recycling programs. At the same time “personal contact from mentors and building staff to explain programs” and “promotions such as recycling contents competitions between departments or colleges” are selected to be the most effective communication media according to their study (Kaplowitz et al., 2009).

2.4 Research Objectives

The objectives of the present study are to understand student recycling and enhance student recycling behaviors.

1. What factors contribute to recycling?
 - a. Does context impact recycling behavior?
 - b. Does environmental attitude impact recycling behavior?
 - c. Do barriers impact recycling behavior?

2. What effective communication approaches encourage student recycling?
 - a. What type of emotional appeals do students consider to be most effective in increasing their recycling behavior?
 - b. Does environmental attitude impact the expected effectiveness of communication?
 - c. What are the most effective communication media according to students?

CHAPTER 3. METHODOLOGY

3.1 Research Design

In order to address the questions outlined in the literature review, this research used a non-experimental, quantitative survey. The advantages of the non-experimental, quantitative survey are low cost and minimal time, avoiding interviewer bias, having accurate results, providing privacy to participants, and low sample size for the population (Salkind, 2005). This research utilized an online survey by Qualtrics for two reasons: First, its economic advantages (Selm & Jankowski, 2006). It was efficient and inexpensive compared to paper-and-pencil surveys. Second, it was an easier tool for approaching college students (Selm & Jankowski, 2006), the subjects of this research. Other advantages included that the researcher did not need to complete data entry because respondents' opinions are stored electronically. Also, it was convenient for respondents to answer (Metha & Sivadas, 1995; Brennan et al., 1999). A non-experiment method suited this research because this paper examines the relationship between variables, and these relationships were not causal. Non-experimental research could describe non-causal relationships between variables (Salkind, 2005). In order to answer the research questions mentioned in the literature review, this study employed descriptive and correlational survey design. Descriptive design was used here because "descriptive research design describes the current state of some phenomenon;" it gave a big picture of a phenomenon (Salkind, 2005). This paper identifies students' recycling barriers on campus and on vacation as well

as the most effective communication messages and channels to address students' recycling. At the same time, this paper uses correlational design, which "... describes the relationship between variables" (Salkind, 2005). This research incorporated correlational design to explore the relationships between variables related to student recycling.

3.2 Questionnaire Design

This questionnaire included six parts: an NEP attitude survey, recycling frequencies in three contexts, a recycling barriers attitude survey of behaviors on campus and on vacation, recycling message preference, a recycling channel attitude survey, and demographic questions.

3.2.1 NEP Attitude Survey

The NEP attitude survey aimed to reveal participants' initial general environmental orientation. The results of this questionnaire revealed participants' basic motivations and abilities to protect the environment. Thanks to the Elaboration Likelihood Model, this information helped to infer the conditions of participants' central route processing procedures. This survey included a revised NEP scale (Dunlap et. al, 2000). The NEP focused on "beliefs about humanity's ability to upset the balance of nature, the existence of limits to growth for human societies, and humanity's right to rule over the rest of nature" (Dunlap et al., 2000). The revised version included two additions: a more balanced and wide-ranging ecological worldview and less outmoded terminology (Dunlap et. al, 2000). The purpose of this NEP scale fitted the aim of the survey and this study as a whole. It included 15 items from both consensus and debatable pro-ecological views. Levels of

agreement in each category varied from 1 (“Strongly Agree”) to 5 (“Strongly Disagree”). Even-numbered categories had been reversed to be consistent with odd-numbered categories, since odd-numbered statements were pro-environmental while even-numbered ones were not. Thus, the lower the score of each category, the more agreement on the pro-environmental side of the statement.

3.2.2 Recycling Frequency in Households, on Campus, and on Vacation

In order to know student recycling behaviors in households, on campus, and on vacation, the present study gave questions to see student recycling behaviors under different situations. It adopted the question used in the Azil et al. (2015) research, which asked participants to rank their frequency of recycling. In order to make this question fit into the present research on recycling in households, on campus, and on vacation, it asked students to choose their recycling frequency under each context separately. It also adopted categories used in previous studies ranging from “Never” to “Always” (e.g., Azil et al., 2015). In Azil and colleagues’ study, recycling frequency was divided into five classes: “Never,” “Seldom,” “Sometimes,” “Most of the Time,” and “Always.” Recycling frequencies here were categorical variables. This recycling frequency classification could be viewed as an indicator of student recycling behaviors.

Self-reported recycling frequencies were detected by the questionnaire in the present study. Self-reported recycling frequency is an established determinant of environmental behavior (Gatersleben et al., 2002, Murphy & Olson, 2008; Rispo et al., 2015). There were two benefits for using self-reported recycling frequency to study environmental behaviors: the ease of use and the low cost and flexibility (Kormos &

Gifford, 2014), as well as the effectiveness: “simply asking participants to report, for example, how often they engage in a particular environmentally relevant behavior along a scale from Never to Always is an easy way to obtain information about that behavior” (Kormos & Gifford, 2014).

3.2.3 Recycling Barriers on Campus vs. on Vacation

As discussed in the literature review, this paper adopted WRAP’s (2014) barrier classification. This barrier classification was up to date and fitting for individual and community recycling (WRAP, 2014). Questions found in different studies fitted the desired classifications (Kaplowitz et al., 2009; Martin et al., 2006; Talor & Todd, 1995; McGain et al., 2012; Jesson, 2009). These questions were modified to University student recycling contexts on campus and on vacation. A series of questions examining attitudes on recycling conducted at Michigan State University was included (Kaplowitz et al., 2009). Attitude surveys were conducted to know individuals’ preferences concerning a particular event, person, or object (Salkind, 2005). The attitude surveys in this research examined participants’ thoughts on potential recycling barriers on campus and on vacation. Likert scales are the most popular attitude scales (Salkind, 2005), because they are simple to perform and widely used (Likert, 1932). Instead of the original five Likert scales, seven Likert scales were adopted in this research, since Nunnally (1994) suggested more scale points are better up until 11 points, when such benefits diminish. A seven-point balance avoided too many response options and provided plenty points of discrimination.

3.2.4 Emotional Message Appeals

To determine whether positive message appeal or negative message appeal was more effective in changing behavior, a pair of message appeals were chosen to represent a positive (altruistic) message appeal and a negative (guilt) message appeal respectively. Because high intensity guilt messages resulted in negative feelings such as anger, and led to a diminished influence (Pinto and Priest, 1991; Coulter & Pinto, 1995), this study used moderate guilt appeal. In order to correspond to the moderate guilt message appeal, this study also adopted a moderate altruistic message appeal.

3.2.4.1 Preferred emotional appeals

In order to know which is the preferred emotional appeal, according to participants' perspectives, to improve recycling behavior on campus, one moderate altruistic message, one neutral message, and one moderate guilt message were provided for students to choose from. This survey was inspired by Davis's (1995) research on the effects of message framing in environmental communications, which compares the effectiveness of gain-framed messages and loss-framed messages. These moderate choices resulted from the following preliminary survey, which discovered the most effective message appeal from students' perspectives.

3.2.4.2 Preliminary survey to choose moderate emotional message

A preliminary survey was undertaken to determine appropriate moderately positive and negative message appeals. There were guilt and altruistic messages with different appeal intensities to choose from. This idea was based on Turner and Underhill's (2012)

approach, which used sentences and phrases such as “your forgetfulness cost everyone,” “being completely selfish,” “there is just no excuse,” and “have an obligation to do” (Turner et.al., 2010) to increase guilt intensity (Turner & Underhill, 2012). Guilt messages that should neither make them respondents “no guilt” nor so guilty to feel angry or resentful were asked to choose, while high intensity guilt messages resulted in negative feelings (i.e., anger), and led to a diminished influence (Pinto & Priest, 1991; Coulter & Pinto, 1995) As for altruistic messages, Johnson and Schneider’s (1995) altruistic appeal phrases and sentences were used, such as “your help is needed” and “thanks for your assistance” to increase altruistic intensity. Altruistic messages, in accordance with the name, had the quality of unselfish concern for the welfare of others and were asked to choose. The messages’ contents were adapted to the context of improving recycling on campus. Also, the preliminary survey contained questions related to participants’ current academic standing, gender, and age for references. The preliminary survey conducted to choose moderate messaging was implemented at a large land-grant University in the Midwestern US. The convenience sample was 59 undergraduate students.

3.2.5 Media to Increase Recycling Behaviors

This survey question was adopted from the recycling survey conducted at Michigan State University (Kaplowitz et al., 2009) to ascertain students’ preferences for recycling communication channels. It offered 6 kinds of common media on campus for student to choose from. There were five scales from “Very Ineffective” to “Very Effective,” which represented scores 1 to 5.

3.2.6 Demographics

The last part of the questionnaire collected demographic information, including age, college in the University, academic standing, and gender. These questions aimed to determine students' basic information and, at the same time, examine the representativeness of the sampling method.

