

THESIS

DEVELOPMENT OF AN EDUCATIONAL PROGRAM:
PROMOTING SUSTAINABILITY IN CONSUMER LAUNDRY BEHAVIOR

Submitted by

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ABSTRACT

DEVELOPMENT OF AN EDUCATIONAL PROGRAM: PROMOTING SUSTAINABILITY IN CONSUMER LAUNDRY BEHAVIOR

Sustainability in business and personal living practices has grown over the past several years and is continuing to develop. Consumption in the apparel industry causes a significant impact on the environment and utilizes unsustainable practices for clothing production, use, and disposal. The use phase of the clothing lifecycle has been established to be the most energy intensive and environmentally impactful. The purpose of this research was to further the understanding of laundry behaviors of consumers and between genders and to test whether education on more sustainable laundry behaviors influenced sustainable laundry behavioral intentions. The Sustainable Laundry Behavior Model was developed to help understand the relationship between knowledge, attitude, and behavior in regards to sustainable laundering. The current levels of sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundry behavior, and sustainable laundry behavioral intentions were measured among young adult college students. An educational program was also developed and tested among the participants. The methodology for this research utilized three phases including a focus group, a pre-educational survey and educational program, and a post-educational survey. Results described participants' current levels of sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundry behavior, and laundry behaviors. Gender differences were evident in a few items that were tested. Results showed improved laundry knowledge in the area of knowledge of action strategies after the educational program, although

knowledge of issues remained consistent between the pre-educational and post-educational surveys. Sustainable laundry behaviors improved after the educational program, suggesting its success. Results suggested that sustainable laundry knowledge influenced attitudes toward the environment and attitudes toward sustainable laundry behavior. Results also suggested that attitudes toward sustainable laundry behavior influenced future intentions for sustainable laundry behavior and future intentions for willingness and ability to practice sustainable laundry behavior.

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DEFINITION OF TERMS

Action Skills	Consumers' perception of their ability to bring about change through their behavior (Kollmuss & Agyeman, 2002)
Attitude toward the Environment	Values and/or feelings of concern toward the environment (Hungerford & Volk, 1990)
Knowledge of Action Strategies	Consumers' understanding how they can act to prevent or lower their impact on the environmental problem (Kollmuss & Agyeman, 2002)
Knowledge of Issues	Consumers' understanding environmental problems and their causes (Kollmuss & Agyeman, 2002)
Laundry Behavior	Washing, drying, ironing, and any other practices related to cleaning clothing (Laitala et al., 2012b)
Life Cycle Assessment (switch)	A tool used to identify possible improvements to various processes (Cullen & Allwood, 2009)
Sustainable Laundry Behavior	Washing, drying, ironing, and any other practices related to cleaning clothing performed with consideration for the needs of future generations (Laitala et al., 2012b; World Commission on Environment and Development, 1987)
Sustainable Laundry Behavioral Intentions	Expectations to behave in a particular way in regards to washing, drying, ironing, and any other practices

related to cleaning clothing (Laitala et al., 2012b;
Mowen & Minor, 2006)

Sustainability

Meeting the current generation's needs without
compromising the needs of future generations (World
Commission on Environment and Development,
1987)

Triple Bottom Line

The idea that companies should conduct all aspects of
their businesses by taking into account economic,
social, and environmental issues (Caniato et al.,
2012).

CHAPTER I

INTRODUCTION

Justification

In 1995 Morris, Hastak, and Mazis wrote that interest in sustainability has grown over the past several years and is expected to continually increase into the future. As of 2014, millions of articles have been written about sustainability in various sectors such as agriculture, economic development, water supply, and others. Sustainability is defined by the World Commission on Environment and Development (1987) as meeting the current generation's needs without jeopardizing future generations' needs. This definition suggests that sustainable behaviors may enhance the quality of life for future generations (Taieb, Hammami, Msali, & Sakli, 2010). More recent definitions of sustainability often include the "triple bottom line" idea which incorporates economic, environmental, and social aspects into overall sustainability. The triple bottom line requires that people be treated fairly, goods be produced adequately in order to maintain reasonable living standards, and the environment's natural resources be protected (Caniato, Caridi, Crippa, & Moretto, 2012). It has become especially important to study sustainability in recent years because climate change, overpopulation, and other life threatening events are occurring at exponential rates (Al-Hallaj et al., 2012).

Much of the impact on the environment and lack of sustainable practices is driven by consumption. Consumers continue to buy more and more in attempts to satisfy their need for social recognition and the rising amount of disposable income makes this possible (Witt, 2011). The throwaway culture, especially seen in America, encourages fast fashion and consumerism with the mindset that everything is replaceable (Fletcher, 2010). Fast fashion fosters increased

clothing purchases by producing clothing that is to be worn less than 10 times. This phenomenon in the apparel industry has caused a rise in consumption (Birtwistle & Moore, 2007). Additionally, the rise in standards of cleanliness has caused an increase in the frequency of laundering which uses water, energy, and detergents. Clothing is now washed more frequently and in smaller loads, using more resources than ever before (Jarvi & Paloviita, 2007). Standards have risen so much so that consumers often practice cleanliness at a higher rate than necessary for hygiene in order to keep up with what are considered social norms (Jack, 2013). With the increase in consumption and cleanliness standards, it is evident that resources are being used more and more extensively.

The consumer use phase, which consists of consumer use, clothing maintenance, and laundering (Brown & Wilmanns, 1997), is shown to have the greatest environmental impact in the apparel sector due to its high energy demand (Laitala, Boks, & Klepp, 2011). Many studies emphasize the production stage as most important in sustainable clothing (Laitala & Boks, 2012), but life cycle assessments, tools used to identify opportunities for improvements in various cycles (Cullen & Allwood, 2009), show the use phase to be just as, if not more, important when looking to lower the apparel sector's environmental impact. Laundry behavior is a crucial step of the use phase (Laitala et al., 2011) and will be studied comprehensively in this research.

The importance of consumer behavior in regards to laundering is evident in the sustainability movement. Based on studies done in Norway and the United Kingdom, many consumers do not follow the proper directions for many parts of the laundry process, which leads to wasted energy. Most consumers sort their laundry based on the color of a garment rather than the fiber type and ignore instructions on clothing tags, which leads to ruined and disposed

clothing and, in turn, overconsumption (Fletcher & Goggin, 2001; Laitala et al., 2011).

Consumers also tend to wash their clothing as a habit rather than as a necessary means of cleaning (Laitala et al., 2011). Few studies focus attention on laundering behavior in the United States, which may vary as laundry behaviors differ by cultural context (Pakula & Stamminger, 2010).

Unsustainable laundering behaviors lead to over use and loss of resources such as fresh water and electricity which have a negative impact on the environment. Studies in Europe have shown that household energy use is rising and household consumption of water and energy adds one third to the total use (Gram-Hanssen, 2007; Steg, 2008). In a study by Pakula and Stamminger (2010), the United States was documented using an average electricity consumption of .43 kWh and water consumption of 144 L per wash cycle. While the energy consumption was relatively low compared to other countries, the U.S. water consumption was the highest, along with Canada (Pakula & Stamminger, 2010). Laundry behaviors tend to incorporate inconspicuous consumption, meaning the laundry consumption routine is ordinary and habitual, thus inconspicuous; consumers do not realize the amount of water, energy, and chemicals they are using while performing laundry tasks (Jack, 2013). Because most consumers are unaware of the impact their laundry has on the environment, educational programming may encourage more sustainable laundering behavioral intentions (Birtwistle & Moore, 2007).

There is further interest in the area of gender differences in regards to laundry behavior. Women are still the primary laundry doers in most households according to a survey completed in Norway in 2002 (Laitala, Klepp, & Boks, 2012). As women have historically been responsible for housework, there is preliminary evidence of gender differences in laundry

behavior even as the gender gap decreases (Bose, Bereano, & Malloy, 1984). This study will investigate the gender differences in laundry behavior in the United States.

Purpose of the Study

Previous studies involving life cycle assessments have shown that the consumer use phase of clothing has the greatest environmental impact due to the high energy usage (Laitala et al., 2011). This study will explore the likelihood for consumers to change their laundry behavioral intentions after gaining more knowledge through an educational program that affects their attitudes toward the environment and sustainable laundry behavior. Because environmental concerns are positively correlated with education (Daneshvary, Daneshvary, & Schwer, 1998), it can be expected that consumers who have been educated specifically on unsustainable aspects of laundering clothing and on the alternatives they can practice that are more sustainable will intend to model their behavior as so. The results could, however, mirror the results of other studies which show that environmental concern is more difficult to incorporate into inconspicuous behaviors (Jack, 2013). Ideally, the educational program will highlight the inconspicuous use of energy, water, and chemicals, allowing consumers to more easily change their behaviors to be more sustainable. The study aims to provoke sustainable laundry behaviors which involve washing, drying, ironing, and any other practices related to cleaning clothing performed with consideration for the needs of future generations (Laitala et al., 2012b; World Commission on Environment and Development, 1987).

The purpose of this study will be to further the understanding of sustainable laundry behaviors of consumers and between genders and to test whether education on proper laundering behavior changes consumers' laundering behavioral intentions to be more sustainable. Specifically, this study aims to understand the current level of laundry knowledge, attitudes

toward the environment and sustainable laundering, and laundry behaviors of young adult college students. Additionally, an educational program will be developed and tested on young adult college students' knowledge, attitudes, and sustainable laundering behaviors.

Three research questions to be answered by this study include:

1. What are the current levels of sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behaviors of young adult college students and are there gender differences?
2. Will college students' sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behavior change to be more sustainable after participating in an educational program?
3. Will college students alter their laundering behavioral intentions to be more sustainable due to increased knowledge of and improved attitude toward sustainable laundering from an educational program?

Overall the aims will be to educate consumers on best practices available for clothing laundering behavior and to achieve more sustainable behaviors. The results of the study may appeal to many design companies who value the triple bottom line and would then be able to use the information to promote their products and ultimately lessen environmental impact that consumers have on the environment. Investigating consumers' laundering behaviors should reveal information on their possible excessive energy, water, and product use and therefore allow consumers to understand their personal impact on the environment.

Research on sustainability is very valuable at this point in time with the growing population and increasing number of threats to the planet (World Commission on Environment and Development, 1987). The need for sustainability is becoming more and more evident in the

fashion and apparel industry which is currently motivated by fast fashion and the throw-away culture (Birtwistle & Moore, 2007; Fletcher, 2010). Sustainable practices will likely improve the condition of the Earth and availability of natural resources for future generations, which would strengthen their quality of life (Taieb et al., 2010).

Theoretical Framework

The theoretical framework for this study is adapted from two models, the Pro-environmental Behavior Model (Kollmuss & Agyeman, 2002) and the Hines Model of Responsible Environmental Behavior (Hungerford & Volk, 1990) (Appendix A, Figures 1 and 2, respectively), which are used to describe pro-environmental behavior. The models were chosen to include the combination of knowledge and pro-environmentalism with sustainable laundry behavior. The participants will be educated on sustainable laundry behavior which will expectantly elicit an attitude change and therefore a behavioral intention change toward more sustainable laundry.

Pro-environmental Behavior Model. The early model of pro-environmental behavior (Appendix A, Figure 1) suggests that environmental knowledge affects environmental attitude which in turn elicits pro-environmental behavior. While the model portrays a linear relationship among knowledge, attitude, and behavior, research has suggested that other variables have to be considered to better predict behavior (Kollmuss & Agyeman, 2002). Pettersen and Boks (2013) have established that there is not a direct relationship between pro-environmental attitudes and pro-environmental behavior. Additionally, attitudes determine behavioral intention but not behaviors (Fishbein & Ajzen, 1975). An additional model is added to this study to incorporate these other variables. The Hines Model of Responsible Environmental Behavior will be

combined with the Pro-environmental Behavior Model in order to better describe the situation of behavioral intention change in regards to sustainability (Hungerford & Volk, 1990).

The Hines Model of Responsible Environmental Behavior. The Hines Model of Responsible Environmental Behavior (HMREB) (Appendix A, Figure 2) factors in several additional aspects that may influence responsible environmental behavior. For this particular study, the knowledge section, which includes action skills, knowledge of action strategies, and knowledge of issues, will be taken into consideration. The HMREB explains that individuals are most likely to take action if they first express intention to take action. In order to express intention to take action, the individual must have knowledge of the issue at stake. The individual must also have knowledge of solutions to that issue (knowledge of action strategies) and the ability to achieve the solutions (action skills) (Hungerford & Volk, 1990). This study will incorporate knowledge of issues, knowledge of action strategies, and ability to carry out action skills into the Pro-environmental Behavior Model.

Sustainable Laundry Behavior Model. The Sustainable Laundry Behavior Model (Appendix A, Figure 3), which was created for this research, will be used to guide the study. The model portrays knowledge, attitudes, and behaviors pertaining to sustainable laundry. In order to change laundry behavioral intentions to be more sustainable, knowledge must be in place to influence attitude. Ideally, knowledge of issues, knowledge of action strategies, and actions skills will all be in place to affect consumer attitude which, in turn, will affect consumer laundry behavior to be more sustainable.

CHAPTER II

LITERATURE REVIEW

Sustainability

“Human-induced climate change through increased greenhouse gas emissions is considered to be one of the most pressing problems of our time.” (Abrahamse, Steg, Vlek, & Rothengatter, 2007, p. 265) This is perhaps the most important reason for people to study and practice sustainability. Sustainability is meeting the current generation’s needs without compromising the needs of future generations (World Commission on Environment and Development, 1987). Sustainability can be explored through a variety of lenses, from a very large view such as global warming down to very specific issues such as textile recycling. This research will explain some general facts on sustainability then focus on the issue of sustainable laundry behavior.

The triple bottom line is one lens of sustainability that is a newer focus. It incorporates environment, society, and economics into the definition of sustainability (Caniato et al., 2011). In relation to the environment, sustainable consumption involves reducing the use of natural resources, toxic materials, and emissions of waste and pollutants (Jarvi & Paloviita, 2007). Social sustainability includes personal responsibility, quality of life, health, well-being and happiness, democratic participation, and cooperative behavior (Bhamra, Lilley, & Tang, 2011). Economic sustainability requires goods to be produced at a rate that encourages economic growth of the company or group (i.e. town, country, etcetera) without over production. Several companies in the apparel industry have incorporated the triple bottom line into their business plans in order to secure a better future (Caniato et al., 2011).

Company views. Many companies in the apparel industry have recognized a need to change their practices, products, and consumers' behaviors to promote sustainability. Companies share the responsibility of sustaining the Earth with individual consumers and do so by providing sufficient and understandable information to consumers on their products, use of their products, and disposal of their products (Jarvi & Paloviita, 2007). One such company is Patagonia, an outdoor clothing company "known for its efforts to improve the environmental performance of its products and overall operations" by using recycled materials and offering recycling and repair programs for their products (Brown & Wilmanns, 1997, p. 28). Nike also acknowledges the shared responsibility for sustainability specifically through its Environmental Design Tool. This tool, which is available to the public, measures the impact of commonly used materials in apparel. Nike shares the Environmental Design Tool to encourage other companies to look at their own footprint and make positive changes (Nike Considered Design, 2010). Influenced by Nike, The Sustainable Apparel Coalition (2012), an organization open to all businesses in the apparel industry, has also provided an industry wide measurement tool, based off of Nike's Environmental Design Tool, for companies to measure the social and environmental impact of their clothing. Other companies, both big and small, are participating in the sustainability movement as well. Eileen Fisher, a well-known American designer, takes sustainability very seriously with eco materials, renewable energy, and recycling (Eileen Fisher, 2013). A smaller American company, Nau, looks at sustainability as a positive force for change. They incorporate a variety of aspects into their entire business plan including recycled materials, philanthropy, and classic lines and aesthetics so that clothing never goes out of style and can essentially be worn forever. Nau produces clothing that is meant to be washed in cold water and line dried without the use of ironing or dry cleaning. They even try to educate their consumers

on the energy use involved with clothing care (Nau International, Inc., 2013). Other companies include Junky Styling and Worn Again, both European, who primarily focus on using recycled textiles and garments to produce new, reinvented looks (Clark, 2008).

Companies are not required by legislation to incorporate the triple bottom line or other sustainable strategies into their business practices, although boycotts and campaigns have popularized the sustainability movement. Nike was at one time participating in child labor and using sweatshops, but changed their practices in part due to consumer boycotting (Crane, 2010). Many apparel companies are still inclined to participate in the fast fashion movement because it may allow for a larger profit due to consumers being encouraged to elevate their spending (Watson & Yan, 2013). As shown through many consumer boycotts though, consumers do have the ability to force companies to change for the better (Crane, 2010). Consumers hold companies responsible not only for their actions, but also for the actions taken by any supplier or producer the company chooses to use (Caniato et al., 2011). This is why a consumer's role is so essential in influencing the apparel industry to use and create sustainable behaviors. Consumers are indirectly supporting sustainable, or non-sustainable, behaviors in the industry (Jarvi & Paloviita, 2007).

Consumer views. Consumers' interest in "green," sustainable, and recycled products and services has grown in recent decades and is expected to continue increasing in the future (Morris, Hastak, & Mazis, 1995). Studies on sustainability in general and sustainability in laundry are increasingly being released in various areas of the United States, although research regarding sustainability is more prevalent in Europe. Sustainable approaches, life cycle assessments, and environmental analyses are a few topics that have been scholarly investigated in the United States (Armstrong & LeHew, 2011; Brown & Wilmanns, 1997; Chen & Burns,

2006), but this does not mean that consumers are aware of any or all of these sectors of the sustainability movement. Most consumers are aware that their purchasing behavior has a direct impact on the environment (Bianchi & Birtwistle, 2012), and by changing their consumption habits, consumers can influence the environmental impacts of products (Jarvi & Paloviita, 2007).

The majority of people have a positive attitude about environmentalism (Brandon & Lewis, 1999). The younger population actually shows more concern for the welfare of the environment, perhaps because they feel the future results will affect them more directly (Niinimaki & Hassi, 2011). Unfortunately, several studies show that concern for the environment usually does not translate to behavior often due to inconvenience and high cost (Brandon & Lewis, 1999; Domina & Koch, 1998; Steg, 2008). Specifically, pro-environmental attitude does not directly relate to pro-environmental behavior (Pettersen & Boks, 2013). The main motivation for behavioral change is monetary concerns (Brandon & Lewis, 1999). Pricing strategies, therefore, may be effective in reducing consumption and in turn reducing production, energy use, and material use (Steg, 2008).

Many consumers also say that they would be willing to change their behaviors if they were more educated on the environmental and social impacts of their actions (Birtwistle & Moore, 2007), so another possible solution for behavioral change in consumption is education. Studies show a positive correlation between consumers' awareness of the environment and textile donation (Bianchi & Birtwistle, 2012). There is also increased awareness of the environment with higher education (Daneshvary et al., 1998). Although evidence shows that consumers understand that "recycled" means that material has been made from other products or packaging, there is still a need for more education as they frequently have a poor understanding of other terms used in environmental claims (Morris et al., 1995; Chen & Burns, 2006). In fact,

Morris et al.'s study (1995) showed that consumers with lower income and education levels have less understanding and comprehension of the terms “recycled” and “recyclable.” These previous studies indicate a need for better education and, in particular, more information on environmentalism.

Sustainability of clothing. It is seemingly impossible to create a garment with absolutely no effects on the planet with the current practices of the apparel industry, which is why many companies like Patagonia have created strategies to reduce their environmental impact. Patagonia discovered that there is no significant difference in the environmental impacts made by polyester, nylon, cotton, and wool due to processing methods (Brown & Wilmanns, 1997). Many consumers mistakenly assume that natural fibers are the answer to environmental problems (Caniato et al., 2011), however technical fibers are useful in sustainable design because they can be chemically recycled and often have better performance than natural fibers, one of which is durability. Technical fibers, like natural fibers, have downsides as well though, such as not being biodegradable (Scaturro, 2008). These facts are evidence that there is no perfect solution to producing sustainable clothing.

