7-2020

Relationship Between University Student Characteristics and Water Conservation Behaviors

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Thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Agricultural and Extension Education

by

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University of Arkansas
Bachelor of Arts in Mathematics, 2018
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July 2020
University of Arkansas

This thesis is approved for recommendation to the Graduate Council.

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Abstract

Water over-consumption is a critical issue due to it being a mismanaged, and virtually finite, natural resource. In order to convey this information to the public and promote change, it is important to understand the public's current attitude towards the topic in order to develop more targeted teaching approaches. The purpose of this study was to determine college-age students' perceptions about water resource usage, their personal levels of active engagement in water conservation, and if any differences existed between agriculture students and non-agriculture students. This study utilized an online quantitative survey, guided by the Theory of Planned Behavior, which was distributed to students enrolled at the University of Arkansas in the spring of 2020. There were 255 responses, with 56.5% being agriculture students and 43.5% being non-agriculture students. Demographics, perceptions, intentions, and engagement towards water conservation were descriptively described prior to bivariate correlational analysis between constructs and demographics. Results indicated that being an agriculture major or non-agriculture major had small effects on construct score differences for a students' perceived importance of water and their perceived behavioral control and negligible effects on students' perceived engagement levels, social norms, future intentions, and actual engagement behaviors. Regression analysis revealed that a linear combination of perceived engagement, perceived behavioral control and political orientation could explain 16% of the variance in actual engagement behaviors, while a linear combination of a student's perceived importance, perceived engagement, perceived behavioral control, and social norms could explain 38% of the variance in their future intentions toward water conservation organizations, programs, and policies. The results concluded that being an agriculture or non-agriculture major does not predict a student's engagement or intentions toward water conservation but did have small

effects on two of the proposed predictors. It is recommended that the scale used to measure future intentions be used in future studies and that the influence of political orientation upon response bias be examined. It is also recommended that educators continue to express the importance of water as both an economic and environmental resource.

Acknowledgements

I would like to express my deepest appreciation to the members of this committee: Dr. Don Johnson, Dr. George Wardlow, and Dr. Kathi Jogan. Without their guidance and expertise, finishing this thesis and graduate degree would have been a daunting task. Each of them, as well as the whole AECT department offered a professional family structure that was always very welcoming of any questions that ever arose. Dr. Johnson, I would like to thank you for always being patient with me, especially during the statistical analysis portion of this thesis. Dr. Wardlow, working with you not only taught me skills applicable to my daily like but also offered an insight into educational management that I had not yet been exposed to, and for that I am very grateful. Dr. Jogan, I cannot begin to express my gratitude for the amount of personal and professional growth I was able to achieve as both your study abroad student and assistant. Each of you have my deepest appreciation. Thank you.

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Chapter 1. Introduction

1.1: Background

Water is among the necessary components that support and sustain life on Earth. Every biological organism relies on water in some fashion, including humans. Throughout history, as humanity evolved and advanced, the number of uses water offered also increased. Today water is used in many aspects of human life, from the large-scale support of industry and agriculture, to the everyday uses of cleaning, consumption, and recreation, among others (U.S. Geological Survey, 2018).

Despite the surface area of the world being over 75% water, roughly 2.5% of that is freshwater and less than that is available for humanity to use (USGS, 2016). From that perspective, freshwater is a valuable and limited resource. The world's current population is already putting a strain on available water, as can be seen through groundwater overexploitation (Scanlon et al, 2012), and as the population increases so too does that strain. With this in mind, it is important to consider the conservation of such a limited resource and promote responsible usage practices (Chaudhary et al., 2017).

The subject of natural resource conservation has become a growing and mainstream topic. Technological advancements have made monitoring natural resources, such as water, easier and more accurate. It has also allowed information to disseminate at rapid rates. This has resulted in topics such as aquifer depletion in the Great Plains to gain the attention of individuals across the world, allowing people who are detached from the issue of water conservation to become aware of how water depletion may directly or indirectly influence their lives (Lamm et al., 2016). Predicting how individuals or groups will respond to the potential threat of water scarcity is important in developing educational curriculum, marketing campaigns and effective conservation methods.

1.2: Overview of Literature

The National Research Agenda with the American Association for Agricultural Education included natural resource management under “Research Priority 7: Addressing Complex Problems,” specifically identifying water overexploitation and water quality as current concerns in the realm of Agricultural and Natural Resources (Roberts et al., 2016). Water is a poorly managed resource (Miller & Spoolman, 2010) in terms of quantity and quality, and in the United States, “public supply” water usage is the third highest withdrawer of water, behind irrigation and thermoelectric (U.S. Geological Survey, 2016). As worldwide population grows, demand placed on water resources will also increase (Cisneros et al., 2014), and any shifts in the world’s water resources could result in significant economic shifts (Berrittella et al., 2007).

In order to conserve or sustain current water resources, multiple problems must be addressed, such as population growth, climate change and agricultural needs. A goal of this research was to provide information about the differences in conservation beliefs held by agriculture and non-agriculture students in a Mid-south university in order to offer insight to how conservation practices might be most efficiently taught to a portion of the growing population.

One way to achieve this goal is to describe demographics and their relationships to conservation values. As would be expected, pro-environmental beliefs often lead to greater awareness of potential environmental issues, such as over exploitation of water (Young, 2005; Barrett & Wallace, 2009). However, other demographics, such as age, education, gender and political orientation (Clark & Finley, 2007; Corral-Verdugo et al.,2006; Chaudhary et al., 2018) have been shown to influence environmental awareness and conservation.

1.3: Research Problem

Water over-consumption is a critical issue due to it being a mismanaged, and virtually finite, natural resource. In order to convey this information to the public and promote change, it is important to understand the public's current attitude towards the topic in order to develop more targeted teaching approaches. Various studies about water conservation practices, habits and opinions have been completed (Huang & Lamm, 2017; Corral-Verdugo et al., 2003; Larson et al., 2011; Chaudhary et al., 2018), however, the mean age of respondents to these surveys was above 40 years. Little formal research regarding the modern college student, specifically the differences between agriculture and non-agriculture students, has analyzed their perceptions, intentions, or behaviors regarding the issue of water conservation.

1.4: Research Purpose and Objectives

The main purpose of this study was to determine college-age students' perceptions about water resource usage, their personal levels of active engagement in water conservation, and if any differences existed between agriculture students and non-agriculture students. The objectives of this study were as follows:

1. Describe student demographics for agriculture and non-agriculture students.
2. Describe the differences in construct scores for attitudes, perceptions, intentions, and engagement towards water conservation between agriculture and non-agriculture students.
3. Determine the correlations between construct and demographic variables.

4. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in actual engagement in water conservation.
5. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in future intentions toward water conservation.

1.5: Limitations

The University of Arkansas - Fayetteville is a Mid-south university with a student body of 27,559 students primarily from Arkansas and Texas residents which account for over 75% of undergraduate enrollment during the 2017-2018 academic year (University of Arkansas, 2019). Therefore, these results will not be generalizable to any population other than students at the University of Arkansas. Additionally, this study was conducted online (Qualtrics, 2019) after the University wide transition to remote instruction due to the COVID19 pandemic and therefore required the combination of convenience sampling and snowball sampling to supplement participants who were initially selected through random sampling, further limiting generalizability.

This study utilized an online survey design, requiring students to answer the survey questionnaire electronically. It also relied upon respondent self-reported behavior, which may be less reliable than direct observation (Owen et al. 2010; Coffey & Joseph, 2013; Kormos & Gifford, 2014).

Chapter 2. Review of the Literature

2.1: Environmental Value of Water

Water is among the most abundant resources on the planet, but freshwater is not. Water covers just over 70% of the Earth's surface and yet 97% of that is saline (Fetter, 2001). The remaining 3% is freshwater, but only a small fraction of that is available to humans for exploitation and consumption, roughly 0.024% of the total water volume on the planet (Miller & Spoolman, 2010). Ice caps and glaciers hold the vast majority of the planet's freshwater and deep, inaccessible aquifers hold a portion of freshwater as well.

Therefore, accessible groundwater reserves, lakes and streams account for almost all of the usable freshwater (Miller & Spoolman, 2010). Atmospheric water is just as important, although it holds the smallest volume of freshwater at 0.001% of the planet's total water volume (Fetter, 2001). Water is constantly moving in and out of the atmosphere in the form of evaporation and precipitation. Precipitation feeds groundwater, lakes and streams, as well as lands not directly influenced by these reserves. This hydrologic cycle maintains a balance that may be, and is, disturbed by human activity (Miller & Spoolman, 2010).

The small amount of freshwater is not just for humanity though, as it is the source of freshwater for the continental life forms, making it a very valuable and importance resource. It is also very mismanaged (Miller & Spoolman, 2010). Freshwater is used as sustenance for many species, but a habitat for many others. These habitats include wetlands, swamps, lakes, streams and more. These habitats overlap with humanity's water resources, so excessive use or alterations to water resources may have unforeseen implications on life and available water in regions.

2.2: Economic Value of Water

2.2.1: Definitions

When discussing the economic value of water one must first define the differences between "withdrawal" and "consumption." Withdrawal refers to the volume of water removed from the source while consumption or consumptive use refers to the volume of water that is withdrawn but then removed from "the immediate water environment" (U.S. Geological Survey, 2018). Withdrawn water may be consumed or not and the distinctions will be made when necessary. Water consumed or withdrawn for specific purposes are described in this paper in terms of the user and the type of use, such as "irrigation water withdrawals." Municipal water use will be referred to as public supply in accordance with USGS labeling.

2.2.2: Water Use in the U.S.

In 2015, the USGS estimated the daily water use for the U.S. to be 322 billion gallons per day, a 9% decrease from 2010 (U.S. Geological Survey, 2018). The USGS also recognized and categorized withdrawals into eight sections, with thermoelectric power, irrigation and public supply using 90% of the total national water withdrawals (U.S. Geological Survey, 2018). Thermoelectric power cooling is the largest user of water withdrawals but the category's consumption is small, roughly 3% of the total thermoelectric water withdrawals. Estimates for irrigation water consumption are 62% of total irrigation water withdrawals, the second highest category for water withdrawals.

Based on the USGS estimates (2018), irrigation was the largest consumer of water in the United States. Irrigation in the U.S. consumed more than the public supply category withdraws by a factor of 1.8. Harvested cropland accounted for over 90% of irrigated land area (United

States Department of Agriculture, 2019). This means that harvested cropland was responsible for the majority of water consumption in the US, with California, Idaho and Arkansas having the highest withdrawals and consumption volumes (United States Geological Survey, 2018). Therefore, should water availability decrease, and water prices increase, two major facets of society would be greatly impacted.

