

***Do Green Campuses Create Green Citizens?: Understanding the Impacts of
a Sustainable College Campus on Alumni Behaviors***

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Abstract

Higher education institutions (HEIs) are taking action to become more sustainable and to fund sustainable innovation. Despite being viewed as vessels for creating more sustainable citizens, little is known about the success of HEIs in influencing sustainable behaviors in their alumni (Venkataraman, 2009; Yang et al., 2021; Lozano et al., 2013). The objective of this study is to determine if attending Allegheny College, a sustainable college, has positively impacted the sustainability behaviors of alumni. A literature review on the role of environmental education in changing preferences demonstrates the importance of having sustainable higher education institutions (HEIs) in order to influence alumni to develop sustainable behaviors. The results of this study found that attending a sustainable college increased the overall sustainability of alumni after graduating. The study found that environmental education, sustainability initiatives, and peer influences were key influences in developing sustainable attitudes and behaviors in alumni. Sustainable colleges play an important role in developing sustainable citizens and finding ways to effectively utilize their influence over students will be key in developing sustainable societies equipped for the future.

Chapter I:

Introduction

Environmental citizenship, or green citizenship, is defined as “citizenship driven by green ideas which result in environmentally friendly actions” (Bauer et al., 2020; Dobson, 2007). Being a green citizen comes with the responsibility to work towards a sustainable version of society and the responsibility to embrace environmentally conscious decisions (Dobson, 2007). Green citizens allow their preference for sustainability to drive their attitude and behaviors (Hamilton, Guckian, & De Young, 2017). Green citizens also understand that their individual actions influence environmental outcomes while also recognizing that everyone is embedded within a social system that is influenced by their decisions (Hamilton, Guckian, & De Young, 2017; Dobson, 2007).

By 2050, the United Nations estimates that 66% of the world’s population will live in a city (“World Urbanization Prospects”, n.d.). With such a large portion of the population expected to reside in cities in the near future, the task of transforming cities from a burden on the environment to a model of sustainable living is more relevant than ever. A sustainable urban system is difficult to develop due to existing built environments and infrastructure that are not sustainable (Lipschutz, De Wit, & Lehmann, 2016). College campuses mimic the layout and bureaucratic structure of cities on a smaller scale, and can successfully implement programs and infrastructure for sustainability (Lipschutz, De Wit, & Lehmann, 2016). These implementations can be scaled up to fit cities due to the similarities college campuses and cities share in layout and functionality (Lipschutz, De Wit, & Lehmann, 2016). Additionally, the students attending these sustainable campuses will soon be the citizens of the sustainable cities, adding to the importance of sustainable colleges that mimic the layout and function of these cities.

Higher education institutions (HEIs) are often believed to be responsible for making students into sustainable citizens once they leave their campuses and thus, contributing to a more sustainable society (Venkataraman, 2009; Yang et al., 2021; Lozano et al., 2013). In one study, alumni from two sustainability education programs were surveyed and it was found that anywhere from 80% to 100% of male alumni and 97% to 100% of female alumni attribute their participation in sustainable behaviors

(PEBs) to their participation in their respective program (Breunig & Russell, 2020). In the same way, surveying alumni of HEIs can provide vital insight into the success of sustainable programs as well as the impacts of these programs on the behaviors of participants. This knowledge can be utilized to understand if a HEI's sustainable programs and initiatives are successfully creating sustainable citizens.

Engaging students in campus sustainability practices can prove to be difficult, with students citing “laziness, forgetfulness, inconvenience, comfort and preference” as barriers to partaking in sustainable behaviors (Thondhlana & Hlatshwayo, 2018). Providing students with sustainability knowledge is often a focus of educational programs that are looking to encourage sustainable behaviors (MacDonald & Shriberg, 2015). However, research has shown that environmental education and knowledge play no direct role in a person's decision to participate in pro-environmental behaviors (PEBs) (Fraj-Andrés & Martínez-Salinas, 2007; Liu et al., 2020; Meyer, 2015; Carmi et al., 2015). Environmental emotions and attitudes play the greatest role in determining whether someone will participate in PEBs, but environmental emotions and attitudes are driven by environmental knowledge, making knowledge an important and influential indirect factor in generating PEBs (Fraj-Andrés & Martínez-Salinas, 2007; Liu et al., 2020; Meyer, 2015; Carmi et al., 2015). Ultimately, giving students only environmental knowledge will only change their environmental behaviors if they have existing environmental emotions (Fraj-Andrés & Martínez-Salinas, 2007; Liu et al., 2020; Meyer, 2015; Carmi et al., 2015). Developing intrinsic motivation can lead individuals to be more sustainable in their actions (Dodds et al., 2020). The influence of other students and peers can encourage these sustainable behaviors as well (Watson et al., 2017).

HEIs are in a unique position to influence students to partake in PEBs because they can use the campus programs and outreach to generate environmental emotion and positive environmental attitudes within the student body. A recent study of university students found a direct relationship between a positive attitude toward sustainability and sustainable behaviors (Unknown Author, in review). HEIs can also provide them with environmental knowledge through curriculum to strengthen and build upon the attitudes and emotions they generate in their students, which aids in furthering the development of their students into sustainable citizens.

Allegheny College is a small liberal arts college located in Meadville, Pennsylvania. Allegheny College has a strong commitment to sustainability that is demonstrated through impressive reductions in resource use such as a 42% reduction in greenhouse gas emissions, a 30% reduction in paper usage, and a 40% reduction in water usage (Sustainability, n.d.). In 2020, Allegheny College became the first carbon neutral school in Pennsylvania and the eighth in the nation (“Allegheny College Becomes...”, 2020). Allegheny College has updated campus infrastructure to include solar panels, geothermal heating and cooling, and LEED certified buildings while also operating large-scale sustainability initiatives such as purchasing 100% renewable energy and building a composting facility on campus property (Sustainability, n.d.). Smaller and more hands-on initiatives such as reusable takeout containers, water bottle refill stations, the campus garden, the bike share, and composting and recycling efforts are a part of student life and allow the students to participate in making Allegheny College a more sustainable campus (Sustainability, n.d.).

Allegheny College created the “Sustainability Coordinator” position to help the college uphold its signed sustainability commitments and to work towards achieving carbon neutrality, all of which the college has achieved (“Allegheny Adds...”, 2008). Since the creation of this position in October of 2008, the college has also dramatically increased its sustainability endeavors and become more vocal about promoting their efforts (“Allegheny Adds...”, 2008). On top of the initiatives, infrastructure updates, and achieving carbon neutrality, Allegheny College’s environmental science program is also currently ranked as the fourth best program in the nation (“Top Environmental Science Schools”, n.d.).

A survey of Allegheny College students identified what current students knew about the college’s sustainability efforts (Schrock et al., 2021). The goal of this research was to determine if Allegheny College’s sustainability efforts and the sustainable campus are well recognized and understood by the student body (Schrock et al., 2021). The survey found that students were very aware of sustainability efforts that they interacted with on a regular basis, such as reusable takeout containers, water bottle refill stations, and the composting facility (Schrock et al., 2021). Students were also likely to be aware of certain visible sustainability efforts that they do not interact with, such as solar panels (Schrock et al., 2021). However, students were not as likely to know about some

less-visible and less-interactive sustainability efforts, such as carbon neutrality and geothermal heating even though these efforts could be considered the most important in the college's quest to limit environmental impacts (Schrock et al., 2021). Another important conclusion of this study is that students studying environmental science know more about the campus sustainability efforts than students of other majors, likely due to increased exposure to the sustainability efforts and more sustainability education through required courses for the environmental science major (Schrock et al., 2021). While this research showed that certain groups of students are well-versed in Allegheny College's sustainability practices, the student body as a whole lacks awareness of some of Allegheny College's sustainable programs and initiatives. There was no information collected on the sustainable behaviors of alumni, so there is little information known on how impactful these programs have been in molding Allegheny College alumni into sustainable citizens.