Eco-design includes design strategies that systematically attempt to reduce environmental impact through better design. With this design strategy, companies have put much focus on resource use in production rather than on consumer behaviors. Studies have determined that the use phase of clothing is the most resource-demanding (Laitala & Boks, 2012), which suggests that more of the responsibility of sustainability in the apparel industry should be on the consumer as opposed to the industry. Companies can help consumers easily forego some of the unsustainable practices through better designs. Clothing can be designed to be washed less frequently with the use of stain-blocking coatings, odor-resistance, and soil-resistance; although

that brings up the question of the sustainability of the coatings in their production methods and their safety to humans (Fletcher & Goggin, 2001). Designers can also design clothing to be washed in cold-water which reduces energy consumption with the removal of heating the wash water. Laundry detergents can be developed to be effective in cold temperatures as well creating energy savings (Cullen & Allwood, 2009). Fibers that are washed in cool temperatures and dry quickly prove to be the most sustainable choices for designers (Fletcher & Goggin, 2001). Less frequent washing of clothing can also reduce the wear and tear which increases the lifetime of the garments (Laitala et al., 2011).

Prolonging the use phase can result in a lower impact on the environment due to fewer garments ending up in landfills and less consumption of new clothing which leads to fewer pieces of clothing produced (Laitala & Boks, 2012). The clothing can then be reused or recycled as part of a sustainable post-purchase choice (Bianchi & Birtwistle, 2012), although only about 25% of recyclable textiles are recycled (Daneshvary et al., 1998). Prolongation of clothing life may be the most sustainable solution for the impacts of the apparel industry (Laitala & Boks, 2012).

Laitala and Boks (2012) found that the most common reason for clothing disposal was degradation of the textiles including dimensional changing due to washing, wear and tear, unraveled seams, pilling, and color fading. The quality of garments has gone down, and therefore the lifetime is shortened. In recent years, fast fashion has made repairing garments not worth the time and money that it takes (Niinimaki & Hassi, 2011). Fast fashion can be defined as a business solution which involves the rapid production of fashionable garments through efficient supply chains to meet consumer demands and is the opposite of sustainable fashion (Watson & Yan, 2013). Garments are discarded when the cost of keeping them is higher than

the cost of disposal and purchase of a new piece (Laitala & Boks, 2012). Domina and Koch (1998) found consumer knowledge on the impacts of purchasing, use, and disposal of clothing to be very limited, though, so most consumers practice behaviors that are most financially beneficial to themselves, not environmentally beneficial to the whole population. Studies show that consumers will purchase environmentally friendly clothing when certain standards are not compromised including price, color, and style (Domina & Koch, 1998).

Life cycle assessments of clothing. A life cycle assessment (LCA) is a tool used to highlight areas for improvement in products or services, particularly by informing the decision makers of the environmental performance (Cullen & Allwood, 2009). The demand for LCA is growing in North America for numerous reasons (Fava, Baer, & Cooper, 2009). Mainly, LCA can be used by the industry, government, and other organizations for strategic planning, priority setting, process design, and product design or redesign (Cullen & Allwood, 2009). Patagonia recognized a need for evaluative tools and created a model for sustainability as the first step. The model included four components: “1. Do not take anything from the Earth’s crust that you cannot put back; 2. Maintain the integrity of the natural ecosystems; 3. Do not spread long-lived human-made materials around the environment; 4. Leave enough for others.” (Brown & Wilmanns, 1997, p. 31). Their model for sustainability worked as a guide and led Patagonia to further create an LCA specifically for their clothing. The six components that identified areas for improvements included in the LCA were product design, material selection, production processes, distribution, product maintenance, and ‘end of life’ (Brown & Wilmanns, 1997).

Patagonia’s and other LCA studies have shown that the use period, called product maintenance in Patagonia’s LCA (Brown & Wilmanns, 1997), is typically the most energy-demanding phase of a piece of clothing’s life cycle. In particular, washing clothing is the most

environmentally intense phase during a piece of clothing's lifecycle (Jack, 2013). Depending on the energy source, the use phase can also be the most polluting phase (Laitala et al., 2011). For example, a Dutch study showed an average piece of clothing to be washed about 20 times and used for 44 days, although large variations between different types of clothing were evident (i.e. skirts versus pants). Compared to the use phase, the production and disposal phases of clothing have a relatively low impact on the environment, although these phases should not be completely ignored (Laitala & Boks, 2012). The "washing machine effect" is the overestimation of the impact of a particular phase, and the "inverse washing machine effect" is when a study excludes an activity involved in the process, therefore underestimating the importance of that activity. LCAs can be helpful to point out priority phases, but other phases should not be completely disregarded in sustainable improvements (Cullen & Allwood, 2009). This study will focus solely on the use phase of clothing, particularly maintenance which includes washing and drying, in order to get a more comprehensive understanding of that phase because few other studies have done so. The importance of other stages of clothing's life cycle is not to be diminished though. Post-consumption behaviors such as recycling, donation, and reuse all play an important role in overall sustainability, especially because textiles that end their life in landfills can release methane emissions into the air and cause groundwater pollution (Niinimäki & Hassi, 2011). The study of clothing maintenance and, in particular, laundry behavior is important due to the possible magnitude of the results if, in fact, an educational program can alter behavioral intentions.

Sustainability and laundering behavior. Throughout the world, the amount of water and energy that goes into laundering varies greatly due to differences in cultural norms, standards of cleanliness, and technology available (Pakula & Stamminger, 2009). The total

amount of household energy is rising though throughout the world (Steg, 2008). Household consumption adds one third to the total amount of energy and water use (Gram-Hanssen, 2007). Laundry washing alone uses 1% of the total electricity consumed in most homes in North America, although that percent can vary due to the technology being used in clothing maintenance. Recent progress in economic development has raised the standards of cleanliness throughout the world and has in turn increased the number of in-home washing machines (Pakula & Stamminger, 2009). Fletcher and Goggin's (2001) research shows that one and two person households tend to wash clothing as needed rather than waiting for a full load to accumulate, thus adding to the amount of water and energy use. Studies also show that consumers frequently over wash clothing beyond what is needed for hygienic purposes due to social concern (Jack, 2013). Although laundromats are widely available and a good alternative to lowering energy and water use due to larger sized washers and the tendency of people to do fewer loads, they are often stigmatized and seen as inconvenient (Fletcher & Goggin, 2001). In general, people are less concerned with saving energy and water and more concerned with not overfilling their washing machines which they perceive will cause damage and not provide good cleaning results (Conrady, Kruschwitz, & Stamminger, 2013). Past studies have shown the unwillingness for consumers to change their laundry behavior and that consumers were especially unwilling to downsize their washing machines and give up their tumble dryers because of the convenience provided (Pettersen & Boks, 2013).

It is best to wash clothing less frequently, on lower temperatures, and in fuller loads (Fletcher & Goggin, 2001). Besides reducing energy use, lowering water temperatures during laundering can reduce the wear and tear on clothing which prolongs their life (Laitala et al., 2011). Properly caring for clothing, which involves following the laundry instructions provided,

will extend the product's lifetime. Hang dry fabric offers the least dimensional change, and tumble dry fabrics show the most dimensional change. This suggests that not only will hang drying prevent unnecessary energy use, but it will also protect clothing providing a longer life cycle (Klausing, Maloney, & Easter, 2012). Although the most sustainable form of laundering has yet to be determined (Pakula & Stamminger, 2009), developing technology, changing consumer behavior, or a combination of the two will improve the sustainability of laundry (Laitala et al., 2011). Pettersen and Boks (2013) reiterate the importance that must be placed on individual consumer behavior in order to lessen the impact entire societies may have on the environment.

Laundry Technology Advances

Appliances. “Efficiency, along with rationality, is one of the two hallmarks of the ideology of technological development.” (Bose et al., 1984, p. 54) The total time spent on housework has not decreased in the last fifty years, despite the new technologies available. This is likely due to the rising standards of cleanliness providing new chores to take up that extra allotted time. Consumers typically prefer a reduction of effort put into housework over a reduction of time though (Bose et al., 1984).

The total environmental impact per wash has been reduced with the advancement of technology, although the time spent per wash remains the same (Laitala et al., 2012b). New washing machines use half as much energy than machines built just 20 years ago (Conrady et al., 2013). Consumers show support for the technological advances that use energy more efficiently (Klausing et al., 2012), however, with the increased frequency of laundering and amount of clothing owned in Western societies, these improvements could be offset (Laitala et al., 2012b).

Improvements on currently available laundering appliances offer significant differences from those in the past. Front-loading washers use up to 38% less water and 58% less energy than standard top-loading machines. The high-speed spin cycle in front-loading machines also saves energy that would otherwise be used in a dryer by removing excess water after the wash cycle. The front-loading horizontal axis washing machine is one of the most important technologies for improving household sustainability (Hustvedt, Ahn, & Emmel, 2013). New front-loading machines often are equipped with sensors to reduce water and electricity consumption in response to smaller load sizes. While top-loading machines are still most common in America, Australia, and Asia, the adoption of the front-loading machines is on the rise. The technology incorporated into new washing machines brings about many benefits including less water and energy consumption (Pakula & Stamminger, 2009). Even with technological improvements, the improved technology for sustainability may quickly become obsolete. With changing situations and contexts of use over time and between different societies new improvements may not be relevant, reiterating the importance of behavioral change (Pettersen & Boks, 2013).

Water consumption from washing machines has been reduced by 60% from thirty years ago (Conrady et al., 2013). Front-loading machines use less water than traditional top-loaders (Klausing et al., 2012). Top-loaders average forty gallons of water per load, with front-loaders averaging only twenty to twenty-five gallons, and oftentimes even less (Hustvedt et al., 2013). Machines in Japan have further improved their sustainability by using recycled water from bathing, which contains residual heat, lessening the energy used to further heat wash water (Pakula & Stamminger, 2009).

Water is just as important in cleaning laundry as detergent and should be used at the recommended temperatures and accurate amounts (Fijan, Fijan, & Sostar-Turk, 2008). Most experts agree that low wash temperatures are satisfactory in home laundering. Once a month, a wash at sixty degrees Celsius (140 degrees Fahrenheit) is suggested to reduce the formation of biofilm along with allowing the washer to dry out with the door open after each cycle. According to research conducted in Norway, few consumers acknowledge the instructions on water hardness, size of washing machine, or the water level of the washing program when selecting the amount of detergent to be used, although these all factor in to the correct dosage (Laitala et al., 2012b).

The age of a washing machine directly influences how much energy and water is used per cycle (Pakula & Stamminger, 2009). If all washing machines were replaced with the most efficient ones available, energy consumption could be reduced by more than 70%. Because most washing machine purchases are bought as replacements though, the adoption of the newer, more efficient machines is slow (Fletcher & Goggin, 2001).

Benefits versus costs. The U.S. Department of Energy has created a set of standards for energy and water efficiency which is denoted on appliances with the Energy Star rating. This helps consumers identify products as having technological and sustainable benefits. American consumers have been slow to adopt the front-loading washer for several reasons, including fear of leakage and concerns with bending to load and unload the washer. Those consumers who have already adopted the newer front-loaders choose to do so for the lower water use and higher cleaning power. Top-loading washing machine owners have reported difficulty with reaching and reading the controls on their machines, which is yet another reason to convert to the front-loading machine (Hustvedt et al., 2013). Consumers do have control over some sustainability

factors of their laundering, despite the technology of the machine, such as washing temperatures and machines settings (Pakula & Stamminger, 2009).

Another benefit of adopting front-loading washing machines is the delicate treatment of clothing. Reduction of mechanical action in front-loaders has the potential to lengthen garment life. Washing and drying can affect the dimensional stability of a garment with the largest percentage of change happening in the first wash and dry cycle. Use of the front-loading washer and air drying clothing can protect garments from damage and dimensional change (Klausing et al., 2012). Furthering consumers' knowledge on the benefits of clothing durability due to less frequent washing may also influence consumers to choose more sustainable laundering behaviors.

Although the benefits appear to outweigh the costs, many consumers still factor initial price into their choices to adopt a front-loading washing machine. Cost of the physical machine was the number one reason Hustvedt et al. (2013) found for consumers to not purchase a front-loader. Thus, they found that adopters of front-loading machines were more likely to have a higher income. Sensors which detect moisture level and allow for automatic termination provide the shortest payback for clothing dryers, which may influence some consumers to make the change to a front-loading machine despite the initial cost (Hustvedt, 2011). Although front-loading machines save tremendous amounts of water, the cost of water is relatively small compared to the entire laundry process, thus, many consumers may not find the benefit worthwhile (Fijan et al., 2008). Because many consumers are unable to afford the new technology to save energy and water, this educational program to change behavioral intentions may be critical to enhance the sustainability of laundry.

Research on Consumer Laundering Behavior

Laundry habits, which are linked to cleanliness, are influenced by culture, society, and morals and are constantly changing (Laitala et al., 2012b). Cleanliness is not specific to time and place. It can be measured by the absence of dirt or bacteria and is an outcome of religious, social, or practical reasons (Klepp, 2007). Cleanliness is often driven by social competition and associated with values like success, acceptance, and happiness. Cleanliness and, in particular, personal hygiene is also associated with health (Gram-Hanssen, 2007). Since the 1950s, dirtiness of clothing has been considered something that comes from within the body, such as sweat or body oils, when it was previously noted as coming from an external source referring to stains, dirt, and dust (Klepp, 2007). Clothing was originally meant to keep the body clean and dirt free, however, now the body is seen as a cause of dirty clothing (Pettersen & Boks, 2013). This change of paradigm has caused an increased focus on odor as unclean rather than visible stains (Klepp, 2007), which is also now the norm for determining when to change and wash clothing. Standards of cleanliness can actually be a cause of internal conflict, as many consumers have trouble understanding social cues and feedback in regards to cleanliness and end up overcompensating in their cleaning behaviors (Jack, 2013). With the rise of cleanliness standards, showering and laundering has increased more than ever in the past several decades (Gram-Hanssen, 2007).

It is likely that the largest positive effect for sustainability is through behavioral change (Laitala et al., 2011). Altering consumer behavior can benefit the earth and, in turn, the human population (Brandon & Lewis, 1999). Unfortunately, environmental and social benefits are not strong enough reasons for the average consumer to change their behaviors when compared with individual consumer wants (Bhamra et al., 2011). It is argued that many consumers are not

concerned with the environmental impact of the increased cleanliness standards because they are not knowledgeable of the problems associated with it (Jarvi & Paloviita, 2007), but there are obvious links between the global environmental problems and individual consumer behavior shown through domestic energy consumption (Brandon & Lewis, 1999).

Laundry knowledge. What consumers know and what consumers think they know are frequently different which is applicable in regards to laundering. “Consumer knowledge is defined as the amount of experience with and information that a person has about particular products or services.” (Mowen & Minor, 2006, p. 64) In regards to this study, knowledge of sustainable laundry issues, knowledge of sustainable actions, and knowledge of how to engage in those actions will be explored.

Information comes to consumers through so many facets that it is difficult for them to know what is truthful. “Green-washing” is an example of false knowledge retrieved from an outside source. Green-washing occurs when false claims are made to exploit green consumers. This can occur purposefully from various companies, although consumers can get false information from other sources that do not know they are giving false information such as friends, family, and internet sites. Many consumers believe that a product is better for the environment if the packaging includes environmentally friendly terms, although this is not necessarily true (Spack, Board, Crighton, Kostka, & Ivory, 2012). Green-washing demonstrates how easily consumers can be manipulated.

The term “green” has become such an umbrella term that its actual meaning is not always clear to consumers, and green product perceptions do not necessarily translate into purchasing behavior (Spack et al., 2012). The most common ways for consumers to learn about washing machines are through the internet and appliance stores. Consequently, the internet does not

always provide accurate information. Online consumer reviews typically highlight the problems of an appliance rather than the positive attributes (Hustvedt et al., 2013), which may deter consumers from purchasing a machine that otherwise meets their needs.

In regards to laundry, consumers are typically not as knowledgeable as they think they are. People tend to follow “general norms” in their everyday lifestyle tasks (Jack, 2013). Consumers are rarely aware of the fiber content of their clothing, despite the fact that clothing is required to be labeled with this information. With this chosen ignorance, consumers oftentimes assume their laundry is primarily cotton and wash it as so, frequently and with high temperatures. Sorting of laundry is usually done on the basis of color, rather than fiber type, which can ruin clothing and also use unnecessary water and energy (Fletcher & Goggin, 2001).

People are aware of and concerned about the problems associated with home energy use, although they know relatively little about their own personal energy use (Steg, 2008). American consumers tend to overestimate their conservation behavior and underestimate their energy consumption (Hustvedt, 2011). Many consumers are unaware that front-loading washers use less energy than top-loaders and further save energy with high spin cycles that remove excess water and allow for shorter dry time. In Hustvedt et al.’s (2013) study in America, front-loading washer owners correctly estimated their water use per load of laundry at 7 gallons, but top-loading washer owners underestimated their water use by more than 50%. This further demonstrates the lack of knowledge that the typical consumer has about laundry. Consumers may not be willing to change their behavior though, due to the hedonic incongruity involved from their parents likely teaching them a specific behavior (Conrady et al., 2013). The post-educational survey in this study will measure the likelihood of participants to change their behavioral intentions to be more sustainable after learning sustainable laundry behavior.

Laundry attitudes. Knowledge is expected to provoke an attitudinal change in this study according to the Sustainable Laundry Behavior Model. Little information is currently known about attitudes toward sustainable laundry specifically. Bose et al.'s (1984) research did note the preference of reduced effort over time toward housework; however, it does not hone in on laundry behavior. Most attitude studies about sustainability completed in the apparel industry recently focus on the disposal or recycling of textiles (Bianchi & Birtwistle, 2011; Daneshvary et al., 1998; Domina & Koch, 1998). One study on environmentalism in the apparel industry found that pro-environmental attitudes did not directly influence purchasing behavior. Instead, environmental attitudes influenced clothing environmental attitudes which then had the possibility of influencing purchasing behavior. Moreover, it is common for consumers to express pro-environmental attitudes, but not practice pro-environmental behaviors unless there is no extra cost (Domina & Koch, 1998). It is suggested that in general, consumers will practice pro-environmental behaviors that demand the least cost, not just economically, but inclusive of time and effort as well. These common results seem odd due to the fact that attitudes, defined as “the enduring positive or negative feeling about some person, object, or issue” (Kollmuss & Agyeman, 2002, p. 252), are closely linked to beliefs and values, and it is typically assumed that consumers make decisions based on their beliefs and values, although Pettersen and Boks (2013) report that there is not a one-to-one relationship between pro-environmental attitudes and pro-environmental behavior, meaning that other factors may need to be considered when trying to invoke pro-environmental behavior change. A possible limitation to this study is the finding that consumers who believe technology will solve most sustainability issues are less willing to make personal sacrifices (Kollmuss & Agyeman, 2002). Consumers may adhere to this belief and ignore their own role in sustainability. Contrarily, consumers may learn from the educational

program in this study that sustainable laundry behaviors do not take a significant amount of extra time or effort and be more willing to adapt to the sustainable laundry behaviors recommended.

Laundry behavior. Laundering behaviors are constantly changing and developing with social, cultural, and moral norms. Recent changes in social norms have led to an increase in laundry and personal hygiene (Laitala et al., 2012b). With an increase in demand for cleanliness has come an increase in demand for energy, water use, and detergent consumption. This has also led to laundry being washed in smaller loads more frequently (Jarvi & Paloviita, 2007). Laitala et al. (2012) have emphasized the need for consumers to improve their laundering behaviors, for instance, by using low wash temperatures, using eco-program settings, filling the machine to capacity, decreasing washing frequencies, and using the correct detergent dosages.

The average American consumer in 2011 did laundry twice a week including six loads of laundry, four of clothing and two of home textiles (Klausing et al., 2012). Many consumers wash clothing habitually after every use without ever evaluating its soil level. Since laundry is done as a habit, many people are unnecessarily washing clothing and using resources. In their research in Norway, Laitala et al. (2012) found that men and older people tend to wait longer between washing which is helpful to the environment, although not necessarily their motivation. Laundry is oftentimes generated out of laziness according to parents involved in a study by Gram-Hanssen (2007). Teenagers would rather put clean clothing back into a laundry bin rather than taking time to fold, sort, and put away their clothing. Although many people change and wash clothing daily (Gram-Hanssen, 2007), some products are typically washed less than others such as towels and jeans. Most agree that underpants should only be used one day before washing, but woolen sweaters can easily be worn more than ten times before washing (Laitala et al., 2012b).