2.2.3: Water Use Worldwide

Cisneros et al. (2014) noted that thermoelectric power plants and irrigation both require very large amounts of water. As previously mentioned, the major water users in the U.S. were thermoelectric power and irrigation. Therefore, irrigation was the largest withdrawer of water worldwide, with thermoelectric being the third largest (UNESCO World Water Assessment Programme, 2019). Miller and Spoolman (2010) note that if thermoelectric was combined with industry then they become the second largest user of water worldwide, and this is supported by data reported by UNESCO WWAP (2019).

With the population approaching eight billion people worldwide, the demand placed on water resources is expected to increase by possibly 12.3% from 2000 to 2050 (Natural Resources Defense Council, 2010). This can be seen extensively in groundwater depletion rates. Dalin et al. (2017) claimed that groundwater depletion increased up to 20% between 2000 and 2010 due in large part to irrigation of cropland, where the U.S. increased its depletion by over 30% and China increased groundwater depletion by over 100%.

Models showed that any threat or change to worldwide water resources could result in large economic shifts (Berrittella et al, 2007). This could lead to global security issues due to increased tensions between countries with access to more sustainable water supplies and those without (Miller & Spoolman, 2010).

Thus far, focus has been placed upon the irrigation and thermoelectric sectors of water use. Young (2007) noted that in many societies, very little water is consumed for life sustaining purposes, and yet public supply rank second worldwide for total water withdrawals (UNESCO, 2019). This then led Young (2007) to claim that the majority of water is used for "convenience, comfort, and aesthetic pleasure."

2.3: Threats to Water Worldwide

Due to natures wide range of reliance on water resources, there are many potential threats to water supplies, with human activity relating to those discussed here. This section details three threats that relate to human activity: population growth, climate change and agricultural needs.

2.3.1: Population Growth

As previously mentioned, very little of Earth's water is readily available for use by humanity yet is a basic resource necessary to sustain human life. Berrittella et al. (2006) noted that estimates suggested the total amount of worldwide freshwater, if equally accessible, would be capable of providing the current population with the minimum required amount of freshwater. The demand placed upon water for public supply and thermoelectric cooling has been predicted to increase alongside the growing U.S. population (Natural Resources Defense Council, 2010), possibly suggesting a direct relationship between the threat of greater demand and population growth.

Not only does a growing population put direct strain on water resources through firsthand consumption, it also strains through indirect consumption. For instance, a growing population may lead to a growing demand for vehicles, which require an estimated 120,000 gallons of water to produce, and higher demand for gasoline, which is estimated to use 70 gallons of water per gallon of gas (Clift & Cuthbert, 2006). Therefore, "demographic, socioeconomic, and technological changes, including lifestyle changes" may directly or indirectly threaten the world's water supply (Cisneros et al., 2014).

2.3.2: Climate Change

In 2010, the Natural Resources Defense Council concluded that climate change would increase risks to water resources such that withdrawal demands would overwhelm current supplies. Climate directly impacts the hydrologic cycle which determines precipitation and evaporation rates which account for the primary influences on worldwide freshwater resources (Cisneros et al., 2014). In specific regard to the United States, climactic shifts resulting in changing precipitation and evaporation patters could cause over 1,100 counties to experience water scarcity (Natural Resources Defense Council, 2010). In turn, this would have direct impacts on local populations and agricultural irrigation practices (Cisneros et al., 2014).

2.3.3: Agriculture

Increased agricultural demand for freshwater is a function of worldwide population growth and climatological changes. Agricultural demand for water is controlled by many factors, including maintenance and crop efficiency (Cisneros et al., 2014). Additionally, Cisneros et al. (2014) suggested cropland irrigation demands may increase as food demands increase, driven by population growth, but that soil moisture and precipitation amounts driven by changing climates may also influence irrigation demands. In this way, agricultural needs exemplify the result of complex interactions between various threats, resulting in an additional threat to water resources.

2.4: Environmental Beliefs

One issue plaguing society's water use is that there are different environmental beliefs that arise worldwide. These may be due to religious, economic, environmental, governmental, or cultural beliefs, to name a few, which often conflict with the economic beliefs of water. For instance, in Bulgaria under the old communist regime, water was viewed as a free commodity to be exploited extensively with no regulation. Eventually, societal views changed after the fall of the communist regime and Bulgaria established a national water regulator (Clark & Finley, 2007).

Environmentalists view excessive water withdrawals and use less from a public viewpoint and more from a geographical and environmental stance. Excessive water withdrawals from different reservoirs, such as lakes and groundwater, can result in aquifer depletion, water table lowering, shrinking lakes, and lower river flow (Miller & Spoolman, 2010).

There can be many reasons to push back against regulation though. In their study, Larson and Santelmann (2007) suggested that physical adjacency or proximity to water has a very large effect on resource protection beliefs. Young (2007) noted that due to the "special cultural, religious, and social values" of water, some prefer it not to be treated as an economic commodity. On the other hand, Young also noted that because water is an essential ingredient to sustaining life, there are those that feel access to clean water should be regulated in order to offer water access at reasonable prices to everyone.

2.5: Predispositions and Characteristics of Water Users

2.5.1: Political

Many studies have been done in age groups older than college age attempting to correlate water using habits and beliefs with characteristics of the population. One such correlation has been political beliefs. In a 2018 study, Chaudhary et al. concluded that those holding liberal political beliefs engaged in water conserving practices were likely to continue conserving water in the future.

A similar study by Larson et al**.** (2011) found that those holding conservative beliefs were less concerned about water consumption and therefore conservation while being more opposed to increasing water prices. Conversely, people holding liberal beliefs were found to be more concerned about consumption and less opposed to the increase in water prices. The study related these correlations to how the subjects valued individualism and their opinions on "government intervention in the free market." Larson et al. went on to conclude that, overall, ecological worldviews, political orientation and ethnicity better explained the environmental perspectives of their subjects than did demographics. Coffey and Joseph (2013) suggested that partisan identification influences nonpolitical subjects such as conservation, with Owen et al. (2010) found that those describing themselves as Democrats were more likely to be strong environmentalists. A meta-analysis conducted by Kormos and Gifford (2014) found that there was no correlation between systematic bias in reporting and socially desirable responding when reporting pro-environmental behavior.

2.5.2: Demographics

In the previous section, Larson et al. (2011) did not find that demographics could explain their subjects' environmental perspectives. However, Clark and Finley (2007) found that of the different demographic categories, some were significantly related to "intention to implement water conservation measures." The demographics that were related include those categorized as "sociodemographic," such as age, education, residence type and if the subject kept a garden. Unrelated demographics include gender, family size and income. Corral-Verdugo et al. (2006) also previously linked age to water conservation, suggesting "older people" were more inclined to conserve water. In contrast to Clark and Finley (2007), Corral-Verdugo et al. also linked gender to water conservation. Clark and Finley correlated older age, less education, dwelling in a house and not keeping a garden suggested a greater intention to conserve water.

While Clark and Finley (2007) found that family size did not significantly relate to intention to conserve water, Barrett and Wallace (2009) found that, in terms of actual use, households with more inhabitants used less water per capita than houses with fewer inhabitants. As previously mentioned, very little public supply or municipal water is used for consumption, with the majority being used for convenience and comfort (Young, 2007). This means that some convenience uses, such as outdoor water use, are not affected by the number of residents in a house. Water would be used in such ways regardless of the number of inhabitants, so adding to the number of inhabitants decreases the mean water use per capita. This effectively makes it appear that larger household sizes are more efficient at using water (Barrett and Wallace, 2009).

Similar to Clark and Finley (2007), Barrett and Wallace (2009) also found that water use was not related to the gender of the subject. This was further suggested by research done by Larson et al. (2011). However, over time, studies on conservation and environmentalism have shown conflicting results in respect to the impact of gender on the subject. Tindall et al. (2003) found that women had greater degrees of environmental engagement but did not necessarily actively promote the ideals of environmentalism or conservation. Similar results were found in a 2006 study by Corral-Verdugo et al.

2.5.3: Beliefs

Of the various beliefs that people hold, two common themes begin to arise. In terms of water conservation, many beliefs lead individuals to be either biocentric or anthropocentric, following the terms used by Larson, et al. (2011). Those with pro-environmental beliefs are more likely to conserve water while those without are more likely to waste water (Larson et al., 2011; Corral-Verdugo et al, 2003; Clark & Finley, 2007). Pro-ecological beliefs have been correlated to water conserving intentions (Clark & Finley, 2007) while utilitarian beliefs have been correlated to increased water consumption (Corral-Verdugo et al, 2003).

In their 2011 study, Larson et al. noted that cultural domains, such as ethnicity and ecological worldviews, significantly influenced their subjects' affective, cognitive and conative judgements concerning water issues. These cultural domains were able to explain environmental perspectives better than demographics. Within the cultural domains studied, Larson et al. (2011) found that having a pro-ecological worldview increased concern about certain issues, including water consumption. These beliefs also led individuals to be more aware of human induced water resource scarcity and to support residential regulations on water consumption.

In terms of anthropocentric views, utilitarian beliefs have been positively linked to water consumption (Corral-Verdugo et al, 2003). This is thought to stem from the utilitarian belief that water is considered an unlimited resource to be exploited by humanity. Corral-Verdugo et al.

(2003) also concluded that there is a significant relationship between older people and the holding of utilitarian beliefs, while younger people generally held more biocentric beliefs. Additionally, this was supported by evidence showing that older people spent more time using water than younger people. The study then concluded that individuals viewing water as “unlimited/disposable” wasted more water than individuals with pro-ecological or biocentric beliefs, who were more likely to engage in water conserving behaviors.

2.5.4: Experiences

Huang and Lamm (2017) conducted a study that examined the how individuals who experienced water issues were affected. Overall, the study divided people by region, and across all regions, the Midwest, Northeast, South and West, low to moderate relationships were generally found between experience and water use behaviors. In the Midwest, individuals who had experienced more water issues tended to be more water conservative. For the Northeast and West, a strong relationship was found between water use behaviors and the application of water conservation practices. Only low to moderate relationships were found in the South (Huang & Lamm, 2017).

Due to the differences in relationships between regions, Huang and Lamm (2017) concluded that there are possibly different levels of awareness relating to water conservation, protection and issues depending on which region the individual resides. Overall, Huang and Lamm (2017) noted that people responded to issues that were more personally relevant. Examples provided include how people in the Midwest and Northeast are heavily active in water activities, such as water sports and fishing, and that individuals from both regions were more responsive to water quality issues, while individuals plagued by drought in the West were concerned with water quantity issues.

