Young People and Climate Change:

Beliefs and Behavioral Choices among High School Students

from Phoenix, AZ and Plainfield, IL

by

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ABSTRACT

As climate change becomes a greater challenge in today's society, it is critical to understand young people's perceptions of the phenomenon because they will become the next generation of decision-makers. This study examines knowledge, beliefs, and behaviors among high school students. The subjects of this study include students from high school science classes in Phoenix, Arizona, and Plainfield, Illinois. Using surveys and small group interviews to engage students in two climatically different locations, three questions were answered:

1) What do American students know and believe about climate change? How is knowledge related to beliefs?
2) What types of behaviors are students exhibiting that may affect climate change? How do beliefs relate to behavioral choices?
3) Do climate change knowledge, beliefs, and behaviors vary between geographic locations in the United States?

The results of this study begin to highlight the differences between knowledge, beliefs, and behaviors around the United States. First, results showed that students have heard of climate change but often confused aspects of the problem, and they tended to focus on causes and impacts, as opposed to solutions. Related to beliefs, students tended to believe that climate change is caused by both humans and natural trends, and would affect plant and animal species more than themselves and their families. Second, students were most likely to participate in individual behaviors such as turning off lights and electronics, and least likely to take public transportation and eat a vegetarian meal. Individual behaviors seem to be most relevant to this age group, in contrast to policy solutions. Third, students in Illinois felt they would be more likely to experience colder temperatures and more

precipitation than those in Arizona, where students were more concerned about rising temperatures.

Understanding behaviors, motivations behind beliefs and choices, and barriers to actions can support pro-environmental behavior change. Educational strategies can be employed to more effectively account for the influences on a young person's belief formation and behavior choices. Providing engagement opportunities with location-specific solutions that are more feasible for youth to participate in on their own could also support efforts for behavior change.

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Climate change is one of the most complex problems this and future generations will encounter, which is why effective communication and education strategies about the topic are critical. As the world's population grows and large developing economies become more industrialized, the temperature of the earth will rise due to the addition of greenhouse gas emissions to the atmosphere (IPCC, 2013). In the United States, for example, much of the country will experience changes to temperatures and precipitation, which can impact agriculture, ecosystems, water resources, and human health, among other things (EPA, 2013a). Yet, the localized impacts of climate change are varied and somewhat uncertain.

For example, the two regions of focus for this study are the Midwest and the Southwest portions of the U.S. The Midwest (which includes the Chicagoland area) will very likely experience hotter, more humid summers with more extreme heat waves (EPA, 2013b; Hayhoe & Wuebbles, 2008). Heavier snowfall and greater flooding potential are also possible for the winter and spring (Hayhoe & Wuebbles, 2008). In the Southwest (including the Phoenix metropolitan area), temperatures will get even hotter, and the area may experience reduced precipitation and worsening drought conditions, impacting the already scarce water supply (Ellis, Hawkins, Balling, & Gober, 2007; EPA, 2013c). If society continues to function as it is, and people act according to the status quo without changing their behaviors to mitigate or adapt to the effects to our changing environment, climate change impacts will continue to be seen well into the future. Doing so will require a change in people's behaviors and mentalities.

According to many studies, people around the world believe that climate change is happening, and many are even convinced that human actions are the main cause (Leiserowitz, 2007; Maibach, Roser-Renouf, & Leiserowitz, 2009; Whitmarsh, 2011). However, less information is available about what young people believe about

climate change, and how their behaviors might be, or have already been, influenced by their knowledge and beliefs, among other factors. This is an important area for sustainability professionals, environmental educators, and decision-makers because teenagers today will be the active citizens who will impact the future. Moreover, research has shown that the beliefs and behaviors of children—as the next generation of leaders and decision makers—are more malleable compared to adults, and their worldviews will become more difficult to change as they get older (Bandura, 2006; Frisk & Larson, 2011; Manoli, Johnson, & Dunlap, 2007; Weber & Stern, 2011).

In this research, I ask the questions: *1) what do American high school students know and believe about the causes, impacts, and potential solutions of climate change, and are knowledge and beliefs related?,* and *2) what types of behaviors are American high school students undertaking in their lives that affect or respond to climate change, and are behavioral choices related to beliefs?* The findings can provide valuable insight into teenage awareness of climate change, and their behavioral engagement with the topic. Based on the findings, I provide suggestions for teenage communication and education that would better equip young people to change their energy-intensive behavior, and engage in more meaningful environmental decision-making and citizen leadership in the future.

Additionally, studies conducted around the world have shown that people in different regions of the world have differing opinions about climate change causes and impacts (Leiserowitz, 2007; Lorenzoni, Leiserowitz, De Franca Doria, Poortinga, & Pidgeon, 2006). For example, people in the US tend to be aware of climate change, but often believe it is a spatially and temporally distant threat (Leiserowitz, 2005). A number of reasons explain differing opinions about climate change—for instance, political beliefs and worldviews (Hulme, 2009; Smith & Leiserowitz, 2012;

Weber, 2010), religious/spiritual beliefs (Hulme, 2009), and socio-economic status (Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011). Another consideration found to influence beliefs about climate change is personal experience with changing weather and climates. In some cases, people tend to associate their personal experiences with local weather changes and their overall beliefs about the causes and impacts of climate change (Akerlof, Maibach, Fitzgerald, Cedeno, & Neuman, 2013; Howe, Markowitz, Lee, Ko, & Leiserowitz, 2012). To date, however, no research (that I have found) specifically addresses how personal or localized experiences impact teenagers' climate change beliefs. Therefore, this study specifically compares teenagers' understanding of and actions concerning climate change in the Phoenix, AZ area (specifically the Ahwatukee neighborhood near South Mountain) with those in the Chicago, IL area (specifically, the Village of Plainfield). This cross-country comparison will shed light on if and how different climatic experiences affect young people's beliefs and behaviors related to climate change. Using data collected from surveys and small group interviews, this research answers a third question: *3) how do climate change knowledge, beliefs, and behaviors differ between students in two different geographic locations in the United States?*

To collect data for this research, I used a mixed research method. A survey questionnaire was used to uncover information about students' knowledge, beliefs and behaviors. Small group interviews were then conducted to allow students to explain any links between their beliefs and personal experiences, and expand upon how they make decisions about their actions and activities. The survey responses were quantitatively analyzed to understand these high school students' knowledge about topic, what they believe about the causes and impacts of climate change, and how they behave. By aggregating various questions into new scales that represent knowledge and beliefs about the impacts of climate change, I was able to uncover

correlations between knowledge, beliefs, and behaviors, and compare the study locations. The three open ended questions and the small group discussion transcripts were qualitatively analyzed to provide additional thematic information about influences on students' beliefs and behavior choices.

In the following chapters, I will address a body of literature to help define the constructs within which this research is situated, and acknowledge the current levels of awareness and beliefs about climate change in young people uncovered in other research endeavors. Research about environmental behaviors and decision-making will also be presented, to lay the groundwork for ideas about behavior change and a discussion about current sustainability education practices. Following this review of currently available research, I will discuss the methodology used in conducting my study, the locations chosen, survey and small group discussion development, student participant recruitment, and analysis techniques. Additional chapters will include the quantitative and qualitative findings and analysis, as well as a discussion of what those findings represent, and how they inform research about young people's perceptions and behavior choices about climate change.

LITERATURE REVIEW

Defining Environmental Knowledge, Perceptions, and Behaviors

Climate change is a complex issue that is not well understood among the public. To better interpret relationships between young people's awareness and behavioral choices regarding the topic, this research employs the cognitive and conative dimensions of a three-part framework of environmental attitudes. The tripartite theoretical approach, as explained by Dunlap and Jones (2002), and further refined and used in practice by Larson, Ibes, and White (2011), consists of cognitive, conative, and affective judgments, which conceptualize the cognitive, behavioral, and emotional aspects of environmental attitudes, respectively. Cognitive aspects of attitudes address objective knowledge (information known to be true) and subjective perceptions (beliefs based on subjective values); conative attitudes are those based on behavioral choices, typically defined using people's intent to behave, or willingness to act, rather than explicit, or actual, behaviors (Dunlap & Jones, 2002).