3.3 Sampling and Data Collection

The subjects for the survey were recruited on campus, and the convenience sample method was adopted. A random selection of 6,000 students' email addresses from the spring 2015 undergraduate enrollment period was supplied by the University's office of the registrar. An email with the survey URL was sent to the email addresses. Two email reminders were sent to non-responders, following the Dillman (1978) modified technique to increase respondent rate. All responses were kept confidential and respondents were not required to answer all questions. Participants could skip any of the questions. In the end, 537 participants answered the survey and about 71.89% completed the entire survey. The demographic results were examined for convenience sample representativeness of the University.

3.4 Data Analysis

The present study employs statistical techniques to investigate research questions respectively as following:

1. What factors contribute to recycling behavior?

- a. Does context impact recycling behavior (chi-square, *t*-test)? The Chi-Square test is used to examine the differences between categorical variables (Yates, 1934). It is used for two kinds of comparisons; one is the test of goodness of fit and the other one is the test of independence. This paper employs a test of independence. This test examines whether paired counts for two categorical variables are independent to or dependent on to each other. A paired *t*-test is used to compare the differences between population means of two sets of paired samples (Goulden, 1956). A paired *t*-test is used when there is one measurement variable and two nominal variables.
- b. Does environmental attitude impact recycling behavior (simple linear regression)? Simple linear regression is used here to model and predict the relationship between two variables. In order to judge whether students who get lower NEP scores (who agree with proenvironmental statements) will be more likely to recycle on campus, the correlation between a student's NEP score and recycling behavior on campus is examined.
- c. Do barriers impact recycling behavior (ANOVA)? Analysis of variance (ANOVA) is used to detect differences between more than two independent groups of means (Moore et al., 2012). This paper employs a one-way ANOVA. A one-way ANOVA has one independent variable with more than 2 conditions. In order to find the most likely kind of barriers for Students to reduce recycling behavior on campus, a one-way ANOVA is employed to measure whether there are significant differences among student recycling barriers on campus.

2. What are effective communications approaches to encourage student recycling?

- a. What type of emotional appeals do students consider to be most effective in increasing their recycling behavior (descriptive statistics)? Descriptive statistics are used here to find out emotional appeals consider by students as the most effective to increase recycling behavior.
- b. Does environmental attitude impact the expected effectiveness of communication (categorical multinomial logistic regression)? Categorical multinomial logistic regression is a method that generates logistic regression for a categorical dependent variable and multiple independent variables (Long & Freese, 2006). It can be used to predict the correlation between dependent and independent variable in the following form: $l_n \left(\frac{P_{y_i}}{P_{y_1}} \right) = b_0 + b_1 x_i + \varepsilon_i$. This paper employs this method to examine the listed research questions instead of other methods, such as simple regression. This method is applied for two reasons. One is that a dependent variable is categorical; the other is that independent variables are multiclass.
- c. What are the most effective communication media in students' opinions (ANOVA)? In order to know the most common barriers for student recycling on vacation, a one-way ANOVA is employed to measure whether there are significant differences among barriers to student's recycling on vacation

CHAPTER 4. RESULTS

4.1 Demographics

The current study surveyed students at a large land-grant University in the midwestern United States. The survey was distributed to 6,000 students and 537 students responded to the survey; 386 (71.88%) completed the entire survey. The profiles of the students responding to the survey generally reflected the overall composition of the student body. As expected, the majority of respondents were aged 18–23 (93.68%). This is consistent with undergraduate students' age distribution. The college enrollment distribution of the demographics in the present study was representative, which meant that the sampling and survey processes were representative of the campus population at large. Table 4.1 shows the enrollment percentages of colleges where respondents were enrolled and the University's enrollment summary for spring 2015.

Table 4.1 College enrollment comparison (N = 386).

College enrolled	Current study	Spring 2015
College of Agriculture	13%	9%
College of Education	3%	2%
College of Engineering	30%	27%
College of Health & Human Science	11%	14%
College of Liberal Arts	11%	10%
College of Pharmacy	2%	2%
College of Science	13%	11%
College of Technology	7%	11%
College of Veterinary Medicine	0%	1%
Exploratory Studies	2%	3%
School of Management	8%	9%

It is noted that respondents to the survey differed slightly from the general population in two ways: students with higher academic standing and female students were found respond more often than other categories of students. Table 4.2 shows current academic standing percentages of respondents in the current study and the corresponding semester percentages of students enrolled in the University. There were fewer male respondents (46%) than female respondents (53%) in this study, while the University's enrollment in the semester of spring 2015 included more male students (57%) than female students (43%).

Table 4.2 Academic standing and gender comparison (N = 386).

Academic standing	Current study	Spring 2015
Freshman	23%	15%
Sophomore	29%	24%
Junior	23%	24%
Senior	22%	37%
Gender	Current study	Spring 2015
Male	46%	57%
Female	53%	43%

4.2 Factors Contribute to Recycling Behavior

The first set of questions addressed the factors that contribute to recycling. These questions examined the perceived impact of context on recycling, the influence of environmental attitude, and perceived barriers to recycling.

4.2.1 The Impact of Context on Recycling Behavior

In the present study, recycling behaviors were considered in three contexts: at home, on campus, and on vacation. This present study examined three contexts in which students might recycle and asked the perceived likelihood of recycling in each context.

Table 4.3 Recycling frequency in different contexts (N = 386).

Context	Recycling frequency		
	Never or rarely	Sometimes	Most of the time or always
At home	12.44%	12.95%	74.61%
On campus	6.74%	16.06%	77.20%
On vacation	30.31%	32.64%	37.05%

The respondents reported high levels of recycling at home. As noted in Table 4.3, over 74.61% reported recycling either most or all of the time. Students also reported high likelihood to recycle on campus with 77.20% reporting they recycle either most or all the time. Students reported they were less likely to recycle on vacation.

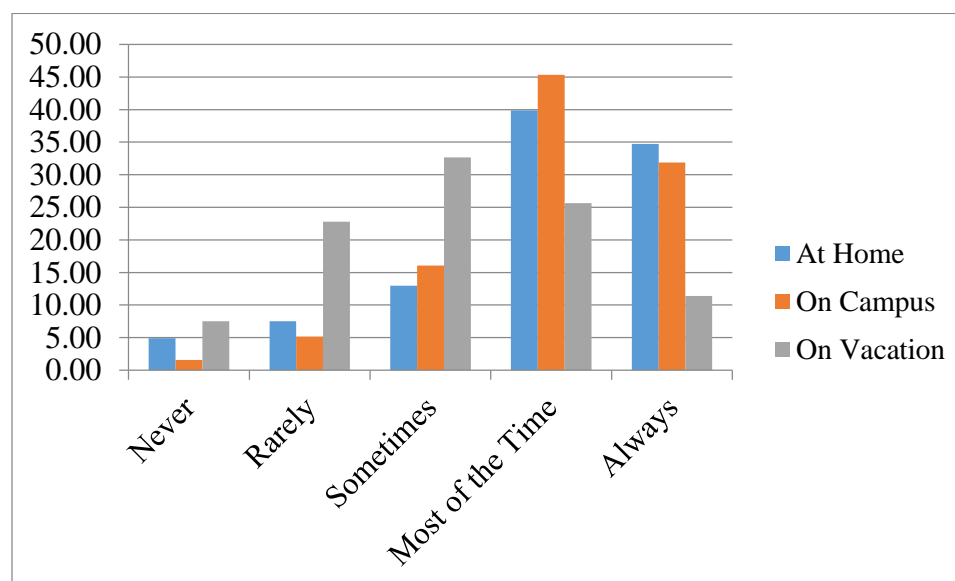


Figure 4.1 Respondents' recycling distribution (%) in different context (N = 386).

4.2.1.1 Relationship between student recycling at home and on campus

Analysis showed there was a relationship between student recycling at home and on campus. To know the relationship between student recycling at home and on campus,

this present study employed a chi-square test. In order to examine whether a student who was likely to recycle at home was more likely to recycle on campus, a chi-square test was employed to measure whether student recycling at home and recycling on campus were independent or related to each other. A 2 (at home vs. on campus) *5 (“Never” to “Always”) contingency table was formulated. First, P -value < 0.0001 ($N = 386$), which means that the distribution of recycling frequency was different between at home and on campus (Table 4.4).

Table 4.4 Chi-square test on at home vs. on campus.

<i>χ^2 Test Table</i>		
Statistics for table of recycling at home by on campus		
Statistics	<i>df</i>	<i>p</i>
χ^2	4	< 0.0001
Likelihood ratio χ^2	4	< 0.0001
Mantel-Haenszel χ^2	1	< 0.0001

Second, most participants recycled the same amounts on campus and at home. The frequency distribution table (Table 4.5) reflected the following: the percentage of students who chose to recycle the same amounts on campus and at home were the diagonal entries, and added up to 68.92% (2.85% + 3.63% + 62.44% = 68.92%).

Table 4.5 Table of recycling percentage at home vs. on campus (N = 386).