2.5.5 Academic Major

In their 1990 study, Walter and Reisner found that a large number of students responded "no opinion" to a large proportion of conservation questions and attitudes, specifically with regards to soil conservation. Many of those "no opinion" responses came from students from urban and/or non-agriculture backgrounds. Walter and Riesner (1990) concluded that those without familiar ties to agriculture enter college with uninformed attitudes and opinions regarding important agricultural issues within the U.S. While differences in respondents from urban and rural backgrounds were addressed, the authors made no comparisons were made between agriculture and non-agriculture students.

Walter and Reisner followed up their 1990 study with their 1992 study which found that college student opinions changed little year to year. Walter and Reisner (1992) found that those specifically from agricultural backgrounds were more likely to oppose regulating or restricting producer production decisions. Walter and Reisner went on to note that of the students willing to report on their opinions, their opinions changed slightly upon entering their sophomore year, which was also when opinion differences between urban and rural respondents began to decrease.

While expanding upon previous studies, Arnocky and Stroink (2011) found that major influenced environmental concern, specifically among outdoor recreation, parks, and tourism majors. Students enrolling in majors related to these subjects were found to have greater levels of self-reported pro-environmental behaviors, as well as greater levels of cooperation and concern (Arnocky & Stroink, 2011).

2.6: Household Water Conservation Methods

Factors influencing an individual's water conservation have been studied in many different regions under many different circumstances, as previously illustrated. Fewer studies have been completed detailing the exact nature of how individuals and households conserve water or what those conservation habits may be. Water conservation techniques and practices may often be found in online articles (Crotta, 2015) as well as pamphlets issued through state departments or colleges (Waskom et al., 2018**;** Hermanson & Simmons, 2003).

There are many different ways to reduce the quantity of water used in a household. Common household water conservation practices include turning off water while brushing teeth and shaving, installation of more efficient faucet heads and toilets, choosing showers over baths, shorter shower durations and general maintenance of household plumbing systems (Waskom et al., 2018). Appliances such as washing machines and dishwashers may also benefit from water conserving practices such as running only full loads to reduce the number of times the appliance uses water (Hermanson & Simmons, 2003).

Hermanson and Simmons (2003) also identified multiple ways water may be conserved in the kitchen. This includes washing dishes by hand while reusing sink water, rinsing fruits and vegetables in sink water and thawing foods in the refrigerator instead of using hot water. However, they go on to provide examples of how water may be conserved outside of the house as well. Hermanson and Simmons (2003) suggested brushing driveways clean instead of watering and rinsing quickly if rinsing away soap on windows or vehicles. The methods and techniques listed are echoed in many resources, such as by Crotta (2015) and Ruda (2018).

While these actions may not seem significant, if unemployed, households may miss the opportunity to save significant amounts of water each day, month and year. Waskom et al.

(2018) pointed out that turning water off while brushing teeth can save up to 25 gallons per month and while shaving for up to 300 gallons per month. Older high-flow shower heads may use up several gallons per minute (Hermanson & Simmons, 2003) while low-flow shower heads might only use up to 12 gallons in five minutes (Waskom et al., 2018). Additionally, leaky faucets, valves, etc. may result in significant waste, with drops leaking every other second accounting for up to 86 gallons per month (Waskom et al., 2018).

A 2017 study by Huang and Lamm sought to describe U.S. residents' "engagement in water use behavior, application of water conservation practices, and willingness to act on water conservation…." Respondents were asked to indicate if any of six water conservation practiced had been implemented in their households, with low-flow shower heads and high-efficiency toilet installations being the most frequent. Practices which were reported as generally unemployed include the use of water efficient plant materials in the yard, collection of rainwater for lawn/garden use, and utilizing recycled wastewater (Huang & Lamm, 2017). Chaudhary et al. (2017) were able to explain 25.1% of the variance in conservation practices when discussing landscape water conservation practices.

2.7: Theoretical Framework

The research presented in this thesis is guided by the Theory of Planned Behavior (TPB) (Azjen, 1991). TPB attempts to predict and explain human behavior based on three determinants: attitude, subjective norms and perceived control (Azjen, 1991). Attitude refers to how favorable an individual's opinion or evaluation is for a given behavior and is determined only by the individual. Subjective norms refer to "perceived social pressure to perform or not to perform the behavior," while perceived control refers to the "perceived ease or difficulty of performing the behavior" (Ajzen, 1991). Ajzen (1991) noted that generally, favorable attitudes, positive subjective norms, and greater perceived control leads to an individual holding a higher intention to perform a behavior. This behavioral intention predicts the likelihood of a behavior being performed (Chaudhary et al., 2017).

For the purpose of this study, Ajzen's (1991) model was adapted in three ways, as can be observed in Figure 1. First, external demographic variables were included in the model but not projected to predict any construct specifically. Second, attitude and subjective norms were also suggested to be predictors of behavior/actual engagement, not just future behavior/intentions. Third, behavior/actual engagement was suggested to be a predictor of future behavior/intention, where in the original model this prediction path was reversed.

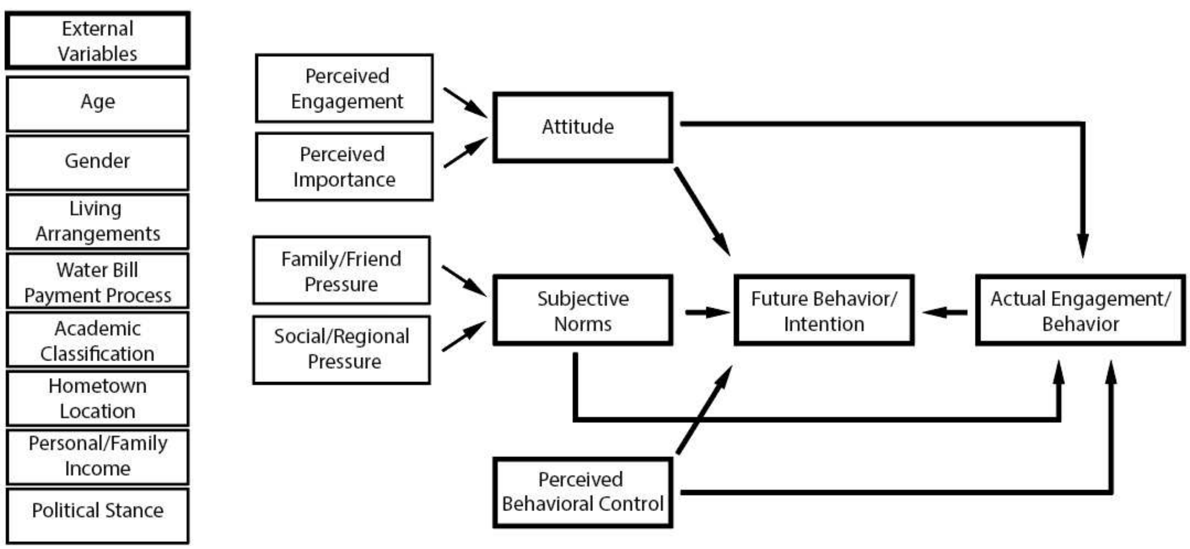

Figure 1: Model of Adapted Theory of Planned Behavior, adapted from Ajzen (1991). This model illustrates the path of predictions used to determine subject behavior and future behavior toward water conservation.

Definitions for the three constructs are similar to those provided by Chaudhary et al. (2017). For the purpose of this research, attitude was defined by the degree to which a student has a positive or negative opinion on water conservation behaviors, subjective norm referred to the societal pressure placed on the individual to perform or not perform water conserving behaviors, and perceived control was defined by the student's perceived ability to engage in water conserving behaviors.

Mancha and Yoder (2015) collected data suggesting that people's intended behaviors, not actual behaviors, were influenced by social pressures. They concluded that if the people surrounding the respondent expected that individual to behave in a specific way then that was likely to influence any intentions that individual may have towards the environment. This supports research conducted by Niaura (2013) who found that PBC affected the actual behavior when observing youth. Niaura (2013) also concluded that the social pressure, related to social norms, applied to youth had less impact on behavioral intentions than did their own perceived behavioral control.

2.8: Chapter Summary

This chapter reviewed the importance of water, its economic role, the various threats to water worldwide, water use, and household water conservation practices. Additionally, this chapter described the theoretical framework used to guide the research conducted by the study by adapting Ajzen's (1991) Theory of Planned Behavior.

Chapter 3. Methodology

3.1: Introduction

The purpose of this study was to determine if academic background, when divided into agriculture and non-agriculture majors, is a predictor of student water conservation behaviors or intentions toward water conservation organizations, programs, and policies. Additionally, this study tested a theoretical model adapted from Ajzen's (1991) Theory of Planned Behavior. Thus, the research objectives of this study were as follows:

1. Describe student demographics for agriculture and non-agriculture students.
2. Describe the differences in construct scores for attitudes, perceptions, intentions, and engagement towards water conservation between agriculture and non-agriculture students.
3. Determine the correlations between construct and demographic variables.
4. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in actual engagement in water conservation.
5. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in future intentions toward water conservation.

3.2: Study Design

This study employed a quantitative survey approach based on the research questions and objectives. Descriptive and correlational approaches were chosen because variables were only observed, not manipulated (Cozby & Bates, 2015). This study sought to compile data from a large sample and report the information in numerical terms (Creswell, 2003). Closed-response questions were used exclusively in the questionnaire. Therefore, a quantitative design was utilized (Creswell, 2003; Cozby and Bates, 2015).

3.3: Population and Sample Selection

For this research, a sample of undergraduate courses taught during the spring of 2020 was selected from the University of Arkansas – Fayetteville (UA) for the large student population and diverse student body background. Total UA enrollment during 2019 (University of Arkansas, 2019) was 27,559 students. The majority of the UA student body was comprised of Arkansas and Texas residents, with Arkansas residents accounting for 53% of the target sample and Texas residents for 24%, as of 2017 (University of Arkansas, 2019). Any student enrolled at UA was included in the population.

The University Office of the Registrar was contacted and provided the researcher with a comprehensive list of courses university-wide with total enrollment greater than or equal to 30 students. This was done in an attempt to shorten the data collection period while controlling for expected non-response error due to the survey being administered online. The comprehensive list of classes was then divided into two groups, agriculture courses and non-agriculture courses, based on course alpha codes. A total of ten classes were randomly selected from each group. Instructors of record for each course were contacted and asked for their cooperation in administering the questionnaire link via email to their students. While six of the contacted instructors responded to the initial email request, it was unknown how many actually administered the questionnaire link to their classes.

For this reason, snowball sampling was also employed to ensure sufficient responses were collected. One non-agriculture instructor offered to send the questionnaire link to every class they taught that semester. Additionally, one agriculture instructor offered to send the questionnaire link to colleagues within the University of Arkansas who were not randomly selected. Both offers were accepted to ensure enough responses were collected to ensure the minimum sample size was met.