The literature regarding cognitive awareness about climate change shows that due to misinformation and previously held beliefs and mental models, people frequently do not have in depth knowledge about the causes, impacts, and viable solutions (Weber & Stern, 2011; Wolf & Moser, 2011). Young people in particular frequently show confusion when it comes to defining and understanding the key components of climate change (Leiserowitz, Smith, & Marlon, 2011; Mower, 2012). Whether or not a person understands the nature of climate change may contribute to whether or not they think it is happening, and if they believe climate change is a natural or a human-induced challenge (Feldman, Nisbet, Leiserowitz, & Maibach, 2010; Leiserowitz et al., 2011; Strife, 2012). Various factors can influence a person's objective knowledge and subjective perceptions about climate change. Youth are

especially impressionable; studies have found that there are a number of influences on young people's awareness and beliefs – what they learn in school, family values, media sources, personal experiences, and demographic characteristics of their community or social surroundings (Barraza & Cuaron, 2004; Howe et al., 2012; Leiserowitz, Kates, & Parris, 2005; Mead et al., 2012).

Perceptions about the causes and impacts of climate change may also contribute to a person's conative attitudes and behavioral decisions regarding the environment. A review of the literature indicates that whether or not a person believes they are part of the cause, and thinks climate change will impact them personally, can determine if they take action to combat its impacts (Hinchliffe, 1996; Schultz & Zelezny, 1998; Whitmarsh, O'Neill, & Lorenzoni, 2013). Framing and communication are also critical considerations for behavior decisions. Research has found that young people respond better to solution orientations rather than problem-based explanations, as it can feel more empowering (Mower, 2012; Ojala, 2013; Strife, 2012; Wibeck, 2013). Value orientations and attitudes (environmental or not) can also influence behavior. Beliefs about who (self or others) or what (the environment) benefits from a particular action can influence whether a person chooses to behave a certain way (Kollmuss & Agyeman, 2002; Stern & Dietz, 1994). Behavior choices can also be affected by feelings of efficacy, pro-environmental attitudes, as well as non-environmental factors (Bandura, 2006; Fishbein & Ajzen, 2005; Kollmuss & Agyeman, 2002; Stern, 2000).

When educating for sustainability and behavior change, a combination of pedagogical styles are the key to successful student learning. Frisk and Larson (2011) outline four knowledge domains that can be used in education – declarative (factual) knowledge, procedural (how-to) knowledge, effectiveness (behavioral impact) knowledge, and social (societal norms) knowledge. They suggest combining

the four styles of knowledge for a more comprehensive and successful attempt to educate for sustainability and encourage environmental behaviors. Students have been found to respond better to more engaging educational techniques, and are often more likely to remember environmental concepts and actions after experiencing a more interactive educational style (Barraza & Cuaron, 2004; Redman, 2013).

Climate Change Awareness and Knowledge

To-date, research on knowledge about climate change in young people indicates that they have heard of climate change (or global warming), but often do not have an in-depth understanding of what it is, what causes it, and what the impacts are (Barraza & Cuaron, 2004; Leiserowitz et al., 2011; Mower, 2012). Young people often confuse distinct environmental processes (such as global warming versus ozone depletion), and frequently associate causes and impacts incorrectly (Mower, 2012). Weather and climate are also often confused; people tend to think that they are the interchangeable concepts, when in reality, personal experiences with weather do not mean that one has experienced climate change (Akerlof et al., 2013; Weber, 2010). These findings are not limited to youth, however. Leiserowitz et al. (2011) compared teenagers to adults in their study, and found that adults also confuse climate-related terms and phenomena, but less so than young people. Adults tend to feel more informed about the topic as well (Leiserowitz et al., 2011). These differences could be due in part to age, and that adults have had more opportunity to learn about climate change concepts.

Adults may also engage with more diverse learning resources than teenagers (such as newspapers, periodicals, news programs), and therefore have access to more information. In their comparative study, Leiserowitz et al. (2011) found that

adults were much more likely to say they learned about global warming from newspapers, the radio, and television than teenagers. Teens noted that they got most of their information from school; the internet, family (in particular parents) and friends, and television were other frequent sources of knowledge gain (Barraza & Cuaron, 2004; Leiserowitz et al., 2011). Another study by Strife (2012) corroborated the finding that television has an impact on what young people learn about climate change. In her study about ecophobia, Strife's (2012) young subjects discussed learning about the environment through sources like the Discovery Channel; this influenced their belief in how the environment was being impacted by climate change and various human activities.

Perceptions and Beliefs about Climate Change

Even though youth are not as knowledgeable as adults about the details of climate dynamics, they do believe that humans are causing climate change, sometimes more so than adults (Feldman et al., 2010; Leiserowitz et al., 2011; Strife, 2012). While teenagers may believe that people cause climate change more frequently than adults do, they do not typically worry about climate change as a global problem (Feldman et al., 2010; Leiserowitz et al., 2011). Weber (2010) and Whitmarsh (2011) note that the "finite pool of worry" hypothesis could be one possible reason why adults may not worry about climate change as much as other topics. Issues like terrorism or the economy may seem more relevant and time sensitive, and therefore could be a higher priority issue upon which to act than environmental issues such as climate change (Leiserowitz, 2007; Weber, 2010). Perhaps this theory could also relate to children – they have many other things to think about, usually more personal issues such as school and grades, activities, friends, and family, and as climate change is often referred to in complex, global

terms, it may not register as something about which to be concerned (Kollmuss & Agyeman, 2002; Leiserowitz et al., 2011). When college age students (18-22 year olds) do worry about climate change, they are more likely to understand and believe that it is a local and immediate threat than their slightly older (23-34 year old) peers (Feldman et al., 2010). The IPCC released its third assessment report in 2001, and won the Nobel Peace Prize (along with Al Gore) in 2007, so there was a lot more media exposure about climate change during that time. The increased exposure to the scientific achievements about this topic could have had an influence on this age group's interest, engagement, and concern with climate change (Feldman et al., 2010).

Teenagers, who are the focus of this study, are affected by the assorted social influences around them. Their belief systems are often shaped by the norms to which they are exposed. Studies have shown that schools and teachers, parents, and the media are not only important sources of information, but they are also critical to shaping climate change beliefs among young people (Barraza & Cuaron, 2004; Leiserowitz et al., 2011; Mead et al., 2012; Strife, 2012). What and how students are taught in school (i.e., in terms of curriculum content and pedagogical approaches) can have a significant impact on what they learn and how well they retain and interpret the information (Barraza & Cuaron, 2004; Frisk & Larson, 2011; Redman, 2013). School is also a critical location for learning and personal belief development because of the constant exposure to a student's peer group. At school, children are surrounded by others kids their age, developing opinions and habits together. For example, health habits are often initially influenced by parents at home, but are reinforced by what students see others doing outside of the familial context, most frequently in a school setting (Bandura, 2006). This constant

interaction and behavior reinforcement can be a significant influence on how children form their own belief structures and habits.

Mead et al.'s study (2012) focused on parental influences on climate change, and found that parents with responsive attitudes about the topic tended to have children that exhibit similar environmental attitudes. They also found that parents who were more educated about climate change tended to talk more about it with their children, which also influenced young peoples' opinions (Mead et al., 2012). The authors posit that this could be due to theories such as family socialization (Tinsley, 1992) and observation learning (Bandura, 1986), both of which indicate that parents raise their children to hold similar belief structures as their own (as cited in Mead et al., 2012, p. 45). The younger generation are also more technologically engaged, which means electronic forms of media, such as social media and the internet, are increasingly becoming more prevalent influences on opinions and perceptions. Teenagers are more likely than adults to go to the Internet to find out more about climate change if they felt they needed more information (Leiserowitz et al., 2011). This shows a reliance on digital and online media, which is a characteristic of the technologically savvy millennial generation**.**

Personal experiences can also influence opinions about climate change, often related to one's exposure to local weather patterns. For example, Howe et al. (2012) found that people who had experienced a warmer than average summer or a relatively dry season prior to taking the climate change survey were more likely to believe that the temperature of the earth was rising than those who did not have the same experiences. The recentness of an experience, such as experiencing warming temperatures over the past 6-12 months, is also a factor in whether or not a person believes in climate change (Howe et al., 2012; Wolf & Moser, 2011). Sometimes, as a result of local personal experience with warming temperatures or changes in

precipitation, people will even go as far as to believe they personally have experienced global warming (Akerlof et al., 2013). While this may or may not actually be true, it is important to note that whether or not a person *believes* he or she has experienced climate change has a significant influence on whether they think climate change is really happening. This finding could impact the way climate change communications are framed to various audiences.