At home	On campus			
	Never or rarely	Sometimes	Most of the time or always	Total
Never or rarely	2.85	2.59	6.99	12.44
Sometimes	1.55	3.63	7.77	12.95
Most of the time or always	2.33	9.84	62.44	74.61
Total	6.74	16.06	77.20	100.00

4.2.1.2 Comparison between students recycling at home and on vacation

To determine if the responses for likelihood to recycle at home were significantly different, a set of paired *t*-tests were conducted. A paired *t*-test was used to compare the differences between population means of two sets of paired samples (Goulden, 1956). A paired *t*-test was used when there was one measurement variable and two nominal variables. The first *t*-test compared the difference between students' recycling frequencies at home and on vacation. It was found that students were more likely to recycle at home than on vacation by 0.5544 (the difference of means is 0.5544). The second *t*-test examined the likelihood to recycle at home and recycle on vacation. The measurement here was the likelihood and scores ranged from 1 ("Never or Rarely") to 3 ("Most of the time or Always"). The two nominal variables were at home and on vacation. Based on the statistical result, a *t*-score of 12.11 with a *P*-value smaller than 0.0001 ($N=386$), there was a significant difference between students' recycling likelihoods at home and on vacation.

4.2.2 Environmental Attitude's Impact on Recycling Behavior

The second factor that the present study measured was the influence students' attitudes toward the environment had on their recycling behaviors. In order to know whether students' attitudes of environment would impact their recycling behaviors on campus and on vacation, the present study tested the students' attitudes of environment and the relationship between students' attitudes of environment and their recycling frequency on campus and on vacation respectively. The results revealed that overall participants held slightly pro-environmental attitudes but that attitudes of environment did not play a significant role in influencing recycling behaviors either on campus or on vacation. Students' attitudes of environment only explained a limited portion of recycling behaviors on campus and on vacation.

In order to understand the students' attitudes toward the environment, the researcher incorporated questions from the NEP scale into the current study. Based on the results from the NEP-related questions, student attitudes of environment were slightly pro-environmental with an average NEP score of 2.42, which slightly inclined toward the pro-environmental side of the spectrum. Table 4.2.4 shows the average NEP score of responses in each category of the NEP test. Levels of agreement in each category varied from 1 ("Strongly Agree") to 5 ("Strongly Disagree"). Even-numbered categories had been reversed to be consistent with odd-numbered categories, since odd-numbered statements were pro-environmental while even-numbered ones were not. Thus, the lower the score in each category, the more pro-environmental the statement. The total average NEP score in the present study was the average score of all 15 categories. The lower the total average score, the more pro-environmental the attitudes.

Table 4.6 NEP items with frequency, mean, and standard deviation of responses.

Scale items	Responses (%) ^b					N	Mean	SD
	SA	MA	U	MD	SD			
1. We are approaching the limit of the number of people the earth can support	29.27	39.12	16.84	10.88	3.89	386	2.21	1.1
2. Humans have the right to modify the natural environment to suit their needs ^a	9.33	32.64	13.47	34.46	10.10	386	3.03	1.2
3. When humans interfere with nature, it often produces disastrous consequences	24.87	45.08	13.99	12.69	3.37	386	2.25	1.07
4. Human ingenuity will insure that we do NOT make the earth unlivable ^a	7.25	20.21	30.83	30.05	11.66	386	3.19	1.11
5. Humans are severely abusing the environment	42.23	38.60	10.36	6.22	2.59	386	1.88	1.00
6. The earth has plenty of natural resources if we just learn how to develop them ^a	5.19	12.21	21.04	38.70	22.86	385	3.62	1.12
7. Plants and animals have as much right as humans to exist	55.70	26.94	7.25	6.48	3.63	386	1.75	1.08
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations ^a	25.45	40.00	16.62	14.55	3.38	385	2.30	1.10
9. Despite our special abilities, humans are still subject to the laws of nature	52.85	34.46	9.33	2.07	1.30	386	1.65	0.83
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated ^a	26.94	31.35	19.95	14.51	7.25	386	2.44	1.23

Table 4.6 continued

11. The earth is like a spaceship with very limited room and resources	21.50	43.78	17.36	14.51	2.85	386	2.33	1.06
12. Humans were meant to rule over the rest of nature ^a	29.27	27.20	16.06	17.10	10.36	386	2.52	1.34
13. The balance of nature is very delicate and easily upset	20.26	44.16	19.22	12.99	3.38	385	2.35	1.05
14. Humans will eventually learn enough about how nature works to be able to control it ^a	16.84	27.72	24.35	22.80	8.29	386	2.78	1.21
15. If things continue on their present course, we will soon experience a major ecological catastrophe	37.05	32.38	20.21	8.29	2.07	386	2.06	1.04
Mean total NEP score							2.42	0.60

Note: ^a Reverse coded

^b SA=Strongly Agree, MA=Mildly Agree, U=Unsure, MD=Mildly Disagree, and SD=Strongly Disagree

4.2.2.1 Students' attitudes of environment and recycling behavior on campus

Given the slightly proenvironmental NEP score the current researcher explored the influence of environmental attitude on recycling behavior on campus. Simple linear regression was used to establish the relationship between two variables. Students' NEP score was the dependent variable. Students' NEP score was an average score of 15 categories in NEP standard test. Students' choices of how likely they were to recycle on campus is the independent variable and scores range from 1 (Never or Rarely) to 3 (Most of the time or Always). Interestingly, the results indicated that Students' attitudes of environment did not influence their recycling behaviors on campus. According to the results, the F Value 29.46 with a P-value < 0.0001 ($N=386$) and the coefficient β in Table

4.7 for dependent variable NEP Score was negative, which meant that the drop in NEP score per change in recycling frequency on campus was significantly different from zero. However, given R-Square was low (R-Square=0.0713), the model was not effective in the predictive sense.

Table 4.7 Parameter Estimates of NEP Score and Recycling Frequency on Campus.

Parameter estimates					
Parameter	<i>df</i>	Parameter estimate	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	1	3.33348	0.11937	27.93	< 0.0001
β	1	-0.25954	0.04781	-5.43	< 0.0001

4.2.2.2 Students' environment attitudes and recycling behaviors on vacation

In the second part of the analysis of attitudes of environment influence on recycling, the researcher examined the impact of attitudes of environment on recycling while on vacation. Again, simple linear regression was used here to establish the relationship between the two variables. The students' NEP score was the dependent variable, and students' NEP score was an average score of the 15 categories in the NEP standard test. Students' choices of how likely they were to recycle on vacation was the independent variable and scores ranged from 1 ("Never or Rarely") to 3 ("Most of the time or Always"). Students' attitudes of environment did not influence their recycling behaviors on vacation apparently either. According to the results, the *F*-value 25.21 with a *P*-value < 0.0001 (*N* = 386) and the coefficient β in Table 4.8 for dependent variable NEP Score was negative,

which meant that the drop in NEP score per change in recycling frequency on vacation is significantly different from zero. However, given R-square was low (R-square = 0.0616), the model was not effective in the predictive sense.

Table 4.8 Parameter estimates of NEP score and recycling frequency on vacation.

Parameter estimates					
Parameter	<i>df</i>	Parameter estimate	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	1	2.88409	0.16762	17.21	< 0.0001
β	1	-0.33710	0.06714	-5.02	< 0.0001

4.2.3 Barriers Impact Recycling Behavior

The final set of factors examined in order to understand what contributes to student recycling is the impact of barriers to recycling. In the present study, there were four categories of barriers (situational barriers, attitude barriers, knowledge barriers, and behavioral barriers) assessed, all from WRAP. This study examined the impacts of elements within these categories of barriers on student recycling behaviors both on campus and on vacation. It was found that attitude barriers and knowledge barriers impacted student recycling behaviors on campus the most, and situational barriers impacted student recycling behaviors on vacation the most. General descriptive data results gave an overview of the average levels of agreement of barriers on campus (Table 4.9). Students did not strongly believe there were barriers impacting their recycling behaviors on campus, according to the results of the present study. For on campus recycling barriers, the average

levels of agreement were nearly all above medium. Table 4.9 presents the average response levels of agreement for 11 recycling barriers on campus (situational barriers: 1, 2, 3, and 4; knowledge barriers: 7, 8, and 10; behavioral barriers: 5 and 6; attitude barriers: 9 and 11). The levels were scored 1 (“Strongly Disagree”) to 7 (“Strongly Agree”). Since the statement of barriers 5 to 11 (“Strongly Agree” means there is such a barrier) were reverses to 1 to 4 (“Strongly Agree” means there is no such barrier), the results were reversed to be consistent with the 1 to 4 scale. Thus, the lower the score, the more agreement on such a barrier.

Table 4.9 Respondents’ average levels of agreement on recycling barriers on campus.