There is little information known about how Allegheny College's sustainability practices have influenced alumni behaviors after graduation. Since Allegheny College has taken steps to become a leader in the sustainable campus movement and prides itself on the success of its sustainability initiatives, the college should strive to be graduating sustainable citizens who are actively seeking to create more sustainable versions of our society. One goal listed in Allegheny College's mission statement is to equip graduates to "meet challenges in a diverse, interconnected world" ("About Allegheny", n.d.). In today's world, the need for citizens who understand the importance of sustainability actions and are equipped to engage in sustainable behaviors is more important than ever. Graduates need to be passionate and knowledgeable about sustainability in order to truly live up to Allegheny College's mission statement.

This research is being conducted in order to understand if Allegheny College alumni from 2015 to 2021 engage in personal environmental behaviors. This study will seek to assess the impact of their time at Allegheny College on their personal decisions to engage in these sustainability behaviors and practices. This data can be used to assist Allegheny College in determining how successful they have been at using a sustainable campus to create sustainable citizens.

Methods

After obtaining the approval from the Allegheny College Institutional Review Board (IRB), a survey of Allegheny College alumni from 2015 to 2021 was conducted. The survey was conducted from November of 2022 to January of 2023. Alumni were made aware of the survey through an email blast sent by Allegheny College to the emails of graduates between the years of 2015 and 2021. There were also posts made in the Parents, Families, and Friends of Allegheny College Facebook group, class-specific Facebook groups, Gator2Gator and the Allegheny College Alumni LinkedIn. This survey sought information from alumni in order to assess if they participate in personal environmental behaviors (PEBs) after graduation and to determine if their time in attendance at Allegheny College had any effect on their decision to engage in PEBs. Limiting the responses to graduates from 2015 to 2021 allows the survey to target alumni who were students at Allegheny College after many of the sustainability initiatives and practices were established.

The survey consisted of questions that utilized various Likert scales (each Likert scale used went from 1 to 5) and short answer questions. Eligible alumni were asked to provide basic demographic information including what gender they identify with, what years they attended Allegheny College, and what their major and minor were. Alumni were also asked to include what city and state they lived in prior to attending Allegheny College and where they currently live after graduating. They were asked to identify the political affiliation of their parents before attending Allegheny, as well as their own political affiliation after graduating from Allegheny. The survey asked participants to include their current income level and any sustainability behaviors they plan to start practicing as well as any barriers limiting their participation in the listed behaviors in the “behaviors after attending Allegheny” section. These questions were included because these demographic factors were determined to have a potential impact on participation in sustainability behaviors.

Participants were then asked the same series of questions about their sustainability behaviors twice. The first time they reflected on their experiences prior to attending Allegheny College and the second time about their experiences after attending Allegheny College. This sequence was meant to differentiate which of an alumnus’ behaviors and attitudes can be attributed to Allegheny College’s development of sustainable citizens and which are due to their environment before attending Allegheny.

This series of questions about sustainable behaviors collected responses from participants using a Likert scale from 1 (extremely unlikely) to 5 (extremely likely). These questions asked participants how likely they were to participate in certain environmental behaviors, such as recycling, composting, limiting meat consumption, and using reusable drinkware and dishes both before and after attending Allegheny College. Participants also answered questions about their tendency to purchase secondhand and their tendency to opt for public transportation, walking, or cycling instead of driving a personal vehicle during both timeframes. Additionally, they were asked about participation in behaviors to minimize water, heat, air conditioning, and electricity usage before and after attending Allegheny College. If participants answered a 4 (likely) or a 5 (extremely likely), they were asked to elaborate on what behaviors they participate in.

After answering both series of questions, participants ranked their personal sustainability before and after Allegheny College using a Likert scale from 1 (not sustainable at all) to 5 (extremely sustainable). Participants had the option to respond to a short answer question asking for an elaboration on why they chose these rankings. Participating alumni were asked to list all of the sustainability initiatives they remember from their time at Allegheny College in a short answer format.

Alumni also ranked Allegheny College's sustainability on a scale from 1 (not sustainable at all) to 5 (extremely sustainable). They were also asked to indicate how much of an impact Allegheny College had on developing their personal sustainability using a Likert scale from 1 (extremely little influence) to 5 (extremely influential). The final question asked participants to elaborate on Allegheny College's influence on their consideration of sustainable efforts and behaviors that benefit the environment.

After all surveys were returned, the data was entered into Google Sheets and analyzed to determine if Allegheny's sustainability efforts have made an impression on alumni and if these sustainability efforts play a role in an alumnus' decision to engage in personal environmental behaviors. Averages and standard errors were calculated for all questions that provided a Likert scale.

Averages were calculated for each response in the series of questions that asked participants about certain sustainable behaviors before and after attending Allegheny College. The before and after responses for each question were compared to determine

whether the likelihood of participation in these sustainable behaviors changed in participants from before attending Allegheny College to after. Additionally, the average rankings for personal sustainability before and after attending Allegheny College were compared to determine if participants felt that personal sustainability changed.

The data was sorted into responses from alumni who majored in environmental science and alumni who did not major in environmental science. Every sustainable behavior was averaged to find the before and after rankings provided by environmental science majors versus non-environmental science majors. Graphs were made to compare the personal sustainability rankings of environmental science major alumni and alumni who did not major in environmental science before and after attending Allegheny College. These comparisons were made to see if the rankings provided by each group differed from the other.

Finally, the data provided in the open-ended question which asked alumni to further expand on Allegheny College's influence on their consideration of sustainable efforts and behaviors that benefit the environment were coded to make the data more usable. The responses were coded to indicate if an individual's sustainable behaviors were influenced or not. Responses were also coded to determine what about Allegheny College influenced the change in behavior. The last set of codes used indicated what behavioral changes an individual made in order to incorporate more sustainable efforts and behaviors. These codes were then used to generate quantitative data by counting the number of occurrences of each recurring theme.

Results

Demographics

One hundred and fifty responses were collected over the course of the study. Of these 150 responses, 143 were usable results. Seven responses were excluded due to the participant graduating outside of the range of graduation years identified (2015-2021), or due to incomplete information.

In this study, participants were asked to classify their gender identity as male, female, or nonbinary. Female participants accounted for 74.8% of responses. Male participants made up 23.1% of responses, and nonbinary participants comprised 2.1% of

responses. These results show a higher proportion of female responses than the actual makeup of the academic class years.

Twelve percent of responses came from Allegheny College alumni from the class of 2015, 12.7% from the class of 2016, 10% from the class of 2017, 14% from the class of 2018, 16.7% from the class of 2019, 17.3% from the class of 2020, and 12.7% from the class of 2021.

As seen in Figure 1.1, graduates who majored in environmental science were the most common participants, accounting for 17.3% of all majors recorded in the study. Alumni with psychology majors (11.7%), economics majors (9.5%), and biology majors (8.4%) were also among common participants in this study (Figure 1.1).