Population characteristics and demographics may also influence how people perceive climate change. Socio-economic resources and adaptive capacity can impact a country or community's ability to invest in infrastructure or technology to mitigate the risks of climate change. At a global level, people in developed and developing countries have different understandings and beliefs about climate change impacts and effects. Developing countries tend to have different priorities (such as economic development) and therefore sustainability and climate change concerns may not be as salient to them (Leiserowitz, Kates, & Parris, 2006). However, other studies show that developing countries are more concerned about environmental issues, perhaps as a result of realizing that issues like climate change are a greater threat than for those in developed countries (Leiserowitz et al., 2005; Leiserowitz, 2007). Political worldviews can also have an impact on climate change perceptions. In the United States, causes of climate change have become a very partisan debate, with the two prominent political parties (Republican and Democrat) falling on opposite sides of the natural vs. anthropogenic spectrum (Hulme, 2009; Maibach et al., 2009; Smith & Leiserowitz, 2012). Political influences have generally been studied in adult contexts, but may also be relevant to young people's beliefs about climate change, especially high school age students, who are getting to be of voting age and may be paying more attention to it.

Behavioral Decisions Linked to Climate Change

Individual and household environmental behaviors, such as those that affect greenhouse gas emissions, have a significant impact on carbon dioxide accumulation in the atmosphere. Sometimes, however, it is argued that individual behaviors are less important to study than broader, collective actions because their impact on GHG reductions is small (Hinchliffe, 1996; Weber & Stern, 2011). Collective policy-related actions are important, but their broad and global implications may not resonate with teenagers, who may feel that they cannot contribute to the bigger solution. Individual and household behaviors, such as energy and water conservation measures or alternative transportation choices, can make climate change a more personal and manageable concept to consider which can improve youth engagement with climate change (Mower, 2012). Behaviors like turning off lights and water and riding a bike rather than driving are choices a young person can individually make, which can increase feelings of self-efficacy and make them feel empowered to make a difference (Mead et al., 2012; Mower, 2012).

Self-efficacy, a person's perceived ability to perform an action or contribute to a particular outcome, is critical for teenagers to develop in their formative years. Feelings of self-efficacy can often predict teenagers' motivation for future behavior choices, effort, and personal reactions to a situation (Zimmerman, 2000). The perception that one can control the outcome of a given situation can give way to better educational and behavioral choices, as well as influence more positive habits (Bandura, 2006; Zimmerman, 2000). Habit formation can be a helpful way to encourage pro-environmental behaviors, in particular for individual and household contexts where familial and social pressure is present. Good habits are easier to develop and bad habits are easier to prevent in teenagers, but it is more difficult to change behaviors once they are well established as a habit or norm (Bandura, 2006).

Establishing pro-environmental habits at an early ago can be beneficial to maintaining those behaviors over the course of person's lifetime.

Many researchers and educators believe that more knowledge about a topic means more appropriate behavior choices; this, however, is not always the case. Cultural values can influence behavior, which are often learned through family and society. Stern & Dietz (1994) and Kollmuss & Agyeman (2002) studied three value orientations that may influence environmental behavior – egoistic (whether a behavior will benefit them personally), social-altruistic (whether it benefits others), or biospheric (whether it benefits the environment). Stern & Dietz (1994) also discuss how having a biospheric-altruistic value orientation indicates concern for how the environment is impacting and being impacted by humans, and could lead to more pro-environmental behaviors. Conversely, having an egoistic value orientation leads one to believe humans are not impacting the environment, and therefore could cause more negative (or at least neutral) environmental behaviors (Stern & Dietz, 1994). These value-orientations are often ingrained through traditions and belief systems learned through social contexts (family and social communities), and can be more difficult to shift due to these personal influences (Kollmuss & Agyeman, 2002; Redman, 2013).

These authors, and others, also recognize that more than just environmental values influence a person to act one way or another. Research has found that the direct relationship between attitudes (towards any subject) and behavior is weak, due to the emotion tied to attitudes, and their tendency to shift throughout a person's life (Fishbein & Ajzen, 2005; Heberlein, 2012; Kollmuss & Agyeman, 2002). If a person shows stronger emotion towards a particular object or behavior, they may form an intention to act, and the likelihood of them performing a certain action increases. However, attitudes and beliefs that influence environmental actions may

not necessarily be environmental in nature. Institutional, economic, infrastructural, and emotional factors may also influence how a person behaves (Fishbein & Ajzen, 2005; Kollmuss & Agyeman, 2002; Stern, 2000). For example, lack of access to public transportation may require that a person use a personal vehicle, or vice versa. Depending on the proposed or desired behavior, sometimes people may act in a pro-environmental way for reasons other than environmental concerns.

Many barriers to engaging with and changing behaviors for climate change exist and must be considered when communicating and educating about it. Having a limited awareness of one's personal contribution to the phenomenon, and therefore not taking personal responsibility for the causes or impacts, can create inaction with regards to climate change (Whitmarsh et al., 2013; Wolf & Moser, 2011). Many people also still believe scientists do not agree about the causes of climate change, and cite uncertainty about the science as a reason they choose not to take action (Capstick & Pidgeon, 2013; Whitmarsh et al., 2013). As previously discussed, climate change is often portrayed as a distant global issue that many people do not believe has local relevance, so people do not think their behaviors will make a difference (Hinchliffe, 1996; Whitmarsh et al., 2013; Wibeck, 2013). Many communication strategies have employed (and overused) fear-inducing imagery to bring climate change to the public's attention; this can create feelings of helplessness which reduce pro-environmental behavior (Horst, 2014; Strife, 2012; Wibeck, 2013). These barriers often make it difficult for adults, let alone teenagers, to understand climate change and act in pro-environmental ways. Removing the barriers, and providing solutions in the form of structural (i.e. situation-based regulations to support an action), technological (i.e. energy-efficient technology to intrinsically support behavior), or cognitive (i.e. informational reminders about positive behavior choices) "fixes," can help people make more effective decisions (Heberlein, 2012).

Educating for Sustainability and Behavior Change

Technological, cultural, and social developments are forcing educational systems to change, and students within the institution must learn to adapt with it. Today's youth have been brought up in an increasingly connected global society, with knowledge and information accessible at their fingertips through the Internet. With the ability to learn anywhere and at any time, children, and teenagers in particular, are being increasingly tasked with self-regulating and managing their education (Bandura, 2006). While schools still play an important role in education, the way students learn is changing, and needs to be considered when developing programs, especially ones related to behavior formation and change. Purely informational strategies are not sufficient; behavior prevention or encouragement programs must also include social skills, social support, and self-efficacy towards the topic (Bandura, 2006).

Hungerford & Volk (1990) emphasize the non-linearity of environmental education, especially when the goal of environmental education is to enact some type of behavior change. They note characteristics that people must have to support responsible citizenship and behavior; these include awareness of the issue, knowledge of what to do in a situation, skills to perform an action, and a desire to take environmental action (Hungerford & Volk, 1990). It is not just about information; a person must feel a sense of responsibility and ownership over the issue and the solution, and they must be empowered and think that their actions can make an environmental difference (Hungerford & Volk, 1990; Ojala, 2013). One way to encourage environmental behavior change is to focus on improving sustainability education concerning what and how youth are taught about climate change. Because of various influences, pro-environmental behaviors are often difficult to teach and change in a formal setting.

Studies have found that engaging with students using more hands-on, interactive methods may help students understand and internalize information in more productive and long-lasting ways (Barraza & Cuaron, 2004; Redman, 2013). Barraza and Cuaron (2004) found that British students who were taught using more practical, hands-on methods were more familiar with environmental terminology than Mexican students, who were engaged with textbooks and more memorization learning styles. Redman (2013) saw relative success in long-term behavior change (at least with waste behaviors) by incorporating more interactive and skills-building activities into her two-week course about food and waste behaviors. She also showed how difficult it is to change environmental behaviors even using a combination of pedagogical styles, finding that behaviors related to food choices in particular are influenced by engrained, steadfast norms. Her study indicates that subjective perceptions and cultural traditions need to be addressed when creating effective communication and education programs, especially for young people (Redman, 2013). Reinforcement is also critical to maintaining environmental behaviors over time. Students who are exposed to and involved in environmental behaviors tend to continue those choices over time (Hungerford & Volk, 1990). If students receive continued reinforcement of the positive nature of their environmental choices, they may show more substantial environmental changes over the long-term.