Barriers	Mean
<u>Situational barriers</u>	
1. There is an adequate number of recycling containers in buildings on campus.	5.03
2. There is an adequate number of recycling containers on the grounds of the campus.	4.71
3. Recycling containers are easy to find when I need them on campus.	4.70
4. Recycling containers are conveniently located on campus.	4.77
<u>Behavioral barriers</u>	
5. It takes a lot of time and effort to recycle at Purdue. ^a	4.98
6. I am normally too busy to recycle when I am on campus. ^a	5.45
<u>Knowledge barriers</u>	
7. I am not sure which types of trash I should recycle on campus. ^a	4.40
8. I am not sure what to put in the different types of trash containers. ^a	4.54
10. I am skeptical that trash deposited in the recycling containers on campus is recycled. ^a	4.58
<u>Attitude barriers</u>	
9. I don’t believe recycling has an impact on the environment. ^a	6.09
11. I believe Purdue should be responsible for sorting recyclable material from trash before sending it to the landfill. ^a	3.78

Note: ^aReverse coded

For the overview of average levels of agreement for barriers on vacation (Table 4.10), students were more likely to agree that recycling barriers impact their recycling behaviors on vacation. The average levels of agreement of more than half of barriers on vacation were under medium. Table 4.10 demonstrated the average response levels of agreement on 11 recycling barriers on vacation. The levels were scored 1 (“Strongly Disagree”) to 7 (“Strongly Agree”). Since the statements for barriers 5 to 11 (“Strongly Agree” means there is such a barrier) were the reverse of 1 to 4 (“Strongly Agree” means there is no such barrier), the results were also reversed to be consistent with the 1 to 4 scale. Thus, in this chart, the lower the score, the more agreement on such barriers.

Table 4.10 Respondents' average level of agreement on recycling barriers on vacation.

Barriers	Mean
<u>Situational Barriers</u>	
1. There is normally an adequate number of recycling containers at the hotel or other accommodation.	2.79
2. There is normally an adequate number of recycling containers at the destination.	2.79
3. Recycling containers are easy to find when I need them on vacation.	2.67
4. Recycling containers are conveniently located in my vacation destination.	2.76
<u>Behavioral Barriers</u>	
5. It takes a lot of time and effort to recycle while on vacation. ^a	3.16
6. I am normally too busy to recycle while on vacation. ^a	4.32
<u>Knowledge Barriers</u>	
7. I am not sure which types of trash I should recycle when I go on vacation. ^a	4.43
8. I am not sure what to put in the different types of trash containers when I go on vacation. ^a	4.44
10. I am skeptical that trash deposited in the recycling containers is recycled at my vacation destination. ^a	5.92
<u>Attitude Barriers</u>	
9. I don't believe recycling has an impact on the environment of my vacation destination. ^a	4.32
11. I believe my hotel should be responsible for sorting recyclable material from trash before sending it to the landfill. ^a	3.94

Note: ^a Reverse coded

4.2.3.1 Students' recycling barriers on campus

In order to find the most likely kind of barriers for students to reduce recycling behavior on campus, a one-way ANOVA was employed to measure whether there were significant differences among student recycling barriers on campus. An analysis of variance (ANOVA) was used to detect differences between more than two independent groups of means (Moore et al., 2012) A one-way ANOVA has one independent variable with more than 2 conditions. The independent variable here was recycling barriers on campus. There were 11 options, equating to 11 conditions. The dependent variable here

was students' level of agreement with barriers and scores ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). Since barriers 5 to 11 were the reverse of 1 to 4, the scores were inverted to be consistent with the 1 to 4 scale. The lower the score, the more students agree with the barrier. According to Table 4.11 and P -value < 0.0001 , there were significant differences between the conditions ($N = 386$). Not all of the students' choices of barriers were equal.

Table 4.11 ANOVA table of respondents' recycling barriers on campus.

<i>ANOVA Table</i>					
SIMPLE ANOVA TABLE					
Source	<i>df</i>	<i>SSE</i>	<i>MSE</i>	<i>F</i>	<i>p</i>
Model	10	1349.76825	134.97683	50.28	$< .0001$
Error	4235	11368.98187	2.68453		
Corrected Total	4245	12718.75012			

It was apparent from Table 4.12 that the P -value for each condition was less than 0.0001, which meant that not all of the conditions were equal. For the purpose of choosing the most agreed upon barriers, the mean score for each condition was checked. The most agreed upon barriers (in descending order) were 11 with a mean of 3.7850 (I believe the university should be responsible for sorting recyclable material from trash before sending it to the landfill), which were classified by T grouping into H and belong to attitude barriers; 7 (with a mean of 4.3990) (I am not sure which types of trash I should recycle on campus), 8 (with the mean of 4.5363) (I am not sure what to put in the different types of trash

containers), and 10 (I am skeptical that trash deposited in the recycling containers on campus is recycled), which were classified by T grouping into G and belong to knowledge barriers.

Table 4.12 GLM procedure *t*-test of recycling barriers on campus.

The GLM procedure <i>t</i> -test(LSD) for score				
On campus barriers	Score LSMEAN	T grouping		
11. I believe Purdue should be responsible for sorting recyclable material from trash before sending it to the landfill.	3.7850		H	
7. I am not sure which types of trash I should recycle on campus.	4.3990			G
8. I am not sure what to put in the different types of trash containers.	4.5363	F		G
10. I am skeptical that trash deposited in the recycling containers on campus is recycled.	4.5829	F		G
3. Recycling containers are easy to find when I need them on campus.	4.7021	F	E	

Table 4.12 continued

2. There is an adequate number of recycling containers on the grounds of the campus.	4.7124	F	E	
4. Recycling containers are conveniently located on campus.	4.7720	D	E	
5. It takes a lot of time and effort to recycle at Purdue.	4.9767	D		
1. There is an adequate number of recycling containers in buildings on campus.	5.0363		C	
6. I am normally too busy to recycle when I am on campus.	5.4508		B	
9. I don't believe recycling has an impact on the environment.	6.0907		A	

4.2.3.2 Students' recycling barriers on vacation

To find out the most important barriers for student recycling on vacation, a one-way ANOVA was employed to measure whether there were significant differences among barriers to students' recycling on vacation. The independent variable here was recycling barriers on vacation. There were 11 barriers and 11 conditions. The dependent variable was students' level of agreement with barriers and scores ranged from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). Since barriers 5 to 11 were the inverse of 1 to 4, they were reversed

so as to be consistent with the 1 to 4 scale. The lower the score, the more students agree with the barrier. According to Table 4.13's P -value < 0.0001 , there were significant differences between the conditions ($N= 361$). Not all of the students' choices of barriers were equal.

Table 4.13 ANOVA table of respondents' recycling barriers on vacation.

<i>ANOVA Table</i>					
SIMPLE ANOVA TABLE					
Source	<i>df</i>	<i>SSE</i>	<i>MSE</i>	<i>F</i>	<i>p</i>
Model	10	3846.97267	384.69727	159.65	< .0001
Error	3956	9532.45662	2.40962		
Corrected total	3966	13379.42929			

It was apparent from Table 4.14 that the P -value for each condition was less than 0.0001, which meant that not all of the conditions were equal. For the purpose of choosing the most agreed upon barriers, the mean score for each condition was checked. The most agreed upon barriers were 3 (with a mean of 2.6676) (Recycling containers are easy to find when I need them on vacation), 4 (with a mean of 2.7611) (Recycling containers are conveniently located in my vacation destination), 2 (with a mean of 2.7867) (There is normally an adequate number of recycling containers on the destination) and 1 (with a mean of 2.7901) (There is an adequate number of recycling containers in buildings on campus), which were classified by T grouping in the same group E, and all belong to the category of situational barriers.

Table 4.14 GLM procedure *t*-test of recycling barriers on vacation.

The GLM Procedure <i>t</i> -test(LSD) for score				
On vacation barriers	Score	T		
	LSMEAN	grouping		
3. Recycling containers are easy to find when I need them on vacation.	2.6676		E	
4. Recycling containers are conveniently located in my vacation destination.	2.7611		E	
2. There is normally an adequate number of recycling containers at the destination.	2.7867		E	
1. There is normally an adequate number of recycling containers at the hotel or other accommodation.	2.7901		E	
5. It takes a lot of time and effort to recycle while on vacation.	3.1551		D	
11. I believe my hotel should be responsible for sorting recyclable material from trash before sending it to the landfill.	3.9444		C	
10. I am skeptical that trash deposited in the recycling containers is recycled at my vacation destination.	4.3194		B	
6. I am normally too busy to recycle while on vacation.	4.3241		B	

Table 4.14 continued

7. I am not sure which types of trash I should recycle when I go on vacation.	4.4294		B	
8. I am not sure what to put in the different types of trash containers when I go on vacation.	4.4417		B	
9. I don't believe recycling has an impact on the environment of my vacation destination.	5.9167		A	

4.3 Expecting Effective Communications Approaches to Encourage Student Recycling

The second set of questions addressed what communication approaches were most effective to encourage student recycling. These questions examined effective emotional appeals considered by students to increase recycling, the impacts of environmental attitude on expected effectiveness of communication, and the most effective communication media according to the students.