The number of laundry loads can be reduced with better utilization of the size of the washing machine (Conrady et al., 2013). European consumers interviewed by Laitala et al. (2012) said that they typically wash full machine loads but not too full for fear of damaging the machine and not getting good cleaning results. One report said that the majority of consumers in Europe use the washing machine at over 75% of its capacity for every wash (Pakula & Stamminger, 2009). Norwegian consumers have also reported that they trust the cotton washing program most and therefore use it most frequently regardless of the content of the laundry (Laitala et al., 2012b). The most common reason for not using a dryer is to protect the clothing from damage, but as a bonus this also uses less electricity (Braun & Stamminger, 2011).

The electricity and water use from laundering in homes varies by the technology of the machine, the number of washes, the wash temperature, and the size of the load. In North America, the average washing temperature is about thirty degrees Celsius which uses about .42 kWh of energy per cycle (Pakula & Stamminger, 2009). Many consumers say that they would like to reduce their environmental impact but not at the cost of extra effort or money or if it conflicted with other goals and values (Laitala et al., 2011). This aligns with the findings of Bose et al. (1984) that reduction of effort put into housework is preferred over saved time.

Other steps can be taken to promote sustainable laundry and eventually reduce consumption of apparel and laundry products, water, and energy as well. Failure to follow instructions on care labels can have lasting effects on clothing which eventually leads to greater clothing consumption. The effects of ignored instructions may include color loss, shrinkage, deformities, and other quality degradations of clothing. Surveys show that American consumers would like to be provided with washing instructions; they do not expect to know exactly how various garments should be washed (Klausing et al., 2012). When instructions are disregarded

by consumers, potential savings are lost for fibers that do not require frequent washing (like wool, which typically just needs to be aired out) (Laitala et al., 2011).

Consumers not only ignore instructions written on their clothing, but there are also studies that show consumers ignore instructions on other laundering products. In their study, Laitala et al. (2012) found that only 12% of their participants accurately followed the detergent instructions and used a measuring cup while doing laundry. Similarly, some consumers from a study in Germany actually use the same amount of detergent for every cycle despite the size of the load or the soil level of the garments (Conrady et al., 2013). Although it is important not to use too little detergent to ensure proper cleaning, overdosing detergents greatly increases the amount of chemicals in the wastewater that go back into our water supply (Fijan et al., 2008). In a study conducted by Conrady et al. (2013), the majority of participants, who were all German, realized their overdosing behavior and expressed intentions to change that after motivational interviewing, which involved open-ended exploratory questioning and an instructional component with visuals. Detergent dosage recommendations have been reduced by two thirds from past recommendations which can allow for significant savings over a length of time (Conrady et al., 2013).

The correct dosage of detergent does influence the cleanliness of clothing (Conrady et al., 2013). A recent study in Norway suggests that detergent labeling can be improved to help consumers in this aspect as previously mentioned. By giving more accurate information about dosage to use according to hardness of water, dirtiness of laundry, and size of the washing machine, consumers may be more likely to stop overdosing. Consumers may also be more likely to purchase detergents with eco-labeling (Jarvi & Paloviita, 2007), though environmental claims that are more specific are perceived more positively than general claims (Spack et al., 2012).

Many consumers depend on product packaging for information for how sustainable a product is and how the product should be used (Spack et al., 2012). Consumers actually regarded detergent packaging information as the most important source of information for product sustainability. Eco-labeling has been intended to help consumers purchase products that are less harmful to the environment, although, as previously noted the terms are often misunderstood or have no significant meaning (Jarvi & Paloviita, 2007).

Use of fabric softener has an impact on the level of sustainability of consumer laundry behavior. Fabric softeners are not considered sustainable due to the chemicals added to the wastewater after use and additionally the production and transportation of the product before its use. In a study by Laitala, Kjeldsberg, and Klepp (2012) in Norway, consumers reported using fabric softener as a means of scenting their laundry. The study went on to prove that laundry treated with fabric softener actually became malodorous sooner than non-treated laundry. Hence, using fabric softener not only contributes to water pollution and additional product consumption, but also may cause consumers to wash their clothing more frequently than if they had not used the fabric softener in the beginning (Laitala et al., 2012a). The lack of research in the United States poses the opportunity for this study to produce some imperative results.

Educational Programs and Behavioral Change

Consumers may modify their behavior if they are more aware of the environmental and social impacts because environmental concern increases with education (Birtwistle & Moore, 2007; Daneshvary et al., 1998). Thus, to create a more sustainable planet, consumers need to be sufficiently educated so that they will have the knowledge to mold their behaviors to incorporate sustainability (Jarvi & Paloviita, 2007). The Sustainable Laundry Behavior Model (Appendix A, Figure 3) used in this study explores the relationship between three elements of knowledge

(knowledge of issues, knowledge of action strategies, and action skills) and their effects on behavioral intention through attitude. Behavioral change in relation to the environment has proven to be difficult unless a clear and direct financial incentive is applied, even if the consumers are aware that consumption affects the energy supply which in turn affects prices of energy (Hustvedt, 2011). The information taught through the educational program in this study will highlight the potential financial savings that come with sustainable laundry behaviors in addition to the other benefits of better clothing care and the use of fewer resources.

Workshops on energy conservation have resulted in higher knowledge on the topic of sustainability, although no behavioral change was noted, suggesting that further action is needed possibly to invoke an attitude change. In-home audits and group goals with rewards have shown successful behavioral change and increased knowledge. Giving households detailed feedback about the effects of their behavioral changes allowed consumers to get a better idea about which behaviors were responsible for energy consumption (Abrahamse et al., 2007). Although it will not be possible to give each participant as much detailed feedback as an individual consultation would allow, the current study aims to provide as much personalized details as possible into the educational program for maximum benefits.

“Informational strategies are especially effective when pro-environmental behavior is relatively convenient and not very costly in terms of money, time, effort or social disapproval, and when individuals do not face severe constraints on behavior.” (Steg, 2008, p. 4450). Fortunately, sustainable laundry behaviors will likely not take extra time or effort and will additionally save consumers money as using less energy and water is a key component. Empathy, from the researcher in this case, is the most important principle needed to change consumer behavioral intentions. Empathy allows the participants to feel unjudged and the

researcher to understand the participants' values and perspectives. The open communication displayed by the researcher showing empathy can then stimulate a behavioral intention change. Cognitive dissonance involves the need to balance one's attitudes and behaviors and is expected to play a role in influencing behavioral intention change in this research due to consumers learning new knowledge (Conrady et al., 2013). The Sustainable Laundry Behavior Model will depend on cognitive dissonance to balance behavioral intentions with newly obtained knowledge changing attitudes. There is a possibility for consumers to obtain their old behaviors though, because a feeling of safety is frequently present when consumers keep their acquired behaviors (Conrady et al., 2013).

Consumers must link their own behavior to environmental and social impact in order to motivate a behavioral intention change (Bhamra et al., 2011). Tailored information and personalized communication has been very effective in changing consumer behavior, and consumers prefer this customized advice over generalized information (Brandon & Lewis, 1999; Conrady et al., 2013; Steg, 2008). Abrahamse et al. (2007) point out that intervention works best with combinations of tailored information, goal setting, and feedback because some consumers are unable to take certain actions due to various barriers. Tailored information will be presented in the educational program in this study in as many ways as possible including explaining the water hardness in the participants' town and how that affects detergent dosing and water temperature. Goal setting will be encouraged on an individual basis by suggesting participants look at their monthly bills and make household goals to lower their energy and water use.

Top-down influence from educators, the media, charities, and retailers may encourage consumers to practice sustainable behaviors (Bianchi & Birtwistle, 2012). There are various examples of top-down influence on sustainable laundry behaviors throughout the world. For

instance, Germany hosts an annual “Action Day Sustainable Washing” to inform consumers on sustainable laundering behaviors. The event is hosted by various organizations throughout Germany including universities, government agencies, and other associations (Goerdeler & Stamminger, 2005). “Action Day Sustainable Washing” has been held every May 10th since 2004 and demonstrates consumers’ roles in the sustainability of laundry. Various programs are put in place during “Action Day Sustainable Washing” to educate consumers including questionnaires and surveys. The practice of distributing information on consumers’ role in sustainable laundry could easily be incorporated into special events throughout the United States to encourage sustainable behavior as well (Braun & Stamminger, 2011). A few similar proceedings have developed in the United States as well, although not throughout the entire country. It is evident that many colleges are taking a stand to inform their students about sustainable laundry behavior. Student interns at the University of California, Berkeley designed and posted static-cling stickers informing consumers about more sustainable laundry behaviors including cold water washing and air drying. The stickers were posted throughout residence hall and university family housing laundry facilities. The project helped to save over \$1000 within one school year including saving 1984.89 kWh and a total avoidance of 13034.54 CO₂ (pounds) (The Green Initiative Fund, 2013). Another college with a sustainable laundry program includes Pomona College in California which provides drying racks to the students living in campus housing and offers other sustainable options for laundry as well (Hodge, 2009). This study will investigate the likelihood of behavioral intention changes of college students due to an educational program. If the program proves successful with the participants, it may be incorporated into other aspects of the college such as freshman orientation in hopes of forming a more sustainable future generation.

CHAPTER III

METHODOLOGY

This research aims to understand young adults' laundering behaviors and to test the effects of an educational program on their potential laundry behavioral intention change toward sustainable laundering in the United States. Three research questions were asked: (1) what are the current levels of knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behaviors of young adult college students and are there gender differences? (2) will college students' sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behavior change to be more sustainable after participating in an educational program? and (3) will college students alter their laundering behavioral intentions to be more sustainable due to increased knowledge of and improved attitude toward sustainable laundering from an educational program? A model was created in order to help answer the three research questions. The Sustainable Laundry Behavior Model used for this study is a combination of the Pro-environmental Behavior Model and the Hines Model of Responsible Behavior. The Sustainable Laundry Behavior Model explains laundry behavioral intention change through knowledge causing an attitude change. The methodology took place in three phases described below including Phase I: Focus Group, Phase II: Pre-educational Survey and Educational Program, and Phase III: Post-educational Survey.

Phase I: Focus Group

Sampling. A focus group was held with six young adult college students with a question-led discussion on their laundering knowledge, attitudes, and behaviors. The focus group contained six participants to allow for optimum discussion and opinions (Lunt &

Livingstone, 1996). There are few studies that provide laundry related measurements, so this focus group verified the validity of and further helped to refine the items included in the surveys that were drafted based on information from the literature review. The focus group further helped to identify key words and concepts and to inform the development of the educational program. The participants for the focus group were one male and five female students ages 20-23 in order to obtain perspectives from both genders. Participants were required to meet the criteria of being a college student aged 18 or older and each had experience doing their own laundry. Participants were recruited from Colorado State University through flyers distributed on campus (Appendix B). Incentives were given to the participants of the focus group in the form of a free pizza dinner.

Data collection procedures. The focus group began with a consent form and a short questionnaire to collect the demographic information of the participants. A discussion was led by the researcher using questions developed from the literature review (Appendix C). The researcher acted as the moderator in the focus group to obtain views and opinions from the participants through open-ended questions (Creswell, 2003). The discussion lasted approximately 30 minutes. The focus group was recorded, so the information could be retrieved at a later point in time.

Data analysis. The tape recording from the focus group was transcribed and coded. Key words and concepts aided in the refinement of the surveys and the educational program used in phases II and III. Because the information gained from the focus group aligned so well with the information from the literature review, very few changes were made. One 7-point Likert type scale question in the surveys was altered from “When I use the dryer, I remove my clothing from the dryer immediately after the dryer stops.” to “When I use the dryer, I only use one cycle.”

This change reflected the participants' responses that multiple dryer cycles were not used to dewrinkle their clothing, but rather because one cycle was not drying their clothing adequately. This response suggested that participants' dryers were not working properly, and thus a statement on washing machine and dryer maintenance was added to the educational program.

Phase II: Pre-Educational Survey and Educational Program

Sampling. One hundred eleven college students (both genders) enrolled at Colorado State University were recruited as participants. These students met the requirements of being at least 18 years old and had experience doing their own laundry before the data were collected. This information was validated through screening questions on the survey. The participants were recruited from two classes (one in the apparel design program and one in the construction management program) at Colorado State University in the spring 2014 semester. Young adult college students were used for this research because the average American moves away from their parents' home at age 18 or 19 (Arnett, 2000). It could be assumed, although there is lack of researched evidence, that young adults living on their own are forcibly responsible for their own chores, including laundering, for what may be the first time in their lives. American college students were used due to the lack of research on sustainable laundering behaviors in the United States.

Data collection procedures. A pre-educational survey (Appendix D) was given to the 111 participants at Colorado State University. Participants from the apparel design program took the survey during their class time, and participants from the construction management program took the survey after their class had ended. The survey was distributed during these times and took approximately 10 to 15 minutes to fill out. The survey inquired about demographics, knowledge related to laundering (knowledge of issues, knowledge of action strategies, and action

skills), attitude toward the environment, attitude toward sustainable laundering behaviors, and laundry behaviors (including but not limited to frequency, sorting, behavior development, detergent use). Multiple answer multiple choice questions, true/false questions, and 7-point Likert type scale questions with answer ranging from strongly disagree (1) to strongly agree (7) and never (1) to always (7) were used throughout the survey. Participants were asked to include the last four digits of their student IDs in order to later perform comparison of pairs testing between the pre-educational and post-educational surveys. Email addresses were also collected in order to invite participants to participate in the post-educational survey and to further ensure accurate survey matching. Email addresses were used to record which students in the specific classes participated in the surveys and educational program in order for their instructors to award them extra credit as an incentive to participate. Email addresses were also used to contact winners in a drawing for two \$20 Visa gift cards. Student identities were kept anonymous. The topics addressed in the survey related back to the Sustainable Laundry Behavior Model involving knowledge of issues, knowledge of action strategies, action skills, attitude toward the environment and sustainable laundry behavior, and behavioral intentions. After the surveys were completed, the educational program was conducted for the participants for approximately 10 minutes using a PowerPoint presentation. Questioning to check for understanding was incorporated with samples of laundry detergent given as prizes to those participants who answered correctly. The program concluded with a take home poster which highlighted the information from the PowerPoint educational program (Appendix F). Participants were encouraged to display the poster in their laundry room for future reference and for others in their household to view. The poster served as a reinforcement tool as environmental behavior is more likely to be changed and knowledge is more likely to be learned with reiteration (Hungerford &

Volk, 1990). The educational program was developed based on information from the literature review and refined by information from the focus group.

Data analysis. The data from the pre-educational survey were not analyzed until the data from the post-educational survey in phase III were collected so that pre-educational and post-educational surveys could be matched by student ID numbers.

Phase III: Post-Educational Survey

Sampling. All participants from phase II were invited by email to participate in phase III. Of the 111 participants, 104 accepted the invitation to continue in the study. Pre-educational surveys were matched with post-educational surveys using the last four digits of the student IDs.

Data collection procedures. A post-educational survey (Appendix G) was distributed by email approximately 10 days after the first survey was completed in an online format using SurveyMonkey.com. The timing was chosen in order to ensure the same students who completed the pre-educational survey were able to complete the post-educational survey before the semester ended because the pre-educational survey was distributed toward the end of the semester. Ten days was hopefully enough time for participants to have practiced their laundry behavior between surveys, was fairly close to the original timeline proposed (two weeks), and additionally reflected information in the focus group which said participants did laundry once every five days to once a month. The post-educational survey asked the same questions as the pre-educational survey using multiple answer multiple choice questions, true/false questions, and 7-point Likert type scale questions with ranges from strongly disagree (1) to strongly agree (7) and from never (1) to always (7). Additionally, the post-educational survey inquired about specific information which was to be learned from the educational program and the participants' future intentions to perform sustainable laundry behaviors. Incentives were offered to two

randomly selected participants who had completed both phases II and III in the form of a \$20 Visa Gift Card which was distributed after the data collection ended. Students were also offered five or 10 points of extra credit in their class for completing the pre-educational and post-educational surveys, respectively.

Data analysis. The data were organized using the last four digits of the participants' student ID numbers to match pre-educational and post-educational surveys in order to compare changes. Two surveys with incomplete information were discarded. Descriptive statistics and factor analyses were conducted first to obtain participant profiles and to determine the factor structure of measurements with multiple items. To answer research question one, the pre-survey data were used to explain current laundry knowledge, attitudes toward the environment and sustainable laundering, and laundering behaviors between genders. An independent t-test was then conducted to compare gender differences on knowledge, attitudes, and behaviors. To answer the second research question, the post-educational survey data were compared with the pre-educational survey data to check for differences in knowledge, attitude, and behavior. Paired samples t-tests were used to compare the data from pre- and post-educational surveys. To answer the third research question, a set of regression analyses was used to analyze which factors influenced attitude and behavioral intention. The data were analyzed using SPSS program.

Instrument Development

Focus group. The focus group was held to gather information related to laundry behavior to help refine the pre- and post-educational surveys as well as the educational program and poster. It served to guide the development of laundry behavior related measurements as little previous research was found to provide necessary scales. Topics that were focused on included laundry knowledge, attitudes, and behavior in regard to the Sustainable Laundry Behavior Model

for this study, in particular, knowledge on laundry issues, knowledge on action strategies, and action skills. Examples of questions included “what is your typical laundry routine?” and “how frequently do you do your laundry?” (Appendix C). Furthermore, environmental awareness and behavior development were discussed in order to get a more comprehensive background. The demographics of the participants were collected as well.

Pre-educational survey. The pre-educational survey (Appendix D) included sections on demographics, knowledge, attitudes, and behaviors in order to measure various components of the Sustainable Laundry Behavior Model. Specifically, the survey used multiple answer multiple choice, true/false, and 7-point Likert type scale questions to measure knowledge, attitudes toward the environment, attitudes toward sustainable laundry behavior, and laundry behavior (i.e. frequencies). A pre-test of the survey was conducted with five participants to further refine and ensure that wording was appropriate.

Knowledge. Knowledge was tested based on the Sustainable Laundry Behavior Model’s components of knowledge, including knowledge of issues, knowledge of action strategies, and action skills.

Knowledge of issues and knowledge of action strategies were tested with three and seven true/false questions, respectively. If the participants answered the true/false questions correctly, they earned one point. A maximum of three points was possible for knowledge of issues; a maximum of seven points was possible for knowledge of action strategies. A higher score showed a participant’s higher level of knowledge. The items in this section of the survey were developed based on the literature review and using Kollmuss and Agyeman’s (2002) definitions of knowledge of issues and knowledge of action strategies. An example of the questions measuring knowledge of issues was “Using hot water when washing my clothing uses more

energy than cold water.” An example of the questions measuring knowledge of action strategies was “It is more sustainable to fill the washing machine with clothing to capacity.”

Action skills were measured with a 7-point Likert type scale ranging from strongly disagree (1) to strongly agree (7). There were three questions measuring the level of action skills participants perceived they had. The items in this study were developed based on the scales in Fraj and Martinez’s (2006) study on ecological consumer behavior and Krystallis, Grunert, de Barcellos, Perrea, and Verbeke’s (2012) study on consumer attitudes toward sustainable food production. Examples of the questions measuring action skills were “I know how to do laundry.” and “I know what sustainability means.”

Attitudes. Attitudes toward the environment and attitudes toward sustainable laundry were both measured. Attitudes were also tested using a 7-point Likert type scale ranging from strongly disagree (1) to strongly agree (7). This scale was also developed based on Fraj and Martinez’s (2006) and Krystallis et al.’s (2012) Likert type scales which measured consumer attitudes toward the environment. Five items were used to measure attitudes toward the environment and four items were used to measure attitude toward sustainable laundry behavior. An example of the questions measuring attitude toward the environment was “I care about the environment.” An example of the questions measuring attitude toward sustainable laundry behavior was “My laundry behaviors can be sustainable.”