Conclusion

This review of the literature emphasizes that young people are an important, but not fully understood, population when considering climate change beliefs and behaviors. Schools, family, and social contexts are critical pieces of the puzzle to understanding how youth form opinions about a complex issue like climate change. Not only do these influences shape belief systems, they also play a role in young

people's behavior choices. Even though there are barriers to action, especially with pro-environmental behaviors (the subject of this study), by better understanding those barriers we can help to effectively encourage youth to make more choices that mitigate risks and assist with adaptation to environmental change.

The following study intends to build on the existing research available about the relationships between climate change knowledge, beliefs, and behavior choices. It will also provide additional insights into belief and behavior influences in teenagers across the country. By better understanding how knowledgeable teenagers are about climate change and what they believe about climate change impacts, environmental educators and communicators can develop more informed strategies to better engage this age group in the conversation about solutions. Understanding environmental behaviors and their motivations is also critical. As this young generation grows up, they will need to make decisions about climate change, and consider actions that support greenhouse gas emissions reductions. Since individual behaviors can be more personally relevant to young people, and are most often connected to feelings of self-efficacy and responsibility, they are the focus of the current study. Knowing what influences those behavioral decisions can help guide communication and education strategies.

The following section will provide background on the methods used to uncover climate change knowledge, beliefs, and behavior choices. Through quantitative and qualitative analysis of surveys and small group discussions with students in both Arizona and Illinois, data will shed light on how these students form beliefs and make behavior choices regarding climate change. The findings discussed from this study can inform future research and strategies that may be beneficial to climate-related behavior change in youth.

METHODOLOGY

Research Approach and Design

This research was conducted using a mixed-methods design, including quantitative data collected via a survey questionnaire, and qualitative data collected through small group interviews. To collect data on cognitive and conative measures of environmental attitudes, survey devices have been a popular method developed and used by numerous researchers (as described in Dunlap & Jones, 2002). Survey questionnaires are good tools when collecting data from a large number of subjects, as they are simple to distribute, easy to understand, and quick to complete (Mower, 2012). Small group interviews are often used prior to or following survey questionnaires; in this research, small group discussions were conducted following completion of the survey to provide an opportunity for explaining and elaborating on survey findings (Short, 2006). Small group discussions were chosen instead of individual interviews to facilitate the group dynamic of a conversation, and allow for students to react and discuss one another's responses (Short, 2006), providing opportunities to teenagers to think about the topics in a variety of ways they may not otherwise consider. This qualitative follow-up allows more in-depth conversations with participants to uncover the nuances of certain beliefs or behaviors (Capstick & Pidgeon, 2013; Wolf & Moser, 2011). In this research, qualitative findings from small group interviews are used to supplement quantitative findings from the survey questionnaire and to create a more holistic and complete picture of influences on teenagers' behaviors and beliefs towards climate change.

The primary purpose of the survey (see Appendix A) was to gather information about high school students' knowledge, beliefs, and behavior choices related to climate change. The same survey was administered in both study locations

so that student responses could be compared across the populations to uncover differences in responses between climatically-different locations. The survey was organized in three parts based on established questions from other researchers and newly developed ones covering:

1) *Climate Change Knowledge and Beliefs*, in which information was gathered about students objective and subjective perceptions about the topic (measuring cognitive characteristics);
2) *Environmental Behaviors*, in which information about students' behavior choices with regards to climate change was requested (measuring conative characteristics)
3) *Personal Information*, where demographic information such as age, gender, and tenure of residence in the study location was gathered, along with relevant descriptive information about the sample, such as sources of climate change knowledge, personal experiences, and extra-curricular involvement.

The questionnaire consisted of predominantly closed-ended questions, using Likert scales and True/False statements, as well as three open-ended questions, which asked students to define climate change and global warming and to note personal behaviors they think relate to climate change.

Some of the questions from the survey were based on other researchers' survey tools, while other questions were designed for this particular study. Knowledge about climate change (and global warming) was measured through seven questions, four of which were designed for the purposes of this study (question numbers 1, 2, 3, and 4). To gauge whether students thought climate change was happening, a question was designed based on Leiserowitz et al. (2011) and Feldman et al. (2010) (question 5). Questions from Leiserowitz et al. (2011) were also used to

measure objective and perceived knowledge (questions 7 and 8). Beliefs about climate change were measured through four questions, one developed for this study (question 10), and three others based on other literature. A question from Leiserowitz et al. (2011) and Feldman et al. (2010) was used to ask about the causes of climate change (question 6). Mead et al. (2012) and Feldman et al. (2010) contributed questions about who or what climate change will impact and when groups will be affected (questions 9 and 11, respectively). Behavior choices were measured by asking students about the frequency of actions (question 13), and awareness of contributions to climate change (questions 12 and 14)(Mower, 2012; Wutich & Brewis, 2012). The third section of demographic and descriptive questions consisted of questions created for this study, except one, which was adapted from Leiserowitz et al. (2011) (question 16). See Appendix A for survey questionnaire.

The small group interviews provided an opportunity to discuss influences on climate change beliefs, leading to how and why students make certain behavioral decisions. The agenda included two topics in particular:

1) *Climate Change Influences*, where students were asked to discuss what or who influences their opinions about climate change (i.e. friends, family, media, personal/weather experiences);
2) *Climate Change Behaviors*, at which time they were asked about their motivations for why (or why not) they participated in certain common or uncommon behaviors.

The behaviors discussed were those indicated as the three most common behaviors, and the three least common behaviors, from the survey question about the topic. The agendas were altered slightly based on the survey responses for the individual high schools participating. See Appendix B for the general small group interview agenda, and Appendix C for full transcripts of each of the small group interviews.

Research Questions and Hypotheses

As explained earlier, this research is focused on what high school students know and believe about climate change, and what influences behavior decisions. There are three main questions addressed by this research:

> **1)** *What do American high school students know about climate change, and what do they believe about the causes, impacts, and potential solutions? Is knowledge about climate change related to beliefs about the phenomenon?*

In this study, the cognitive aspects of attitudes focus on a person's objective knowledge as well as subjective beliefs about the causes, impacts, and solutions (in the form of behaviors) about climate change (see similar approaches by Larson, White, Gober, Harlan, & Wutich, 2009; Larson, Ibes, & White, 2011; and Larson, Wutich, White, Muñoz-erickson, & Harlan, 2011). Overall, I hypothesize that teenagers will not be very knowledgeable of the concept, and will not know the correct answers to questions about objective scientific information. However, with some knowledge comes opinions; the more a person knows about climate change, the more likely they are to hold the beliefs that climate change is impacting the global world and themselves more personally. The hypothesis for the first research question is as follows:

> ***H1)*** *There is a positive relationship between climate change knowledge and beliefs about climate change impacts.*

2) *What types of behaviors are American high school students exhibiting in their lives that may affect climate change? How do beliefs about climate change impacts relate to behavioral choices?*

This research focuses on self-reported behaviors about individual actions such as energy use, transportation, water use, and food choices from high school students. These behaviors were chosen to represent actions teenagers could partake in on their own, or within the context of their household and everyday life. Self-reported behaviors may not provide completely accurate details about the extent of climate-related actions, so survey responses can be used to indicate teenagers' intent to act. Reported behavior, therefore, is operationalized to signify conative attitudes, which are akin to behavioral intent. The goal is to understand what students do to affect climate change, to discuss their impacts on the phenomenon, and to uncover why they choose to do certain behaviors and not others. Through the survey questionnaire, data was gathered about the frequency with which a student participates in the behavior. The hypothesis for the second research question relates the cognitive to the conative findings:

(H2) *Exhibiting climate change related behaviors is positively related to knowledge about climate change and to beliefs about the impacts of climate change*.

3) *Do climate change knowledge, beliefs, and behaviors vary between students in different geographic locations in the United States (who experience different climatic conditions)?*

Students' cognitive and conative characteristics are also compared across the two geographical locations in this study. Due to the different personal weather experiences of students in each location, they may think about the impacts of climate change differently. Related to the cognitive measure of students' subjective climate change beliefs, a third hypothesis states:

> ***(H3a)*** *Students in Phoenix, AZ will show higher beliefs in the global and personal impacts of climate change than students in Plainfield, IL due to their personal experiences in a hot, dry climate, and the common perception that climate change will cause temperatures to get even warmer.*

Differing beliefs about climate change may also impact students' behaviors in different locations. For example, students in a warmer, arid climate may have more opportunity to walk or bike to school year-round, and therefore may choose that mode of transportation more frequently than students in a colder, more temperate climate. A fourth hypothesis relates to the geographical differences in conative measures of attitude:

> ***(H3b)*** *The most common behaviors that students in Phoenix, AZ exhibit will be different than the most common behaviors exhibited by students in Plainfield, IL due to different local weather conditions and opportunities available to take certain actions*.