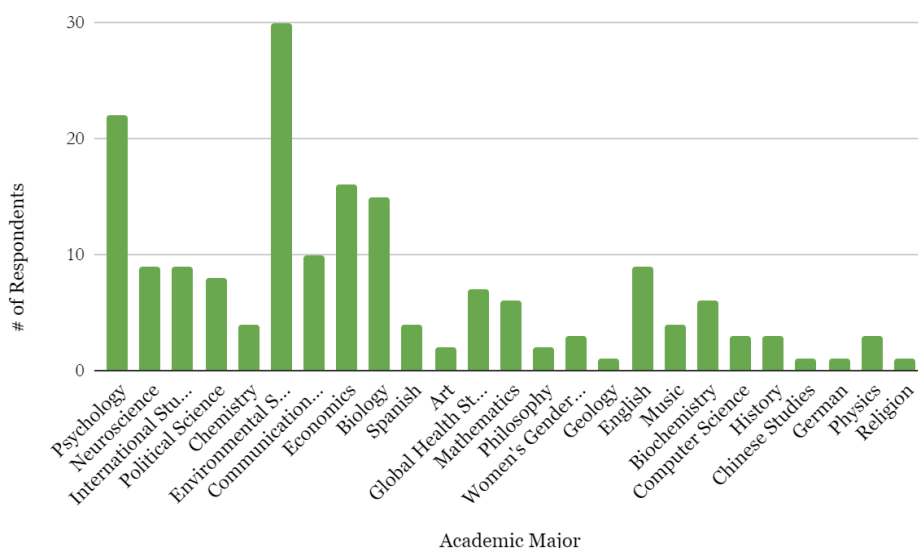


Figure 1.1: This figure shows the distribution of academic majors of survey participants.

Sustainability Rankings

Ranking Allegheny College's sustainability

Participants were asked to rank Allegheny College's sustainability on a Likert scale from 1 (not sustainable at all) to 5 (extremely sustainable) and the average ranking was a 4.1 (SE $\pm$ 0.07), showing that on average, respondents felt that Allegheny College exhibits an above average level of sustainability. The most common response was a ranking of 4, which appeared in 49% of responses. This ranking means that the most frequent response identifies Allegheny College as above average sustainability.

Before v. after (average using all responses)

Participants were asked to indicate their likelihood to participate in certain sustainable behaviors before and after attending Allegheny College. The likelihood for an alumni to participate in each sustainable behavior increased after attendance at Allegheny. The most significant increases were seen with utilizing alternative forms of transportation, incorporating meatless meals, and using a reusable water bottle (Table 1). Most participants were already using reusable dishes (Table 1).

Participants were then asked about their likelihood of choosing alternative forms of transportation (such as public transportation, cycling, or walking) instead of driving a personal vehicle. Participants were also asked to elaborate on why they chose their ranking. One participant, who ranked their likelihood of choosing alternative forms of transportation a 5, or extremely likely, before attending Allegheny College, indicated that they chose this ranking because “we owned a car, but I went to school in Manhattan and used the subway most.” Another participant indicated their likelihood to participate in using alternative transportation before Allegheny College was a 2, indicating that they were not likely, and elaborated by saying, “where I grew up, there is very little public transit and not very many convenient local options. There also aren’t many sidewalks making walking unsafe. I did see bikers from time to time but not very common. However, carpooling was super common growing up for extracurriculars.”

A participant who ranked their likelihood to choose alternative forms of transportation after attending Allegheny College as a 5 (extremely likely) elaborated by saying, “I live in a city now so I bike almost everywhere! I usually try to ride the bus when I’m not cycling and use cars only when I need to get somewhere inaccessible in a hurry.” Another participant, who ranked their likelihood as a 2 (not likely) after attending Allegheny College says, “I prefer to carpool when I can but public transport is just not good where I live. It’s possible it just takes over an hour [to walk] 0.5 miles to go somewhere I can drive in 20 minutes.”

Participants were asked to indicate their likelihood to engage in behaviors to minimize their water usage, and also asked to expand on what behaviors they participated in, if any. One participant ranked their likelihood of participating in these behaviors before attending Allegheny College as a 4, meaning they were likely to engage in these behaviors, and indicated that in order to minimize water consumption they

“would take timed showers [and] use rainwater for outdoor watering.” Many participants indicated that the water saving behaviors they engage in after attending Allegheny College are the same behaviors they participated in before Allegheny.

Participants were asked about their likelihood to engage in behaviors to minimize heat and air conditioning usage. They were also asked to elaborate on what behaviors they have participated in order to minimize their usage. Responses indicate that common behaviors to minimize heat usage were not changing the thermostat settings, utilizing a fireplace and wearing extra layers of clothing. Common behaviors to minimize air conditioning usage were not changing thermostat settings, opening windows and turning on fans. The open-ended responses indicate similar behaviors to the pre-Allegheny responses.

Additionally, survey respondents were asked about the likelihood of engaging in behaviors to limit electricity usage prior to and after attending Allegheny. Common behaviors cited were turning off lights when they are not being used, unplugging cords and electronics when not in use, and using energy efficient light bulbs and appliances.

	Before Allegheny College	After Allegheny College
Recycling	3.7 (SE + 0.11)	4.3 (SE + 0.08)
Composting	1.9 (SE + 0.11)	2.5 (SE + 0.11)
Meals without meat	2.1 (SE + 0.10)	3.3 (SE + 0.10)
Reusable water bottle	3.4 (SE + 0.11)	4.6 (SE + 0.06)
Reusable dishes	4.3 (SE + 0.07)	4.6 (SE + 0.06)
Alternative form of transportation	1.9 (SE + 0.09)	2.6 (SE + 0.10)
Secondhand clothing	2.4 (SE + 0.10)	3.1 (SE + 0.10)
Water usage	2.6 (SE + 0.09)	3.1 (SE + 0.09)
Heat usage	2.8 (SE + 0.10)	3.3 (SE + 0.09)
Air Conditioning usage	2.9 (SE + 0.11)	3.3 (SE + 0.10)
Electricity Usage	2.8 (SE + 0.09)	3.5 (SE + 0.08)

Table 1: This table indicates the average likelihood for participants to engage in each sustainable behavior before and after attending Allegheny College, as well as the standard errors for each ranking.

Personal Sustainability Rankings

Participants were asked to rank their personal sustainability before and after attending Allegheny College on a Likert scale from 1 (extremely unsustainable) to 5 (extremely sustainable). The average response for this question from participants before attending Allegheny College was a 2.5 (SE $\pm$ 0.07). After attending Allegheny, the average ranking of personal sustainability increased to 3.5 (SE $\pm$ 0.07).

The sustainability rankings for both ESS majors and non-ESS majors increased after attending Allegheny College (Figure 1.2). The before college ranking for ESS majors was greater than non-ESS majors. (Figure 1.2).