Finally, two instructors not randomly selected were contacted due to their classes having greater than 100 students enrolled. Both instructors, one agriculture, one non-agriculture, agreed to send the questionnaire link via email to their students. This was also done to ensure enough responses were collected to ensure the minimum sample size.

Based on an anticipated effect size of $f^2 = 0.15$, 0.95 statistical power level, 14 predictors and a probability level of 0.05 ($\alpha = 0.05$), a minimum sample size of 195 subjects was calculated using an online *a priori* sample size calculator (Soper, 2019),.

3.4: Instrument Development

The questionnaire utilized by this study was a researcher-developed instrument initially created during the summer of 2019 with the assistance of a survey development course in the social sciences. After initial development, the instrument underwent a cognitive interview with a University of Arkansas faculty member specializing in quantitative social science survey development. Face and construct validity were then established by a panel of three experts in social science research fields. Organization, wording and formatting of the items and questionnaire were made based on suggestions from the panel of experts.

The instrument was comprised of seven sections: perceived importance (PI), perceived engagement (PE), perceived behavioral control (PBC), social norms (SN), future intentions (FI), actual engagement (AE) and demographics. Items for PI, PE, PBC, SN and FI were developed based on instruments from previous studies (Braakhuis, 2016; Huang, 2016; Huang & Lamm, 2017; Kilbourne & Pickett, 2008; Corral-Verdugo et al., 2003) while AE questions were developed based on known household water use practices (Marandu et al., 2010; Attari, 2014; Huang & Lamm, 2017;). Each section was preceded by a description of the section and instructions for how to respond. Following the approved IRB protocol (Appendix B), an informed consent form was displayed at the beginning of each questionnaire (Appendix A)

The sections of PI, PE, PBC, SN, FI, and AE were composed of Likert scale questions. PI, PE, PBC, SN, and FI were assessed based on four-point Likert scales ranging from strongly disagree to strongly agree. The construct of AE was assessed on a five-point scale ranging from never to always. Instrument reliability was established through test-retest assessment with a college sophomore level class, with two weeks between tests. Test-retest reliability was conducted, however, students within the test group responded very similarly to one another, reducing the variability within responses. Therefore, agreement percentages were reported instead. The constructs of PI, PE, PBC, SN, FI and AE had agreement percentages of 50%, 71%, 59%, 56%, 66%, and 50%, respectively, with a 64% overall agreement percentage. Cronbach's alpha analysis yielded alpha levels of 0.30, 0.66, 0.66, 0.85, 0.43 for PI, PBC, SN, FI and AE, respectively. Due to the initial low alpha level of PBC, only three of the five items comprising that construct were used to calculate the overall construct score as the two omitted items were determined to be internally inconsistent in the construct.

Finally, the instrument was developed into a Qualtrics online survey open to any individual who possessed the direct Qualtrics URL link to the questionnaire. The questionnaire was locked, allowing only a single response per personal email to be completed. Respondents were given the option to pause the survey to be continued at a later date.

To maintain anonymity, students were not given the opportunity to provide any identifying details, such as name, birthday, or social security number, within the questionnaire that could be linked directly to the respondent. Additionally, personal emails were not linked to any responses.

3.5: Data Collection

Data collection took place during the spring semester of 2020 at the University of Arkansas – Fayetteville over the course of seven weeks. Due to the move to remote instruction during the COVID19 pandemic, data were collected via an online questionnaire. Collection took place between March and May, 2020.

3.6: Data Analysis

Data were analyzed using SAS statistical software (SAS Institute Inc, 2013). Demographic information was analyzed through descriptive statistics. Constructs were analyzed individually, item by item, and analyzed through descriptive statistics. Negatively worded items were reverse coded prior to calculating the overall construct score for each construct. Construct scores were calculated based on a mean summated scale using the reverse coded negatively worded items. Bivariate correlation analyses were conducted between all demographic variables and overall construct scores. Significantly correlated variables were retained for multiple linear regression analysis to construct models predicting AE and FI. Following multiple regression analysis, uniqueness indices were calculated for each predictor present in each model.

3.7: Chapter Summary

This chapter has described the methods utilized to conduct this study. This study was a descriptive, quantitative study to describe the population of students at the University of Arkansas – Fayetteville. A researcher developed questionnaire was created to collect data, which took place during the spring of 2020. Subsequent data were analyzed using statistical software utilizing descriptive, correlational, and linear regression statistics.

Chapter 4. Results

Chapter IV presents the results from this study, using data collected through an online survey completed by University of Arkansas students (n = 255), as detailed in Chapter III. Results are presented in five sections. The first section contains demographic information on the subjects. The second section presents descriptive statistics summarizing the score on each construct by group and overall. The third section presents results detailing correlations between constructs for the entire sample and by group. The fourth section presents regression models predicting actual water conservation engagement and future intentions to participate in water conservation programs and policies based upon significant correlations for the entire sample.

4.1: Demographics

Of the 255 University of Arkansas students responding to the survey, a majority were female (58.7%) with males accounting for 40.9% and gender nonresponse accounting for 0.4%. Analysis for age indicated the sample data was positively skewed (skewness = 2.41) and contained multiple outliers. Therefore, results for variables measured on the interval or ratio scale were reported using the median, interquartile range (*IQR*), and range. The median age of the respondents was 20 years with an *IQR* of 2.0 years and range of 17 years. Additionally, students were categorized as being "agriculture" or "non-agriculture" with 56.5% of respondents categorized as agriculture and 43.5% categorized as non-agriculture. Of the respondents reporting academic classification (n = 254), 28.4% were "freshmen," 30.3% "sophomores," 22.8% "junior," 17.7% "seniors," and 0.8% "other."

As shown in Table 1, there was a greater percentage of "somewhat conservative" and "very conservative" agriculture students (61.8%) than non-agriculture students (51.5%).

Additionally, a higher percentage of agriculture students reported living with parents (38.9%) than non-agriculture students (28.8%) while a higher percentage of non-agriculture students reported renting homes (52.3%) than agriculture students (43.1%). Agriculture students were also more likely to categorize their hometown as “very rural” or “somewhat rural” (56.0%) than non-agriculture students (46.8%).

Table 1
Select Student Demographic Characteristics by Major and Overall

Baseline Characteristic	Agriculture Students		Non-Agriculture Students		Total	
	n	%	*n*	%	*n*	%
Gender						
Female	70	48.6	79	71.2	149	58.7
Male	74	51.4	31	27.9	105	41.0
Other	0	0	1	0.9	1	0.4
Academic Classification						
Freshman	42	29.2	30	27.0	72	28.4
Sophomore	46	31.9	32	28.8	77	30.3
Junior	35	24.3	23	20.7	58	22.8
Senior	21	14.6	24	21.6	45	17.7
Graduate	0	0	0	0	0	0
Other	0	0	2	1.8	2	0.8
Living Arrangements						
Live with parents	56	38.9	32	28.8	87	34.3
Live in a dorm	19	13.2	15	13.5	34	13.4
Rent a home	62	43.1	58	52.3	120	47.2
Own a home	7	4.9	6	5.4	13	5.1
Hometown Urban-Rural Classification						
Very Rural	32	22.4	16	14.4	48	18.9
Somewhat Rural	48	33.6	36	32.4	84	33.1
Somewhat Urban	47	32.9	40	36.0	87	34.3
Very Urban	16	11.2	19	17.1	35	13.8
Political Stance						
Very Liberal	7	4.9	8	7.3	15	5.9
Somewhat Liberal	14	9.7	13	11.8	27	10.7
Moderate	34	23.6	33	30.0	67	26.5
Somewhat Conservative	51	35.4	31	28.8	82	32.4
Very Conservative	38	26.4	25	22.7	62	24.5
Payment for household Water Usage						
Pay a separate bill	44	30.6	29	26.1	73	28.7
Included in rent	37	25.7	36	32.4	73	28.7
No	63	43.8	46	41.4	108	42.5

Note. Percentages have been rounded and may not total 100

4.2: Attitudes, Perceptions, Intentions and Engagement towards Water Conservation

A total of six constructs were measured by the questionnaire: perceived importance of water resources (PI), perceived engagement in water conservation (PE), perceived behavioral control upon water resource conservation (PBC), social norms to conserve water (SN), future intentions toward water conservation (FI), and actual engagement in water conservation (AE). The first five constructs, PI, PE, PBC, SN, and FI, measured agreement levels on a mean scale comprised of individual items rated on 1 to 4 Likert scales, where 1 indicated "Strongly Disagree" and 4 indicated "Strongly Agree." The sixth construct, actual engagement in water conservation behavior, measured engagement frequency on a mean summated scale comprised of individual items rated on a 1 to 5 Likert scale, where 1 indicated "Never" and 5 indicated "Always." This section presents the mean results for each item in each construct, followed by the overall construct score. Results are presented for agriculture students, non-agriculture students, and overall.

4.2.1: Student Perceived Importance (PI)

Students responded to a series of five items which described their personal perceptions of water as a natural and monetary resource. Agriculture students disagreed more strongly than non-agriculture students that water resource management is less important now than in the past, while agreeing more strongly that there is a need for water resource management, as shown in Table 2. Additionally, agriculture students agreed more strongly that a growing population would negatively affect water quantity. Overall, both groups generally disagreed with the statement that the cost of water caused them to use less in their daily lives. The observed construct mean for agriculture students was greater than that of non-agriculture students with a Cohen's *d* of 0.40 indicating a small effect size between groups (Cohen, 1988).

Table 2
Student Perceived Importance (PI) of Water Conservation, by Group and Overall

Statement	Ag	Non-Ag	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Water resource management is less important now than it was in the past.	1.76 (0.85)	1.89 (0.75)	1.82 (0.81)
There is a need for water resource management.	3.24 (0.92)	3.05 (0.92)	3.16 (0.92)
Freshwater is a quickly renewable resource.	2.26 (0.79)	2.40 (0.73)	2.32 (0.77)
A growing population will negatively affect water quantity.	3.29 (0.63)	3.13 (0.70)	3.22 (0.66)
The cost of water causes me to use less in my daily life.	2.14 (0.74)	2.00 (0.73)	2.08 (0.73)
Perceived Importance (PI)[a]	**2.93 (0.14)**	**2.77 (0.37)**	**2.86 (0.40)**

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[a] Negatively worded statements were reverse coded prior to calculating the construct scores.

4.2.2: Student Perceived Engagement (PE)

Student perceived engagement was measured from a single item. Agriculture students generally agreed more with the statement, "I am engaged in water conservation," reporting a mean of 2.50 (*SD* = 0.75), than non-agriculture students, who reported a mean of 2.40 (*SD* = 0.74). The Cohen's *d* of 0.13 indicates a negligible effect size between agriculture and non-agriculture group construct scores (Cohen, 1988).