Site Selection and Student Participants

Data collection for this research took place at the beginning of the 2014-2015 academic school year in two high schools – Desert Vista High School (DVHS) in the

suburban Ahwatukee neighborhood of Phoenix, AZ and Plainfield North High School (PNHS) in Plainfield, IL, a suburb of Chicago, IL. These locations were chosen to gather data from across the country on high school students' knowledge, beliefs, and behavioral choices as they pertain to climate change. The focus of this geographical comparison is to examine whether personal experiences with *different climatic conditions* have an impact on knowledge, beliefs, and behaviors, so two distinctly different locations (in terms of climate) were chosen to meet this criteria. Income and ethnicity were not the subjects of this research, so those characteristics were kept as similar as possible to minimize their biasing effects. Though demographics were not the central focus on this research, some factors are discussed in relation to each of the study sites.

Ahwatukee, Phoenix, AZ and Desert Vista High School. Desert Vista High School (DVHS) is located in the Ahwatukee neighborhood of Phoenix, AZ, south of South Mountain. Ahwatukee is a suburban neighborhood, located approximately 15-20 miles outside of the Phoenix central city. The Phoenix area is considered part of the Southwest region of the United States, situated in the Sonoran Desert. As shown in Table 1, Phoenix has a hot, dry climate. In the future, Phoenix will likely become hotter and drier. Regional projections from the IPCC 2007 Assessment Report (Christensen et al., 2007) are shown in Table 1 as well; however, the IPCC includes Phoenix, AZ within the broader Western North America, which includes a wide range of climate zones. According to an IPCC, the southwest is described as likely to experience hotter high temperatures during the summer months, and decreased precipitation due to changes in Pacific Ocean and anticyclone patterns (Christensen et al., 2007, p. 887–888). While the southwest is already prone to drought conditions, changes in precipitation are more uncertain than temperature

trends. However, more extreme drought conditions are possible if climate change continues to impact the region (Ellis et al., 2007; Huber & Gulledge, 2011).

Table 1

Current Climate Averages and Future Climate Change Ranges

	Avg. Max Temp (°F)	Avg. Min Temp (°F)	Avg. Temp (°F)	# Days Max ≥ 90°F	# Days Max ≤ 32°F	# Days Min ≤ 0°F	Avg. Annual Precip.
Phoenix, AZ, ***Historic*** Climate Conditions[a]	79°F	61°F	70°F	124	0	0	8″
Phoenix, AZ, ***Future*** Climate Projections[b]	Range: +4 – 10°F Median: +6°F			N/A	N/A	N/A	Range: -3% - +14%
Plainfield, IL, ***Historic*** Climate Conditions[c]	60°F	39°F	49°F	17	46	13	37″
Plainfield, IL, ***Future*** Climate Projections[b]	Range: +4 – 10°F Median: +6°F			N/A	N/A	N/A	Range: -16% - +15%

[a] Data collected from http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az6479 (Phoenix S Mtn station)
[b] Data from IPCC 2007 Assessment Report (Christensen et al., 2007, sec. 11, table 11.1)
[c] Data collected from http://mrcc.isws.illinois.edu/mw_climate/stnAlmanac.jsp# (Joliet Brandon Rd Dam, Will Co., IL station)

Desert Vista High School is part of the Tempe Union High School District (one of two Tempe Union schools located within Phoenix). DVHS opened in 1995, and today, has a student body of approximately 3,000 students, grades 9-12. About 8% of the population would be considered eligible for free/reduced lunch (Hauer, 2014). See Figure 1 for the ethnic distribution of students at DVHS.

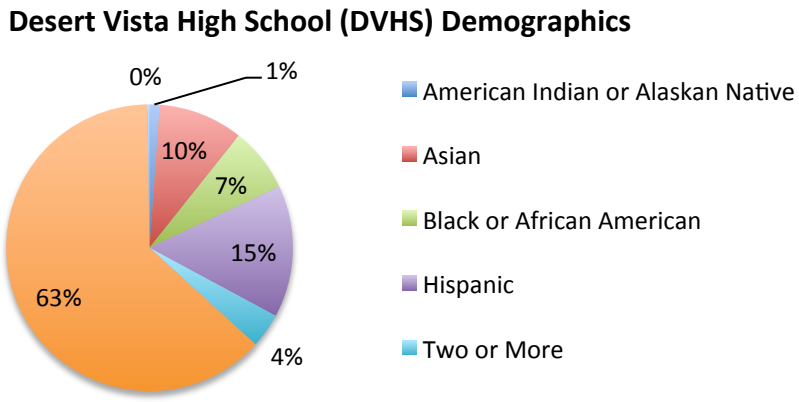

Figure 1. Desert Vista High School demographic breakdown

The Tempe Union High School District (TUHSD) has a sustainability mission and vision, which is accessible through the district's homepage: "OUR MISSION: An educated community, a sustainable future. OUR VISION: TUHSD creates and maintains learning environments that exist in productive harmony with our required resources and integrates instruction with relevant social, economic and scientific sustainability awareness concepts" (Tempe Union High School District, 2014). Through a partnership with Chevron Energy Solutions, many of the TUHSD high schools have alternative energy systems incorporated into their campus, with technologies and dashboards to bring the energy data real-time into the classrooms. The plan for these "Living Laboratories" is for teachers and students to be able to access the information about energy use and efficiency real-time, and use the data in the classroom. Desert Vista has a solar panel array installed; however, it is not being thoroughly incorporated into classrooms at this time.

DVHS does not have an environmental or sustainability statement on their public website, but there are internal efforts to promote sustainability that have been in place for the past few years. A Sustainable Schools Fellow (a program run through Arizona State University, and funded by the National Science Foundation) has been

assigned to work with DVHS for the past 4 years, to support their teachers and administration with sustainability efforts, projects, and lessons on campus and through classes. Through this program and the efforts of dedicated teachers, DVHS students have been exposed to various sustainability initiatives over the years. A recycling program is available on campus, and this year, has been emphasized more publicly to students and teachers. A number of student clubs are also engaged in activities and projects related to sustainability – the Karma Yoga Club focuses on activities related to healthy living and wellness; the Nature Club participates in sustainability-related activities on campus and engages in outdoor activities such as hiking; the Engineering and Robotics Club works on projects using solar power and other alternative energy technologies.

DVHS offers a few classes that focus on environmental topics, such as Earth Science and AP Environmental Science. These classes teach the basics of environmental systems, and address topics like climate change throughout their curriculum, often towards the end of the school year. Other classes, such as Biology, Chemistry, Biotechnology, and Engineering, address climate change and other sustainability topics at the teacher's discretion, time-permitting. A handful of teachers have worked with the DVHS Sustainable Schools fellows over the years to incorporate projects and lessons about various sustainability topics into their classrooms, but this is not always consistent across departments. Science classes are more likely to incorporate these topics; however, there are some examples of sustainability lessons in other subjects, but these are few and not well documented.

Plainfield, IL and Plainfield North High School. The Village of Plainfield, IL is located approximately 35-40 miles southwest of the City of Chicago, and is considered a suburb of Chicago. This is considered part of the Midwest region of the United States, and Chicago is located on the southern tip of Lake Michigan, part of

the Great Lakes. Table 1 provides a snapshot of historical annual averages for climate data, as provided by the Midwestern Regional Climate Center. Future projections for climate changes are represented in the IPCC Fourth Assessment Report: Climate Change 2007 (Christensen et al., 2007). The study region of Plainfield, IL is a part of the Central North America region, which is expected to experience increases or decreases in temperature and precipitation (see Table 1). Extreme weather events are not clearly a result of climate change, but evidence from climate trends and scientific findings suggests they are linked (Huber & Gulledge, 2011). In other words, more frequent extreme events are highly probable as possible effects of climate change. In the Chicagoland area specifically, more extreme heat waves (like the one in 1995 that killed over 700 people), and increased precipitation, will most likely increase, especially in the spring and summer months (Hayhoe & Wuebbles, 2008; Huber & Gulledge, 2011).

Plainfield North High School is a public high school, part of the Plainfield Community Consolidated School District 202, which includes elementary, middle, and high schools in the area. PNHS opened in 2005, and currently has approximately 2,100 students, grades 9-12. Demographically, 12% of PNHS's students are considered low income (eligible for free/reduced lunch, live in substitute care, or are from families who receive aid) (Plainfield North High School (9-12) Illinois Report Card, 2013). Figure 2 shows the ethnic breakdown of the students at PNHS.