4.3.1 Expected Effective Emotional Appeals to Increase Student recycling

behaviors

As noted previously, the use of emotional appeals in crafting communications had been showed to impact communication effectiveness. The present study examined what types of emotional appeals were perceived to be most effective to increase student recycling behaviors. It was found that altruistic messaging seemed to prevail, while guilt messaging was least promising. Students were asked to rate the effectiveness of three

messages, each with a different type of emotional appeal. The appeals were designed to be “moderately guilt inducing,” emotionally neutral, or to generate moderately altruistic emotions.

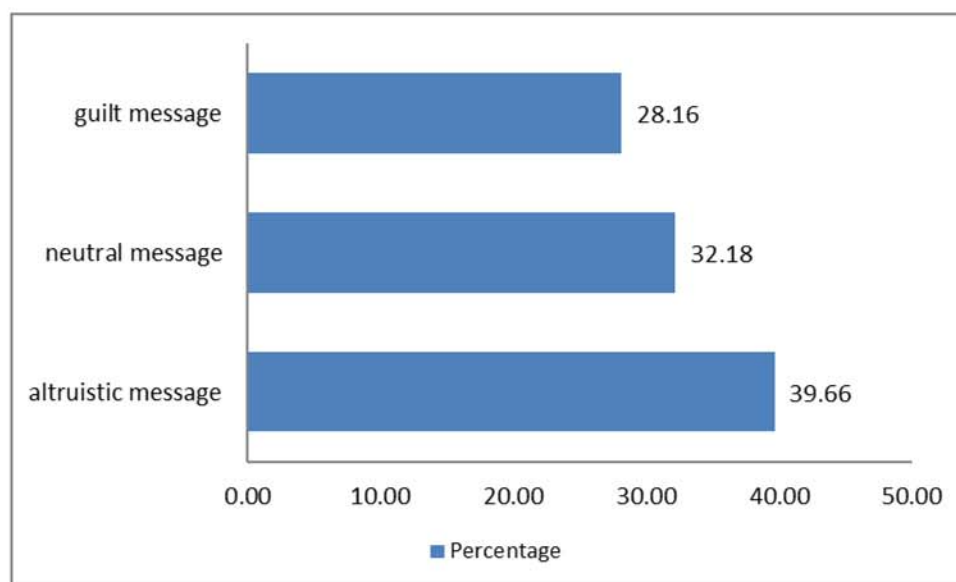


Figure 4.2 Respondents' message selection percentage (N = 348).

Positive message appeals were considered by students as more effective than negative message appeals for increasing recycling behaviors. As noted in Figure 4.2, the positive message (altruistic message, 39.66%) was perceived to be the most effective type of message for increasing recycling behavior. The neutral message was perceived as next most effective, while the guilt message was perceived to be least effective of the choices (28.16%).

4.3.2 Environmental Attitude's Impact on the Expected Effectiveness of Communication

While the results noted above showed the perception of the effectiveness of the three emotional appeals, the researcher also sought to understand if environmental attitude was a factor in the effectiveness of emotional appeals. To address this research question, a categorical multinomial logistic regression was employed to examine the relationship between student NEP score and the emotional appeal reported by students as the most effective type of message. It was found that students with more pro-environment attitudes believed negative messages were more effective, while students with less pro-environmental attitudes believed positive message were more effective. Categorical multinomial logistic regression is a method that generates logistic regression for a categorical dependent variable and multiple independent variables (Long & Freese, 2006). It could be used to predict the correlation between dependent and independent variables in the following formula: $l_n \left(\frac{P_{y_i}}{P_{y_1}} \right) = b_0 + b_1 x_i + \varepsilon_i$. This method was applied in the present study for two reasons: because a dependent variable was categorical; independent variables were multiclass.

In order to find out what messages students with more pro-environmental attitudes (lower NEP scores) thought to be most effective in increasing recycling behaviors, and what messages students with less pro-environmental attitudes (higher NEP scores) thought to be most effective in increasing recycling behaviors, the correlation between students' NEP scores and message choices was examined using a categorical multinomial logistic regression method. Students' NEP score here was the independent variable, with 15

categories. Students' levels of agreements for each category varied from 1 ("Strongly Agree") to 5 ("Strongly Disagree"). Students' message choice was the dependent variable, with scores varying from 1 ("Altruistic Message"), 2 ("Neutral Message"), and 3 ("Guilt Message"). According to Table 4.15, the likelihood ratio chi-square 12.0255 with a P -value $0.0024 < 0.05$ meant that the categorical multinomial logistic regression model was effective here. It could be used to analyze the research question at hand. It also meant there was a significant correlation between students' NEP score and students' message preferences.

Table 4.15 Regression of NEP score and different recycling messages.

<i>Categorical Multinomial Logistic Regression Table</i>			
Testing Global Null Hypothesis: BETA = 0			
Test	χ^2	df	p
Likelihood ratio	12.0255	2	0.0024
Score	11.9215	2	0.0026
Wald	11.5039	2	0.0032

According to Table 4.16, there was a negative relationship between the dependent variable and independent variables. Using formula $l_n\left(\frac{P_{y_i}}{P_{y_1}}\right) = b_0 + b_1x_i + \varepsilon_i$ to understand the situation, here $l_n\left(\frac{P_{y_i}}{P_{y_1}}\right) = b_0 + b_1x_i + \varepsilon_i$, $i = 2,3$. Compared to $i = 2$ (neutral message), all the estimates of b_1 are negative. This meant that the higher students' NEP score, the more likely they preferred a neutral message ($i = 2$). From Table 4.17's

parameter estimates for β , the absolute value of b_1 increased when i increased, which suggested that the lower a student's NEP score, the more likely he or she preferred a guilt message.

Table 4.17 Likelihood estimates of NEP score and different recycling messages.

<i>Categorical multinomial logistic regression table</i>						
Analysis of maximum likelihood estimates						
Parameter	Message	<i>df</i>	Parameter estimate	<i>SE B</i>	Wald χ^2	<i>p</i>
B	1	1	1.5262	0.5529	7.6190	0.0058
B	3	1	1.7869	0.6038	8.7592	0.0031
β	1	1	-0.5362	0.2183	6.0355	0.0140
β	3	1	-0.7960	0.2447	10.5820	0.0011

4.3.3 The Most Effective Communication Media in Students' Opinions

The final element of the communication process the current researcher addressed was media. The present study investigated to find out the most effective communication media in students' opinions. It was found that, according to students' opinions, all of these communication media were helpful, and the most helpful ones were "clear, informative, and consistent bin infrastructure and bin labels" and "promotions such as recycling contests [and] competitions between departments or colleges." In this part of the study, six media common on college campuses were presented to the students, and they were asked to identify which was most effective for communicating messages about recycling. Students

reported “clear, informative, and consistent bin infrastructure and bin labels” were the most effective media through which to receive information about recycling. This was followed by “promotions such as recycling contests [and] competitions between departments [and] colleges.” Figure 4.3 displays responses on the effectiveness of six media channels for promoting recycling on campus. Possible scores ranged from 1 (“Very Ineffective”) to 5 (“Very Effective”); the higher the score, the more effective the media according to respondents.

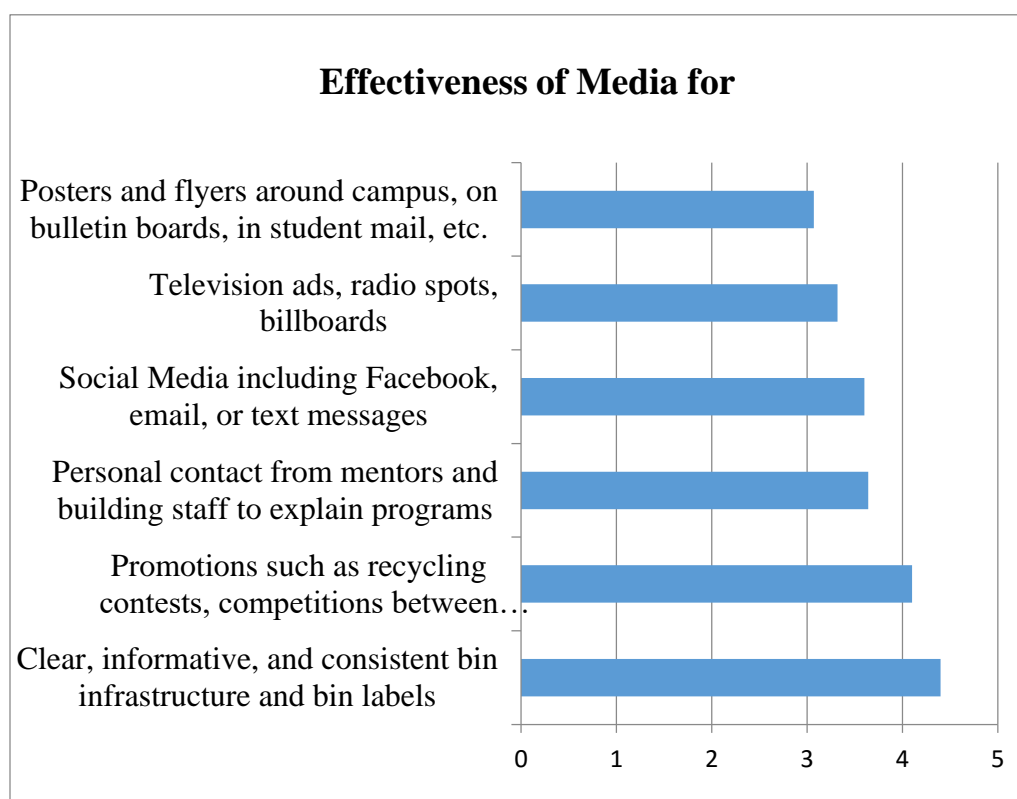


Figure 4.3 Respondents' views of the effectiveness of media.