4.2.3: Student Perceived Behavioral Control (PBC)

Students responded to a series of three items measuring their perceived behavioral control on their impact on water use as an individual and as part of a group. As shown in Table 3, the greatest difference in scores between agriculture and non-agriculture was in response to the item that "it would make no difference if everyone conserved more household water," with non-agriculture students agreeing more than agriculture students. Overall, students generally agreed that they could easily cut down their water use if they wanted to, with only a small difference between groups. Due to low internal consistency, two items were omitted from calculating the overall construct mean. The observed construct mean for agriculture students was greater than that of non-agriculture students with a Cohen's *d* of 0.25 indicating a small effect size between groups (Cohen, 1988).

Table 3
Student Perceived Behavioral Control (PBC) of Water Conservation, by Group and Overall

Statement	Ag	Non-Ag	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Conserving water is easier for me than for others.[a]	2.59 (0.70)	2.50 (0.75)	2.55 (0.72)
My water use has little impact on water quantity in my region.	2.48 (0.75)	2.63 (0.75)	2.55 (0.75)
If I wanted to, I could easily cut down my water use.[a]	2.87 (0.68)	2.88 (0.65)	2.88 (0.67)
It would make no difference if I conserved more household water.	2.03 (0.70)	2.13 (0.75)	2.07 (0.72)
It would make no difference if everyone conserved more household water.	1.51 (0.66)	1.68 (0.81)	1.59 (0.73)
Perceived Behavioral Control (PBC)[b]	**2.99 (0.53)**	**2.85 (0.60)**	**2.93 (0.57)**

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[a] Item was not used to calculate final construct mean due to low internal consistency.
[b] Negatively worded statements were reverse coded prior to calculating the construct scores.

4.2.4: Student Subjective Norms (SN)

Students responded to a series of five items measuring the societal impact upon their water use and conservation practices. Overall, students disagreed most with the items "I feel social pressure to conserve water," and "people in my hometown are concerned about local water quantity," with non-agriculture students disagreeing more than agriculture students, as shown in Table 4. Additionally, both groups similarly reported general disagreement that friends practice water conservation, but agriculture students reported a greater level of disagreement with regards to their families practicing water conservation. The observed construct mean for agriculture students was greater than that of non-agriculture students with a Cohen's *d* of 0.02 indicating a negligible effect size between groups (Cohen, 1988).

Table 4
Student Subjective Norms (SN) of Water Conservation, by Group and Overall

Statement	Ag	Non-Ag	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
My friends practice water conservation.	2.22 (0.67)	2.20 (0.72)	2.21 (0.69)
My family practice water conservation.	2.32 (0.71)	2.45 (0.79)	2.38 (0.75)
The people I spend time with do not care whether I conserve water.	2.68 (0.67)	2.76 (0.65)	2.71 (0.66)
I feel social pressure to conserve water.	2.13 (0.70)	1.96 (0.73)	2.06 (0.71)
People in my hometown are concerned about local water quantity.	2.13 (0.73)	1.95 (0.73)	2.06 (0.74)
Subjective Norms (SN)[a]	**2.10 (0.39)**	**2.11 (0.48)**	**2.10 (0.43)**

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[a] Negatively worded statements were reverse coded prior to calculating the construct scores.

4.2.5: Student Future Intentions (FI)

Students responded to a series of five items measuring their future intentions to engage in water conservation programs, organizations, and policies. As shown in Table 5, agriculture students reported greater levels of agreement that in the future they would likely vote for stricter water use laws and join a water conservation organization. Overall, both groups indicated agreement that they were likely to support water conservation programs and care more deeply about water conservation. The observed construct mean for agriculture students was greater than that of non-agriculture students with a Cohen's *d* of 0.15 indicating a negligible effect size between groups (Cohen, 1988).

Table 5
Student Future Intentions in Water Conservation, by Group and Overall

Statement	Ag	Non-Ag	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Vote for stricter water use laws.	2.62 (0.84)	2.48 (0.70)	2.56 (0.78)
Support water conservation programs.	3.04 (0.66)	3.02 (0.61)	3.03 (0.64)
Join a water conservation organization.	2.97 (0.64)	2.83 (0.71)	2.91 (0.67)
Donate money to support water conservation.	2.49 (0.75)	2.42 (0.70)	2.46 (0.73)
Care more deeply about water conservation.	2.97 (0.68)	2.94 (0.63)	2.96 (0.66)
Future Intentions (FI)[a]	**2.82 (0.58)**	**2.74 (0.51)**	**2.78 (0.55)**

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[a]Negatively worded statements were reverse coded prior to calculating the construct scores.

4.2.6: Student Actual Engagement (AE)

Students responded to a series of nine items which describe in-home water use. Of these items, the most frequent water saving behaviors were turning water off while brushing teeth, running washing machines with full loads of laundry only, and running the dishwasher with a full load of dishes, as shown in Table 6. Scores for these activities indicated the majority of students “Always” engaged in these water saving practices. Conversely, students reported they “Rarely” showered for five minutes or less, indicating they frequently showered for more than that time. Students also generally reported that they “Frequently” thawed food under running water. The observed construct mean for agriculture students was no different than that of non-agriculture students with a Cohen’s *d* of 0.00 indicating no effect for academic major on student actual engagement (Cohen, 1988).

Table 6
Student Actual Engagement (AE) in Water Conservation, by Group and Overall

Statement	Ag	Non-Ag	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
I turn off the water while brushing my teeth	4.13 (1.12)	4.05 (1.29)	4.09 (1.19)
I leave the water running in the kitchen while cleaning the dishes	3.12 (1.21)	3.20 (1.23)	3.15 (1.21)
I shower for five minutes or less	2.61 (1.07)	2.41 (1.15)	2.52 (1.11)
I run the washing machine with a full load of laundry	4.39 (0.84)	4.27 (0.93)	4.34 (0.89)
I run the dishwasher with a full load of dishes	4.57 (0.82)	4.52 (0.88)	4.55 (0.85)
I thaw frozen foods under running water	2.44 (1.06)	2.42 (1.09)	2.43 (1.07)
I use hot water instead of cold water	3.69 (0.87)	3.57 (1.02)	3.64 (0.94)
I wash my car	2.70 (1.22)	2.40 (1.05)	2.57 (1.10)
I wear clothes more than once before washing them.	3.39 (1.11)	3.55 (1.13)	3.46 (1.12)
Actual Engagement (AE)[a]	**3.47 (0.43)**	**3.47 (0.47)**	**3.47 (0.45)**

Note. The items were measured on a Likert scale: 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Frequently,* 5 = *Always.*
[a] Negatively worded statements were reverse coded prior to calculating the construct scores.

4.2.7: Summary of Construct Scores

A total of six constructs were measured using a series of Likert type items and construct scores were then determined by calculating the means of the items in the construct for agriculture students, non-agriculture students and for the group total. These constructs were given scores based on mean, summated Likert scales and these scores were separated by agriculture and non-agriculture students. The Cohen's *d* values indicating effect size of group on construct ranged from negligible to small (Cohen, 1988). Academic major had the largest effect size on PI, while no effect was present between academic major and AE (Table 7).

Table 7
Summary of Student Construct Scores, by Group and Overall

Construct	Ag	Non-Ag	Total	Cohen's *d*
	M(SD)	*M(SD)*	*M(SD)*	
Perceived Importance (PI)[a]	2.93 (0.14)	2.77 (0.37)	2.86 (0.40)	0.40
Perceived Behavioral Control (PBC)[a]	2.99 (0.53)	2.85 (0.60)	2.93 (0.57)	0.25
Perceived engagement (PE)[a]	2.50 (0.75)	2.40 (0.74)	2.45 (0.75)	0.13
Subjective Norms (SN)[a]	2.10 (0.39)	2.11 (0.48)	2.10 (0.43)	0.02
Future Intentions (FI)[a]	2.82 (0.58)	2.74 (0.51)	2.78 (0.55)	0.15
Actual Engagement (AE)[b]	3.47 (0.43)	3.47 (0.47)	3.47 (0.45)	0.00

[a] Items were measured on a mean summated Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[b] Items were measured on a mean summated Likert scale: 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Frequently,* 5 = *Always.*

4.3: Intercorrelations of Students' Attitudes, Perceptions, Intentions and Engagement towards Water Conservation

Correlation analyses were conducted to determine which variables and constructs were significantly correlated with one another. Constructs were measured based on overall scores, not by individual items within each construct. Demographics significantly correlated with construct variables are outlined in this section and an overall correlation table is presented at the end of the section. The alpha level for testing correlations was set at the 0.05 level. To better understand the nature of the significant correlations between the selected demographics and constructs, mean scores on each construct by level of each demographic variable are presented within this section. This section identifies demographic variables which were determined to be significantly correlated to at least one construct. A full breakdown of the bivariate correlation analysis may be seen in Table 8 below. Variables with significant correlations were retained for testing with multiple regression.

Table 8

Intercorrelations of Students' Attitudes, Perceptions, Intentions, and Engagement towards Water Conservation with Demographics

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PI[a]	1.00	.30***	.47***	-.10	.41***	.20**	-.06	-.01	-.09	.13*	.04	-.20**	-.20**	.24***
2. PE[a]		1.00	.17**	.29***	.45***	.12	-.01	.05	-.06	.00	.02	-.15*	-.07	.27***
3. PBC[a]			1.00	-.33***	.30***	.13*	-.26***	-.03	-.06	.06	.06	-.16**	-.12	.30***
4. SN[a]				1.00	.29***	-.03	.07	.07	-.01	-.09	.00	.02	.01	.00
5. FI[a]					1.00	.07	-.11	.10	-.12	-.01	.06	-.22***	-.08	.32***
6. Age						1.00	-.03	.33***	-.37***	.61***	-.02	-.07	-.01	.02
7. Gender[b]							1.00	0.08	-.14*	.08	-.09	.29***	-.21***	-.07
8. Living[c]								1.00	-.71***	.44***	.05	-.10	.11	.00
9. Water[d]									1.00	-.42***	.02	.10	.02	-.10
10. Class[e]										1.00	.05	-.04	.09	0.09
11.Region[f]											1.00	-.08	.11	.05
12.Political[g]												1.00	-.08	-.25***
13. Major[h]													1.00	-.02
14. AE[i]														1.00

[a] Coded as: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.*
[b] Coded as non-response = 0, "female" = 1, "male" = 2.
[c] Coded as "I live with my parents" = 1, "I live in a dorm" = 2, "I rent my own home" = 3, "I own my own home" = 4.
[d] Coded as "Yes- I pay a separate [water] utility bill" = 1, "It is included in my rent" = 2, "No" = 3.
[e] Coded as "freshman" = 1, "sophomore" = 2, "junior" = 3, "senior" = 4, "graduate" = 5, "other" = 6.
[f] Coded as "very rural" = 1, "somewhat rural" = 2, "somewhat urban" = 3, "very rural" = 4.
[g] Coded as "very liberal" = 1, "somewhat liberal" = 2, "moderate" = 3, "somewhat conservative" = 4, "very conservative" = 5.
[h] Coded as "non-agriculture major" = 1, "agriculture major" = 2.
[i] Coded as: 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Frequently,* 5 = *Always.*
* ($p \leq .05$), ** ($p \leq .01$), *** ($p \leq .001$).