Behaviors. Behaviors were measured in two sections. There were five multiple answer multiple choice questions measuring laundry behaviors which could be answered by selecting one or more answers provided. An example of the multiple answer multiple choice questions was “I learned how to do laundry from: (a) my mother (b) my father (c) another female relative (d) another male relative (e) reading the instructions on the washer/dryer or laundry detergent

packaging.” There were nine Likert type scale questions measuring sustainable laundry behavior frequency with the leading question “When I do laundry...” and answers ranging from never (1) to always (7). This Likert type scale was also developed based on Fraj and Martinez’s (2006) and Krystallis et al.’s (2012) Likert type scales. An example of the questions was “I use the same amount of laundry detergent for every load.”

Post-educational survey. The post-educational survey included the same questions used in the pre-educational survey and additional questions related to future intentions for sustainable laundering behavior. Four questions about the effectiveness of the educational program were also asked using 7-point Likert type scale questions ranging from strongly disagree (1) to strongly agree (7). An example of the effectiveness of the educational program question is “I think the educational program was helpful.” Future intentions were measured in two sections using 7-point Likert type scale questioning with answers ranging from strongly disagree (1) to strongly agree (7). The first section asked questions regarding participants’ ability and willingness to practice sustainable laundry behaviors. An example is, “I have the ability to practice sustainable laundry behaviors. The second section asked participants future intentions of their laundry behaviors. An example is, “I plan to wash my clothing less frequently.”

Educational Program. The educational program was developed based on information collected from the literature review and refined by information from the focus group. The program involved a PowerPoint presentation with questioning to check for understanding and a take home informational poster. The PowerPoint presentation included contents on more sustainable laundry behaviors such as how to sort laundry and what water temperature to use (Appendix E). There was also some tailored information included such as the water hardness in the area the participants are currently living. The poster served to reiterate the information that

was to be learned during the educational program since reinforcement encourages behavioral change (Appendix F) (Hungerford & Volk, 1990).

CHAPTER IV

RESULTS

The data were gathered in three phases during a period of about one month (between April and May) and included a focus group, a pre-educational survey and educational program, and a post-educational survey. Results from each phase are included in the following sections.

Focus Group and Its Participants

The respondents for the focus group were recruited with recruitment flyers hung around campus. A total of six participants were present for the focus group, one male and five females. The ages ranged from 20-23 years with a mean age of 21.33 years and the participants were sophomores through graduate students at a large Midwestern university. Four of the respondents were non-Hispanic white, one was African-American, and one was mixed race. Respondents reported being responsible for their own laundry from three to 10 years. The focus group lasted 30 minutes and allowed for the opportunity to identify key words for refinement of the surveys and educational program. Of the 10 questions that were asked, all respondents' answers aligned with the expectations from the literature review. One item that was added to the educational program involved information regarding the cleaning of laundry appliances in order to increase appliance cleaning efficiency. One item on the pre-educational and post-educational surveys was altered to better reflect the focus group conversation. The item was a 7-point Likert type scale question in the Laundry Behavior section and began as, "When I use the dryer, I remove my clothing from the dryer immediately after the dryer stops." and was changed to, "When I use the dryer, I only use one cycle." This change reflected the responses that multiple dryer cycles were mainly due to clothing not being dried in a timely manner rather than using the dryer for

dewrinkling purposes. The original question was created to examine consumer behavior and ironing as part of the laundry process. Braun and Stamminger (2011) found that ironing is one of the most time-consuming steps of the laundry process. Ironing may also be considered one of the most effort-consuming steps for modern day laundry, although no literature was found supporting this. Because consumers are more concerned with reduced effort than reduced time (Bose et al., 1984), it is reasonable to believe that a consumer may opt to dewrinkle an article of clothing by putting it in the dryer rather than using an iron. No information regarding this topic in the United States could be found. Because the focus group denied any form of ironing or dewrinkling performed in their everyday laundering behavior, the question was altered to reflect their feedback on dryers not performing efficiently.

Pre-Educational Surveys

Profile of participants. The survey data were gathered by surveying students enrolled in two classes (one in the apparel design program and one in the construction management program) at a large Midwestern university. A total of 111 pre-educational surveys were completed, all of which were usable. Among the surveys, few had incomplete answers to the demographic questions. Descriptive statistics for the demographic data reported in the pre-educational survey are shown in Table 1. Participants were ages 18-38 with a mean age of 21 years. About twenty-three percent of participants were male (n=26) and 76.6% were female (n=85). The participants were 82% non-Hispanic white, 10.8% Latino or Hispanic, 2.7% Middle Eastern, 1.8% African American, 0.9% East Asian, and 0.9% other. The participants were classified as freshman (28.8%), sophomores (39.6%), juniors (11.7%), seniors (12.6%), and graduate students (3.6%). For the initial screening questions, 93.7% of respondents answered that they were solely responsible for doing their own laundry, although 100% of respondents had

some laundry experience. Participants reported having been responsible for doing their own laundry from one half to 23 years with the mean being 6.27 years. Forty-five percent of respondents answered that they first became responsible for doing their laundry once they entered college.

Demographics of Pre-Educational Survey Participants (n=111)		
Characteristics	(n)	%
Age		
Mean	21	
Range	18-38	
Gender		
Female	85	76.6
Male	26	23.4
Ethnicity		
African American	2	1.8
East Asian	1	0.9
Latino or Hispanic	12	10.8
Middle Eastern	3	2.7
Non-Hispanic White	91	82.0
Other	1	0.9
Year in School		
Freshman	32	28.8
Sophomore	44	39.6
Junior	13	11.7
Senior	14	12.6
Graduate Student	4	3.6
Solely Responsible for their own laundry		
Yes	104	93.7
No	7	6.3
First became responsible for their own laundry in college		
Yes	50	45
No	61	55
How long participants have been doing their own laundry		
Mean	6.27 years	
Range	0.5-23 years	

Laundry behavior. The respondents' laundry behavior backgrounds were recorded on the pre-educational survey through multiple answer multiple choice questioning, displayed in Table 2. Descriptive statistics showed that respondents reported having learned how to do laundry from their mother (90.1%), from their father (15.3%), from reading directions on the washer/dryer/laundry detergent (11.7%), from a female relative or friend (6.3%), and from a male relative or friend (1.8%). Respondents reported choosing their laundry detergent based on what their parents use (45.0%), what is on sale or the cheapest (30.6%), on the scent (26.1%), on environmentally friendly product/practices (18.9%), and other (6.3%). Respondents were given the opportunity to write in other reasons for choosing a laundry detergent that were not included in the multiple answers. The other reasons included presence of chemical irritants, skin sensitive ingredients, whether it contained oxy-clean, convenience like Tide pods, and dye-free.

Respondents reported choosing to wash a piece of clothing if it had been worn it several times (48.6%), smelled unclean (43.2%), had been worn once (32.4%), and had visual dirt on it (27.0%). Respondents answered how frequently they did a load of laundry and reported once a week (37.8%), once every two weeks (36.0%), when they ran out of clean clothing (26.1%), when they need a piece of clothing that is unclean (14.4%), once a month (4.5%), and multiple times a week (1.8%). Respondents were asked how they determined the amount of detergent to use and results showed that they chose by the amount of laundry (70.3%), by always using the same amount (27.0%), by the level of uncleanliness (13.5%), and other (1.8%). The other responses included using Tide pods and following the directions on the detergent packaging.

Pre-Educational Survey Laundry Behavior Backgrounds (n=111)		
Laundry Behaviors	(n)	%
Learned how to do laundry from...		
Mother	100	90.1
Father	17	15.3
Female relative or friend	7	6.3
Male relative or friend	2	1.8
Reading the directions on the washer/dryer/detergent	13	11.7
Choose laundry detergent based on...		
What parents use	50	45.0
What is on sale or the cheapest	34	30.6
Scent	29	26.1
Environmentally friendly products/practices	21	18.9
Other	7	6.3
Typically wash a piece of clothing if...		
Worn once	36	32.4
Worn several times	54	48.6
Smells unclean	48	43.2
Has visual dirt on it	30	27.0
Typically do a load of laundry...		
Multiple times a week	2	1.8
Once a week	42	37.8
Once every two weeks	40	36.0
Once a month	5	4.5
When clean clothing runs out	29	26.1
When need a piece of clothing that isn't clean	16	14.4
Decide how much detergent to use by...		
Amount of laundry	78	70.3
Level of uncleanliness	15	13.5
Always use the same amount	30	27.0
Other	2	1.8

Note. Participants were allowed to check all answers that apply, therefore, numbers may add up to more than 111.

Respondents were further questioned on their laundry behaviors in regards to frequency in the pre-educational survey with nine 7-point Likert type scale questions ranging from Never (1) to Always (7). Two of the variables were reverse coded in order for all the variables to be compared on the same scale with seven being the most sustainable action and one being the least sustainable. The means are reported below in Table 3. The most frequent behaviors that are considered sustainable included using a measuring device for laundry detergent (M=5.49), using

only one dryer cycle (M=5.37), and filling the washer to capacity (M=5.05). The least frequent behaviors reported were sorting laundry by fiber content (M=2.41) and hang drying laundry (M=3.72).

Pre-Educational Laundry Behavior Frequencies	
Behavior	M
I sort my laundry by fiber type on label.	2.41
I fill the machine to capacity.	5.03
I check the laundry detergent packaging for information on dosing.	4.24
I use a measuring device to decide how much detergent to use.	5.49
I use the same amount of laundry detergent for every load. ^a	4.04
I use cold water to wash my laundry.	4.98
I use fabric softener. ^a	4.75
I hang dry my laundry.	3.72
When I use the dryer, I only use one cycle.	5.37

Note. Means closer to 7 indicate a higher frequency of that behavior, however, items were coded so that a higher mean indicates a more sustainable behavior.

^aItems were reverse coded.

Laundry Knowledge. Laundry knowledge was recorded based on the Model for Sustainable Laundry Behavior including action skills, knowledge of action strategies, and knowledge of issues. The following sections document the results.

Action skills. Action skills were recorded based on participants' subjective knowledge about laundry. Three 7-point Likert type scale questions ranging from Strongly Disagree (1) to Strongly Agree (7) were asked in the pre-educational survey. The means are recorded below in Table 4.

Pre-Educational Survey Action Skills Knowledge	
Action Skills	M
I know how to do laundry.	6.27
I know what sustainability means.	6.11
I know the most sustainable laundry practices.	3.78

Note. Items were tested on a scale from 1-7 where 1= Strongly Disagree and 7= Strongly Agree. Higher means indicate more knowledge.

Knowledge of issues and action strategies. The participants’ knowledge of issues and knowledge of action strategies were recorded through three and seven true/false questions, respectively, on the pre-educational survey. Because of the nature of these questions, factor analysis was not run for these items; instead, a composite score was calculated based on the number of questions answered correctly. Those participants with a higher score had more knowledge. The range for knowledge of issues was one to three with a mean of 2.77. The range for knowledge of action strategies was one to seven with a mean of 4.91. The results are shown below in Table 5.

Pre-Educational Survey Composite Knowledge of Issues and Action Strategies		
Knowledge of	M	Range
Issues	2.77	1-3
Action Strategies	4.91	1-7

Note. Higher means correlate to higher knowledge. Knowledge of Issues had 3 possible points. Knowledge of Action Strategies had 7 possible points.

The percentages of correctly answered questions are shown below in Table 6. A high percentage of respondents answered several of the questions correctly. All respondents (100%) correctly identified the item, “It’s sustainable to wash most of my clothing after every wear.” as false. Most respondents (99.1%) correctly identified the item, “Washing my clothing more frequently can affect the quality of the garment.” as true. Most respondents (94.6%) correctly identified the item, “Using hot water when washing my clothing consumes more energy than using cold water.” as true. There were also several items that were frequently answered incorrectly. Only 61.3% of participants correctly identified the item, “If I fill the machine to capacity, the clothes will not get clean.” as false. Only 59.5% of participants correctly identified the item, “I should sort my clothing by the fiber content on the label.” as true. Only 51.4% of

participants correctly identified the item, “Using cold water cleans the laundry just as well as hot water.” as true.

Table 6		
Pre-Educational Survey Knowledge of Issues and Action Strategies (n=111)		
Issues	Correct Responses	
	(n)	%
Using hot water when washing my clothing consumes more energy than using cold water. (True)	105	94.6
Doing several small loads of laundry consumes less energy and water than one large load. (False)	92	82.9
Washing my clothing more frequently can affect the quality of the garment. (True)	110	99.1
Action Strategies		
It's more sustainable to fill the washing machine with clothing to capacity. (True)	74	66.7
It's sustainable to wash most of my clothing after every wear. (False)	111	100.0
I should sort my clothing by the fiber content on the label. (True)	66	59.5
The water hardness affects the amount of laundry detergent needed. (True)	82	73.9
If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow. (False).	84	75.7
Using cold water cleans the laundry just as well as hot water. (True)	57	51.4
If I fill the machine to capacity, the clothes will not get clean. (False)	68	61.3

Attitude toward the Environment and Sustainable Laundry Behavior. Respondents were questioned on their attitude toward the environment and toward sustainable laundry in the pre-educational survey with five and three 7-point Likert type scale questions, respectively. Answers ranged from Strongly Disagree (1) to Strongly Agree (7). One variable was reverse coded in order for all the variables to be measured on a scale with seven being the most favorable option toward sustainability. Results are shown below in Table 7. Participants most agreed that the Earth's natural resources are depleting (M=6.22). Participants least agreed that they had the ability to practice sustainable laundry behaviors, however, the mean was close to neutral (M=4.75).

Pre-Educational Survey Attitudes toward the Environment and Sustainable Laundry Behavior	
Attitude	M
I care about the environment.	6.11
My actions and behaviors reflect my attitude toward the environment.	5.45
The Earth's natural resources are depleting.	6.22
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	5.26
My own actions have little impact on the Earth. ^a	5.34
My laundry behaviors can be sustainable.	5.61
I personally can make a difference in the future with sustainable laundry behaviors.	5.37
I have the ability to practice sustainable laundry behaviors.	4.75

Note. Means closer to 7 indicated a more positive attitude toward sustainability.
^aItem was reverse coded so that a higher mean equated to a more sustainable attitude.

Post-Educational Surveys

Profile of participants. One hundred six post-educational surveys were completed, 104 of which were usable. Two post-educational surveys were removed due to incomplete responses. Among the usable surveys, few had incomplete answers to the demographic questions. Descriptive statistics for the demographic data are shown in Table 8. Only participants who completed the pre-educational survey were invited to partake in the post-educational survey, therefore, the demographics only changed slightly. The average age was 21 years with a range of 18-38 years. A majority of the participants were female (n=80, 76.9%) while a small portion were male (n=24, 23.1%). The participants were non-Hispanic white (81.7%), Latino or Hispanic (10.6%), Middle Eastern (2.9%), African American (1.9%), East Asian (1.0%), and other (1.0%). The participants for the post-educational survey were classified as college freshmen (26.9%), sophomores (38.5%), juniors (12.5%), seniors (10.6%), and graduate students (3.8%).

Demographics of Post-Educational Survey Participants (n=104)		
Characteristics	(n)	%
Age		
Mean	21	
Range	18-38	
Gender		
Female	80	76.9
Male	24	23.1
Ethnicity		
African American	2	1.9
East Asian	1	1.0
Latino or Hispanic	11	10.6
Middle Eastern	3	2.9
Non-Hispanic White	85	81.7
Other	1	1.0
Year in School		
Freshman	28	26.9
Sophomore	40	38.5
Junior	13	12.5
Senior	11	10.6
Graduate Student	4	3.8
Solely Responsible for their own laundry		
Yes	97	93.3
No	7	6.7
First became responsible for their own laundry in college		
Yes	48	46.2
No	56	53.8
How long participants have been doing their own laundry		
Mean	6.35 years	
Range	0.5-23 years	

Effectiveness of educational program. Participants were asked whether or not they participated in the educational program and four 7-point Likert type scale questions related to the effectiveness of the program. The answers ranged from Strongly Disagree (1) to Strongly Agree (7). One hundred percent of the post-educational survey participants participated in the educational program. Means are displayed in Table 9 below.

Table 9	
Effectiveness of the Educational Program	
	M
I paid attention during the educational program.	5.80
I think the educational program was useful.	5.63
I think the educational program was helpful.	5.62
I learned about sustainable laundry behaviors from the educational program.	5.80
<i>Note.</i> Items were tested on a scale from 1-7 where 1= Strongly Disagree and 7= Strongly Agree.	

Laundry behavior. Laundry behavior was recorded in the post-educational survey with multiple answer multiple choice questions and with 7-point Likert type scale questions with answers ranging from Never (1) to Always (7). The questions remained the same from the pre-educational survey to the post-educational survey; however, the answers varied a fair amount in certain cases. The data from the post-educational surveys are shown below in Tables 10 and 11. Participants' behavior in regards to how frequently a piece of clothing is washed varied from pre-educational to post-educational survey. In the post-educational survey, 23.1% of participants reported washing a piece of clothing after wearing it once. Nearly 64% of participants reported washing a piece of clothing after wearing it several times. Approximately 54% of participants reported washing a piece of clothing if it smelled unclean. Almost 44% of participants reported washing a piece of clothing if there is visual dirt on it.

Table 10		
Post-Educational Survey Laundry Behavior Backgrounds (n=104)		
Laundry Behaviors	(n)	%
Learned how to do laundry from...		
Mother	93	89.4
Father	18	17.3
Female relative or friend	10	9.6
Male relative or friend	2	1.9
Reading the directions on the washer/dryer/detergent	11	10.6
Choose laundry detergent based on...		
What parents use	55	52.9
What is on sale or the cheapest	35	33.7
Scent	30	28.8
Environmentally friendly products/practices	21	20.2
Table 10 (continued)		
Laundry Behaviors	(n)	%
Choose laundry detergent based on...		
Other	3	2.9
Typically wash a piece of clothing if...		
Worn once	24	23.1
Worn several times	66	63.5
Smells unclean	56	53.8
Has visual dirt on it	46	44.2
Typically do a load of laundry...		
Multiple times a week	3	2.9
Once a week	39	37.5
Once every two weeks	43	41.3
Once a month	11	10.6
When clean clothing runs out	31	29.8
When need a piece of clothing that isn't clean	14	13.5
Decide how much detergent to use by...		
Amount of laundry	77	74.0
Level of uncleanliness	20	19.2
Always use the same amount	26	25.0
Other	2	1.9
<i>Note.</i> Participants were allowed to check all answers that apply, therefore, numbers may add up to more than 104.		

Behaviors with higher means (reported below in Table 11) indicate that the behavior is more sustainable. Participants reported more frequently using a measuring device to decide how much laundry detergent to use (M=5.65). Participants reported more frequently only using one dryer cycle (M=5.64). Participants reported more frequently filling the machine to capacity

(M=5.56). These three behaviors also had the highest means in the pre-educational program, although, means for every behavior (except using fabric softener) went up. More details on these results will be discussed later.

Post-Educational Survey Laundry Behavior Frequencies	
Behavior	M
I sort my laundry by fiber type on label.	2.71
I fill the machine to capacity.	5.56
I check the laundry detergent packaging for information on dosing.	4.86
I use a measuring device to decide how much detergent to use.	5.65
I use the same amount of laundry detergent for every load. ^a	4.15
I use cold water to wash my laundry.	5.46
I use fabric softener. ^a	4.66
I hang dry my laundry.	3.77
When I use the dryer, I only use one cycle.	5.64

Note. Means closer to 7 indicated more sustainable behaviors.
^aItems have been reverse coded so that the higher number equates with a more sustainable behavior.

Laundry knowledge. Laundry knowledge was evaluated the same on the pre-educational and post-educational surveys based on the Model for Sustainable Laundry Behavior including action skills, knowledge of action strategies, and knowledge of issues. The following sections report the results from the post-educational surveys.

Action skills. Action skills were again recorded based on participants' subjective knowledge about laundry using three 7-point Likert type scale questions with answers ranging from Strongly Disagree (1) to Strongly Agree (7). The means are recorded in Table 12 below.

Post-Educational Survey Action Skill Knowledge	
Action Skill	M
I know how to do laundry.	5.85
I know what sustainability means.	5.81
I know the most sustainable laundry practices.	5.12

Note. Items tested on a scale from 1-7 where 1= Strongly Disagree and 7= Strongly Agree. Higher means indicate more agreement.