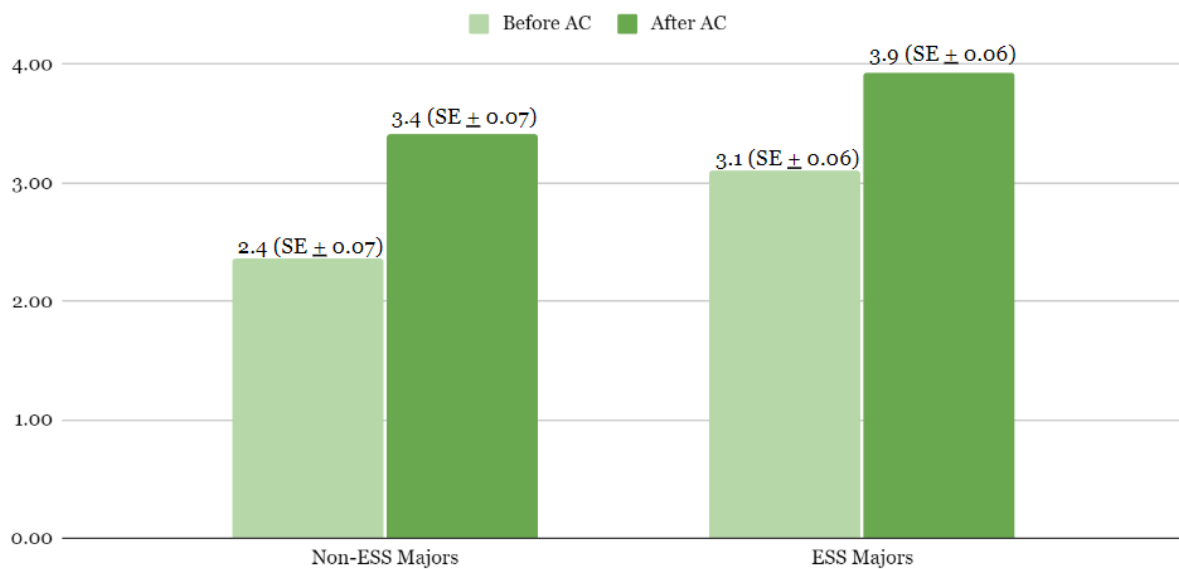


Figure 1.2: This figure shows the average personal sustainability ranking of participants before and after attending Allegheny College, differentiated between participants who majored in environmental science and participants with other majors.

Influence on Behaviors

Participants were asked to indicate how much positive influence did Allegheny College's sustainability initiatives and programs have on their own sustainability behaviors and attitudes using a Likert scale from 1 (extremely little influence) to 5 (extremely influential). The average response to this question was a ranking of 3.7 (SE $\pm$ 0.07).

0.08), which indicates that participants feel that Allegheny College was influential in developing their personal sustainability behaviors and attitudes.

Respondents were asked to elaborate further about Allegheny College's influence on their consideration of sustainable efforts and behaviors in an open-ended format. Sixty-eight point five percent of participants answered this question. Twelve point two percent of these responses indicated that attending Allegheny College had no influence on a survey participant's sustainable efforts and behaviors. Eighty-seven point eight percent of responses indicated that the college influenced survey respondent's participation in sustainable efforts and behaviors. Fifty-three point four percent of responses did not specify what aspect of attending Allegheny College influenced a respondent's change in sustainable behaviors. Twenty-four point four percent of respondents indicated that Allegheny College's sustainability initiatives (such as the composting facility, recycling program, solar panels, and geothermal heat pumps) influenced a change in their sustainability behaviors and attitudes. Seventeen point four percent of responses indicated that other individuals at Allegheny College or campus organizations were responsible for impacting a participant's personal sustainability behaviors. Nine point three percent of responses indicated that the Environmental Science and Sustainability Department or classes were responsible for a respondent's change in behavior.

Results were coded to identify what changes participants made to their sustainability behaviors after graduating from Allegheny College. Sixty-eight point six percent of responses did not specify any behavioral changes made after attending Allegheny. Eleven point six percent of responses indicated an increase in composting behavior. Nine point three percent of responses indicated a positive change in recycling behaviors. Five point eight percent of responses indicated that attending Allegheny College influenced participants' purchasing behaviors. Some examples of changes in purchasing behavior that were included are an increased likelihood to purchase secondhand items, purchasing less items to minimize consumption, and switching to non-toxic or environmentally-friendly alternatives for standard products. Five point eight percent of responses showed participants have become more likely to use reusable dishes and water bottles. Four point seven percent of responses highlighted a change in participant behavior to limit meat consumption, either through reducing their number

of meals that include meat, or through practicing vegetarianism. Three point five percent of responses indicated that survey participants are engaging in behaviors to reduce waste, such as avoiding single-use plastics, and being more mindful of reusing items instead of throwing them away. Three point five percent of responses indicate that the participant is engaging in energy conservation behaviors, such as unplugging unused electronic devices and appliances. Other changes in sustainability behaviors made up 3.5% of responses. The “other” category includes starting a garden, changes in transportation behaviors, such as increases in the frequency of carpooling, and choosing a career in a sustainability-related field as a result of attending Allegheny College.

Discussion

Yang et al. (2013) states that “...universities have a moral obligation to work towards sustainable societies” and that “...universities are following society and companies when it comes to integrating sustainability into their systems and better contributing to making societies more sustainable.” The results from this survey indicate that alumni believe that they are more sustainable after attending Allegheny College.

The average ranking of personal sustainability for participants before and after attending Allegheny College increased by a point on the Likert scale. The average ranking for all participants was above an average level of sustainability. When ESS majors are separated from other majors, both ESS majors and other majors felt that their personal sustainability increased over their time at Allegheny College. Alumni who did not major in ESS reported a slightly larger increase in personal sustainability from before attending Allegheny College to after. ESS majors reported a higher level of personal sustainability than alumni from other majors before and after coming to Allegheny College. ESS majors ranking their personal sustainability higher on the Likert scale before attending Allegheny College indicates a higher preference and stronger intrinsic motivation towards sustainability, leading them to major in ESS. This aligns with research that intrinsic motivation plays a key role in sustainable behaviors (Dodds, Holmes, and Novatny, 2020).

The results also show that Allegheny College alumni have an increased likelihood to participate in sustainable behaviors after graduating. Alumni were asked to indicate their likelihood to participate in a list of sustainable behaviors before attending

Allegheny College and after. One major takeaway from these results is that the average ranking for every single behavior listed increased from prior to attending Allegheny College to after. The largest increases in the average likelihood of participating in a sustainable behavior were incorporating meatless meals and using a reusable water bottle. Other notable increases were seen in the likelihood of using alternative forms of transportation and the likelihood of purchasing secondhand clothing. Schrock et al. (2021) conducted a study of undergraduate students at Allegheny College which found that students were most aware of the sustainability initiatives they interact with on a regular basis, which aligns with the results collected in this study from alumni, as meatless meals and reusable water bottles are sustainability initiatives that alumni would've engaged with on a regular basis during their time at Allegheny College.

Overall, the outcomes of this survey highlight that alumni feel that attending Allegheny College had a positive impact on their sustainability and their likelihood to engage in sustainable behaviors. According to the alumni surveyed, both overall personal sustainability and likelihood to engage in sustainable behaviors have increased after attending Allegheny. HEIs are often charged with the task of making students into sustainable citizens and contributing to a more sustainable society overall (Venkataraman, 2009; Yang et al., 2021; Lozano et al., 2013). These results indicate that Allegheny College may be living up to these expectations based on the development of personal sustainability and increased participation in sustainable behaviors by alumni.

It is difficult to isolate what aspects of attending Allegheny College resulted in the changes in attitude and behavior alumni indicated in their survey responses. There are many overlapping factors to consider when determining influence, but there were a few recurring themes in the open-ended responses provided by survey participants.