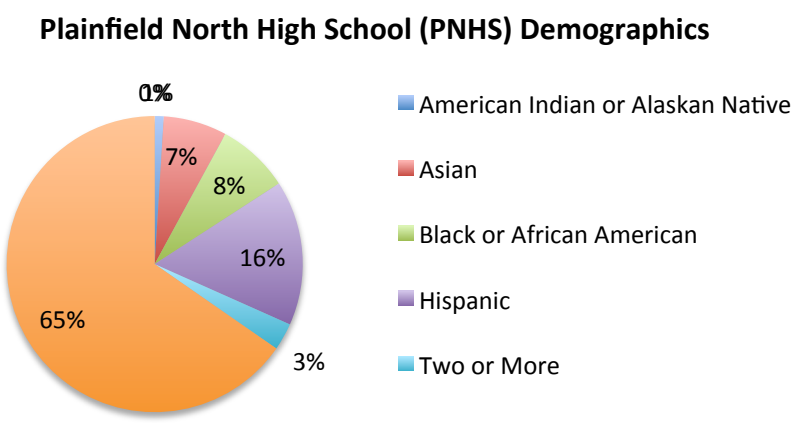

Figure 2. Plainfield North High School demographic breakdown

Plainfield Community Consolidated School District 202 does not have a sustainability mission or vision; nor does Plainfield North High School. Neither website provides public information about sustainability or environmental initiatives at the district schools. Sustainability initiatives at PNHS are typically student-driven, and often not school-wide. The vocational education students primarily drive recycling efforts at the school; teachers will place their recycling bins outside their classroom doors one time per week, and vocational education students pick them up and empty them. A student club dedicated to sustainability initiatives was active at the school a few years ago, but the teacher sponsoring the club left the school, so participation has decreased. There is renewed student interest in environmental topics, especially in Environmental Science classes, so the Environmental Science teacher will be helping students restart an environmental student club during the 2014-2015 school year.

There are classes at PNHS that focus on environmental topics, namely Environmental Science. Environmental Science is offered at the general and AP levels, and tends to have one to two sections per level per year. In these courses, the teacher covers climate change at the end of the year, due to the curriculum

organization and timing. In AP Environmental Science, the beginning of the course also covers environmental issues in general. To address this topic, the teacher assigns a project where the students must pick an environmental topic and complete a poster (or other deliverable) about it. Biology is another science class that may address climate change, dependent on available time. For example, the AP Biology teacher will assign climate change as a summer work topic for incoming students, as the curriculum does not allow for in-depth study during the year. Sustainability in general is also addressed in other classrooms, such as Foreign Languages (i.e. German, and French), as the teacher sees fit, and as it corresponds with their required curriculum.

Student participants. The sample population for this research was science classrooms at DVHS and PNHS – at DVHS, students enrolled in Earth Science (general level) and Biotechnology (1-2) classes were asked to participate; at PNHS, students in Environmental Science (general and AP levels) were asked to participate (see Table 2 for class statistics). These classes were chosen, in cooperation with the Science Department chairs of each school, with the goal to engage students who had not yet received formal education about climate change. In all subjects, however, the teachers will talk about climate change at the end of the academic year, and therefore, will be able to relate the survey to a unit later in their curriculum. Because this research was conducted at the beginning of the school year, the students did not yet have formal teaching about climate change in the classroom, and would be able to respond to the survey with their unbiased knowledge and opinions. By working with these students, this research can better ascertain basic knowledge and beliefs from a personal, informally educated point-of-view.

Table 2

Population Descriptions and Characteristics

	# of Participants	*M* Yr Born (*Avg Age*)	% Male / % Female	% Sophomore/ % Junior/ % Senior/
Total Population	132	1997 (*17*)	47% / 53%	1.5% / 50% / 48.5%
Desert Vista HS [AZ]	85	1997 (*17*)	46% / 54%	2.4% / 75.3% / 22.4%
Plainfield North HS [IL]	47	1997 (*17*)	49% / 51%	0% / 4.3% / 95.7%

As most of the students involved were minors (under 18 years old), a parental consent form was required to participate in the survey and small group interviews (see Appendix D for Institutional Review Board approval letter). The parental consent form was sent home one week prior to the survey being distributed, and was handed in when the survey was taken. There is potential selection bias associated with the parental consent forms that could not be controlled for by the research. Students whose parents who were not comfortable with the topic or students who forgot or chose not to have their parents sign the consent form were ineligible to participate in this research, and therefore selectively removed themselves from the sample population.

The population characteristics of each group of students (AZ and IL), as well as a whole, are shown in Table 2. The total population was an average age of 17 years old (based on their year of birth), relatively evenly distributed between males (47%) and females (53%), and between grade levels (mostly juniors and seniors, with a few sophomores at DVHS). The biggest difference between the two schools was the percentage of juniors vs. seniors in the classes – the PNHS Environmental Science classes were majority seniors, while the Earth Science and Biotechnology classes at DVHS were majority juniors. Table 3 describes participation rates for the

surveys and the small group interviews; more details about data collection and participation are included below.

Table 3

Student Participation Characteristics

	Desert Vista HS			Plainfield North HS		
	Invited Students Total	Actual Survey Participants (# / %)	Small Group Participants (# / %)	Invited Students Total	Actual Survey Participants (# / %)	Small Group Participants (# / %)
General Science Class[a]	97	41/42%	0/0%	38	19/50%	0/0%
Advanced Science Class[b]	61	44/72%	10/16%	41	28/68%	4/10%
Totals	**158**	**85/54%**	**10/6%**	**79**	**47/59%**	**4/5%**

[a] General science classes included Earth Science classes (at DVHS) and Environmental Science classes (at PNHS).
[b] Advanced science classes included Biotechnology 1-2 classes (at DVHS) and AP Environmental Science classes (at PNHS).

Data Collection and Procedures

Survey questionnaire distribution procedure and response characteristics.

The survey was distributed at DVHS on August 8, 2014 to five classrooms; because PNHS started school a few weeks after DVHS did, surveys were distributed on September 12, 2014. At both DVHS and PNHS, I was present to distribute the survey questionnaire (see Appendix A for survey). The process for distribution began with an introduction by the teacher and collection of parental consent forms (see Appendix D for Institutional Review Board approval letter). I had a class roster on which I marked which students submitted a parent permission form, and whether they had been given permission to participate in both the survey and the small group discussions, or just the survey. Only students with signed permission forms were allowed to complete a survey during class. At DVHS, out of five classrooms totaling 158 students, 85 completed the survey, for a response rate of

54%. At PNHS, from four classrooms totaling 79 students, 47 students completed surveys, for a 59% response rate. As a whole, 237 students were asked to participate, and 132 students completed surveys, for an overall response rate of 56% (see Table 2 for population characteristics and Table 3 for class participation rates).

When the surveys were distributed, I introduced the survey topics, explained the optional nature of the questions, the anonymity of the survey responses, and the confidentiality with which the surveys would be kept. After this brief explanation, I requested that each student taking the survey sign the assent form, which was stapled to the front of the survey. The surveys took approximately 20 minutes to complete. Students who were not completing the survey were given an alternative task to complete by the teacher. As students completed the surveys and handed them in, I signed the "Signature of Investigator" line, separated the assent form from the survey, labeled the survey with a number (starting with 001 and ascending in number), and placed the documents in two separate piles. When all students were finished with the survey, I asked each student whose parent had also given them permission to participate in the small group interviews to confirm their desire to participate, and the date and time they were available (see below for more details on the small group interview procedures).

Small group interview procedure and response characteristics. Small group interviews were scheduled a week and a half after the survey was distributed at each school, during lunch periods on Tuesday, Wednesday, and Thursday of the respective week. The small group interviews at DVHS were held on August 19 and 20, 2014, and at PNHS on September 23 and 24, 2014. Only students whose parents had signed the permission section for the small group discussions were given the option to participate. As participation was optional for the student, even if they had

parental permission, not everyone signed up for a discussion, and not everyone who signed up ended up attending.