Knowledge of issues and action strategies. Knowledge of issues and action strategies were again measured using true/false questioning. Composite scores were calculated based on the number of correct responses. Higher scores denoted more knowledge on that topic. A maximum of three and seven points were available for knowledge of issues and knowledge of action strategies, respectively. Means are shown below in Table 13.

Post-Educational Survey Composite Knowledge of Issues and Action Strategies	
Knowledge of	M
Issues ^a	2.77
Action Strategies ^b	6.25
<i>Note.</i> Higher means correlate to higher knowledge.	
^a 3 points maximum	
^b 7 points maximum	

Percentages of correct responses to the true/false questions about knowledge of issues and action strategies from the post-educational survey are reported below in Table 14. Most respondents (99%) correctly identified the item, “Washing my clothing more frequently can affect the quality of the garment.” as true. Most respondents (95.2%) correctly identified the item, “It’s sustainable to wash most of my clothing after every wear.” as false. Most respondents (94.2%) correctly identified the item, “Using hot water when washing my clothing consumes more energy than using cold water.” as true. These items were the most correctly answered variables in the pre-educational survey as well, although the percentage of correct answers actually dropped from the pre-educational to the post-educational survey. These results will be further discussed in later sections. The items from the pre-educational survey that were answered correctly the least (“If I fill the machine to capacity, the clothes will not get clean;” “I should sort my clothing by the fiber content on the label;” and “Using cold water cleans the laundry just as well as hot water.”) all had higher percentages of correct answers in the post-educational survey (83.7%, 93.3%, and 92.3%, respectively).

Table 14		
Post-Educational Survey Knowledge of Issues and Action Strategies (n=104)		
Issues	Correct Responses	
	(n)	%
Using hot water when washing my clothing consumes more energy than using cold water. (True)	98	94.2
Doing several small loads of laundry consumes less energy and water than one large load. (False)	87	83.7
Issues	(n)	%
Washing my clothing more frequently can affect the quality of the garment. (True)	103	99.0
Action Strategies		
It's more sustainable to fill the washing machine with clothing to capacity. (True)	93	89.4
It's sustainable to wash most of my clothing after every wear. (False)	99	95.2
I should sort my clothing by the fiber content on the label. (True)	97	93.3
The water hardness affects the amount of laundry detergent needed. (True)	94	90.4
If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow. (False).	84	80.8
Using cold water cleans the laundry just as well as hot water. (True)	96	92.3
If I fill the machine to capacity, the clothes will not get clean. (False)	87	83.7

Attitude toward the environment and sustainable laundry behavior. Attitudes toward the environment and sustainable laundry behavior were again recorded through five and three 7-point Likert type scale questions, respectively. Answers ranged from Strongly Disagree (1) to Strongly Agree (7). The means that were closer to seven indicate a more favorable attitude toward sustainability. One item in this section was reverse coded to make it comparable on this scale. The results from the post-educational survey are recorded below in Table 15. Participants most often agreed that they had the ability to practice sustainable laundry behaviors (M=5.92), which is an improvement. That item was most disagreed with in the pre-educational survey. These results will be further discussed in later sections.

Table 15**Post-Educational Survey Attitudes toward the Environment and Sustainable Laundry Behavior**

Attitude	M
I care about the environment.	5.78
My actions and behaviors reflect my attitude toward the environment.	5.40
The Earth's natural resources are depleting.	5.85
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	5.23
My own actions have little impact on the Earth. ^a	4.84
My laundry behaviors can be sustainable.	5.82
I personally can make a difference in the future with sustainable laundry behaviors.	5.64
I have the ability to practice sustainable laundry behaviors	5.92

Note. Means closer to 7 indicate a more positive attitude toward sustainability.
^aItem was reverse coded.

Sustainable laundry behavioral intention. Sustainable laundry behavioral intentions were recorded as part of the post-educational survey. Future intentions were recorded using 11 7-point Likert type scale questions with answers ranging from Strongly Disagree (1) to Strongly Agree (7). Means are reported in Table 16 below.

Table 16

Future Intentions	M
I know how I can make a difference for future generations by practicing sustainable laundry behaviors.	5.69
I have the ability to practice sustainable laundry behaviors.	5.99
I plan to practice sustainable laundry behaviors.	5.82
I have already altered some of my laundry behaviors due to the educational program.	5.32
I have or plan to tell family and friends how to practice sustainable laundry behavior.	5.21
In the future...	
I plan to wash my clothing less frequently.	5.27
I plan to sort my clothing by fiber type.	4.68
I plan to fill the washing machine to capacity.	5.92
I plan to use cold temperatures for washing my clothing.	5.83
I plan to use the recommended detergent dosing.	5.86
I plan to hang dry my clothing.	4.68

Note. Means closer to 7 indicate more sustainable future intentions.

Factor Analyses

Before further analyses, factor analyses were conducted on the multi-item scale items including action skills, attitude toward the environment, attitude toward sustainable laundry behavior, effectiveness of the educational program, and future behavioral intentions. These tests were run using the combined data from the pre-educational and post-educational surveys, which included a total number of 100 surveys. Factor analyses were used to ensure correlation between the items in a specific variable and to identify items for removal within that variable (Kerlinger & Lee, 2000).

Action skills. A factor analysis test was run on the items recorded in the action skills section from the combined pre-educational and post-educational surveys. The result from the factor analysis revealed one factor with all three items showing acceptable factor loadings. The Cronbach's Alpha was 0.92 with almost 86% variance extracted. The results are shown below in Table 17.

	Factor Loading	Reliability	Variance Extracted (%)
Action Skills		0.92	85.74
I know how to do laundry.	0.95		
I know what sustainability means.	0.94		
I know the most sustainable laundry practices	0.89		

Attitude toward the environment. Factor analysis revealed one factor for the items in the attitude toward the environment section in the combined data from the pre-educational and post-educational surveys. Because one item (“My own actions have little impact on the Earth.”) had a low factor loading (0.10), it was removed and factor analysis was conducted again without that item. One factor was again revealed with Cronbach's Alpha=0.85 with a variance of 70.76% extracted. Results are shown in Table 18 below.

Table 18

Factor Analysis for Attitude toward the Environment			
	Factor Loading	Reliability	Variance Extracted (%)
Items		0.85	70.75
I care about the environment.	0.87		
My actions and behaviors reflect my attitude toward the environment.	0.83		
The Earth's natural resources are depleting.	0.89		
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	0.78		

Attitude toward sustainable laundry behavior. A factor analysis test was run on the variables measuring attitude toward sustainable laundry behavior from the combined pre-educational and post-educational survey data. The results revealed one factor for these items. The Cronbach's Alpha equaled 0.90 with a variance of 84.03 extracted. Results are shown below in Table 19.

Table 19

Factor Analysis for Attitude toward Sustainable Laundry Behavior			
	Factor Loading	Reliability	Variance Extracted (%)
Items		0.90	84.03
My laundry behaviors can be sustainable.	0.91		
I personally can make a difference in the future with sustainable laundry behaviors.	0.91		
I have the ability to practice sustainable laundry behaviors.	0.93		

Effectiveness of the educational program. Factor analysis was conducted with the data from the section on effectiveness of the educational program and revealed one factor with Cronbach's Alpha=0.95 with a variance of 87.97 extracted. Results are shown in Table 20 below.

Factor Analysis for Effectiveness of the Educational Program			
	Factor Loading	Reliability	Variance Extracted (%)
Items		0.95	87.97
I paid attention during the educational program.	0.91		
I thought the educational program was useful.	0.95		
I thought the educational program was helpful.	0.95		
I learned about sustainable laundry behaviors from the educational program.	0.94		

Future behavioral intentions. Factor analysis was conducted with the data on future behavioral intentions. After removing two items because of crossloading issues (“I plan to use the recommended detergent dosing.” and “I plan to hang dry my clothing.”), two factors were revealed within the 11 items. The results are shown in Table 21 below. The first factor reflected statements on willingness and ability to participate in sustainable laundry behaviors and was named as so. Cronbach’s Alpha for this variable was equal to 0.93. The second factor reflected participants’ intentions for sustainable laundry behavior and was named as so. Cronbach’s Alpha for the second variable was equal to 0.88.

Table 21

Factor Analysis on Future Behavioral Intentions			
	Factor Loading	Reliability	Variance Extracted (%)
Factor 1: Ability and Willingness to Participate in Sustainable Laundry Behaviors		0.93	59.99
I know how I can make a difference for future generations by practicing sustainable laundry behaviors.	0.90		
I have the ability to practice sustainable laundry behaviors.	0.91		
I plan to practice sustainable laundry behaviors	0.80		
Factor 2: Sustainable Laundry Behavioral Intentions		0.88	12.30
I have already altered some of my laundry behaviors due to the educational program.	0.74		
I have or plan to tell family and friends how to practice sustainable laundry behavior.	0.69		
I plan to wash my clothing less frequently.	0.80		
I plan to sort my clothing by fiber type.	0.77		
I plan to fill the washing machine to capacity.	0.63		
I plan to use cold temperatures for washing my clothing.	0.76		

Research Question One

The first research question was: what are the current levels of sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behaviors or young adult college students and are there gender differences? Descriptive statistics in the previous sections explained the current level of knowledge, attitude toward the environment and sustainable laundering, and the laundry behaviors. This question was further answered by analyzing the data collected from the pre-educational surveys. The following sections will discuss the gender differences to fully answer research question one.

Laundry knowledge (pre-educational survey). Laundry knowledge was measured with three factors: action skills, knowledge of issues, and knowledge of action strategies. The following sections report the gender differences in laundry knowledge.

Action skills. In order to answer research question one regarding gender differences, independent samples t tests were conducted to compare gender differences in action skills. Results are shown below in Table 22. Results showed that there was no gender difference in the composite score of action skills ($M_{\text{male}}=5.12$, $M_{\text{female}}=5.46$, $t=-1.55$, $p>0.05$), although females reported a higher level of actions skills than did males. Looking at the individual items specifically, results showed that females reportedly had a higher level of knowledge on knowing how to do laundry ($M_{\text{male}}=5.92$, $M_{\text{female}}=6.34$, $t=-1.98$, $p<0.05$).

Action Skill	M_{male}	M_{female}	t
Composite Score for Action Skills	5.12	5.46	-1.55
I know how to do laundry.	5.92	6.34	-1.98*
I know what sustainability means.	6.04	6.14	-0.37
I know the most sustainable laundry practices.	3.38	3.91	-1.39

Note. Higher means correlate to higher levels of knowledge (maximum 7)
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Knowledge of issues and action strategies. Knowledge of issues and action strategies were compared between genders using independent samples t tests. Results are shown below in Table 23. True/false questioning was used in this section and was analyzed using zero for an incorrect response and one for a correct response; therefore, a mean closer to one indicates more correct answers. Results showed a significant difference between males and females knowing whether water hardness affects the amount of laundry detergent needed. More females correctly identified that item than did males ($M_{\text{male}}=0.56$, $M_{\text{female}}=0.81$, $t=-2.27$, $p<0.05$).

Table 23**Gender Comparison for Knowledge of Issues and Action Strategies (Pre-Educational Survey)**

Issues	M_{male}	M_{female}	t
Composite Score for Knowledge of Issues ^a	2.81	2.75	0.48
Using hot water when washing my clothing consumes more energy than using cold water. (True)	0.96	0.94	0.40
Doing several small loads of laundry consumes less energy and water than one large load. (False)	0.85	0.82	0.27
Washing my clothing more frequently can affect the quality of the garment. (True)	1.00	0.99	0.55
Action Strategies			
Composite Score for Knowledge of Action Strategies ^b	4.60	5.00	-1.33
It's more sustainable to fill the washing machine with clothing to capacity. (True)	0.69	0.66	0.31
It's sustainable to wash most of my clothing after every wear. (False)	1.00	1.00	
I should sort my clothing by the fiber content on the label. (True)	0.50	0.62	-1.12
The water hardness affects the amount of laundry detergent needed. (True)	0.56	0.81	-2.27*
If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow. (False).	0.85	0.74	1.25
Using cold water cleans the laundry just as well as hot water. (True)	0.38	0.56	-1.56
If I fill the machine to capacity, the clothes will not get clean. (False)	0.69	0.60	0.91

^aThis item had a range of 0-3, with 3 indicating the highest level of knowledge. ^bThis item had a range of 0-7, with 7 indicating the highest level of knowledge.

*p<0.05, **p<0.01, ***p<0.001

Attitudes (pre-educational survey). Attitudes toward the environment and sustainable laundry behavior were compared between genders using independent samples t tests. The results for attitude toward the environment are shown below in Table 24. Results showed that female participants reported a more favorable attitude toward the environment for the composite score; although only two individual items revealed significant differences. Females reportedly more strongly agreed with the statement of “if things continue on their present course, we will experience a major ecological catastrophe by 2050” ($M_{\text{male}}=4.56$, $M_{\text{female}}=5.47$, $t=-2.57$, $p<0.01$). Females also reportedly more strongly disagreed that their own actions have little impact on the

Earth which was reverse coded so that a higher mean correlated to a more favorable attitude toward sustainability ($M_{\text{male}}=4.69$, $M_{\text{female}}=5.54$, $t=-2.66$, $p<0.01$).

	M_{male}	M_{female}	t
Composite Score for Attitude toward the Environment	5.42	5.76	-1.59
I care about the environment.	6.31	6.05	1.12
My actions and behaviors reflect my attitude toward the environment.	5.31	5.50	-0.65
The Earth's natural resources are depleting.	6.23	6.21	0.08
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	4.56	5.47	-2.57**
My own actions have little impact on the Earth. ^a	4.69	5.54	-2.66**

Note. Means closer to 7 have a more positive attitude toward sustainability.
^aReverse coded item
 * $p<0.05$, ** $p<0.01$, *** $p<0.001$

The results for attitude toward sustainable laundry behavior are shown below in Table 25. Results showed that there was no significant difference between genders for attitudes toward sustainable laundry behavior.

	M_{male}	M_{female}	t
Composite Score for Attitude toward Sustainable Laundry Behavior	5.04	5.30	-0.96
My laundry behaviors can be sustainable.	5.54	5.64	-0.36
I personally can make a difference in the future with sustainable laundry behaviors.	5.23	5.42	-0.62
I have the ability to practice sustainable laundry behaviors.	4.35	4.87	-1.55

Note. Means closer to 7 have a more positive attitude toward sustainability.
 * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Laundry behavior (pre-educational survey). Frequency tests were run on the laundry behavior multiple answer multiple choice questions in order to describe participants' current laundry behaviors. Results are shown in the previous section in Table 2.

Chi-square tests were conducted to further answer research question one by analyzing the difference between genders and their laundry behaviors. Chi-square tests were used because

both variables, gender and the multiple choice behavioral items, were categorical variables. Results showed that there was a gender difference in laundry detergent being selected based on what is on sale or what is the cheapest. Nearly 54% of males chose their laundry detergent based on the price while only 23.5% of females chose detergent this way. This suggests that males are more likely to choose a detergent based on lowest price. No other variables had significant differences between genders. Complete results are shown in Table 26 below.

Table 26

Gender Comparison for Laundry Behavior Backgrounds (Pre-Educational Survey)							
Laundry Behaviors	Total		Males		Females		χ^2
	(n)	%	(n)	%	(n)	%	
Learned how to do laundry from...							
Mother	100	90.1	24	92.3	76	89.4	0.19
Father	17	15.3	6	23.1	11	12.9	1.58
Female relative or friend	7	6.3	2	7.7	5	5.9	0.11
Male relative or friend	2	1.8	0	0.0	2	2.4	0.62
Reading the directions on the washer/dryer/detergent	13	11.7	1	7.7	12	14.1	2.03
Choose laundry detergent based on...							
What parents use	50	45.0	8	30.8	42	49.4	2.80
What is on sale or the cheapest	34	30.6	14	53.8	20	23.5	8.61**
Scent	29	26.1	5	19.2	24	28.2	0.84
Environmentally friendly products/practices	21	18.9	3	11.5	18	21.2	1.21
Other	7	6.3	3	11.5	4	4.7	1.57
Typically wash a piece of clothing if...							
Worn once	36	32.4	9	34.6	27	31.8	
Worn several times	54	48.6	9	34.6	45	52.9	2.68
Smells unclean	48	43.2	11	42.3	37	43.5	0.01
Has visual dirt on it	30	27.0	5	19.2	25	29.4	1.05
Typically do a load of laundry...							
Multiple times a week	2	1.8	1	3.8	1	1.2	0.80
Once a week	42	37.8	9	34.6	33	38.8	0.15
Once every two weeks	40	36.0	6	23.1	34	40.0	2.47
Once a month	5	4.5	1	3.8	4	4.7	0.03
When clean clothing runs out	29	26.1	10	38.5	19	22.4	2.68
When need a piece of clothing that isn't clean	16	14.4	2	7.7	14	16.5	1.24
Decide how much detergent to use by...							
Amount of laundry	78	70.3	17	65.4	61	71.8	0.39
Level of uncleanliness	15	13.5	3	11.5	12	14.1	0.11
Always use the same amount	30	27.0	9	34.6	21	24.7	0.99
Other	2	1.8	0	0.0	2	2.4	0.62

*p<0.05, **p<0.01, ***p<0.001

To further answer research question one, results from the laundry behavior frequency section were compared between genders using independent samples t tests. Results are shown below in Table 27. Females reported using cold water to wash their laundry more frequently in the pre-educational survey than males ($M_{\text{male}}=4.26$, $M_{\text{female}}=5.20$, $t=-2.66$, $p<0.01$). Females

reported using fabric softener more frequently in the pre-educational survey than males ($M_{\text{male}}=2.38$, $M_{\text{female}}=3.52$, $t=-2.30$, $p<0.05$). Females also reported hang drying their clothing more frequently in the pre-educational survey than males ($M_{\text{male}}=2.19$, $M_{\text{female}}=4.19$, $t=-5.24$, $p<0.001$).

Table 27
Gender Comparison for Laundry Behavior Frequency (Pre-Educational Survey)

Laundry Behavior	M_{male}	M_{female}	t
I sort my laundry by fiber type on label.	2.27	2.45	-0.47
I fill the machine to capacity.	5.46	4.89	1.74
I check the laundry detergent packaging for information on dosing.	3.92	4.33	-0.89
I use a measuring device to decide how much detergent to use.	5.23	5.56	-0.83
I use the same amount of laundry detergent for every load.	4.20	3.89	0.67
I use cold water to wash my laundry.	4.26	5.20	-2.66**
I use fabric softener.	2.38	3.52	-2.30*
I hang dry my laundry.	2.19	4.19	-5.24***
When I use the dryer, I only use one cycle.	5.35	5.39	-0.08

Note. Means are based on a scale of 1-7 where 1= Strongly Disagree and 7=Strongly Agree.
 * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Research Question Two

The second research question was: will college students' sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behavior change to be more sustainable after participating in an educational program? The data collected from 100 participants from the pre-educational and post-educational surveys were used to answer the second research question in the following sections.

Laundry Knowledge (pre-educational and post-educational surveys). Laundry knowledge was compared between pre-educational and post-educational surveys for the three variables involved in the Sustainable Laundry Behavior Model: action skills, knowledge of issues, and knowledge of action strategies.

Action skills. Using a paired samples t test, the pre-educational and post-educational survey responses for the action skills section were compared. Results are shown below in Table 28. A composite score for action skills was calculated by averaging the answers to the three variables in that section. The composite score for action skills was not significantly different between the pre-educational and post-educational surveys ($M_{pre}=5.39$, $M_{post}=5.57$, $p>0.05$). To further understand the difference, comparisons were also made on individual items included in the action skills section. Some of the individual items regarding action skills were significant. Participants reported a lower knowledge level on whether they knew how to do laundry in the post-educational survey ($M_{pre}=6.27$, $M_{post}=5.83$, $t=2.72$, $p<0.01$). This suggests that participants may have become aware that they did not know as much about laundry as they originally thought. Participants reported a higher knowledge level on knowing the most sustainable laundry practices ($M_{pre}=3.78$, $M_{post}=5.57$, $t=-5.92$, $p<0.001$). This suggests that the participants learned more about more sustainable laundry practices from the educational program.