One aspect of attending Allegheny College that respondents indicated played an important role in impacting their personal sustainability was the education they received. Alumni indicated that certain classes and faculty had a strong influence on their knowledge and actions surrounding sustainability. This type of response was almost exclusively received from alumni who were a part of the ESS department during their time at Allegheny. Blatt (2012) indicates that taking environmental science courses aids in a student's development of their environmental identity. Alumni who took classes in the ESS department indicated that they played a large role in developing their

personal preferences for sustainability, aligning with the research on the connection between taking environmental science courses and developing a personal identity that values sustainability.

Researchers have not come to a set conclusion on the role that environmental education plays in increasing participation in environmental behaviors. Research about the influence of environmental education on the influence of environmental behaviors is split with some studies showing that environmental education leads to pro environmental behaviors (Prieto-Sandoval et al., 2022; Varela-Candamio et al., 2018; Zsóka et al., 2013) while others don't (Fraj-Andrés & Martínez-Salinas, 2007; Liu et al., 2020; Meyer, 2015; Carmi et al., 2015). The conclusions drawn from the survey of Allegheny College alumni indicate that participants who engaged in environmental education while in attendance attribute at least some portion of their development of personal sustainability behaviors and attitudes to these courses and their time in the ESS department.

One key takeaway from this study is the role that environmental science courses played in developing sustainable behaviors in alumni who majored in ESS. The majority of responses indicating that classes at Allegheny College positively influenced the development of sustainable behaviors were ESS majors. While positive, this data highlights an important gap in the current curriculum for other academic majors outside of ESS. Colleges could utilize sustainability education to encourage students in all academic disciplines to develop environmental emotions and sustainable behaviors. By weaving environmental education into all academic disciplines, not only ESS, more students will be exposed to sustainable concepts and have a better grasp on how their individual actions affect the broader scope of the environment.

Another commonly identified source of personal sustainability development was Allegheny College's sustainability initiatives. Certain initiatives, like composting, reusable food containers and water bottles, and sustainable gardening, were mentioned by name, while other responses indicated that the sustainability initiatives as a whole provided them with actionable solutions and accessible ways to incorporate sustainable behaviors into their daily lives. Schrock et al. (2021) discusses how students show increased participation in sustainability initiatives that they interact with on a regular basis. This lines up with the results of this survey as composting, reusable food and

drink containers, and the sustainable campus garden are all visible, interactive sustainability efforts on Allegheny College's campus that are designed to encourage student participation. This study adds to the research by finding that these are the types of sustainability behaviors alumni are carrying on after leaving a sustainable college.

A number of open-ended responses also indicated that the individuals at Allegheny College or certain student-led organizations had a significant impact on the personal sustainability of alumni. There were a number of respondents who indicated that the sustainable habits they developed over the course of their time at Allegheny College can be attributed to the people they surrounded themselves with, not necessarily the college itself, the education they received, or the sustainability initiatives. Watson et al. (2017) found that "peer support influences conservation behaviors" in students. The responses indicate that interactions with other students or student-run clubs and organizations caused individuals to reevaluate their own sustainability behaviors and to increase their participation in behaviors. Intrinsic motivation plays a key role in developing sustainable behaviors (Dodds et al., 2020), and by interacting with other students who valued sustainability, these individuals may have developed an intrinsic motivation that led to an increased preference for sustainability. The impact of other students' sustainable behaviors on an individual's preference for sustainability has not been directly studied, however this research indicates that there could be a direct relationship between these factors.

The outcome of this research shows the amount of success a sustainable college has achieved in terms of turning students into sustainable citizens after graduation. According to other studies, one of the most successful ways to create sustainable behavior is generating environmental emotion (Fraj-Andrés & Martínez-Salinas, 2007; Liu et al., 2020; Meyer, 2015; Carmi et al., 2015), as well as peer pressure which plays a role in creating intrinsic motivation in an individual to encourage participation in sustainable behaviors (Dodds, Holmes, and Novatny, 2020). In the case of Allegheny College, students who already have sustainable behaviors may play a significant role in not only generating a form of peer pressure where other students feel the urge to replicate sustainable behaviors, but also in generating environmental emotions in their peers who do not already have the same sustainable tendencies. Environmental emotion also encourages a change in behavior towards more sustainable actions.

In order to best understand how Allegheny College is utilizing environmental education as a means to create sustainable alumni, a comprehensive overview of the curriculum of each academic department could be generated, as well as an action plan for reworking the current curriculum of each department. This next step could begin by focusing on the most popular academic departments, such as Economics, Psychology, and Biology.

One shortcoming of this research is that the survey did not ask respondents to specify what aspects of attending Allegheny College influenced their development of sustainable attitudes and behaviors. This led to a large number of responses that did not indicate this information. A future study should seek to be more specific in collecting information from alumni about Allegheny College's role in developing their sustainable behaviors as well as what exactly about attending Allegheny College influenced this change.

Similarly, this study did not ask for alumni to specify what sustainable behaviors they have changed since attending Allegheny. This led to a lack of data about which sustainable behaviors alumni have developed. This data would be beneficial because the college would know exactly how alumni are changing behaviors and could better tailor education and the campus as a whole to promote the development of the most beneficial sustainable behaviors. A future study could further examine what habits and behaviors alumni have altered since attending Allegheny College.

This study provides a good start to understanding the role of HEIs in creating sustainable citizens. HEIs need to continue learning how to develop long-lasting, impactful sustainable attitudes and behaviors in students that carry on after graduation, as well as focusing on how to best communicate the value of sustainability to students in all academic disciplines. HEIs share a large portion of the responsibility to create sustainable citizens, making this research and any further research on the topic of using HEIs to generate sustainable behaviors and attitudes vitally important for the success of future generations.

Chapter II:

Theory Section

Consumer Choice Model

The purpose of this study is to understand the impact of attendance at Allegheny College on the occurrence of positive environmental behaviors in alumni. Understanding more of the process of decision making is imperative to evaluating the success of Allegheny College at creating sustainable citizens. The economic theory of consumer choice is used to justify how consumers make decisions. The theory accounts for what consumers can afford and what the consumer wants in order to determine the consumer's optimal choice, or the most beneficial combination of goods and services the consumer can purchase based on their individual budget and preferences (Mankiw, 2004). The purpose of this economic theory section is to explain the theory of consumer choice and how consumers handle tradeoffs and make decisions. More specifically, this theory section looks to understand the way that consumers make consumption decisions and view tradeoffs between regular and sustainable goods and services.

This chapter is meant to demonstrate the economic theory behind practical applications of sustainable behaviors. Understanding how attending Allegheny College may change or develop alumni's sustainability behaviors is important. This chapter takes that research a step further and applies these changes in behavior developed from attending a sustainable college to an actual example of sustainable decision making.

Budget Constraints

In this paper, it is assumed that consumers have the choice between purchasing the regular option and the more sustainable alternative for nearly every good on the market, including clothing, food, energy, vehicle, and much more. The consumer choice model consists of two sections: budget constraints and indifference curves. Consumers would always prefer to consume more of a good or consume goods of a higher quality, but they are constrained by their individual budget and the price of the goods (Mankiw, 2004). These choices are limited by a consumer's budget constraint. The budget constraint depicts every combination of goods that a consumer can afford given their budget and is shown as a straight line. Using a simplified two-good model, an example can be shown using a regular good, such as normal clothing and an

environmentally-friendly alternative, sustainably produced clothing. In this example, normal clothing items are clothing items produced through fast fashion where production is cheap, but extremely resource intensive and sustainably-produced clothing items are clothing items that are more expensive to produce, but put less strain on the environment through the production process (Gomes de Oliveira et al., 2022; Reichert & Drew, 2019; Sachdeva, 2015).