To determine if there were significant differences between these responses, a one-way ANOVA was employed. The independent variable here was the possible recycling

communication channels. There were 6 channels, and accordingly 6 conditions here. The dependent variable was how effective students thought channels were and possible scores ranging from 1 (“Very Ineffective”) to 5 (“Very Effective”). It meant the higher the score, the more effective the media outlet according to the students. According to Table 4.18, P -value < 0.0001 , there were significant differences between the conditions ($N= 349$). This meant that there was at least one significant difference among students’ choices, and not all choices were equal.

Table 4.18 ANOVA table of effective communication channels.

<i>ANOVA Table</i>					
SIMPLE ANOVA TABLE					
Source	<i>df</i>	<i>SSE</i>	<i>MSE</i>	<i>F</i>	<i>p</i>
Model	5	416.191500	83.238300	84.57	< .0001
Error	2088	2055.174785	0.984279		
Corrected total	2093	2471.366285			

It was apparent in Table 4.19 that the P -value for each condition was less than 0.0001, which meant that not all conditions were equal. With the purpose of choosing the most effective communication channels, the mean score for each condition was checked. The two most effective communication channels (in descending order) were 6 (with mean of 4.39541547) (Clear, informative, and consistent bin infrastructure and bin labels), which was classified by T grouping into A; and 5 (with mean of 4.09742120) (Promotions such

as recycling contests [and] competitions between departments or colleges), which was classified by T grouping into B.

Table 4.19 GLM procedure t-test of effective communication channels.

The GLM procedure <i>t</i> -test(LSD) for score				
Media	Score MEAN	T grouping		
6. Clear, informative, and consistent bin infrastructure and bin labels	4.39542		A	
5. Promotions such as recycling contests [and] competitions between departments or colleges	4.09742		B	
4. Personal contact from mentors and building staff to explain programs	3.64183		C	
3. Social media including Facebook, email, or text messages	3.60458		C	
2. Television ads, radio spots, billboards	3.31519		D	
1. Posters and flyers around campus, on bulletin boards, in student mail, etc.	3.07450		E	

CHAPTER 5. DISCUSSION, IMPLICATIONS, LIMITATIONS AND FUTURE

5.1 Discussions and Implication

The present study was designed to provide insight into student recycling behaviors. The study provided insights into factors that contribute to recycling, including the context in which the student is recycling, the impact of the student's environmental attitude on recycling, and the impacts of barriers to recycling and perceptions of likelihood to recycle. The study also explored the impact of various elements of communication, including emotional appeal and media on recycling behavior. The present study aimed at understanding and enhancing student recycling behaviors. These findings have important implications for student recycling, which are discussed in this section. To understand student recycling behaviors, factors contributing to student recycling were addressed. To know how to enhance student recycling behaviors through communication, effective communication approaches that encourage students to recycle were examined and implemented. To better understand the present study and to improve student recycling behaviors, implications and suggestions are discussed in the following section.

5.1.1 Factors Contributing to Recycling Behavior

By examining students' perceived likelihood of recycling in three different contexts, students' attitudes of environment, and the barriers they face on campus and on vacation, we found that, first, context impacts student recycling behaviors. Most students who

recycled at home also recycled on campus, and students recycled more frequently at home compared to when on vacation. Second, although attitudes of environment can predict student recycling behaviors, in the present study, when there were more factors impacting student recycling behaviors on campus and on vacation, environmental attitude explained student recycling behaviors to a limited degree. Third, students believed that attitude barriers and knowledge barriers impacted their recycling behaviors on campus the most, and that situational barriers impacted their recycling behaviors on vacation the most. Suggestions were given to increase student recycling behaviors.

5.1.1.1 Context impacts recycling behavior

To understand the impact of context on student recycling behavior, the present study analyzed the questions from two aspects: whether household recycling behaviors would affect recycling behaviors on campus and the difference between students' recycling frequencies at home and on vacation.

Results showed that a student who was likely to recycle at home was also likely to recycle on campus, in the examination of the relationship between student recycling behaviors at home and on campus. This was interesting because the present finding is consistent with that of previous literature (Philippsen, 2015). Home is an important resource for students to receive recycling information (Rainay, 1997) and impacts student recycling habits. Students with recycling habits at home were more likely to recycle on University campuses. This was important because it meant that since students' recycling habits had already existed, it was more important to provide recycling accessibility, create a better recycling atmosphere, and increase recycling awareness on campus in order to form

student recycling habits on campus. A previous study suggested that recycling facilities such as recycling bins could increase recycling awareness and change students' past habits of not recycling (Comber & Thieme, 2013). Student awareness of recycling on campus can be aroused by providing more recycling facilities, and doing so can help them form recycling habits on campus.

The results supported that students were more likely to recycle at home than on vacation, and the difference between the two frequencies was significant. This finding was not surprising, as previous studies pointed out there was a gap between pro-environmental behaviors at home and on vacation (Dolnicar & Leisch, 2008; Dolnicar & Grun, 2009). Dolnicar and Grun (2009) compared pro-environmental behaviors, including recycling behaviors, within domestic and vacation contexts. Based on their analysis, people felt responsible to maintain a particular living environment and were willing to keep their recycling habit at home. One important reason they did not recycle on vacation was that there was a lack of available infrastructure to maintain their usual pro-environmental behaviors (Dolnicar & Grun, 2009). The high student recycling frequency at home and on campus suggested that students might not get the opportunity to recycle on vacation for the similar reasons. The present finding was important because it meant that to increase student recycling behaviors on vacation, providing more accessibility to recycling facilities was necessary. A previous study gave an example that although an individual and his or her friends were very positive about recycling at home, the lack of an easily operating recycling facility led to their failure to recycle (Philippsen, 2015). Students were willing to recycle, but they did not have the opportunity, due to lack of recycling infrastructure on vacation. Thus, there should be more recycling facilities and support systems on vacation.

5.1.1.2 Environmental attitude's impact on recycling behavior

To understand the impact of student attitudes of environment on recycling behavior, questions were asked regarding their environmental attitude and recycling frequency. It was found that students hold slightly pro-environmental attitudes, and environmental attitude explained student recycling behaviors on campus and on vacation to a limited degree. First, according to the results, students received an average NEP score of 2.42. This score showed that students slightly agree on pro-environmental attitudes. It is interesting to note that this average score was equal to the average level of students' agreement on pro-environmental attitudes. Hawcroft and Milfont (2010) collected studies using the NEP scale with different numbers of items from 69 studies and 36 countries in the past 30 years. According to Hawcroft and Milfont's (2010) research, scores of 15-item NEP studies from up to 58 examples ranged between 1.78 and 2.78, while the average score was 2.28. Among these 15-item NEP studies, 5,947 participants of 33 examples were students. The weighted average score for them was 2.27 (Hawcroft & Milfont, 2010). This meant that although 2.42 was a score supporting pro-environmental attitudes, compared to other student groups, our participants were less likely to agree on pro-environmental attitudes.

Second, it was found that pro-environmental attitudes could predict students' recycling behaviors on campus and on vacation to a limited degree, though when there was an impact, students with more pro-environmental attitudes were more likely to recycle on campus and on vacation. This finding was consistent with previous literature insofar as there was a relationship between recycling behaviors and attitudes (Tonglet et al., 2004; Mannetti et al. 2004), in that one's willingness to protect the environment and his or her concerns toward it would contribute to recycling. To further corroborate these findings, it

was stated in previous literature that attitudes were a crucial determinant of behaviors that protected the environment (Bradley et al., 1999). However, the R-square of both regressions (regression between NEP score and on-campus recycling behaviors, and regression between NEP score and on-vacation recycling behaviors) were 0.0713 and 0.0616 respectively, which were not high. This was influential because it meant that although the NEP score could be used as a predictor of recycling behaviors on campus and on vacation, it could be used as a predictor on campus and on vacation to explain a very limited portion of recycling behaviors. In other words, when there were more factors such as contexts and recycling barriers effecting student recycling behaviors, environmental attitude was not that important. This meant that there could be factors improving recycling behavior and overcoming the results that environmental attitude brought about. A previous study found that “while all participants in all scenarios showed equally strong willingness to recycle, the percentage of people who recycled is over 25% higher in the scenario with easily accessible recycling facilities, compared to those with hardly accessible facilities” (Zhang et al., 2016). Adding more recycling infrastructures could overcome negative attitudes of environment. Thus, the present findings implied that improving students’ attitudes of environment was good but not enough, and that increasing recycling facilities on campus needed to be done first. Providing recycling facilities and support systems should be the primary concern before improving individual attitudes of environment (Ittiravivongs, 2012). Students’ attitudes of environment were not as important as accessibility of recycling bins. To increase student recycling behaviors on campus and on vacation, the most essential element is sufficient recycling infrastructure.