Table 28

Action Skills (Pre-Educational versus Post-Educational Survey)			
Action Skills	M_{pre}	M_{post}	t
Composite Score for Action Skills	5.39	5.57	-1.08
I know how to do laundry.	6.27	5.83	2.72**
I know what sustainability means.	6.11	5.78	1.79
I know the most sustainable laundry practices.	3.78	5.10	-5.92***
<i>Note.</i> Items were tested on a scale from 1-7 where 1= Strongly Disagree and 7= Strongly Agree.			
* $p<0.05$, ** $p<0.01$, *** $p<0.001$			

Knowledge of issues and action strategies. Paired samples t tests were used to compare knowledge of issues and action strategies between the pre-educational and post-educational surveys to evaluate the change in knowledge. Results are shown below in Table 29. Composite scores were calculated for both knowledge of issues and knowledge of action strategies by adding the number of correct answers for each section. A total of three and seven points were

possible for knowledge of issues and knowledge of action strategies, respectively. The composite score for knowledge of issues was not changed significantly between the pre-educational and post-educational surveys ($M_{pre}=2.80$, $M_{post}=2.76$, $t=0.75$, $p>0.05$). Results showed that knowledge of action strategies increased from the pre-educational survey to the post-educational survey ($M_{pre}=4.91$, $M_{post}=6.27$, $t=-7.96$, $p<0.001$).

Individual responses from the knowledge of issues and knowledge of action strategies section were also compared using paired samples t-tests to evaluate specific change of knowledge. The results are shown below in Table 29. Correct answers were given one point; thus the closer the mean is to one, the more participants correctly answered that question. None of the items measuring knowledge of issues had significant changes between the pre-educational and post-educational surveys. Several of the items measuring knowledge of action strategies showed participants' improved knowledge for that variable. More participants correctly answered the true/false question, "It's more sustainable to fill the machine with clothing to capacity." ($M_{pre}=0.69$, $M_{post}=0.90$, $t=-4.05$, $p<0.001$). More participants correctly answered the true/false question, "I should sort my clothing by fiber content on the label." ($M_{pre}=0.59$, $M_{post}=0.93$, $t=-6.34$, $p<0.001$). More participants correctly answered the question, "The water hardness affects the amount of laundry detergent needed." ($M_{pre}=0.77$, $M_{post}=0.92$, $t=-3.13$, $p<0.01$). More participants correctly answered the true/false question, "Using cold water cleans the laundry just as well as hot water." ($M_{pre}=0.53$, $M_{post}=0.94$, $t=-7.85$, $p<0.001$). More participants correctly answered the true/false question, "If I fill the machine to capacity, the clothes will not get clean." ($M_{pre}=0.61$, $M_{post}=0.84$, $t=-4.07$, $p<0.001$). More participants incorrectly answered the true/false question, "It's sustainable to wash most of my clothing after

every wear.” ($M_{pre}=1.00$, $M_{post}=0.95$, $t=2.28$, $p<0.05$). This result will be addressed in the discussion section.

Issues	M_{pre}	M_{post}	t
Composite Knowledge of Issues (out of 3)	2.80	2.76	0.75
Using hot water when washing my clothing consumes more energy than using cold water. (True)	0.95	0.94	0.30
Doing several small loads of laundry consumes less energy and water than one large load. (False)	0.86	0.83	0.73
Washing my clothing more frequently can affect the quality of the garment. (True)	0.99	0.99	0.00
Action Strategies			
Composite Knowledge of Action Strategies (out of 7)	4.91	6.27	-7.96***
It’s more sustainable to fill the washing machine with clothing to capacity. (True)	0.69	0.90	-4.05***
It’s sustainable to wash most of my clothing after every wear. (False)	1.00	0.95	2.28*
I should sort my clothing by the fiber content on the label. (True)	0.59	0.93	-6.34***
The water hardness affects the amount of laundry detergent needed. (True)	0.77	0.92	-3.13**
If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow. (False).	0.74	0.81	-1.30
Using cold water cleans the laundry just as well as hot water. (True)	0.53	0.94	-7.85***
If I fill the machine to capacity, the clothes will not get clean. (False)	0.61	0.84	-4.07***

Note. Means closer to 1 represent items that were answered correctly by more participants.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Attitudes (pre-educational and post-educational surveys). Paired samples t tests were used to compare attitudes between the pre-educational and post-educational surveys. Results are shown below in Table 30. Participants’ attitudes toward the environment actually went down from the pre-educational to the post-educational survey ($M_{pre}=5.73$, $M_{post}=5.43$, $t=2.60$, $p<0.05$). Their attitude toward sustainable laundry behavior improved from the pre-educational program

to the post-educational program ($M_{pre}=5.32, M_{post}=5.84, t=-2.99, p<0.01$). These results will be further discussed in a later section.

Individual items on attitude toward the environment and sustainable laundry behavior were also compared between pre-educational and post-educational surveys using paired samples t tests. Results are shown below in Table 30. Participants reported more positive attitudes toward the statement, “I have the ability to practice sustainable laundry behaviors.” ($M_{pre}=4.85, M_{post}=5.96, t=-5.58, p<0.001$) on a 7-point Likert type scale with seven being strongly agree.

Table 30
Attitudes toward the Environment and Sustainable Laundry Behavior

	M_{pre}	M_{post}	t
Composite score for Attitude toward the Environment	5.73	5.43	2.60*
I care about the environment.	6.17	5.82	2.40*
My actions and behaviors reflect my attitude toward the environment.	5.53	5.38	0.86
The Earth’s natural resources are depleting.	6.25	5.85	2.73**
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	5.31	5.26	0.30
My own actions have little impact on the Earth. ^a	5.38	4.85	2.77**
Composite score for Attitude toward Sustainable Laundry Behavior	5.32	5.84	-2.99**
My laundry behaviors can be sustainable.	5.67	5.87	-1.10**
I personally can make a difference in the future with sustainable laundry behaviors.	5.46	5.71	-1.35
I have the ability to practice sustainable laundry behaviors.	4.85	5.96	-5.58***

Note. Means are based on a 7-point Likert type scale where 7 is the most favorable attitude toward sustainability.
^aThis variable was reverse coded.
 * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Laundry behavior (pre-educational and post-educational surveys). Paired samples t tests were conducted to compare laundry behavior between the pre-educational and the post-educational survey to evaluate behavioral changes. Results are shown below in Table 31. Few variables had significant differences. Higher means indicated more participants engaging in that behavior (Participants received one point for engaging in a behavior and zero points for not engaging in a behavior.). More participants reported choosing their laundry detergent based on

what their parents use ($M_{pre}=0.44$, $M_{post}=0.52$, $t=-2.36$, $p<0.05$). Fewer participants reported choosing their laundry detergent based on other reasons (e.g skin irritants, convenience- tide pods, whether it contains oxyclean)($M_{pre}=0.07$, $M_{post}=0.03$, $t=2.03$, $p<0.05$). The frequency of washing a piece of clothing had significant changes between the pre-educational and post-educational surveys. Fewer participants reported washing a piece of clothing after one wear ($M_{pre}=0.33$, $M_{post}=0.23$, $t=2.57$, $p<0.05$). This suggests that participants are doing less laundry. More participants reported washing a piece of clothing after several wears ($M_{pre}=0.48$, $M_{post}=0.62$, $t=-2.73$, $p<0.01$). This suggests that participants are wearing clothing more before washing. More participants reported washing a piece of clothing if it smells unclean ($M_{pre}=0.46$, $M_{post}=0.55$, $t=-2.10$, $p<0.05$). This suggests that participants may be taking the time to check if their clothing is dirty before putting it in the laundry. Fewer participants reported washing a piece of clothing if there was visual dirt on it ($M_{pre}=0.46$, $M_{post}=0.30$, $t=-3.61$, $p<0.001$).

Table 31

Comparison of Pre-Educational and Post-Educational Behaviors			
Laundry Behavior	M_{pre}	M_{post}	t
Learned how to do laundry from...			
Mother	0.90	0.90	0.00
Father	0.17	0.18	-0.58
Female relative or friend	0.07	0.10	-1.75
Male relative or friend	0.01	0.01	
Reading the directions on the washer/dryer/detergent	0.12	0.11	0.30
Choose laundry detergent based on...			
What parents use	0.44	0.52	-2.36*
What is on sale or the cheapest	0.30	0.34	-1.65
Scent	0.28	0.30	-0.63
Environmentally friendly products/practices	0.19	0.20	-0.38
Other	0.07	0.03	2.03*
Typically wash a piece of clothing if...			
Worn once	0.33	0.23	2.57*
Worn several times	0.48	0.62	-2.73**
Smells unclean	0.46	0.55	-2.10*
Has visual dirt on it	0.46	0.30	-3.61***
Typically do a load of laundry...			
Multiple times a week	0.02	0.03	-1.00
Once a week	0.39	0.38	0.28
Once every two weeks	0.34	0.40	-1.62
Once a month	0.05	0.11	-1.92
When clean clothing runs out	0.27	0.30	-0.69
When need a piece of clothing that isn't clean	0.16	0.13	0.90
Decide how much detergent to use by...			
Amount of laundry	0.72	0.75	-0.77
Level of uncleanliness	0.14	0.19	-1.09
Always use the same amount	0.25	0.24	0.28
Other	0.02	0.02	0.00

Note. Means closer to 1 indicate more participants who exhibit that behavior.
 *p<0.05, **p<0.01, ***p<0.001

Laundry behavior frequency was also compared between pre-educational and post-educational surveys to evaluate behavioral change using paired samples t tests. The results are shown in Table 32 below. Participants reportedly filled the machine to capacity more frequently after the educational program ($M_{pre}=5.00$, $M_{post}=5.54$, $t=-3.58$, $p<0.001$). Participants reportedly checked the laundry detergent packaging for dosing instructions more frequently after the educational program ($M_{pre}=4.39$, $M_{post}=4.88$, $t=-2.45$, $p<0.05$). Participants also reportedly

washed their clothing using cold water more frequently after the educational program

($M_{pre}=5.04$, $M_{post}=5.46$, $t=-2.71$, $p<0.01$).

Table 32
Laundry Behavioral Changes from Pre-Educational to Post-Educational Surveys

Behavior	M_{pre}	M_{post}	t
I sort my laundry by fiber type on label.	2.46	2.74	-1.58
I fill the machine to capacity.	5.00	5.54	-3.58***
I check the laundry detergent packaging for information on dosing.	4.39	4.88	-2.45*
I use a measuring device to decide how much detergent to use.	5.54	5.72	-1.13
I use the same amount of laundry detergent for every load. ^a	3.97	4.19	-1.39
I use cold water to wash my laundry.	5.04	5.46	-2.71**
I use fabric softener. ^a	4.72	4.64	0.52
I hang dry my laundry.	3.72	3.77	-0.42
When I use the dryer, I only use one cycle.	5.41	5.62	-1.30

Note. Means are based on 7-point Likert type scale questions with 7 being the most sustainable behavior.
^aVariables were reverse coded.
 * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Research Question Three

The third research question asked: will college students alter their laundering behavioral intentions to be more sustainable due to increased knowledge of and improved attitude toward sustainable laundering from an educational program? Data collected in the post-educational program were analyzed to understand the factors that may help explain any behavioral changes.

Regression analysis was first conducted to test the effect of increased knowledge on attitude change toward the environment and toward sustainable laundry behavior. Results are shown in Table 33. Independent variables were action skills, knowledge of issues, and knowledge of action strategies and were tested against the dependent variables of attitude toward the environment and attitude toward sustainable laundry behavior. Regression analysis revealed that the overall model to predict attitude toward the environment was significant ($R^2=0.35$, $F=17.69$, $p<0.001$). Specifically, the results showed that only action skills positively influenced participants' attitude toward the environment ($\beta=0.54$, $t=6.17$, $p<0.001$). Regression analysis

also revealed that the overall model to predict attitude toward sustainable laundry behavior was significant ($R^2=0.38$, $F=20.30$, $p<0.001$). Again, only action skills positively predicted participants' attitude toward sustainable laundry behavior ($\beta=0.52$, $t=6.13$, $p<0.001$).

Table 33.
Regression Analysis for Consumer Attitude

	<i>df</i>	R²	F	β	t
Dependent Variable: Attitude toward the Environment	101	0.35	17.69***		
Action Skills				0.54	6.17***
Knowledge of Issues				0.04	0.33
Knowledge of Action Strategies				0.10	0.84
Dependent Variable: Attitude toward Sustainable Laundry Behavior	102	0.38	20.30***		
Action Skills				0.52	6.13***
Knowledge of Issues				0.09	0.75
Knowledge of Action Strategies				0.13	1.17

Regression analysis was also used to understand the effect of attitudes on the changes in behavioral intention. Results are shown below in Table 34. Independent variables were attitude toward the environment and attitude toward sustainable laundry behavior, which were tested against the dependent variables of future intentions for sustainable laundry behavior and future intentions for willingness and ability. The first regression analysis showed that the overall model predicting future intentions for sustainable laundry behavior was significant ($R^2=0.26$, $F=16.91$, $p<0.001$). Specifically, attitude toward sustainable laundry behavior positively influenced future intentions for sustainable laundry behavior ($\beta=0.55$, $t=3.97$, $p<0.001$). The second regression analysis showed that the overall model predicting future intentions for willingness and ability was also significant ($R^2=0.50$, $F=49.27$, $p<0.001$). Again, the variable of attitude toward sustainable laundry behavior positively predicted participants' future intentions for willingness and ability ($\beta=0.57$, $t=5.02$, $p<0.001$).

Table 34.

Regression Analysis for Future Behavioral Intentions					
	<i>df</i>	R²	F	β	t
Dependent Variable: Future Intentions for Sustainable Laundry Behavior	101	0.26	16.91***		
Attitude toward the Environment				-0.06	-0.45
Attitude toward Sustainable Laundry Behavior				0.55	3.97***
Dependent Variable: Future Intentions for Willingness and Ability	101	0.50	49.27***		
Attitude toward the Environment				0.16	1.43
Attitude toward Sustainable Laundry Behavior				0.57	5.02***

CHAPTER V

DISCUSSION AND CONCLUSIONS

Previous studies have shown through life cycle assessments that the consumer use phase of clothing has the greatest environmental impact because of the high energy use involved (Laitala et al., 2011). This research sought to investigate the likelihood of consumers changing their laundry behavior to be more environmentally friendly due to an attitude change influenced by increased knowledge on the subject of sustainable laundry; thus, the Sustainable Laundry Behavior Model was developed based on previous literature. The first goal of this research was to explore and expand upon the knowledge of current consumer laundry behavior, attitudes, and knowledge among young adult consumers (i.e. college students). Additionally, differences between genders among these three factors were explored. The second goal of this research was to examine the likelihood of a change in behavioral intent due to knowledge and attitude change among college students after learning about the topic of sustainable laundry. The third goal was to test whether the Sustainable Laundry Behavior Model would sustain in suggesting that knowledge will influence attitude and, in turn, influence behavioral intent in the context of consumer laundry behavior.

In this Discussion and Conclusions chapter, the findings of this research study are discussed. Theoretical and practical implications, limitations of the study, and suggestions for future research are included in the Conclusions section.

Discussion

Research Question One

Research question one asked what is the current levels of knowledge, attitudes toward the environment and sustainable laundry behavior, and laundry behaviors of young adult college students and whether there were gender differences. Many of the laundry behaviors recorded aligned with the literature review. The majority of participants learned how to do laundry from their mother, which was expected due to the history of women's responsibility to household chores including laundry (Bose et al., 1984). The highest percent of participants also chose their laundry detergent based on what their parents' use, following the theory of hedonic incongruity which explains consumers' tendency to continue behaviors taught to them by their parents (Conrady et al., 2013). The highest percentage of participants reported that they decided to wash a piece of clothing if they have worn it several times. The second highest percentage of participants reported washing their clothing based on it smelling unclean which aligns with the current emphasis on odor rather than visual cleanliness according to a European study (Klepp, 2007). The highest percentages of participants reported doing a load of laundry once a week or once every two weeks. This result is similar to the finding from Klausing, Maloney, and Easter's (2012) study which revealed that the average American consumer does laundry twice a week. The majority of participants reported deciding how much detergent to use by the amount of laundry, which was an unexpected result due to a previous study which found that only 12% of consumers follow the dosing directions provided on the detergent packaging (Laitala et al., 2012b). This result aligns with Conrady, Kruschwitz, and Stamminger's (2013) finding that many consumers choose the detergent amount based on intuition about the dosage necessary for the amount of laundry and uncleanliness level. The second highest percentage of participants

reported always using the same amount of laundry detergent which aligns with the findings of that same study which showed that many consumers always use the same amount of detergent (Conrady et al., 2013). The fewest amount of participants reported analyzing the level of uncleanliness of their laundry to determine the amount of detergent to use, which, according to most laundry detergent directions, needs to be evaluated to decide the proper amount of detergent to use.

Laundry behavior frequency was also recorded to evaluate the current sustainability levels of college students' laundry behaviors. As expected, a low number of participants sorted their laundry by fiber type. This is expected as studies show that the majority of consumers sort their laundry based on color rather than fiber type (Fletcher & Goggin, 2001). A high percentage of participants reported filling the machine to capacity most of the time when doing laundry. This varied from other studies where participants reported not filling the machine to avoid overflowing or machine maintenance problems (Conrady et al., 2013), which could be explained by information from the focus group where students explained that they often paid for laundry by the individual load to save money. Findings suggested a neutral trend for participants checking the laundry detergent packaging for dosing information. A low number was expected for this behavior because of information from a study revealing that very few consumers actually read the instructions on the detergent packaging (Conrady et al., 2013). Just above neutral numbers were reported for the frequency of participants using cold water to wash their clothing and using fabric softener. A likely explanation for these factors has to do with participants using cold water or fabric softener only for specific clothing products rather than every wash. Participants reported rarely hang drying their clothing. This is expected as the culture in America has a strong preference for using dryers for their clothing although there was no literature found to

support this. Participants reported only using one dry cycle frequently. This is unexpected as the focus group suggested that many of the participants were unaware of necessary cleaning of dryers in order to maintain their functions.

In addition to reporting current laundry behaviors, gender differences were compared for knowledge, attitude and behavioral components. Because information on gender and laundry has not been researched and reported in previous studies, the only expectation was that women would have higher knowledge about laundry due to the historical relationship between women and household chores (Bose et al., 1984).

In regards to knowledge, three aspects were measured: action skills, knowledge of issues, and knowledge of action strategies. Action skills were measured through subjective questioning, and females reported a higher knowledge than males, as expected based on previous studies (Bose et al., 1984). Knowledge of issues and knowledge of action strategies were measured with objective true/false questions, which showed no gender difference overall. This is an interesting result displaying the contrast between subjective knowledge, what consumers think they know, and objective knowledge, what consumers actually know. Subjective knowledge often indicates self-confidence on a topic (Brucks, 1985), and in this case, may also be correlated to the looking glass self theory by Charles Horton Cooley which “states that a person’s self grows out of a person’s social interactions with others” (Isaksen, 2013). Females may believe that they have higher laundry knowledge because culturally and historically they are expected to know how to do laundry. Males may doubt their knowledge of laundry because laundry is not historically attributed to a male duty (Bose et al., 1984).

Results on attitude toward the environment and sustainable laundry behavior revealed no gender difference overall. However, two items measured in the section on attitude toward the

environment had significant gender differences. Females more strongly agreed that if things continue on their present course a major ecological catastrophe will occur by 2050. Females also more strongly agreed that their own personal actions have an impact on the Earth. Although previous studies have suggested gender differences in attitudes toward the environment, with results showing more favorable attitudes by males in some studies and females in other studies, a cross-national analysis by Hayes (2001) revealed no gender differences despite three common arguments including men being socialized to be un-ecological, male patriarchy leading to both female inequality and environmental problems, and traditional female roles of nurturers generating pro-environmental attitudes. These common arguments may have influenced the female preferences for these two items. The means reported in the section on attitude toward sustainable laundry behavior showed that females had more favorable attitudes toward sustainability than did males, however, the differences were not significant.