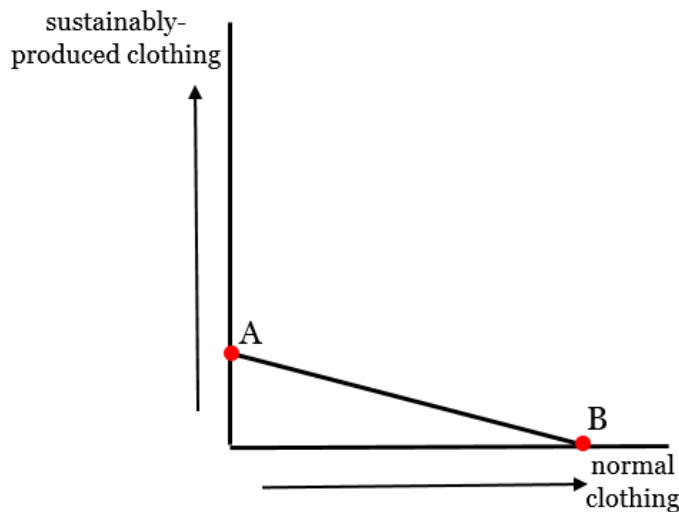


Figure 2.1: This figure depicts the budget constraint for normal clothing and sustainably-produced clothing.

Figure 2.1 depicts the budget constraint for a consumer with sustainably-produced clothing on the vertical axis and the regular good, normal clothing on the horizontal axis. A budget constraint is drawn as a straight line between the vertical and horizontal axes. The shallow slope of the budget constraint line highlights the price difference between normal clothing and sustainably-produced clothing. Sustainable goods tend to be more expensive than their less-sustainable counterparts (Sachdeva, 2015). Therefore, the relatively flat slope is due to the quantity of sustainably-produced clothing a consumer can purchase being far less than the quantity of normal clothing the consumer can purchase with the same budget (Figure 2.1).

A corner solution is located on each end of the budget constraint line on the axes themselves. These solutions represent the quantity of goods the consumer could

purchase if they purchased only a regular good or only the sustainable alternative of a good. Point A shows the point on the budget constraint where the consumer purchases entirely sustainably-produced clothing (Figure 2.1). Similarly, point B is the point where the consumer purchases only normal clothing (Figure 2.1).

Budget constraints highlight the limitations a consumer has when deciding what goods or services to purchase, a main factor of consumer choice. However, many other factors play a role in the determination of the optimal point for a consumer to purchase on their budget constraint. These preferences are accounted for through the inclusion of indifference curves in the model.

Indifference Curves

Consumer preferences are often represented by indifference curves, which identify combinations of goods that give a customer equal satisfaction (Mankiw, 2004). Consumers make their decisions on purchasing the sustainable or less-sustainable version of a good based on many factors, including moral obligation, environmental ethics, green attitudes (Akhtar et al., 2021).

Most indifference curves share the same four properties (Mankiw, 2004). First, a higher indifference curve is preferred to a lower indifference curve (Mankiw, 2004). As previously stated, consumers would usually prefer increased levels of consumption, which is reflected by a higher indifference curve (Mankiw, 2004). Second, indifference curves have a downward slope (Mankiw, 2004). A consumer is equally happy with any combination of goods shown on one indifference curve. The downward slope of the indifference curve indicates the tradeoff between a consumer receiving less of one good in order to consume more of the other good while remaining equally satisfied (Mankiw, 2004). The third shared property is that indifference curves do not overlap because of the transitive property (Mankiw, 2004). The final shared characteristic of indifference curves is that they bow inwards (Mankiw, 2004). Consumers are more willing to trade one good for the other if they have an abundance of the good they are trading and less willing to make that tradeoff if they do not have an excess of the good they are trading, hence the inward bow of the indifference curve (Mankiw, 2004).

How Preferences Shape Indifference Curves

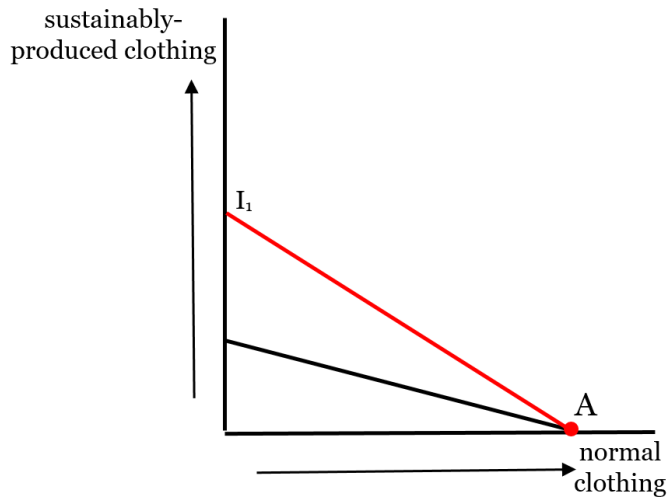


Figure 2.2: This figure shows the indifference curve for a typical consumer with no preference towards sustainability (normal clothing vs. sustainably-produced clothing).

Figure 2.2 depicts the budget constraint and indifference curve for a typical consumer who views normal clothing and sustainably-produced clothing as perfect substitutes. This consumer has no preference between the two goods, and therefore the point of tangency between the budget constraint and the indifference curve is on the horizontal axis, which means that this consumer would purchase only normal clothing (Figure 2.2). The consumer would be equally happy with the same quantity of normal clothing and sustainably-produced clothing, but the increased price of sustainably-produced clothing lowers the quantity the customer can purchase given their budget constraint. This is why the customer's tangency point is on the "normal clothing" axis (Figure 2.2).

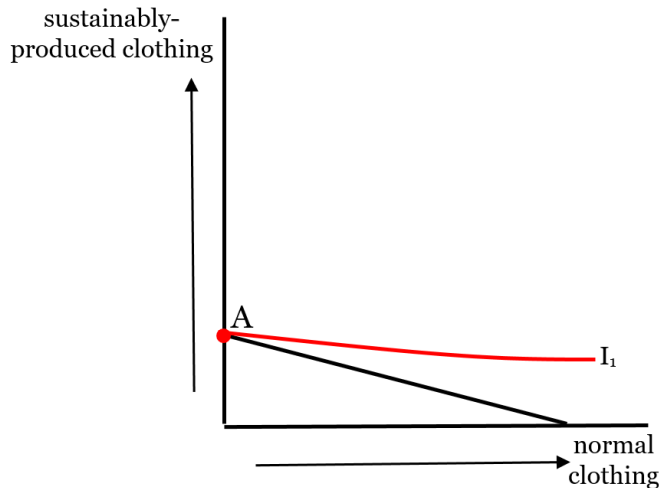


Figure 2.3: This figure shows the indifference curve for an extremely sustainably-minded consumer (normal clothing vs. sustainably-produced clothing).

In Figure 2.3, the budget constraint and indifference curve for an extremely sustainably-minded consumer is shown. The shape of the indifference curve, labeled as I_1 , is flat because the consumer shows a strong preference for sustainably-produced clothing over regular clothing (Figure 2.3). The flat slope of the indifference curve indicates that the consumer would need to purchase a much larger amount of normal clothing in order to be willing to give up purchasing a small amount of sustainably-produced clothing (Figure 2.3). This makes this consumer's point of tangency on the vertical axis, purchasing entirely sustainably-produced clothing (Figure 2.3).