5.1.1.3 Barriers impact recycling behavior

To understand student recycling barriers, students were asked questions about recycling barriers on campus and on vacation. The present study found significant student recycling barriers according to students' perspectives.

The recycling barriers on campus perceived to be most important to students were attitude barriers and knowledge barriers. Attitude barriers included not believing there was an environmental benefit, viewing recycling as the University's job and not theirs, and not getting a personal reward or any recognition for their efforts; and knowledge barriers included not knowing what to put in each container and understanding the basic mechanics of how the scheme works according to WRAP (2014). Students' top listed barriers (from more significant to less) on campus thought to most likely reduce recycling behaviors were as follows: the belief that "the university should be responsible for sorting recyclable material from trash before sending it to the landfill," an attitude barrier; the uncertainty of "which types of trash [one] should recycle on campus;" the uncertainty of "what to put in the different types of trash containers;" and the skepticism "that trash deposited in the recycling containers on campus is recycled," the latter three which were knowledge barriers. Thus, the biggest recycling barriers on campus were attitude barriers and the lack of knowledge about recycling, or knowledge barriers. Some of these findings were consistent with previous literature, namely, that attitude barriers were one of the most prevalent barriers keeping people from recycling (Mutang et al., 2015). However, previous literature argued that situational barriers such as inconvenience are the most significant barriers (McCarty & Shrum, 1994; Walkington, 2009; Viscusi et al., 2011). This is important to note, especially because some of this previous research was conducted on students

(McCarty & Shrum, 1994; Walkington, 2009). It meant that before the students in the present study decided to take actions on recycling using recycling facilities and adopting convenient recycling access, they were stopped by their confusion about what did they need to do to recycle. The implications of these findings were that it was important to increase student recycling awareness, that recycling could bring environmental benefits, and that it was not only the universities' job to recycle. Moreover, while there need to be more recycling containers, recycling spaces, reliable collections, and easier access to recycling sites on campus, students need more education in how to recycle in a practical way and how recycling schemes worked (WRAP, 2014).

It was found that the most commonly occurring barriers for students on vacation were situational barriers. Situational barriers were inadequate containers, lack of space, unreliable collections, and no access to bring sites (WRAP, 2014). In the present study, they (from more significant to less) were that “recycling containers are not easy to find when [they're needed] on vacation;” “recycling containers are not conveniently located in . . . vacation destination[s];” “there is normally not an adequate number of recycling containers [at tourist] destination[s];” and “there is normally not an adequate number of recycling containers at . . . hotel[s] or other accommodation[s].” These barriers were all situational barriers. The finding was consistent with previous literature (McCarty & Shrum, 1994; Walkington, 2009; Viscusi et al., 2011). Students believed that facility and infrastructure for recycling behaviors were often inadequate and inconvenient on vacations. This finding implied that more recycling facilities and supports were needed on vacation. As discussed previously, Dolnica and Grun (2009) proposed that there were not enough recycling infrastructures at vacation sites to support people in maintaining their normal

recycling habits. Students recycling at home got used to using facilities and infrastructures offered by the community that support recycling. When there were situational barriers on vacation they were unaccustomed to, their recycling frequency decreased. Therefore, to increase recycling on vacation, more facilities to support recycling are necessary.

5.1.2 Effective Communications Approaches to Encourage Student Recycling

To know how to enhance student recycling behaviors by using communication approaches, this present study discovered effective communication approaches thought by students to enhance their recycling behaviors. After detecting students' opinions on effective emotional appeals to increase their recycling behaviors, expected effective messages for students with different attitudes of environment, and the most effective communication media, there were three findings. First, altruist appeals were thought by most students to be most effective in increasing their recycling behaviors. Second, attitudes of environment impacted the expected effectiveness of communication. Students with less pro-environmental attitudes expected neutral messages to be more effective in enhancing their recycling behaviors, while students with more pro-environmental attitudes believed messages with emotional appeals were more effective for them. Third, students believed "clear, informative, and consistent bin infrastructure and bin labels" and "promotions such as recycling contests [and] competitions between departments or colleges" were helpful media for increasing increase their recycling behaviors. Suggestions are provided to increase student recycling behaviors.

5.1.2.1 Emotional appeals considered by students to be the most effective to increase recycling behavior

It was found that overall students thought positive messaging was the most effective emotional appeal for improving recycling, more so than neutral or negative messaging. It could be inferred that positive messages, such as messages with altruistic appeals, would influence students to improve their recycling behaviors. At the same time, the number of students who chose neutral messaging was larger than students who chose guilt messaging. Although this finding was inconsistent with the literature review conclusion that negative messages were more effective than positive messages (Cox & Cox, 2001; Leshner et al., 2010), it was reasonable that students preferred positive appeals over neutral and negative counterparts because positive message appeal could arouse positive feelings. This finding was useful because it implied that to improve student recycling behaviors, the University could use more positively framed messages with altruistic appeals to encourage student recycling and educate students about how to recycle. Altruistic appeals commonly emphasize how one's conduct could benefit others; such appeals could be especially persuasive (Reinhart et al., 2007). Using altruistic messages to encourage student recycling could remind students about how recycling behavior benefits others, and hence arouse student willingness to recycle actively.

5.1.2.2 The impact of environmental attitude on the effectiveness of communication

To know the impact of environmental attitude on the expected effectiveness of communication, the present study examined the effective messages promoting recycling that pro-environmental students came up with. It was found that students with less pro-

environmental attitudes (higher NEP scores) thought neutral messaging was the most effective, while students with more pro-environmental attitudes (lower NEP score) thought messages with emotional appeals were the most effective. These findings could be explained by the Elaboration Likelihood Model, considering that “central processing procedures will be activated in order to cope with a rationally oriented message, whereas peripheral processing procedures are expected to be put into operation for treating emotionally oriented message” (Liebermann & Flint-Goor, 1996; Pallak et al., 1983). When a processing message was given, information in the message went through central processing procedures, while emotional appeals required peripheral processing procedures. Students with less pro-environmental attitudes had stronger motivations than others to not recycle; thus, they refused to give in to the emotional attractiveness of the message and aroused the peripheral processing procedures. Accordingly, they preferred a neutral message. Students with more pro-environmental attitudes were strongly motivated to recycle; thus, they gravitated to and preferred the emotional attractiveness of the message and aroused the peripheral processing procedures. The implication of the present finding is that universities could use messages with emotional appeals to arouse students’ (those with less pro-environmental attitudes who refuse to give in to emotional appeals) awareness and attract them to think more about recycling. As presented in the literature review, negative emotions were processed more rapidly and earlier, while positive emotions took more time to process and were elaborated on more thoroughly (Zajonc, 1984; Lazarus, 1984). For longer lasting results, positive messages are recommended.

5.1.2.3 The most effective communication media in students' opinions

The present study found that the two most distinctively effective communication channels were (in descending order) “clear, informative, and consistent bin infrastructure and bin labels,” and “promotions such as recycling contests [and] competitions between departments or colleges.” The third and fourth communication media were considered by students to be of similar importance, based on the grouping results, and thus were not discussed here. This finding was interesting because it was similar to the Kaplowitz et al. (2009) study carried out at Michigan State University. Their study suggested that promotion and personal contacts ranked first and second. This present study's results ranked informative labels and promotions first and second. The consistency of the findings suggests that promotion might be the most effective communication channel through which to encourage undergraduate students to recycle. Participants in the present study preferred clear and informative recycling labels more than those from Michigan State University. There are two implications according to the findings. First, clear and informative labels communicating which types of trash can be recycled in each recycling container should be placed on campus recycling bins. It was vital to teach students what to recycle and how to recycle. Second, the University could hold activities such as “recycling contests and competitions between departments or colleges,” and “...the competitions would reiterate the value of individual action and encourage environmentally friendly behavior within the campus community” (Wu & Tikasz, 2013). These actions would encourage students to participate in recycling and increase their recycling awareness.