The small group interviews at DVHS were approximately 30 minutes long, conducted during lunch periods. Fourth period lunch interviews were held in a vacant science classroom; fifth period lunch interviews were held in a small conference room in the Science Workroom. At PNHS, lunch periods are combined with study hall, so students who signed up to participate were given passes from the attendance office excusing them from their study hall as well as lunch. The small group discussions at PNHS were approximately 50 minutes long, using most of the lunch/study hall period. These discussions were held in a workroom within the Media Center at the high school. In all small group interviews, I hung up large notepads, on which I took notes using Post-It Notes during the discussion. The agenda for each focus group generally followed the same sequence, starting with the EPA definition of climate change, then moving on to influences on beliefs about climate change, and ending with a conversation about behaviors. These interviews were open, however, so if a student had additional questions or ideas about a related topic, I allowed the discussion to take that direction for a short period of time before redirecting the conversation back to the agenda. Each of these small group interviews was also audio recorded. See Appendix C for transcripts of each small group interview.

At DVHS, six small group discussions were offered, two each day (4th period lunch and 5th period lunch). Thirty-four students signed up to participate during five of the six offered lunch periods; ten students ended up attending four different small group discussions, a 29% participation rate (see Table 3). All ten of those students were from a Biotechnology 1-2 class; this reflects a selection bias in the results of the small group discussions, as this population is not representative of the school, or of the entire population that participated in the survey. Biotechnology is a more

specialized elective science class than Earth Science, so students in this class may be more interested in the topic, and therefore may be more inclined to attend a discussion about it.

At PNHS, nine small group discussions were offered, three each day (4th, 5th, and 6th period lunch/study hall). Eight students signed up to participate during three of the nine offered times; four students attended during the three periods, a 50% participation rate (see Table 3). Similar to the Arizona case, only students from AP Environmental Science signed up to participate in the small group discussions, and therefore the four students who attended were from an AP level section. Again, this creates a biased population that is not representative of the school or total research participants. Not many parents in the general level Environmental Science classes gave their child permission to participate, so there were a limited number of students who could attend the small group discussions from those classes. Students in the AP Environmental Science classes tend to be higher academic achievers than those in general Environmental Science, so there could be more interest in and desire to learn more about climate change.

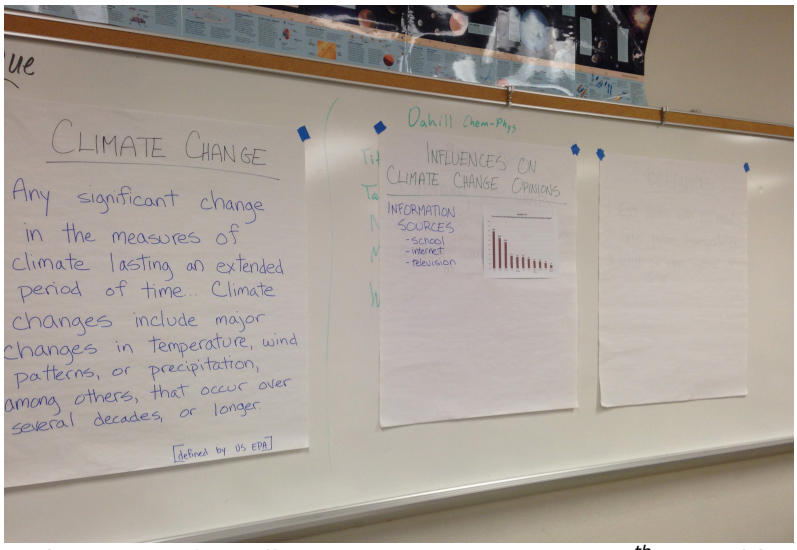

Figure 3. *Example set-up of small group interview – DVHS 4th period lunch in a vacant classroom*

Analysis Procedures

Multiple software tools were used to assist with statistical analysis and qualitative coding of the survey data and small group discussion recordings. The survey data was input and analyzed using SPSS Version 22. The small group discussion recordings were transcribed by a third party and then imported into MAX QDA for coding.

After inputting the survey results into SPSS, I ran descriptive statistics to begin to understand the central tendency and distributions for individual variables. Many questions had "don't know" responses as an option. Since "don't know" can mean many things to different students (i.e. lack of knowledge, misunderstanding of the question, a choice not to respond otherwise to the question), those responses were categorized as user-defined missing values. By categorizing them as user-defined missing values, they were not included in the analysis for certain tests (specifically related to questions 5, 6, 9, 10, 14, 19, and 20 on the survey; see Appendix A). The parts of question 7 also had "don't know" responses, but as these were knowledge based questions (True/False/Don't know response options), "don't know" responses were not defined as missing because they indicate a lack of knowledge, which was the purpose of the items.

Knowledge scale construction. After running descriptive statistics (mean, median, standard deviation, minimum, and maximum values) on the questions, I created scales to represent the study constructs of this research. To define knowledge, I created two different scales – one a qualitatively "graded" score (including questions 1, 3, 5, and 7), and the second a summative scale of correct responses (for questions 5 and 7) (see Appendix A, Table 4 and Table 5 for variable and scale statistics). Each of these scales represents a score of "correctness" to

better determine how knowledgeable students are with regards to climate change topics.

Table 4

Knowledge Questions: Descriptive Statistics

Q#	Question	Aggregate All Students	Ahwatukee, AZ	Plainfield, IL
1	To what extent have you heard of "Climate Change" before taking this survey? [KL]	75%: Know something	75%: Know something	75%: Know something
2	To what extent have you heard of "Global Warming" before taking this survey?	75% Know something	75% Know something	75% Know something
5	Do you think that climate change is happening? [KL]	Yes: 98% No: 2%	Yes: 97% No: 3%	Yes: 100% [a]
5 [correct]	Do you think that climate change is happening? [a, KN]	Correct: 81% Incorrect: 19%	Correct: 81% Incorrect: 19%	Correct: 81% Incorrect: 19%
6	What do you think is the main cause of climate change?	Humans: 25% Nature: 22% Both: 54%	Humans: 28% Nature: 23% Both: 49%	Humans: 19% Nature: 19% Both: 62%
7a	Climate and weather mean pretty much the same thing (F) [KL, KN]	Correct: 58% Incorrect: 42%	Correct: 58% Incorrect: 42%	Correct: 57% Incorrect: 43%
7b	Weather often changes from year to year (T) [KL, KN]	Correct: 80% Incorrect: 21%	Correct: 77% Incorrect: 24%	Correct: 85% Incorrect: 15%
7c	Climate often changes from year to year (F) [KL, KN]	Correct: 36% Incorrect: 64%	Correct: 31% Incorrect: 69%	Correct: 45% Incorrect: 55%
7d	The Earth is actually cooling, not warming (F) [KL, KN]	Correct: 61% Incorrect: 39%	Correct: 65% Incorrect: 35%	Correct: 55% Incorrect: 45%
7e	In the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase (T) [KL, KN]	Correct: 71% Incorrect: 29%	Correct: 75% Incorrect: 25%	Correct: 64% Incorrect: 36%
7f	Climate change will cause some places to get wetter, while others will get drier (T) [KL, KN]	Correct: 78% Incorrect: 22%	Correct: 79% Incorrect: 21%	Correct: 77% Incorrect: 23%
7g	Climate change will increase crop yields in some places, and decrease it in others (T) [KL, KN]	Correct: 62% Incorrect: 38%	Correct: 61% Incorrect: 39%	Correct: 64% Incorrect: 36%
7h	The record low temperatures and snow this winter in the Midwestern and Eastern United States prove that global warming is not happening (F) [KL, KN]	Correct: 73% Incorrect: 27%	Correct: 72% Incorrect: 28%	Correct: 75% Incorrect: 26%
7i	Climate change is happening, but will be more beneficial than harmful (F) [KL, KN]	Correct: 49% Incorrect: 52%	Correct: 46% Incorrect: 54%	Correct: 53% Incorrect: 47% [b]
8[c]	Personally, how well informed do you feel you are about… [*M*(SD)]			
8a	How the Earth's "climate system" works?	2.83 (.70)	2.87 (.70)	2.74 (.71)

8b	The different causes of climate change?	2.73 (.74)	2.67 (.75)	2.85 (.72)
8c	The different consequences of climate change?	2.52 (.82)	2.47 (.80)	2.60 (.85)
8d	Ways in which we can reduce climate change?	2.64 (.86)	2.60 (.88)	2.72 (.83)

Note. Some totals may not add up to 100% due to rounding. Percentage values shown in this table are "Valid Percentage" values, and may not include missing values, as designated in the data. Missing data was user defined for "Don't know" responses in Qs 5, 6, 9, 10, 14, 19, and 20. See Appendix A for full survey questionnaire and question response scales.