4.3.1: Political Orientation

Political orientation was significantly correlated with the constructs of PI, PE, PBC, FI, and AE, with r values of -0.20, -0.15, -0.16, -0.22, and -0.25, respectively. The mean scores for Very Liberal PE and AE was 2.53 and 3.56 respectively, which do not conform to a general decrease in scores as political orientation becomes more conservative (Table 9). Both of these values experience negative skewness in excess of -0.5, with actual skewness values of -1.33 and -0.97 for Very Liberal PE and AE, respectively. Therefore, the median value is a more acceptable descriptor for these scores, with median values of 3.00 (IQR = 1.00) and 3.67 (IQR = 0.67), respectively.

Table 9
Summary of Mean Scores for Primary Constructs by Political Orientation

Political Orientation	PI	PE	PBC	FI	AE
Very Liberal	3.03	2.53	2.91	3.21	3.56
Somewhat Liberal	2.95	2.85	3.10	2.93	3.70
Moderate	2.96	2.52	3.05	2.80	3.51
Somewhat Conservative	2.79	2.32	2.90	2.71	3.46
Very Conservative	2.78	2.39	2.76	2.70	3.30

4.3.2: Age

Age was significantly correlated with PI (r = 0.20), where mean construct scores increased with age. As shown in Table 10, eighteen-year-old students scored the lowest with a mean of 2.80 (SD = 0.37) while 23-35 year-olds scored the highest with a mean of 3.02 (SD = 0.18). Due to low frequencies, respondents between the ages of 23 and 35 were combined into a single group.

Table 10
Summary of Mean Scores for Perceived Importance (PI) Based on Age

Age (years)	*n*	*M* (*SD*)
18	39	2.76 (0.47)
19	58	2.80 (0.37)
20	61	2.84 (0.33)
21	39	2.85 (0.40)
22	30	2.99 (0.43)
23-35	26	3.09 (0.60)

4.3.3: Gender

Gender was significantly correlated with PBC (r = -0.26), with females generally having higher construct scores than males. Females had a higher mean score of 3.04 (SD = 0.51) whereas males scored 2.79 (SD = 0.59). Gender nonresponse accounted for only a single individual, and so this response was left out of analysis. The Cohen's d value of 0.48 indicated a small effect of gender on PBC.

4.3.4: Academic Major

Academic major was shown to be significantly correlated with PI (r = -0.20) with agriculture students scoring higher values than non-agriculture students. Agriculture students scored 2.93 while non-agriculture students had mean construct scores of 2.77.

4.4: Predicting Future Intentions and Actual Engagement in Water Conservation

Two regression models were estimated to accomplish objectives four and five of this study. The first model sought to test the null hypothesis that a single or linear combination of construct scores (PI, PE, PBC, SN, FI, AE) and demographic variables (age, gender, living, water, class, region, political orientation, major) would not explain a significant ($p \leq .05$) portion of the variance in students' actual engagement in water conservation. The second model sought to test the null hypothesis that a single or linear combination of construct scores (PI, PE, PBC, SN, FI, AE) and demographic variables (age, gender, living, water, class, region, political orientation, major) would not explain a significant ($p \leq .05$) portion of the variance in students' future intentions towards water conservation scores.

4.4.1: Predicting Actual Engagement (AE)

During correlation testing for all respondents, PI, PE, PBC, FI, and political orientation were significantly correlated with AE (Table 8). During regression analysis, the constructs PI, PE, and FI were not significantly ($p \leq .05$) correlated to the independent variable AE, and therefore were not included in the regression model. The resulting regression model predicting AE was statistically significant, F(5, 238) = 10.22, $p < .001$, $R^2 = 0.18$; thus the null hypothesis was rejected, meaning the model did explain a significant ($p \leq .05$) portion of the variance in student actual engagement in water conservation. The combination of predictors resulted in an adjusted R^2 value of 0.16, which represented a medium effect size (Cohen, 1988).

$$AE = 2.64015 + 0.10411(PE) + 0.15302(PBC) – 0.05396(Political)$$

As indicated by the regression equation, an increase in PBC score and an increase in liberal political orientation was associated with an increased actual engagement in water conservation behavior score. Uniqueness indices were calculated showing the unique variance explained by each predictor when controlling for the other predictor. As shown in Table 11, PBC, PE and Political were all statistically significant in the regression model and all had statistically significant ($p \leq .05$) uniqueness indexes. With a uniqueness index of 0.05, PBC was the most robust predictor of AE, explaining 5% of the unique variance in AE when controlling for the other three predictors, while PE and political orientation explained 4% and 3%, respectively.

Table 11
Summary of Regression Analysis Predicting Actual Engagement in Water Conservation for All Students

Predictor	*df*	*B*	*SE*	*t*	Uniqueness Index
Intercept	1	2.64	0.25	10.69^{***}	
PBC	1	0.10	0.05	2.83^{**}	$.05^{*}$
PE	1	0.15	0.04	2.54^{*}	$.04^{*}$
Political	1	-0.05	0.02	-2.25^{*}	$.03^{*}$

* ($p \leq .05$), ** ($p \leq .01$), *** ($p \leq .001$)

4.4.2: Predicting Future Intentions (FI)

During correlation testing for all respondents, PI, PE, PBC, SN, AE, and political orientation had statistically significant correlations with FI (Table 8). Because the bivariate correlations between FI, AE and Political were not significant ($p \leq .05$), these variables were not included in the regression model. The resulting regression model predicting FI was statistically significant, F(6, 236) = 25.76, $p < .001$, $R^2 = .40$; thus the null hypothesis was rejected, meaning the model did explain a significant ($p \leq .05$) portion of the variance in student future intentions toward water conservation. The combination of predictors resulted in an adjusted R^2 value of .38, which represents a large effect size (Cohen, 1988).

$$FI = -0.18392 + 0.28413(PI) + 0.15313(PE) + 0.2317(PBC) + 0.39824(SN)$$

As indicated by the regression equation for FI, an increase in PI, PE, PBC and SN scores resulted in an increase in future intentions toward water conservation scores. Uniqueness indices were calculated showing the unique variance explained by each predictor when controlling for the other predictor. As shown in Table 12, PI, PE, PBC, and SN were all statistically significant in the regression model and all had statistically significant ($p \leq .05$) uniqueness indexes. With a uniqueness index of 0.08, SN was the most robust predictor of FI, explaining 8% of the unique variance in FI when controlling for the other three predictors, followed by PE, explaining 5% and PBC and PI both explaining 4% each.

Table 12
Summary of Regression Analysis Predicting Future Inentions in Water Conservation for All Students

Predictor	*df*	*B*	*SE*	*t*	Uniqueness Index
Intercept	1	-0.18	0.35	-0.52^{NS}	
PI	1	0.28	0.08	3.54^{***}	0.04^{*}
PE	1	0.15	0.04	3.53^{***}	0.05^{*}
PBC	1	0.23	0.06	3.82^{***}	0.04^{*}
SN	1	0.40	0.07	5.49^{***}	0.08^{*}

^{NS} Not Significant, *($p \leq .05$), ** ($p \leq .01$), *** ($p \leq .001$)

4.5: Chapter Summary

This chapter described respondents' demographics and their perceived importance of water resources (PI), perceived engagement in water conservation (PE), perceived behavioral control upon water resource conservation (PBC), social norms to conserve water (SN), future intentions toward water conservation (FI), and actual engagement in water conservation (AE). The guiding objectives to this study sought to use attitudes, perceptions, intentions and select demographic information to predict student engagement in water conservation practices as well as predict their future intentions to engage in water conservation organizations, programs, and policies. Upon completion of regression analysis, it was shown that a linear combination of PE, PBC and political orientation could generate a statistically significant regression model predicting actual engagement ($R^2_{adj} = 0.16$), while a linear combination of PI, PE, PBC and SN could generate a statistically significant regression model predicting future intentions ($R^2_{adj} = 0.38$).

Chapter 5. Summary, Conclusions and Recommendations

The main goal of this study was to offer an analysis of college-age student perceptions about water resource usage, in addition to their personal levels of active engagement in water conservation while determining if any differences existed between agriculture students and non-agriculture students. The first section of this chapter covers the conclusions to the results of this study. The second section offers recommendations for practice and for future studies. The objectives of this study were as follows:

1. Describe student demographics for agriculture and non-agriculture students.
2. Describe the differences in construct scores for attitudes, perceptions, intentions, and engagement towards water conservation between agriculture and non-agriculture students.
3. Determine the correlations between construct and demographic variables.
4. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in actual engagement in water conservation.
5. Determine if a single or linear combination of variables could explain a significant ($p \leq 0.05$) portion of the variance in future intentions toward water conservation.

5.1: Limitations to the Study

This study was conducted at the University of Arkansas – Fayetteville and utilized an online survey design. Sampling techniques comprised of random sampling, snowball sampling and targeted convenience sampling, were utilized for sample selection. Since a random sampling strategy was not employed, caution should be used when generalizing these results to other groups.

The instrument utilized in this study had an overall agreement level of 64% in the pilot test. The constructs within the instrument yielded Cronbach's alpha levels of 0.30, 0.66, 0.66, 0.85, 0.43 for PI, PBC, SN, FI and AE, respectively. These alpha levels may have been impacted by the low number of items within each construct (three to five items) as well as the respondents' unfamiliarity with the content covered by these constructs (Streiner, 2010). PI, PBC, SN and FI all had five or fewer questions comprising the construct, which could negatively affect alpha levels (Streiner, 2010). The topic of this study covered water conservation knowledge, perceptions, intentions and behaviors and it is possible that respondents have not had to consider this topic in depth before. It is possible that a lack of prior consideration regarding this topic impacted stability and consistency to some degree. Therefore, these constructs should not necessarily be dismissed, but it should be noted that low stability and internal consistency values may cause these constructs to be incorrectly associated or correlated to other variables. These low values of these measures of reliability may cause variable relationships to be under-estimated which would increase the risk of Type II errors (Osborne & Waters, 2002). Additionally, during multiple regression, effect sizes of other independent variables may be over-estimated. This may also lead to increased potential for Type II error regarding the unreliable error while increasing the potential for Type I error among the remaining variables (Osborne & Waters, 2002). These limitations should be considered when interpreting these results.