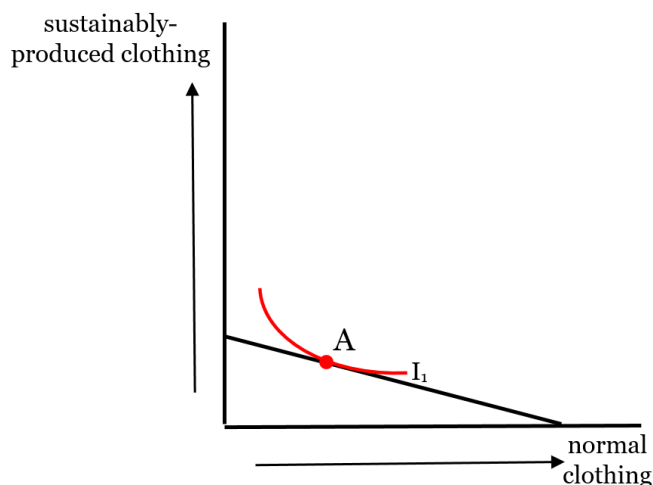


Figure 2.4: This figure shows the indifference curve for a mildly-sustainable consumer (normal clothing vs. sustainably-produced clothing).

Figure 2.3 shows a very unrealistic vision of the ideal sustainable consumer. In actuality, most consumers with sustainable preferences will consume somewhere between the consumer in Figure 2.2 and the consumer in Figure 2.3. Figure 2.4 shows one example of a mildly sustainable consumer. This consumer's indifference curve is flatter than a consumer with no preference for sustainability (as seen in Figure 2.2), but steeper than a consumer with an extreme preference for sustainability (as seen in Figure 2.3) (Figure 2.4). The point of tangency between the budget constraint and indifference curve for the consumer in Figure 2.4 is shown by point A. At this point, the consumer will purchase a combination of normal clothing and sustainably-produced clothing (Figure 2.4).

Effects of Changes on Consumers' Choices

Every consumer's purchasing decisions are impacted by a unique set of preferences. A consumer's choices can be impacted by changes to many factors, including income and the prices of goods (Mankiw, 2004). A positive change in income shifts the budget constraint outwards, allowing a consumer to access higher indifference curves that are more desirable to the consumer because they can now increase their level of consumption (Mankiw, 2004). In a similar fashion, a negative change in income would shift the budget constraint inwards and offer lower indifference curves as well (Mankiw, 2004).

An increase in the price of the goods represented on a graphical representation of the consumer choice model would cause the budget constraint to move inwards and shift the indifference curves inwards with it (Mankiw, 2004). A decrease in the price of the goods would shift the budget constraint and the indifference curves outwards allowing for an increase in consumption (Mankiw, 2004).

In terms of sustainable purchasing decisions, other factors influence an individual's decision of what point on the budget constraint they decide to purchase at. Factors such as environmental education, environmental ethics, moral obligation, prosocial behaviors, and green attitude were shown to increase an individual's pro environmental behaviors (Akhtar et al., 2021; Paco et al., 2019; Suárez-Perales et al., 2021; Varela-Candamio et al., 2018). An increase in an individual's participation in pro environmental behaviors would suggest an increase in an individual's green

consumption habits because understanding the value of green products has been found to increase a consumer's willingness to pay for more sustainable products, such as sustainably-produced clothing (Moser, 2015). This change in preferences would signal a shift of a consumer's indifference curve. In the example shown, an increase in factors such as environmental education would shift a consumer's indifference curve closer to the vertical axis. This shift would cause an increase in their consumption of sustainably-produced clothing.

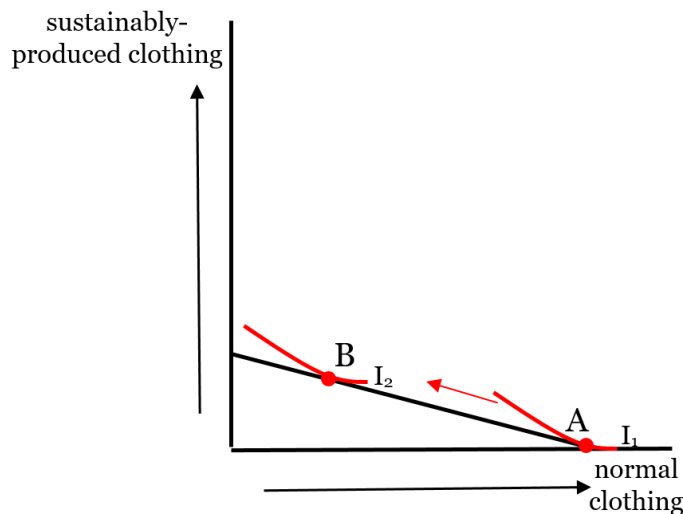


Figure 2.5: This figure shows the shift of a consumer's indifference curves as a result of environmental education (normal clothing vs. sustainably-produced clothing).

Allegheny College is providing students with a sustainable environment and exposure to a large variety of sustainable initiatives and sustainability-based educational opportunities. If students are truly being exposed and influenced by Allegheny College's institutional sustainability, then a student with an Allegheny education would shift their indifference curve toward the axis with the sustainable good. In Figure 2.5, the shift in indifference curve from I_1 to I_2 would show that individuals with an Allegheny education purchase larger quantities of sustainable clothing.

Understanding how changes in consumer preferences shift their consumption habits is important in the context of sustainable consumption. The next step is understanding what causes a shift in consumer preferences towards sustainable goods, and how these shifts can be motivated to increase levels of sustainable consumption.

Literature Review

The purpose of this research is to determine if attendance at Allegheny College is generating alumni who are sustainable citizens. Allegheny College has a wide range of sustainability initiatives and offers many environmental education classes (Sustainability, n.d.). Therefore, Allegheny College should be creating sustainable behaviors in students through attendance at the institution. This literature review section will discuss previous research on these topics and contribute to a framework for sustainable college campuses to turn students into sustainable citizens.

Consumption Decisions

The typical consumer spends very little time making consumption decisions about everyday products (Hoyer, 1984; Thøgersen et al., 2012). Purchasing environmentally friendly alternatives to regular, high-impact goods gives consumers a chance to minimize their impacts on the environment through their consumption choices (Moser, 2015). Thøgersen et al. (2012) studied consumer behavior when purchasing regular and organic milk, an environmentally friendly alternative, at two grocery stores in order to assess the decision making habits of consumers. Their findings show that consumers tend to make purchasing decisions by simplifying their options through the use of choice heuristics, such as choosing the cheapest version of the product or repeating a consumption choice they have made previously. In regards to consumers who purchased the more sustainable alternative, their research has shown that these green consumers do not take significantly longer to make decisions than a normal consumer, but instead are believed to consider different choice heuristics when making their consumption decisions, such as purchasing the most sustainable alternative present (Thøgersen et al., 2012).

A consumer's decision to engage in pro environmental behaviors that lead to sustainable consumption practices is directly and indirectly influenced by many factors, such as environmental education, environmental ethics, moral obligation, prosocial behaviors, generativity, and green attitude (Akhtar et al., 2021; Moser, 2015; Paço et al., 2019; Shiel et al., 2020; Suárez-Perales et al., 2021; Varela-Candamio et al., 2018). These factors shape a consumer's indifference curve. The importance of these factors,

especially education, on generating sustainable consumption can be further understood through the literature.