Gender differences were compared with consumer laundry behavior. The first section in the pre-educational and post-educational surveys measuring laundry behavior looked into the background of consumer laundry behavior. The only item that showed a significant difference in this section was that more males reported choosing their laundry detergent based on what is on sale or what is the cheapest. This result was expected based on a study by Hoyer (1984) where female shoppers tended to be more brand loyal in their laundry detergent purchases, whereas males displayed faster purchase decisions which may have been based on price. The second section on laundry behavior measured frequency of certain laundry behaviors. Females reported using cold water to wash their laundry, using fabric softener, and hang drying their laundry more frequently than males. Although no literature could be found to support this, these results were expected for several reasons. First, females may tend to spend more time caring for their

clothing due to the nature of female clothing being more delicate than male clothing. Second, females in this study were mostly apparel design students which may indicate higher levels of knowledge and interest in clothing and clothing care. Lastly, males may be more likely to purchase clothing that requires less cleaning effort due to its availability on the market.

Research Question Two

The second research question asked whether college students would have their sustainable laundry knowledge, attitudes toward the environment, attitudes toward sustainable laundering, and laundry behaviors changed to be more sustainable after an educational program. The expected results were increased knowledge, more positive attitudes toward the environment, more positive attitude toward sustainable laundry behavior, and more frequent sustainable laundry behaviors. First, the change in level of knowledge was measured from pre-educational to post-educational survey, followed by change in attitude, and change in behavior.

Level of knowledge was measured with three variables. The section on action skills was measured with subjective questioning and showed interesting results. Participants reported a lower level of knowledge on the post-educational survey when asked if they knew how to do laundry. This result may be attributed to what consumers know versus what they think they know. After the educational program, consumers may have realized that there are more aspects to laundry behavior than they originally thought, lowering their confidence in laundry knowledge. Because subjective knowledge is related to confidence (Brucks, 1985), the numbers may have been reported lower than those on the pre-educational survey. Participants also reported higher knowledge for knowing the most sustainable laundry practices, which was expected due to the educational program and indicated that participants learned about sustainable laundry behaviors from the educational program.

Results showed that the participants' knowledge of issues was unchanged from the pre-educational to the post-educational survey. This may be because the knowledge of issues on the pre-educational survey was already very high ($M_{pre}=2.77$, Range= 1-3). Results did show a slight increase on the knowledge of action strategies from the pre-educational survey to the post-educational survey. More participants correctly answered the true/false questions, "It's more sustainable to fill the machine to with clothing to capacity;" "I should sort my clothing by fiber content on the label;" "The water hardness affects the amount of laundry detergent needed;" "Using cold water cleans the laundry just as well as hot water;" "If I fill the machine to capacity, the clothes will not get clean." These items were all addressed during the educational program which shows that participants paid attention and learned from the program as reported in Table 9. One item, "It's sustainable to wash most of my clothing after every wear." actually had fewer participants answer correctly on the post-educational survey. It is possible that this item was not clear in its wording and therefore confused participants.

Unexpectedly, consumer attitude toward the environment went down from the pre-educational survey to the post-educational survey. The difference in the survey settings (The pre-educational survey was taken in a classroom setting, and the post-educational survey was distributed by email so participants could take it when and where they chose) may have impacted the results for this variable. Additionally, participants may have not paid as close attention when answering the post-educational survey because they had seen the questions previously on the pre-educational survey. There might be other factors that may have affected participants' decrease in their attitudes toward the environment. As it is unclear exactly why the change occurred, there is an opportunity for future research to investigate the issue further. Contrary to the results of this study, other studies on sustainability recording behavioral changes based on

increased knowledge and improved attitude do not record a change in pro-environmental attitude after education (Hsu, 2010). Several items measuring this variable showed significant decrease after the educational program. In particular, participants reported less favorable attitudes toward caring about the environment, believing that the Earth's natural resources are depleting, and believing that their individual actions can make an impact on the Earth.

Consumer attitude toward sustainable laundry behavior positively increased on the post-educational survey. This was the expected and hoped for outcome. After learning about the topic of sustainable laundry behavior, participants showed more favorable attitudes toward it. This result may be related to participants' preferences towards decreased effort (Bose et al., 1984). After learning that sustainable laundry behavior in general requires little effort (e.g., using cold water instead of hot, doing laundry less frequently, etc.), participants may have been more apt to favor it. One individual item in this section showed a significant difference between the pre-educational and post-educational survey, and was perhaps the most important item. Consumers reported a more favorable attitude toward having the ability to practice sustainable laundry behaviors.

Consumer behavioral change was measured in two sections. The first section recorded the backgrounds of the participants' behaviors. Expectedly, few of these behaviors changed because they were based on background behaviors rather than current behaviors. One item which recorded a current behavior, the frequency of washing a piece of clothing, showed significant improvement from the pre-educational survey to the post-educational survey. Fewer participants reported washing a piece of clothing after only one wear, suggesting less frequent laundering. More participants reported wearing a piece of clothing several times before washing it, which is a more sustainable behavior. More participants reported washing a piece of clothing

if it smells unclean, supporting Klepp's (2007) finding that current cleanliness standards are based on odor rather than visual dirt. This also suggests participants may be evaluating the uncleanliness level of their clothing before deciding to wash. Fewer participants reported washing a piece of clothing if there is visual dirt on it. This is an unexpected result, but may suggest that participants are spot cleaning their clothing rather than washing the entire garment. No literature could be found on spot cleaning laundry for sustainability purposes, so this finding opens a new area for research.

The second section on laundry behavior measured frequency of particular behaviors. Nearly all of the behaviors tested in this section showed improved sustainability. Three of the items were significantly improved. Participants reported more frequently filling the machine to capacity, checking the laundry detergent packaging for dosing information, and using cold water to wash. These items were all addressed in the educational program, further supporting participants' responses in the post-educational survey that the program was helpful, useful, and educational as seen in Table 9.

Research Question Three

Research question three asked whether college students would alter their sustainable laundry behavioral intent due to improved attitude caused by increased knowledge. The expected results were that the increased knowledge would influence consumer attitudes which would in turn influence consumer behavioral intent. This chain of reaction has not always been successful in sustainability studies, but was used in this study because of the specified areas of knowledge (action skills, knowledge of issues, and knowledge of action strategies) which have been successful in sustainability studies (Kollmuss & Agyeman, 2002).

The results in this study showed that both attitudes toward the environment and toward sustainable laundry behavior were influenced by the action skills reported. This is interesting because the action skills were based on subjective knowledge and research has shown that subjective knowledge is a better indicator of consumer decision-making than objective knowledge (Brucks, 1985). The results also showed that behavioral intent for sustainable laundry behavior and willingness and ability was influenced by attitude toward sustainable laundry behavior. Attitude toward the environment was not a predictor of behavioral intent for sustainable laundry. This aligns with most studies on pro-environmentalism which state that pro-environmental attitude does not predict pro-environmental behavior (Domina & Koch, 1998; Pettersen & Boks, 2013); Eagly and Chaiken (1993) noted that attitudes and behavioral change must be compared on comparable levels. That being said, general attitude toward the environment would be less likely to predict sustainable laundry behavior, but attitude toward sustainable laundry behavior would be more likely to predict behavior with the same level of specificity. The theory of planned behavior, which suggests that only certain attitudes toward a behavior are predictors of that behavior, may have also influenced participants' future behavioral intent (Ajzen, 1991). Other influencers may have played a role in the change in behavioral intent, but were not included in this study. Past laundry experience, indicated by one of the survey items, may have affected participants' behavioral intent. Available resources, including money, appliances, and space, was discussed in the focus group as a possible influencer to laundry behavior. Social conventions and collective conventions are a part of everyday life tasks, which may have shaped some participants' future behavioral intent (Jack, 2013).

Conclusions

The intent of this study was to further the understanding of consumers' sustainable laundry behavior, sustainable laundry knowledge, attitudes toward the environment, and attitudes toward sustainable laundry behavior. The Sustainable Laundry Behavior Model was developed in order to better understand the influencers of sustainable laundry behavioral intent.

Additionally, an educational program was developed and tested on young adult college students to evaluate the Sustainable Laundry Behavior Model.

The research questions were answered through comparison of pre-educational and post-educational surveys, comparison of genders in the pre-educational surveys, and testing the relationships between the variables of knowledge, attitude, and behavior.

Theoretical Implications

In general, this study expanded the body of knowledge on sustainable laundry behavior using a sample of U.S. college students. Specifically, there are three theoretical implications. First, the study expanded on the Pro-Environmental Behavior Model (Kollmus & Agyeman, 2002) by combining it with the Hine's Model for Responsible Environmental Behavior Model (Hungerford & Volk, 1990) to create the Sustainable Laundry Behavior Model, which, to the researcher's knowledge, was the first attempt to apply the model in understanding American consumers' laundry behaviors, specifically, college students. Findings of this study suggest that consumer subjective knowledge of laundry influences their attitude toward sustainable laundry, which in turn impacts their intention and willingness to perform sustainable laundry behavior.

Second, this study found gender differences in laundry behavior. There was little evidence in previous literature to suggest gender difference in the context of laundry behavior. Findings of this study concluded that there are some gender differences in regards to sustainable

laundry knowledge, attitude toward the environment, and some laundry behaviors. Findings suggest a higher level of subjective sustainable laundry knowledge among females. Findings also show a more positive attitude from females with certain aspects of environmental attitude (e.g. personal impact on the environment). Findings of this study also suggest a gender difference in specific laundry behaviors; males are more likely to choose laundry detergent based on cheap prices; females more frequently use cold water washes, fabric softener, and hang dry their clothing.

Lastly, the educational program designed to improve sustainable laundry knowledge, attitudes, and behavioral intentions was found to be successful overall. Sustainable laundry knowledge, attitudes toward sustainable laundry behavior, and several behaviors improved (e.g. frequency of washing, use of cold water, filling the machine to capacity). Behavioral intentions showed high means toward sustainable behaviors. Findings suggest participants' level of knowledge of sustainable laundry practices improved significantly after the educational program, as did their level of knowledge of action strategies. Although attitudes toward the environment declined slightly, attitudes toward sustainable laundry behavior improved significantly after the educational program. Findings also suggest several behavioral changes after the educational program, including less frequent washing, more filling washing machines to capacity, more checking detergent dosing instructions, and more cold water washing. Findings suggest the educational program was effective with high ratings (all above five on the 7-point Likert type scale) on the helpfulness, usefulness, and educational quality of the program. The average-to-high ratings of future laundry behavior intentions (all above 4.6 on the 7-point Likert type scale) further reflect the success of the educational program.

Practical Implications

The results from this study also provide practical implications for the apparel industry, laundry industry, and academia. First, previous research (Bose et al., 1984) and the current study suggest that additional effort dissuades consumers from engaging in certain activities. Participants reported the lowest frequency rating on future intent for sorting their laundry by fiber type, a sustainable laundry behavior requiring more effort than others. This finding suggests that if it were possible to reduce the effort in this and other tasks, more consumers would be willing to engage in sustainable behaviors. If consumers are better informed on the importance of this issue (e.g., it prolongs the clothing's lifecycle, therefore saving the consumer money), they may be more willing to exert the extra effort. Fashion and apparel companies may be able to use this information to incorporate washing instructions into their labeling that are more easily understood. Additionally, laundry appliance companies could use more clear labeling to help consumers understand the proper wash and dry settings to use for various items (e.g., labeling washer dials with "cotton" rather than "permanent press" to encourage consumers to wash all their cotton items together on the correct settings).

Secondly, this research showed participants' lack of knowledge on detergent dosing. Detergent and laundry appliance companies should further educate their consumers and promote sustainability. Previous studies show that consumers expect and want clearly written dosing instructions on their detergents (Jarvi & Paloviita, 2007). Detergent and laundry appliance companies should emphasize the proper detergent dosing on the packaging. By providing easily understood instructions on the packaging, companies may be able to capture more consumers and keep them as loyal customers.

Lastly, because the educational program was overall successful, colleges can utilize programs like the one implemented in this study to make their campuses more sustainable. Educational programs can be incorporated into classroom content, orientations, and resident hall programs. With the use of short educational programs, sustainable laundry behavior can become more widely known and practiced. Other organizations can also participate in educating consumers on proper laundering habits. For example, apparel companies can train their sales associates to educate consumers on proper laundering at the time of purchase. Laundry companies can further educate consumers through advertisements and product packaging.

Limitations

Although several implications were gained through this study, the following limitations must be considered. First, gender frequencies were disproportionate among the recruited participants, thus, the generalizability in terms of gender differences are limited. The disproportionate number of genders was made apparent after the initial distribution of pre-educational surveys. Although additional male participants were recruited, few responded so the numbers remained disproportionate. This may have caused the results to be skewed one way or another.

The second limitation was that there were participants included in the study who reported not being solely responsible for their own laundry. Participants who were not solely responsible for their laundry may have varied behaviors and behavior frequencies from those who are solely responsible which may have skewed the results of this study. While this may have affected some of the data, a possible explanation is that they were adult non-traditional college students who have already established families and may share the responsibility of laundry with their spouse.

Other participants may use laundry services, have their parents do their laundry, or share the responsibility with house mates, all of which may have affected responses on the surveys.

The third limitation is that participants took the pre-educational survey in a classroom setting and were emailed the post-educational survey to take when and where they chose. This may have affected some of the results. For example, the numbers for attitudes toward the environment were lower on the post-educational survey. Ideally, the pre-educational and post-educational surveys would have been distributed in the same setting to prevent outside variables affecting participants' responses.

The fourth limitation is that there were time restraints on the study which may have affected the data. Due to unforeseen circumstances, the surveys and educational program could not be distributed until late in the semester, which forced a shorter lapse of time between the pre-educational and post-educational surveys. The time frame between pre-educational and post-educational surveys may have affected responses. Participants may have reported more sustainable answers because information was easily remembered due to the short time period, or they may have reported responses that might not reflect their actual laundry behavior due to not having enough time between surveys. Although this time lapse may have affected the results, the surveys were still distributed nearly two weeks apart, which was the original aim.

Future Research

This study has opened up many opportunities for future research. First, one of the screening questions in the surveys asked the length of time participants had been doing their own laundry. The mean year reported was about 6 years, which was much higher than expected. This result brings up the topic of time commitment and behavioral change. It would be interesting to test behavioral intent between participants who are new to doing their own laundry

versus those who have developed their laundry behavior over many years. Participants who have been behaving a certain way for a greater length of time may be less likely to change that behavior.

An additional time consideration is how the length of time after the educational program affects participants' knowledge, attitudes, and behaviors. By distributing additional post-educational surveys after greater time lapses, the effect of the educational program could be further confirmed. Testing monthly, bi-annually, or annually after the initial educational program would likely produce interesting results on whether knowledge, attitudes, and behaviors change over time or are maintained.

Other methods of testing could be used in future research as well. Rather than surveying participants, making observation while consumers are doing their laundry could produce more accurate results because participants do not always accurately report their actions. However, direct observation creates room for error due to the possibility of the Hawthorne Effect, which states that participants alter their behavior when they know they are being observed (McCambridge, Witton, & Elbourne, 2014).

More areas for future research have opened as the low R^2 from the regression analyses suggest that other influencers besides attitude toward sustainable laundry behavior may predict the sustainable laundry intention. Factors such as available resources (money, appliances, space, time), social and collective conventions, personality, and planned behavior should be considered in future studies regarding sustainable laundry behavior.

Further analysis of the Sustainable Laundry Behavior Model could be run to understand the causal effects among the variables. Path analysis and structural equation modeling could supplement the current results.

Furthermore, while most students gave the educational program high ratings and knowledge was improved afterwards, future research should study the best method of distributing information on sustainable laundry behavior. Other studies have posted informational flyers and directions on laundry room appliances (The Green Initiative Fund, 2013); however, comparing the various methods would be useful in exploring the most efficient approach.

Lastly, other future research topics that were revealed during this research but could not be explored within this study are spot cleaning laundry, ironing versus tumble drying laundry, American consumer preferences for tumble dryers versus line drying, laundry care for female versus male clothing, behavioral change among consumers of public laundry rooms (e.g. college residence halls, apartment complexes, etc.), and environmental attitude change after sustainable laundry educational program.

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APPENDICES

Appendix A

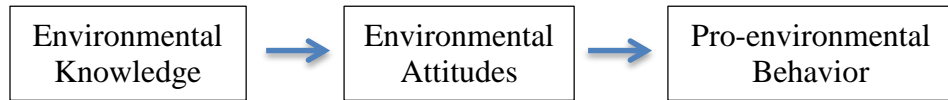


Figure 1- Pro-environmental Behavior Model

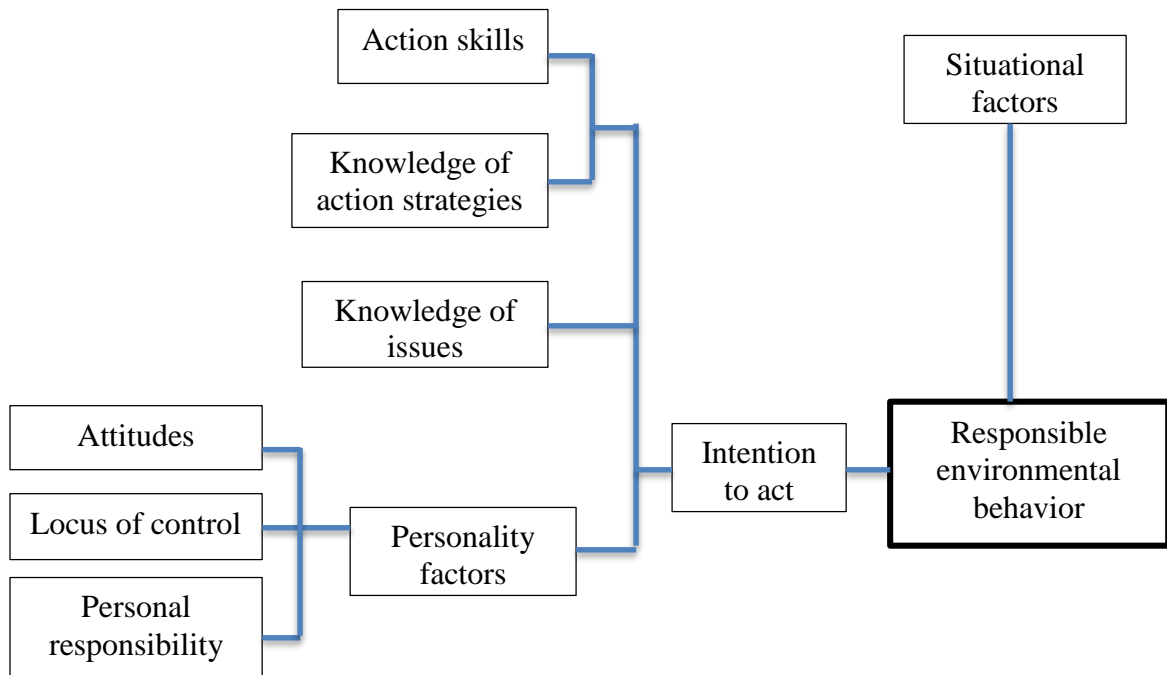


Figure 2- Hines Model of Responsible Environmental Behavior

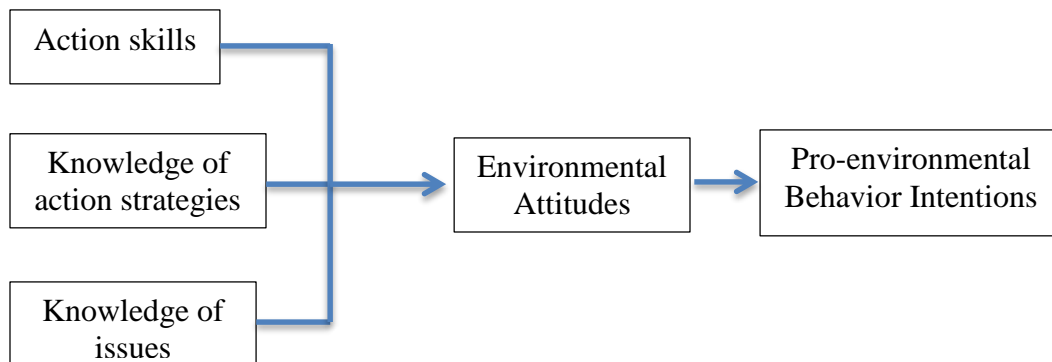


Figure 3- Sustainable Laundry Behavior Model

Appendix B- Focus Group Recruitment Poster

**Participants Needed for
Research Focus Group**

Who: Any students 18+ who are solely responsible for doing their own laundry
What: A focus group will be led by the researcher that consists of discussion on laundry behaviors
Duration: Approximately 45 minutes
Where: Aylesworth Building

Please contact Mary Coats
at mkcoats@rams.colostate.edu
if interested

Free Pizza Dinner Included

Laundry Behavior Focus Group
Contact Mary Coats at
mkcoats@rams.colostate.edu

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Appendix C- Instrument for Focus Group

Part I: Demographic Information

Please fill out the questionnaire:

Age: _____ Year in School: _____

Gender: _____ Ethnicity: _____

How long have you been responsible for doing your own laundry? _____ years

How frequently do you do your laundry?