5.2: Conclusion of Results

This section includes the conclusion of the results section, organized by objective. The first subsection discusses respondent demographics. The second subsection discusses respondents' attitudes, perceptions, intentions, and engagement toward water conservation. The third subsection discusses the bivariate correlations present between the constructs and demographic information for the respondents. Finally, the fourth subsection discusses the regression models predicting respondent engagement in water conservation and future intentions toward water conservation.

5.1.1: Demographics

Students attending the University of Arkansas-Fayetteville were the target population for this study. Based on the 2017 enrollment total of 27,558 students, a minimum sample size of 195 subjects was calculated using an online *a priori* sample size calculator (Soper, 2019). A total of 254 usable responses were collected. Of those, 144 were classified as agriculture students and 110 were classified as non-agriculture students. Female respondents accounted for 58.7% of the sample, while males and gender non-response accounted for 41.0% and 0.4%, respectively. The sample consisted of more conservative leaning respondents than liberal, 56.9% of respondents reporting somewhat or very conservative political stances, 26.5% reporting a moderate stance, and 16.6% reporting somewhat or very liberal stances.

5.1.2: Attitudes, Perceptions, Intentions and Engagement towards Water Conservation between Agriculture and Non-Agriculture Students

A total of six constructs were measured in this study: perceived importance of water resources (PI), perceived engagement in water conservation (PE), perceived behavioral control over water resource conservation (PBC), societal pressure to conserve water (SN), future intentions toward water conservation (FI), and actual engagement in water conservation (AE). The first five constructs, PI, PE, PBC, SN, and FI, measured agreement levels on a mean scale comprised of individual items rated on 1 to 4 Likert scales. For this scale, 1 indicated “Strongly Disagree” and 4 indicated “Strongly Agree.” An overall score for each construct was developed based on a mean summated scale, where 1 indicated a negative opinion/understanding for the construct and 4 indicated a more positive opinion/understanding of the construct. The sixth construct, actual engagement in water conservation behavior, measured engagement frequency on a mean summated scale comprised of individual items rated on a 1 to 5 Likert scale. An overall score was developed based on a mean summated scale, where 1 indicated no engagement in water conservation and 5 indicated being always engaged in water conservation.

Agriculture students had a higher mean construct score (2.93) for PI than non-agriculture students (2.77) with a Cohen's *d* of 0.40. This indicates that agriculture students have an overall better perceived importance of water as a resource than non-agriculture students do to a small effect size. Within the construct, agriculture students also agree more that there is a need for water conservation. However, non-agriculture students agreed more that groundwater is not a quickly renewable resource. These differences may be due to the differences in educational track, including the courses which students must take, or a predisposition students may have guiding them to an agriculture or non-agriculture field of study. It appears that agriculture students understand the environmental and social value of water more than non-agriculture students, but that they do not have the understanding of water as a resource that non-agriculture students have, based on the brief set of questions covering this construct (PI) in the questionnaire.

Agriculture students felt that they were more engaged in water conservation than non-agriculture students, with mean construct scores of 2.50 and 2.40, respectively, and a Cohen's *d* of 0.13, indicating major had a negligible effect on the difference between scores. However, these scores indicate the groups held general indecision on the subject. Upon analysis of the actual conservation behaviors, it was shown that students participated "sometimes" to "frequently," indicating that respondents may not realize they are participating in water conserving behaviors.

Perceived behavioral control measured the impact on water resources and conservation the students feel they have as an individual. Agricultural students had a higher mean construct score (2.99) than non-agriculture students (2.85), which means they feel like the individual has a greater degree of influence. The effect of major on PBC scores was deemed small, based on a Cohen's *d* of 0.25. Both groups understand that their individual use has an impact on water resources. This supports research conducted by Niaura (2013) who found that PBC affected the actual behavior in youth.

Overall, both groups indicated that their family and friends generally do not practice water conservation and that the people around them generally do not care if they conserve water. The Cohen's *d* score of 0.02 indicated that academic major had a negligible effect on SN scores between the groups. Students reported that society did not influence the students, nor did hometowns. However, SN was a predictor for FI in the regression model, as well as providing for the most unique variance explained in the model (8%), indicating that this may not be the case. This is in contradiction with Niaura's (2013) findings, which suggest that social pressure applied to youth had less impact on their behavioral intentions than did their own perceived behavioral control.

Future intentions measured the likelihood that students would participate in water conservation programs, organizations, and policies. Overall, students indicated they were more likely than not to do so, with agriculture students agreeing to an overall higher likelihood than non-agriculture students based on construct scores of 2.82 and 2.74, respectively, and a Cohen's *d* score of 0.15, indicating academic major had a negligible effect on FI scores. This makes sense given they also have a greater overall understanding of the need for conservation and believe that the individual has greater amounts of influence. However, there is the possibility that, because it is socially acceptable to be an environmentalist and conservationist, respondents answered in a way that would adhere to current social trends. Intentions do not always translate to behavior. Mancha and Yoder (2015) collected data suggesting that people's intended behaviors, not actual behaviors, were influenced by social pressures. They concluded that if the people surrounding the respondent expect that individual to behave in a specific way then that is likely to influence any intentions that individual may have towards the environment. It is possible that, on a larger scale, community and/or societal pressure may have the same effects given that SN was significantly correlated to FI and explained the most unique variance within the regression model.

There was almost no difference between groups and their levels of actual engagement in water conservation. Major had no effect on AE scores, as shown by the Cohen's *d* of 0.00. Both groups indicated that, overall, they engaged in water conserving practices "sometimes" to "frequently," as shown by the mean summated construct score of 3.47 for both groups and therefore overall. When looking at the construct item by item, students appeared to engage in more water conservation behaviors while performing more water intensive activities, such as washing dishes, laundry, and vehicles.

5.1.3: Intercorrelations of Students' Attitudes, Perceptions, Intentions and Engagement towards Water Conservation

Political orientation was significantly correlated with five of the six constructs: PI (r = -0.20), PE (r = -0.15), PBC (r = -0.16), FI (r = -0.22) and AE (r = -0.25). These findings are consistent with other research studies (Coffey & Joseph, 2013; Owen et al., 2010; Chaudhary et al., 2018; Larson et al., 2011) which found that those holding more liberal political beliefs were more likely to engage in water conserving behaviors, as well as hold complimentary beliefs. This project supports those previous findings by finding that those holding more conservative political beliefs would be less engaged in conservation than those holding liberal political beliefs with the same trend for future intentions. Therefore, it also makes sense that the same relationship would be, and was, found in the constructs of PI, PE, and PBC, since the theory of planned behavior suggests these are all predictors of both intentions and behavior. However, Coffey and Joseph (2013) suggest that "cognitive dissonance may induce a reverse causal process in that liberals and Democrats alter intentions for conservation to maintain internal consistency," but go on to say that behavior did "differ consistently by party," with democrats being more environmentally conservative. In this study, the relationship seen between political orientation and FI is also seen with AE, with students identifying as politically liberal engaging more frequently in water conserving behavior than students identifying as politically conservative.

The variable age was only significantly correlated with one of the constructs, PI (r = 0.20). General understanding of water resources increased with age. This is not surprising given that older students would likely have had more classes and therefore a greater probability of having taken a class that convers the material. This is somewhat supported in previous studies, such as Corral-Verdugo et al. (2006), who suggest that pro-water conservation behaviors increase with age. Clark and Finley (2007) found that some demographics, including age, were related to "intentions to implement water conservation measures." While these studies do not measure PI the way this study did, this study found PI to be significantly correlated to intentions, similar to the intentions Corral- Verdugo et al. (2006) and Clark and Finley (2007) measured. This could mean that as people age and experience new things and information that this information impacts their understanding of a topic, in this case, water conservation. The theory of planned behavior classifies PI as part of a person's attitudes, which in turn is a predictor of intentions and behaviors. Influencing an individuals or groups perceptions of the importance of a subject is one step to influencing their behaviors and intentions.

Gender was significantly correlated with PBC (r = -0.26), where females held a greater belief that the individual has more impact on water conservation than males held. This is a correlation that has a complicated history full of contradictory findings. Clark and Finely (2007) found that gender was unrelated to environmental intentions, of which PBC was found to be a predictor of in this study. Tindall et al. (2003) found that, while females exerted a greater degree of environmentally conserving behavior, they were not necessarily more active in promoting conservation beliefs. Corral-Verdugo et al. (2006) reported similar findings, concluding that females are more pro-environment than males. While these previous studies report findings based on intentions and behaviors in general conservation and environmentalism, the model this study employed suggested and showed that PBC was a predictor of both intentions and engagement behaviors, but that gender was not correlated with either. This result suggests that gender may not have any correlation with water conservation intentions or behaviors but does influence the amount of perceived behavioral control an individual has on water conservation.

5.1.4: Predicting Future Intentions and Actual Engagement in Water Conservation

The model predicting actual engagement was able to explain only 16% of the variance for in home water conservation practices. This is lower than the 25.1% of variance explained by Chaudhary et al. (2017). It should be noted that their study researched landscape water conservation practices, not in-home practices. In regard to the model, PI, PE, PBC and SN were expected to be predictors of AE. However, only PE and PBC were included as predictor variables, and so this model does not follow the full adapted theoretical model as proposed in this study. This model was unable to utilize the constructs of SN and PI, which accounts for half of the “attitude” construct within the theory of planned behavior. It does consider political orientation, which has been previously linked to a person’s actual water conservation practices.

The model predicting student future intentions towards water conservation was a more powerful model, explaining 38% of the variance. It utilized almost all the constructs from the theory of planned behavior, with the exception of actual engagement. This does conform to the adapted theory model used for this study but conforms to Ajzen’s model (1991). The theory of planned behavior uses attitudes, social norms and perceived behavioral control to predict intentions, then uses intentions and perceived behavioral control to predict engagement/behavior (Ajzen, 1991). Actual engagement was expected to be a predictor of FI based on the adapted model, and the two constructs were significantly correlated (r = 0.32) during bivariate correlation testing but failed to be significant predictors of FI in the regression model during linear regression analysis. This shows that actual water conservation behaviors did not influence a student’s future intentions towards water conservation. This is possibly because the future intentions do not involve a student actively conserving water, but rather supporting an organization, program or policy that would apply to or influence more than just themselves.