5.2 Conclusion

In conclusion, first, by understanding the factors that contribute to student recycling behaviors, more recycling facilities and accessibility is needed in order to increase student recycling behaviors on campus and on vacation. Students tended to continue holding their past attitudes of environment and acting on recycling habits at home after they went to college (Comber & Thieme, 2013), and they recycled less frequently on vacation. They would have barriers recycling on campus and on vacation because they had difficulties knowing how to recycle on campus or they did not have opportunities to recycle because there were not enough recycling facilities. Thus, recycling information and recycling facilities are needed on campus and on vacation to foster a recycling atmosphere and to increase student recycling awareness. If such initiatives were enacted, students with recycling habits at home would become educated in how to recycle on campus and would not face the inconvenience of few recycling facilities available; for students without recycling habits at home, this education and exposure to recycling facilities would arouse their recycling awareness and help them form recycling habits. Second, to increase student recycling behaviors, informative, clear recycling signs and labels with positive messages could be useful. Since students preferred positive messages overall, informative signs with positive message appeal, such as altruism, could be effective in communicating with students and arousing their recycling awareness. At the same time, the University could hold recycling contests and competitions among departments and colleges and use recycling messages with communication appeals as materials at the same time to attract students to recycle.

5.3 Limitations and Future Studies

The present study had three limitations. First, the present study chose a non-experimental quantitative survey instead of experimental design research. As a consequence, this study focused on relationships between independents. The researcher purely acted as an observer and was not able to control the exposures (Colamesta & Pistelli, 2014). This enabled the observation of a phenomenon rather than a cause and effect relationship. Further studies might investigate the reasons for these cause and effect relationships. Second, the present study is based on self-reported results. Previous research has found that a majority of students are inconsistent between their self-reported environmental attitude and actual behavior (Schahn & Holzer, 1990). It means students would like to choose higher recycling frequency than they actually do in the reality when they fill in the questionnaires. Additionally, although students do have pro-environmental attitudes, they often do not recycle. As for this condition, researchers explain it as students not believing their individual recycling behaviors could make a difference and thus refusing to take their responsibility to recycle (Barker et al., 1994). Further studies might choose to observe students' recycling behaviors instead of letting them self-report.

Apart from the practical advice in discussions of implications, the present study had two theoretical contributions to future studies. First, the present study suggested that taking action to improve student recycling behaviors such as foster recycling environment and increase recycling facilities could increase student recycling awareness and thus overcome the effect that attitudes of environment brought about. Previous literature believed that attitudes of environment could predict individual recycling behaviors (Chung and Poon, 2001; Largo et al., 2012), but the present study proposed that if there were more factors

impacting student recycling behaviors, attitudes of environment might not be the most impactful one. Further study on student recycling behaviors could work to find factors that are more determinant than attitudes of environment about student recycling. Second, in this present study, students showed clear preferences for positive messages on increasing recycling behaviors. Further study could do more research on the usage of positive messages about student recycling behaviors.

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APPENDICES

Appendix A

These questions ask about your general attitude towards the environment.

1. Please indicate your level of agreement with the following questions.

	SA	MA	UA	MD	SD
1. We are approaching the limit of the number of people the earth can support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Humans have the right to modify the natural environment to suit their needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. When humans interfere with nature, it often produces disastrous consequences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Human ingenuity will insure that we do NOT make the earth unlivable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Humans are severely abusing the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. The earth has plenty of natural resources if we just learn how to develop them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Plants and animals have as much right as humans to exist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Despite our special abilities, humans are still subject to the laws of nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. The earth is like a spaceship with very limited room and resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Humans were meant to rule over the rest of nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The balance of nature is very delicate and easily upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Humans will eventually learn enough about how nature works to be able to control it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If things continue on their present course, we will soon experience a major ecological catastrophe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: SA=Strongly Agree, MA=Mildly Agree, U=Unsure, MD=Mildly Disagree, and SD=Strongly Disagree

2. Please indicate how likely you are to recycle in the following situations:

	Never	Rarely	Sometimes	Most of the Time	Always
At home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On campus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On vacation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the following section, we will ask you questions about recycling.

3. Please indicate your level of agreement with the following statements about recycling on campus?

I am normally too busy to recycle while on vacation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not sure which types of trash I should recycle when I go on vacation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not sure what to put in the different types of trash containers when I go on vacation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't believe recycling has an impact on the environment of my vacation destination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am skeptical that trash deposited in the recycling containers is recycled at my vacation destination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my hotel should be responsible for sorting recyclable material from trash before sending it to landfill	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: SD=Strongly Disagree, D=Disagree, SWD=Somewhat Disagree, N=Neutral, SA=Strongly Agree, A=Agree, and SWA=Somewhat Agree

This question is designed to assist us in understanding what types of messages are most effective in encouraging recycling behavior. Please read the three messages and answer the question.

5. Which of the following messages would be most likely to encourage you to recycle on campus?

- Recycle – Don't let the planet down! Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. Don't feel bad letting your friends and community down. Not recycling leads to greater waste and higher costs in

waste collection and disposal. Stop being part of the problem. Failing to recycle places pressure on our planet's environment. Your choice not to recycle has impacts not only your future – but the future of your friends, family and community.

- Recycle and make a difference in the world! Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. You will feel good knowing that you are helping save the planet and create a sustainable future for your friends and family. Be part of the solution! Recycling is the right thing to do. Your recycling reduces waste and reduces greenhouse gas emissions.
- Recycle Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. Well-run recycling programs reduces waste, reduces greenhouse gas emissions and cost less to operate than waste collection, land filling, and incineration. It improves the environment and creates a sustainable future.

6. How effective do you think the following types of media would be for promoting recycling on campus?

	VI	I	NEI	E	VE
Posters and flyers around campus, on bulletin boards, in student mail, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Television ads, radio spots, billboards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Media including Facebook, email or text messages.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal contact from mentors and building staff to explain programs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promotions such as recycling contents, competitions between departments or colleges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear, informative and consistent bin infrastructure and bin labels.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: VI= Very Ineffective, I=Ineffective, NEI= Neither Effective nor Ineffective, E=Effective, and VE=Very Effective

Thank you for your insights on recycling and the environment. The following questions tell us a little more about you.

7. In which college are you enrolled?

- College of Agriculture
- College of Education
- College of Engineering
- College of Health & Human Science
- College of Liberal Arts
- College of Pharmacy
- College of Science
- College of Technology
- College of Veterinary Medicine
- Exploratory Studies
- Krannert School of Management
- Prefer not to say
- Other _____

8. What is your current academic standing?

- Freshman
- Sophomore
- Junior
- Senior
- Master's student
- Ph.D. Student
- Prefer not to say

9. What is your gender?

- Male
- Female
- Prefer not to say

10. What is your age?

- 17 or younger
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31 -35
- 36 or over

Appendix B

Scenario 1:

This question is designed to help us to choose message with a moderate level of guilt. Please read each of the following messages and choose which version of the message below you feel has a moderate level of guilt. The message should not have “no guilt” and it should not make you feel so guilty that you feel angry or resentful.

A. Recycle- Don't let the planet down!

Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. Don't let your friends and community down. Not recycling leads to greater waste and higher costs in trash collection and disposal.

Failing to recycle places pressure on our planet's environment. Your choice not to recycle has impacts not only your future –but the future of your friends, family and community.

B. Recycle –Don't let the planet down!

Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. Don't feel bad letting your friends and community down. Not recycling leads to greater waste and higher costs in waste collection and disposal.

Stop being part of the problem. Failing to recycle places pressure on our planet's environment. Your choice not to recycle has impacts not only your future – but the future of your friends, family and community.

C. Recycle –Don't let the planet down!

Recycle is easy. Across campus and in our community are many convenient opportunities to recycle. Don't feel the burden of your friends and community down. Not recycling leads greater waste and higher costs in waste collection and disposal.

Stop being selfish and think about the environment. Failing to recycle places pressure on our planet's environment. You have a duty and your choice not to recycle has impacts on your future –and the future of your friends, family and community.

Scenario 2:

This question is designed to help us choose a message with a moderate level of altruism. Please read the three messages and choose which version of the message below you feel

has a moderate level of altruism. Altruism is described as the quality of unselfish concern for the welfare of others.

A. Recycle and make a difference in the world!

Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. When you recycle you are helping save the planet and create a sustainable future for your friends and family.

Recycling is the right thing to do. Your recycling reduces waste and reduces greenhouse gas emissions.

B. Recycle and make a difference in the world!

Recycling is easy. Across camps and in our community are many convenient opportunities to recycle. You will feel good knowing that you are helping save the planet and create a sustainable future for your friends and family.

Be part of the solution! Recycling is the right thing to do. Your recycling reduces waste and reduces greenhouse gas emissions.

C. Recycle and make a difference in the world.

Recycling is easy. Across campus and in our community are many convenient opportunities to recycle. You will feel great knowing that you help with contribute significantly saving the planet and creating a more sustainable future for your friends and family. They will appreciate your assistance.

Our planet needs your help! Recycling is the right thing to do. Your recycling reduces waste and reduces green house gas emissions.

A few questions about you:

What is your current academic standing?

- Freshman
- Sophomore
- Junior
- Senior
- Master's student
- PhD. Student

What is your gender?

- Male
- Female

What is your age?

- 20 or Below
- Between 21 and 25

- Between 26 and 30
- Between 31 and 35
- Greater than 35