- Multiple times each week
- Once a week
- Once every two weeks
- Once a month
- When I run out of clean clothing
- When I need to wear a piece of clothing that isn't clean

Part II: Interview Schedule

1. How frequently do you do your laundry? What are reasons for this?
2. What type of washer/dryer do you use/have?
3. What is your typical laundry routine (include sorting, wash settings, wash temperatures, drying, ironing, etc.)?
4. How did you learn to do laundry this way?
5. How much laundry detergent/fabric softener do you use? How do you decide this?
6. How conscientious are you of the environment? Are you aware of current environmental issues?
7. Do you practice any sustainable behaviors? Why do you practice these but not others?
8. Do you think laundry behavior has an impact on the environment? How so?
9. Have you heard of “sustainable laundry?” What does that mean to you?
10. Would you consider yourself knowledgeable about doing sustainable laundry? How so?
11. Do you feel you have what it takes to practice sustainable laundry? Why or why not?
12. What's your attitude about sustainable laundry?

Appendix D- Cover Letter for Pre-Educational Survey



Department of Design and Merchandising
150 Aylesworth Hall SE
1574 Campus Delivery
Fort Collins, Colorado 80523-1574
(970) 491-1629
FAX: (970) 491-4855
<http://www.caahs.colostate.edu/dm>

Spring 2014
Dear Student:

Presently, we are conducting a research study entitled, "Development of an Educational Program: Promoting Sustainability of Consumer Laundry Behavior." The purpose of our study is to further the understanding of sustainable laundry behaviors of consumers and between genders and to test if education on proper laundry behavior changes consumers' laundering behavioral intentions to be more sustainable.

We would like to invite you to participate in this research. Your participation in this study is completely voluntary. If you decide to participate in this research, you will be asked to respond to a survey that includes questions on demographics, laundry behaviors, knowledge and attitudes toward laundry, attitude toward the environment and sustainable laundry, and laundry behavior frequency. The survey will take approximately 10-15 minutes. Directly following the survey will be an educational program explaining sustainability, laundry's role in sustainability, more sustainable laundry behaviors, benefits of sustainable laundry, and future recommendations. The educational program will take approximately 10-15 minutes. An additional survey will be emailed out approximately 2-3 weeks after the initial survey. This survey will take 10-15 minutes to complete.

For your participation in this study, you will receive 5 or 10 extra credit points in DM 120 (5 for completing part 1, 10 for completing both parts). You will receive these extra credit points even if you choose to discontinue your participation in this study. If you do agree to participate in the study, please be sure to come to your DM 120 class on Wednesday, April 23 at 12:00 pm as the first part of the study will be conducted during your class time. Please note, if you do not participate in part 1, you are not eligible to participate in part 2. Additionally, there will be a drawing for two random winners for \$20 Visa gift cards. You will only be eligible to win if you participate in the entire study (i.e. both surveys).

Please be assured that any information or responses that you provide in connection with this research will remain confidential and anonymous. Your name will not be attached to the questionnaire; rather, a numeric code will be assigned to your survey. Your email address will only be used to send the secondary survey or to notify you if you win the drawing. All questionnaires will be destroyed in the year 2017. Also, if you decide to participate, you may decline to answer any questionnaire item(s) you choose and may stop participating at any time.

There are no known risks to participating in this research. Similarly, there are no known benefits to participating in this study, but we expect that participants will have an improved knowledge of sustainable laundry behavior. If you have any questions about the study, please phone Dr. Yan at (970) 491-5331 or email her at Ruoh-Nan.Yan@Colostate.Edu. If you have questions about human research participants' rights, please contact Evelyn Swiss at 970-491-1381 or Evelyn.Swiss@colostate.edu.

Thank you for considering our request to participate in this study.

Sincerely,
Ruoh-Nan Yan, Ph.D. Mary Coats
Associate Professor Graduate Student
CSU CSU

Appendix E- Pre-Educational Survey

Please note the instructions for each section.

Section I. About Yourself

Please answer the following questions.

Last 4 digits of student ID number: _____

(ID number will only be used for matching pre- and post- surveys. Your identity will be kept anonymous.)

Gender: Male
 Female

Age: _____

Ethnicity: African American
 East Asian
 Latino or Hispanic
 Middle Eastern
 Native American or Alaskan Native
 Non-Hispanic White
 South Asian
 Other _____

Year in School: Freshman
 Sophomore
 Junior
 Senior
 Graduate Student

I am solely responsible for doing my laundry.

Yes

No

I first became responsible for my laundry once I entered college.

Yes

No

How long have you been doing your own laundry? _____years

Section II. Laundry Behaviors

Please answer the following by checking all that apply:

I learned how to do laundry from...

- My mother
- My father
- Another female relative or friend
- Another male relative or friend
- Reading the directions on the washer/dryer/laundry detergent

I choose my laundry detergent based off of...

- What my parents use
- What is on sale/what is the cheapest
- The scent
- Environmentally friendly products/practices
- Other (please specify): _____

I most typically wash a piece of clothing if...

- I've worn it once
- I've worn it several times
- It smells unclean
- It has visual dirt on it

I typically do a load of laundry...

- Multiple times each week
- Once a week
- Once every two weeks
- Once a month
- When I run out of clean clothing
- When I need to wear a piece of clothing that isn't clean

I decide how much detergent to use by...

- The amount of laundry
- The level of uncleanliness
- I always use the same amount
- Other (please specify):_____

Section III. Knowledge and Attitudes about Laundry

Please rate the following statements from strongly disagree (1) to strongly agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I know how to do laundry.	1	2	3	4	5	6	7
I know what sustainability means.	1	2	3	4	5	6	7
I know the most sustainable laundry practices.	1	2	3	4	5	6	7

Please circle the correct answer.

- True False Using hot water when washing my clothing consumes more energy than using cold water.
- True False It's more sustainable to fill the washing machine with clothing to capacity.
- True False It's sustainable to wash most of my clothing after every wear.
- True False I should sort my clothing by the fiber content on the label.
- True False Doing several small loads of laundry consumes less energy and water than one large load.
- True False The water hardness affects the amount of laundry detergent needed.
- True False If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow.
- True False Using cold water cleans the laundry just as good as hot water.
- True False Washing my clothing more frequently can affect the quality of the garment.
- True False If I fill the machine to capacity, the clothes will not get clean.

Section IV. Attitude toward the Environment and Sustainable Laundry

Please rate the following statements from strongly disagree (1) to strongly agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I care about the environment.	1	2	3	4	5	6	7
My actions and behaviors reflect my attitude toward the environment.	1	2	3	4	5	6	7
The Earth's natural resources are depleting.	1	2	3	4	5	6	7
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	1	2	3	4	5	6	7
My own actions have little impact on the Earth.	1	2	3	4	5	6	7
My laundry behaviors can be sustainable.	1	2	3	4	5	6	7
I personally can make a difference in the future with sustainable behaviors.	1	2	3	4	5	6	7
I have the ability to practice sustainable laundry behaviors.	1	2	3	4	5	6	7

Section V. Your Laundry Behavior

Please rate the frequency of the following behaviors by circling the corresponding number (1=Never, 7=Always).

When I do laundry...	Never		Sometimes			Always	
I sort my laundry by the fiber type on the label.	1	2	3	4	5	6	7
I fill the machine to capacity.	1	2	3	4	5	6	7
I check the laundry detergent packaging for information on dosing.	1	2	3	4	5	6	7
I use a measuring device to decide how much detergent to use.	1	2	3	4	5	6	7
I use the same amount of laundry detergent for every load.	1	2	3	4	5	6	7
I use cold water to wash my laundry	1	2	3	4	5	6	7
I use fabric softener.	1	2	3	4	5	6	7
I hang dry my laundry.	1	2	3	4	5	6	7
When I use the dryer, I only use one cycle.	1	2	3	4	5	6	7

Appendix F- Educational Program

Promoting
Sustainability of
Consumer
Laundry
Behavior
Spring 2014

What is Sustainability?

- Meeting the current generation's needs without jeopardizing future generations needs (WCED, 1987)
- Triple Bottom Line
 - Economic, environmental, and social components are taken into account
 - Also known as the 3 P's: People, Planet, Profit (Carliata et al., 2011)

Global Issues

- People are increasing the average temperature of the Earth's atmosphere through carbon dioxide, methane, and Greenhouse gases
- This has caused:
 - Variations in plant growth cycles
 - Variations in animal and insect migration patterns
 - Melting glaciers and ice caps

(Al-Hattaj et al., 2012)



Laundry's role in sustainability

- Current laundry practices use energy, water, and resources.
- Current standards of cleanliness promote more washing and drying than ever before (Pakula & Stamminger, 2009)



Sustainable Laundry Behaviors

- Wash clothing only when it's dirty (Fletcher & Goggins, 2001).
- Sort laundry by fiber type on label (Fletcher & Goggin, 2001).
- Fill the machine to capacity (Fletcher & Goggins, 2001).
- Use low washing temperatures (Fletcher & Goggins, 2001).
- Use the gentle cycle (Laitala et al., 2012).



Sustainable Laundry Behaviors Cont.

- Use the recommended amount of detergent and fabric softener (Fletcher & Goggins, 2001).
- Fort Collins typically has slightly hard water. This means that more detergent may be required, and liquid detergent may be more efficient (Cameron, 2011).
- Hang dry clothing (Klausing et al., 2012).
- Remove clothing from the dryer immediately to avoid extra dryer use for de-wrinkling or ironing (Braun & Stamminger, 2011).



Laundry Symbols



Laundry Symbols



Benefits of Sustainable Laundry

- Reduction in the use of energy, water, and products
- Financial savings with lowered energy and water bills
- Extends the life of your garments from less wear and tear
- Less chores for you to do



Sustainable Laundry Programs



- UC Berkeley's sustainable laundry campaign "End the Cycle"
- Resulted in \$1,182 saved in one school year (The Green Initiative Fund, 2013)

Recommendations

- Check your monthly bills for your water and electricity usage
- Set goals to use less
- Compare monthly bills to see if you meet your goals
- Routinely clean your washer and dryer every 3-4 months



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Sustainable Laundry Behavior

Reminders!

Recommendations

- Check your monthly bills for your water and electricity usage
- Set goals to use less
- Compare monthly bills to see if you meet your goals
- Routinely clean your washer and dryer every 3-4 months

Sustainable Behaviors

Wash clothing only when it's dirty

Sort laundry by fiber type on label

Fill the machine to capacity

Use low washing temperatures

Use the gentle cycle

Use the recommended amount of detergent and fabric softener

Fort Collins typically has slightly hard water. This means that more detergent may be required, and liquid detergent may be more efficient

Hang dry clothing

Remove clothing from the dryer immediately to avoid extra dryer use for de-wrinkling or ironing

Machine Wash Normal		Laundry Symbols
Hand Wash		
Do Not Wash		Line Dry 
Bleach When Needed		Dry Flat 
Tumble Dry Normal		Dry Clean 
Do Not Tumble Dry		

Appendix H- Post-Educational Survey

Spring 2014
Dear Student:

Presently, we are conducting a research study entitled, “Development of an Educational Program: Promoting Sustainability of Consumer Laundry Behavior.” The purpose of our study is to further the understanding of sustainable laundry behaviors of consumers and between genders and to test if education on proper laundry behavior changes consumers’ laundering behavioral intentions to be more sustainable.

We would like to invite you to participate in this research. Your participation in this study is completely voluntary. If you decide to participate in this research, you will be asked to respond to a survey that includes questions on demographics, laundry behaviors, knowledge and attitudes toward laundry, attitude toward the environment and sustainable laundry, laundry behavior frequency, and future intentions. The survey will take approximately 10-15 minutes.

For your participation in this secondary survey, you will receive an additional 5 extra credit points in CON 267 or DM 120 (a total of 10 points for completing both parts). You will receive these extra credit points even if you choose to discontinue your participation in this study. If you do agree to participate in the study, please complete the survey by Friday, May 9. Additionally, there will be a drawing for two random winners for \$20 Visa gift cards. You will only be eligible to win if you participate in the entire study (i.e. both surveys).

Please be assured that any information or responses that you provide in connection with this research will remain confidential and anonymous. Your name will not be attached to the questionnaire; rather, a numeric code will be assigned to your survey. Your email address will only be used to send the secondary survey or to notify you if you win the drawing. All questionnaires will be destroyed in the year 2017. Also, if you decide to participate, you may decline to answer any questionnaire item(s) you choose and may stop participating at any time.

There are no known risks to participating in this research. Similarly, there are no known benefits to participating in this study, but we expect that participants will have an improved knowledge of sustainable laundry behavior. If you have any questions about the study, please phone Dr. Yan at (970) 491-5331 or email her at Ruoh-Nan.Yan@Colostate.Edu. If you have questions about human research participants’ rights, please contact Evelyn Swiss at 970-491-1381 or Evelyn.Swiss@colostate.edu.

Thank you for considering our request to participate in this study.

Sincerely,

Ruoh-Nan Yan, Ph.D.	Mary Coats
Associate Professor	Graduate Student
CSU	CSU

By selecting "next" you are agreeing to participate in this research.

About Yourself

Q1. Please enter the last four digits of your CSU student ID number (ID number will only be used for matching pre- and post- surveys. Your identity will be kept anonymous.)

Q2. What is your gender?

- Female
- Male

Q3. What is your age?

Q4. What is your ethnicity?

- African American
- East Asian
- Latino or Hispanic
- Middle Eastern
- Native American or Alaskan Native
- Non-Hispanic White
- South Asian
- Other _____

Q5. I am solely responsible for doing my laundry. Yes No

Q6. I became responsible for my laundry once I entered college. Yes No

Q7. How long have you been doing your own laundry (in years)?

Your Laundry Behaviors

Q8. I learned how to do laundry from (please select all that apply):

- My mother
- My father
- Another female relative or friend
- Another male relative or friend
- Reading the directions on the washer/dryer/laundry detergent

Q9. I choose my laundry detergent based off of (please select all that apply):

- What my parents use
- What is on sale/what is the cheapest
- The scent
- Environmentally friendly products/practices
- Other (please specify): _____

Q10. I most typically wash a piece of clothing if (please select all that apply):

- I've worn it once
- I've worn it several times
- It smells unclean
- It has visual dirt on it

Q11. I typically do a load of laundry (please select all that apply):

- Multiple times each week
- Once a week
- Once every two weeks
- Once a month
- When I run out of clean clothing
- When I need to wear a piece of clothing that isn't clean

Q12. I decide how much detergent to use by (please select all that apply):

- The amount of laundry
- The level of uncleanliness
- I always use the same amount
- Other (please specify):_____

The Sustainable Laundry Educational Program

Q13. I participated in the educational program on either April 23 (in DM 120 or for CON 267) or April 29 (for CON 267).

- Yes
- No

Q14. Please rate the following statements from Strongly Disagree (1) to Strongly Agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I paid attention during the educational program.	1	2	3	4	5	6	7
I think the educational program was useful.	1	2	3	4	5	6	7
I think the educational program was helpful.	1	2	3	4	5	6	7
I learned about sustainable laundry behaviors from the educational program.	1	2	3	4	5	6	7

Knowledge and Attitudes about Laundry

Q15. Please rate the following statements from Strongly Disagree (1) to Strongly Agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I know how to do laundry.	1	2	3	4	5	6	7
I know what sustainability means.	1	2	3	4	5	6	7
I know the most sustainable laundry practices.	1	2	3	4	5	6	7

Q16. Please select the correct answer for each of the following statements:

True False

- Using hot water when washing my clothing consumes more energy than using cold water.
- It's more sustainable to fill the washing machine with clothing to capacity.
- It's sustainable to wash most of my clothing after every wear.
- I should sort my clothing by the fiber content on the label.
- Doing several small loads of laundry consumes less energy and water than one large load.
- The water hardness affects the amount of laundry detergent needed.
- If I fill the machine to capacity with dirty clothes, it will likely cause water to overflow.
- Using cold water cleans the laundry just as good as hot water.
- Washing my clothing more frequently can affect the quality of the garment.
- If I fill the machine to capacity, the clothes will not get clean.

Attitude toward the Environment

Q17. Please rate the following statements from Strongly Disagree (1) to Strongly Agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I care about the environment.	1	2	3	4	5	6	7
My actions and behaviors reflect my attitude toward the environment.	1	2	3	4	5	6	7
The Earth's natural resources are depleting.	1	2	3	4	5	6	7
If things continue on their present course, we will experience a major ecological catastrophe by 2050.	1	2	3	4	5	6	7
My own actions have little impact on the Earth.	1	2	3	4	5	6	7
My laundry behaviors can be sustainable.	1	2	3	4	5	6	7
I personally can make a difference in the future with sustainable behaviors.	1	2	3	4	5	6	7
I have the ability to practice sustainable laundry behaviors.	1	2	3	4	5	6	7

Laundry Behaviors

Q18. Please rate the frequency of the following behaviors from Never (1) to Always (7).

When I do laundry...

	Never		Sometimes			Always	
I sort my laundry by the fiber type on the label.	1	2	3	4	5	6	7
I fill the machine to capacity.	1	2	3	4	5	6	7
I check the laundry detergent packaging for information on dosing.	1	2	3	4	5	6	7
I use a measuring device to decide how much detergent to use.	1	2	3	4	5	6	7
I use the same amount of laundry detergent for every load.	1	2	3	4	5	6	7
I use cold water to wash my laundry	1	2	3	4	5	6	7
I use fabric softener.	1	2	3	4	5	6	7
I hang dry my laundry.	1	2	3	4	5	6	7
When I use the dryer, I only use one cycle.	1	2	3	4	5	6	7

Q19. Please rate the following statements from strongly disagree (1) to strongly agree (7).

	Strongly Disagree		Neutral			Strongly Agree	
I know how I can make a difference for future generations by practicing sustainable laundry behaviors.	1	2	3	4	5	6	7
I have the ability to practice sustainable laundry behaviors.	1	2	3	4	5	6	7
I plan to practice sustainable behaviors.	1	2	3	4	5	6	7
I have already altered some of my laundry behaviors due to the educational program.	1	2	3	4	5	6	7
I have or plan to tell family and friends how to practice sustainable laundry behavior.	1	2	3	4	5	6	7

Q20. Please rate the following statements from Strongly Disagree (1) to Strongly Agree (7).

In the future...	Strongly Disagree		Neutral			Strongly Agree	
I plan to wash my clothing less frequently.	1	2	3	4	5	6	7
I plan to sort my clothing by fiber type.	1	2	3	4	5	6	7
I plan to fill the washing machine to capacity with clothing.	1	2	3	4	5	6	7
I plan to use cold temperatures for washing my clothing.	1	2	3	4	5	6	7
I plan to use the recommended detergent dosing.	1	2	3	4	5	6	7
I plan to hang dry my clothing.	1	2	3	4	5	6	7

Q21. Please enter your email address below in order to earn 5 additional extra credit points for DM 120 or CON 267. By entering your email, you will also be entered to win one of two \$20 Visa gift cards for your participation. Your email address will not be given out, shared, or sold to anyone. It is for the sole purposes of this research.