Additionally, this study sought to determine if being an agriculture major or non-agriculture major influenced respondents’ behaviors or intentions. While major, as previously mentioned, was significantly correlated with the construct PI (r = -0.20), it was not significantly related to AE or FI and thus was not used in the regression models for predicting these constructs. Based on this, it appears that there is a difference in how these two groups of students understand water as a resource but does not ultimately impact their intentions or behaviors towards water conservation. Young adults projected to enter the agriculture industry have remarkably similar intentions and behaviors to those not projected to enter the agriculture industry.

It should be noted that PI, PBC, SN and AE were deemed to have low internal consistency and reliability. Therefore, the presence or absence of these constructs within either the AE or FI regression models should not indicate whether they are, or are not, predictors. Due to the low reliability and internal consistency within these constructs, it is possible other constructs or variables may be predictors of the models but, upon analysis, do not appear in the regression equation.

5.3: Recommendations

This section discusses the recommendations for future research and based on the findings and conclusions of this study. The first subsection details the recommendations this study makes for future research and the section subsection details the recommendations this study makes for practice.

5.2.1: Recommendations for Future Research

Instrument stability, in terms of agreement level and instrument internal consistency in terms of Cronbach's Alpha, was low, with an overall agreement percentage of 64% with construct agreement levels for PI, PE, PBC, SN, FI and AE of 50%, 71%, 59%, 56%, 66%, and 50%, respectively. It is recommended that this instrument be retested with a larger group and modifications made to the wording and content of individual items to achieve an instrument with greater stability and internal consistency levels. Additionally, the low Cronbach's alpha scores of 0.30 and 0.43 for PI and AE indicate these constructs do not have an acceptable level of internal consistency. It is recommended that these constructs and the items comprising them be revised and retested. However, the Cronbach's alpha of 0.85 for FI indicates this scale is internally consistent. Because of this, it is recommended this scale be used in future studies to determine an individual's future intentions toward water conservation organizations, programs, and policies. Additionally, it is recommended that additional research be conducted to identify additional predictors which improve the portion of variance explained beyond 38% by the model predicting FI.

This study showed that students are more engaged in water conservation than they might think. However, because they are not socially pressured to do so, it is possible these conservation behaviors are out of convenience, rather than out of a desire to consciously conserve water. It is recommended that future research be conducted that measures both a respondent's perceived engagement practices and their actual water conservation practices. A meta-analysis conducted by Kormos and Gifford (2014) found that there was no correlation between systematic bias in reporting and socially desirable responding when reporting pro-environmental behavior. However, it should be noted that Kormos and Gifford (2014) used previous studies from multiple facets of conservation behavior, not just water conservation. Given that PE was a predictor of both AE and FI, the influence of socially desirable responses should be explored in greater depth.

Of the demographic variables observed, political orientation was the only one to become a predictor in either regression model, predicting AE. This study focused on a young population, primarily ages 18 to 22, and so it is recommended that further research be conducted to determine the extent of the effects of political orientation on actual engagement behavior. Additionally, further research should be conducted which examines the possible link between political orientation and any corresponding socially acceptable response which may be based on social pressure applied along party lines.

5.2.2: Recommendations for Practice

This study and its adapted model of the theory of planned behavior does not add value to the original TPB when predicting an individual's actual behavior. Only two of the five construct predictors, PE and PBC, were significantly correlated to AE. Even then, there was only a medium effect. However, the study did support the original theory, not the adapted model, in that attitudes, comprised of the constructs PI and PE, combined with the constructs of SN and PBC can all be used to predict an individual's intentions to perform an action. In this case, those actions would be to support a water conservation organization, program and/or policy. This study suggests that by understanding a group's attitudes, SN and PBC, towards water conservation, as shown in the unmodified Theory of Planned Behavior model, their predisposition towards water conservation organizations, programs, and policies may be able to be anticipated before the arrival of said organizations, programs, and policies.

It is recommended that, in order to stress the importance of water as a resource, educators should stress to students how important water is and the nature of it as a resource. The USGS (2018) estimated that agricultural irrigation is the largest consumer of water in the US. While academic major was correlated to perceived importance, it did not influence intentions or actual engagement in water conservation. Therefore, it is recommended that if entities desire to promote and implement water conservation practices within the agriculture industry, education on the subject must be started earlier than adulthood and possibly earlier than college to positively impact the actual behaviors of the population.

5.4: Chapter Summary

This study sought to determine the perceptions, intentions, and engagement levels in water conservation in college age students, a task commonly applied to home owning adults (Corral-Verdugo et al., 2003; Lamm et al., 2016; Chaudhary et al., 2018). Additionally, this study sought to determine any differences that may be present in student perceptions, intentions and engagement based on if the student was an agriculture student or a non-agricultural student. Using an adapted model of the Theory of Planned behavior originally developed by Ajzen (1991), six constructs were developed: perceived importance, perceived engagement, social norms, perceived behavioral control, future intentions, and actual engagement.

This study concluded that political orientation was significantly correlated with all constructs, with the exception of social norms and was the only demographic variable to factor into the regression models. Additionally, this study concluded that the adapted model of the Theory of Planned Behavior used by this study was unable to sufficiently predict actual water conservation engagement behaviors but was able to predict intention towards water conservation organizations, programs, and policies. Finally, whether or not a respondent was an agriculture or non-agriculture student was not a factor in either regression model, though had significant correlations with the constructs of PI and PBC.

This study led to recommendations for both future research and practice. Given that behaviors were self-reported and not physically observed by the researchers, it was suggested that AE behavior data be collected through self-reported means as well as by direct observation to determine how accurate self-reported water conservation data is, as well as any impacts political orientation may have on self-reported behavior when directly compared to observed behavior. It was also recommended that, prior to introducing water conservation organizations,

organizations, or policies that the affected group of people be surveyed using the unmodified Theory of Planned behavior model to determine the intentions held by the group in question. Finally, it was recommended that educators continue to stress the importance of water as both an environmental and economic resource in order to promote better understanding of water's influence.

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Appendix

Appendix A

I am Austin Wise, from the University of Arkansas Department of Agricultural Education, Communication and Technology. I am conducting a research study on student perceptions of, and engagement in, water conservation. The research will help understand and describe current student perceptions and engagement levels in water conservation activities.

Today you have the opportunity to participate in a questionnaire-based survey, which should take approximately 10 minutes to complete. Your participation in this study is voluntary and will not affect your standing in this class or your relationship with this University. If you do not wish to participate then do not fill out a questionnaire. If you start and decide to stop, you may stop at any time and discard the questionnaire. Responses will be anonymous and untraceable to you. There are no risks associated with this survey.

You may keep this letter for your records. If you have any questions regarding the research, contact myself, Austin Wise (mawise@uark.edu), the advisor of this study, Dr. Don Johnson (dmjohnso@uark.edu) or IRB coordinator Ro Windwalker (irb@uark.edu, 479-575-2105). If you have any questions regarding your rights as a research subject, please contact the University of Arkansas Institutional Review Board at irb@uark.edu.

Water Resources Opinions: The following questions seek to gather information describing your opinions of water as a resource and a conservation topic.

Q1 Please indicate your level of agreement or disagreement for the following statements:

SD = Strongly Disagree, D = Disagree, A = Agree, SA = Strongly Agree

Statement:				
Water resource management is less important now than it was in the past.	SD	D	A	SA
There is a need for water resource management.	SD	D	A	SA
Freshwater is a quickly renewable resource.	SD	D	A	SA
A growing population will negatively affect water quantity.	SD	D	A	SA
The cost of water causes me to use less in my daily life.	SD	D	A	SA
I am engaged in water conservation.	SD	D	A	SA
Conserving water is easier for me than for others.	SD	D	A	SA
My water use has little impact on water quantity in my region.	SD	D	A	SA
If I wanted to, I could easily cut down my water use.	SD	D	A	SA
It would make no difference if I conserved more household water.	SD	D	A	SA
It would make no difference if everyone conserved more household water.	SD	D	A	SA
My friends practice water conservation.	SD	D	A	SA
My family practice water conservation.	SD	D	A	SA
The people I spend time with do not care whether I conserve water.	SD	D	A	SA
I feel social pressure to conserve water.	SD	D	A	SA
People in my hometown are concerned about local water quantity.	SD	D	A	SA
In the future I am likely to:				
Vote for stricter water use laws.	SD	D	A	SA
Support water conservation programs.	SD	D	A	SA
Join a water conservation organization.	SD	D	A	SA
Donate money to support water conservation.	SD	D	A	SA
Care more deeply about water conservation.	SD	D	A	SA

The following questions seek to collect information on your water use habits.

Q2 Please indicate how often you perform each of the following activities:

N = Never, R = Rarely, S = Sometimes, F = Frequently, A = Always, N/A = Does Not Apply

Statement:						
I turn off the water while brushing my teeth.	N	R	S	F	A	N/A
I leave the water running in the kitchen while cleaning the dishes.	N	R	S	F	A	N/A
I shower for five minutes or less.	N	R	S	F	A	N/A
I run the washing machine with a full load of laundry.	N	R	S	F	A	N/A
I run the dishwasher with a full load of dishes.	N	R	S	F	A	N/A
I thaw frozen foods under running water.	N	R	S	F	A	N/A
I use hot water instead of cold water.	N	R	S	F	A	N/A
I wash my car.	N	R	S	F	A	N/A
I wear clothes more than once before washing them.	N	R	S	F	A	N/A

Demographics: This section seeks to collect basic demographic information.

Q3 Please indicate your age: _________________

Q4 Please indicate your gender: _________________

Q5 Please describe your current living arrangement:

a) I live with my parents
b) I live in a dorm
c) I rent my own home
d) I own my own home

Q6 Do you pay for your water usage?

a) Yes- I pay a separate utility bill
b) It is included in my rent
c) No

Q7 Please circle your current academic classification:

a) Freshman
b) Sophomore
c) Junior
d) Senior
e) Graduate
f) Other

Q8 Are you currently majoring in an agricultural discipline?

a) No
b) Yes, I am a(n) ________________________________ major.

Q9 Please provide the zip code of your hometown: ____________________

Q10 Please describe the geographical area of your hometown.

a) Very Rural
b) Somewhat Rural
c) Somewhat Urban
d) Very Urban

Q11 Please indicate your current political stance:

a) Very Liberal
b) Somewhat Liberal
c) Moderate
d) Somewhat Conservative
e) Very Conservative

Q12 Please estimate your annual income: $______________________

Q13 Please estimate your childhood household annual income: $______________________

Appendix B

UNIVERSITY OF ARKANSAS

To:	Donald M Johnson AGRI 00205
From:	Douglas James Adams, Chair IRB Committee
Date:	11/27/2019
Action:	**Exemption Granted**
Action Date:	11/27/2019
Protocol #:	1909216400
Study Title:	Predicting Student Water Conservation Habits

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Matthew A Wise, Investigator