Environmental Education Leads To Environmental Behaviors

Sustainable citizens partake in environmentally friendly actions and behaviors as a result of their belief in green ideas (Bauer et al., 2020, Dobson, 2007). Research has shown that increasing environmental education can increase an individual's tendency to engage in environmentally friendly behaviors (Prieto-Sandoval et al., 2022; Varela-Candamio et al., 2018; Zsóka et al., 2013).

Varela-Candamio et al. (2018) administered a questionnaire in a metropolitan area of Spain that sought to identify the relationship between pro environmental behaviors and factors that are thought to drive pro environmental behavior. The results of this study found that environmental education and intrapersonal factors were the main drivers of pro environmental behaviors (Varela-Candamio et al., 2018).

Suárez-Perales et al. (2021) studied a sample of 222 business administration students to analyze the link between environmental education and pro environmental knowledge. While this study found no direct link between these concepts, it showed an indirect relationship where environmental education increases environmental concern, and environmental concern increases participation in pro environmental behaviors (Suárez-Perales et al., 2021).

The link between environmental education and participation in pro environmental behaviors is vital to the debate of sustainable consumption preferences because participating in pro environmental behaviors can indicate that an individual will partake in sustainable consumption habits (Moser, 2015). This can be attributed to the understanding that increasing a consumer's understanding of the value of a sustainable product will increase their willingness to pay for the sustainable product, making them more likely to purchase the sustainable version of a product over the normal version (Moser, 2015).

Environmental education has also been directly linked to increased awareness and participation in sustainable consumption through multiple studies (Prieto-Sandoval et al., 2022; Zsóka et al., 2013). Zsóka et al. (2013) surveyed cohorts of high school and college age students in Hungary in order to determine the strength of the relationship

between environmental education and environmental knowledge and attitudes, as well as the strength of the relationship between environmental education and actual participation in environmentally friendly actions in students. This research found a strong correlation between the amount of environmental education and knowledge as well as finding that incorporating education on consumerism into environmental education, increases awareness in individuals of the need for lifestyle changes to minimize the impact of consumption (Zsóka et al., 2013). Prieto-Sandoval et al. (2022) sought to understand the impacts of non-required college courses on sustainability and the circular economy on the environmental motivations and behaviors of students. Researchers found that these courses increased student's proclivity for sustainable consumption (Prieto-Sandoval et al., 2022).

The Attitude-Behavior Gap In Sustainable Consumption

Despite the evidence linking education and sustainable behavior, there is often a disconnect between what consumers value and their consumption choices. The attitude-behavior gap is used to explain the gap between a consumer's positive attitude toward sustainable goods and their actual consumption preferences (Park & Lin, 2020; Weiderhold & Martinez, 2018; Goodarzi et al., 2021). Essentially, their positive attitude towards sustainable goods is not always reflected in their consumption decisions (Park & Lin, 2020). While consumer attitudes can often be used to predict normal consumption behaviors, they are not reliable for predicting green consumption behavior (Park & Lin, 2020). Explaining the cause of the attitude-behavior gap is difficult due to the many barriers consumers face while trying to engage in sustainable consumption, but many causes have been identified through studies of green consumption habits.

Despite the extensive research on the attitude-behavior gap in green consumers, researchers have struggled to conclusively determine what is causing this gap. Consumers face many barriers to engaging in sustainable consumption practices, so despite having a positive attitude towards sustainable goods, these attitudes are not expressed through their actual consumption habits (Park & Lin, 2020; Weiderhold & Martinez, 2018). Barriers such as higher prices, decreased product availability, lack of education and information, and lack of transparency have been shown to drive the attitude-behavior gap in sustainable consumers (Park & Lin, 2020; Weiderhold &

Martinez, 2018; Goodarzi et al., 2021). Park and & Lin (2020) also highlight that consumers express that concerns about the quality, practicality, and functionality of sustainable alternatives alter their consumption behaviors. Pinpointing the specific cause of the attitude-behavior gap is difficult, leading researchers to propose many solutions for shrinking the gap and lowering the barriers for consumers to engage in sustainable behaviors.

Without determining the cause of the gap, targeted solutions for closing the attitude-behavior gap are difficult to generate. However, certain factors have been identified as drivers of green consumption behaviors and shrink the attitude-behavior gap. Increased levels of income are shown to increase sustainable consumption behaviors in consumers with a positive attitude towards sustainability (Park & Lin, 2020). This is not surprising, but increasing income levels for all consumers is not an attainable solution for increasing sustainable consumption habits. For certain goods, such as second-hand or sustainably-produced clothing, products with a high utilitarian value, or high levels of functionality and practicality, are more appealing to consumers looking to make sustainable purchasing choices (Park & Lin, 2020). Businesses and marketing teams can also diminish the barriers between consumer attitudes and consumer habits. Weiderhold and Martinez (2018) present three solutions for green clothing companies to lower these barriers: “(a) to concentrate on specific product attributes; (b) to adopt an efficient digital communication strategy; and (c) to make a greater effort on making green apparel attainable” (Weiderhold & Martinez, 2018, p. 419). Finally, a study on consumers’ adoption of environmental technology found that unbiased information from a third party source fueled the adoption of sustainable behaviors, while generic information or information from commercial channels could influence sustainable attitudes, but did not affect behaviors (Goodarzi et al., 2021).

Conclusion

Understanding the impacts of environmental education on sustainable attitudes and behaviors is difficult due to the abundance of factors that create barriers for consumers to adopt sustainable behaviors. The persistence of the attitude-behavior gap

in green consumption proves that there is often a disconnect between consumer attitudes and behaviors (Park & Lin, 2020; Weiderhold & Martinez, 2018; Goodarzi et al., 2021). However, researchers have found direct links between increased levels of environmental education and sustainable behaviors, indicating that the relationship exists (Prieto-Sandoval et al., 2022; Varela-Candamio et al., 2018; Zsóka et al., 2013). This relationship may be weakened by the factors that drive the attitude-behavior gap, such as the increased price, lack of access, and decreased utilitarian value of sustainable product alternatives (Park & Lin, 2020; Weiderhold & Martinez, 2018).

Understanding the role that education can play in developing sustainable behaviors is crucial to begin to understand the role that colleges and universities play in developing sustainable citizens. Creating sustainable consumers is a vital step to creating sustainable citizens as a whole, and therefore we must understand if and how environmental education and sustainability initiatives at colleges drive environmentally-friendly consumption behaviors in students who attend these schools. Determining the effectiveness of current efforts at colleges and universities to create sustainable citizens can reveal what is successful and what needs to be altered to generate more impact on students.

Due to the many environmental science classes offered and the large number of sustainability efforts and initiatives, Allegheny College is an ideal subject for this type of research. By surveying recent alumni on sustainability behaviors before and after attending Allegheny College, the results indicate that Allegheny College alumni feel they have increased their personal sustainability and their likelihood to engage in sustainable behaviors after attending Allegheny College. Understanding how this shift in mindset is applied to everyday decisions and behaviors, such as purchasing habits, begins by understanding what factors are important to consumers. This research can also help sustainable colleges better tailor their curriculum and campus initiatives to develop desired sustainable behaviors in students and alumni.

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