[a] "Don't know" was categorized as missing from Q5, but in Q5 [Correct], "Don't know" was categorized as "Incorrect." In IL, no students marked "No" to Q5, but some did mark "Don't know," which was categorized as "Incorrect."

[b] All 47% of the IL "Incorrect" responses for this question were "Don't know."

[c] Response scale for this question included: 1=Very well informed, 2=Fairly well informed, 3=Not very well informed, 4=Not at all informed

[KN] Variables with this note are included in the quantitative knowledge scale (see Table 5 for more details)

[KL] Variables with this note are included in the qualitative knowledge score (see Table 5 for more details)

Table 5

Scale Construction of Knowledge Variables

	Cronbach's Alpha	# Items	All students *Median* (SD)	Arizona *Median* (SD)	Illinois *Median* (SD)
Quantitative Summative Knowledge Scale [Items designated by [KN] in Table 4]	.54	10	7 (2.02)	7 (1.09)	6 (1.92)
Qualitative "Graded" Knowledge Score [Items designated by [KL] in Table 4]	N/A	12	8 (2.35)	8 (2.43)	8 (2.21)

The qualitatively "graded" score was graded using the following as an answer key: for Question 1, students received one point if they marked that they *knew something about climate change* before taking the survey, and received two points if they marked that they *knew a lot about climate change* before taking the survey; this question shows personally perceived knowledge of the topic. Question 3 was a write-in response about what climate change means to the student; students received one point for mentioning each of the following: (1) climate changes are a decrease or increase in average weather conditions (not just temperature; students needed to refer to weather, or multiple weather elements), (1) reference to a specific region/place/location to indicate they realize effects are place-based, and (1)

mention that it is a change over time, and not just a short-term phenomenon. Question 5 asked students if they think climate change is happening; as science has shown that climate change is happening across the world (IPCC, 2013), the correct answer is *yes*, and students received one point for marking that response. Finally, question 7 included nine True/False statements; students received one point for each item they answered correctly (see Table 4). The highest "grade" someone could receive on this score was 15.

To create the summative scale of knowledge, I added a variable to the data that indicated whether the respondent answered the question correctly (1=correct response, 0=incorrect response). These "correct" responses were then added together and divided by ten to create a final scale score. This scale is different from the "graded" one described above because it does not include perceived knowledge, and it does not include personal definitions and meaning, which can be difficult for teenagers to articulate. To test for the internal consistency and reliability of the scale to measure knowledge, Cronbach's Alpha was calculated and returned a value of .539. While Cronbach's Alpha of greater than .7 is typically considered reliable, this scale will be retained and used in further analyses (Pallant, 2013).

Belief scale construction. To explore the dimensions of beliefs represented by students' responses, and define the belief construct in the data, I created a correlation table of items from questions 9 and 10, and ran factor analysis in SPSS on variables that showed correlation coefficients greater than 0.4. A principal components analysis with Varimax rotation was run, and based on a review of the eigenvalues greater than one and the scree plot, two components were ultimately retained (see Appendix E for initial factor analysis results). Only variables that loaded at .5 or higher on those components were included in the final scale. Any variable

that loaded .5 or higher on multiple components was removed from the analysis (see Table 6 for belief variable statistics, Table 7 for final scales and related statistics).

Table 6

Belief Questions: Descriptive Statistics

Q#	Question	Aggregate All Students	Ahwatukee, AZ	Plainfield, IL
9[a]	How much do you think climate change will affect… [*M*(SD)]			
9a	You personally?	2.64 (.88)	2.67 (.90)	2.59 (.85)
9b	Your family?	2.59 (.93)	2.65 (.92)	2.44 (.94)
9c	People in your community?	2.88 (.74)	2.87 (.81)	2.90 (.60)
9d	People in the United States?	3.43 (.59)	3.44 (.60)	3.41 (.59)
9e	People in other industrialized developed countries (like Canada, England, and Japan)?	3.41 (.63)	3.42 (.62)	3.39 (.67)
9f	People in developing countries (like Mexico, India, and Brazil)?	3.55 (.60)	3.54 (.63)	3.56 (.55)
9g	Future generations of people?	3.79 (.52)	3.74 (.61)	3.88 (.33)
9h	Plant and animal species?	3.76 (.47)	3.68 (.52)	3.89 (.32)
10[a]	How do you think climate change will impact you locally? [*M*(SD)]			
10a	More rain and/or snow (precipitation)?	2.58 (1.07)	2.23 (1.06)	3.25 (.71)
10b	Less rain and/or snow (precipitation)?	2.62 (1.05)	2.68 (1.07)	2.49 (1.01)
10c	Hotter temperatures?	3.10 (.85)	3.25 (.82)	2.80 (.90)
10d	Colder temperatures?	2.54 (1.10)	2.28 (1.10)	3.02 (.91)
11	When do you think climate change will start to affect… (% response)			
11a	People in the United States?	34%: Now 21%: 10 yrs 21%: 25 yrs 15%: 50 yrs 6%: 100 yrs 3%: Never	36%: Now 19%: 10 yrs 21%: 25 yrs 14%: 50 yrs 6%: 100 yrs 4%: Never	32%: Now 26%: 10 yrs 19%: 25 yrs 15%: 50 yrs 6%: 100 yrs 2%: Never
11b	Other people around the world?	36%: Now 18%: 10 yrs 22%: 25 yrs 15%: 50 yrs 5%: 100 yrs 4%: Never	38%: Now 16%: 10 yrs 24%: 25 yrs 13%: 50 yrs 5%: 100 yrs 5%: Never	34%: Now 21%: 10 yrs 19%: 25 yrs 19%: 50 yrs 4%: 100 yrs 2%: Never

Note. Some totals may not add up to 100% due to rounding. Percentage values shown in this table are "Valid Percentage" values, and may not include missing values, as designated in the data. Missing data was user defined for "Don't know" responses in Qs 5, 6, 9, 10, 14, 19, and 20. See Appendix A for full survey questionnaire and question response scales.

[a] Response scale for this question included: 1=Not at all, 2=Only a little, 3=Somewhat, 4=A great deal.

Table 7

Final Factor Analysis Results: Variable Loadings for Final Scales for Beliefs about Effects and Impacts of Climate Change

Variables Q9: How much do you think climate change will affect… Q10: How do you think climate change will impact you locally…	**Global Impacts**[a]	**Personal Impacts**[b]
	1	**2**
Q9: …You personally?		**.865**
Q9: …Your family?		**.769**
Q10: …Hotter temperatures?		**.758**
Q9: …People in the United States?	**.857**	
Q9: …People in other industrialized developed countries (like Canada, England, and Japan)?	**.879**	
Q9: …People in developing countries (like Mexico, India, and Brazil)?	**.787**	
Eigenvalues	3.065	1.231
% Variance	51.1%	20.5%
Cumulative % Variance	*51.1%*	*71.6%*
Cronbach's Alpha	.84	.76
All Students: *M*(SD)	.00 (1.00)	-.04 (.99)
Arizona: *M*(SD)	.03 (1.01)	.01 (1.03)
Illinois: *M*(SD)	-.06 (.97)	-.16 (.92)

Note. Factor analysis was completed on all student responses, using Principal Components Analysis with a Varimax Rotation. These final scales are used in the subsequent analysis of beliefs.
[a] Full description of this factor would be "Beliefs about Global Impacts on People"
[b] Full description of this factor would be "Beliefs about Personally Relevant Impacts of Climate Change"

The two scales defined by the factor analysis were distinct and are labeled according to who climate change impacts will affect. The first component scale to come out of the factor analysis included variables referencing global people, from the United States, developed countries, and developing countries. Based on the wording of these items, this scale has been labeled "Belief in the global impacts of climate

change on people." The Cronbach's Alpha for this scale is .840, indicating high reliability. The second component to come out of the factor analysis showed variables that represent more personal connections to climate change: self, family, and hotter temperature effects (a commonly recognized effect of climate change). This scale is labeled "Beliefs about personally relevant impacts of climate change," and returns a Cronbach's Alpha equal to .759, showing high reliability as well.

Behavior construct analysis. After examining a correlation matrix of the items in question 13 about the frequency of environmental behaviors, most correlation values were low. This indicates that these items do not relate enough to create a scale that would represent a person's likelihood of performing environmental behaviors. Therefore, instead of creating a scale that represents sustainable behaviors, or even energy or transportation behaviors, I use the items individually in my analysis. See Table 8 for behavior variables and statistics.

Table 8

Behavior Questions: Descriptive Statistics

Q#	Question	Aggregate All Students *M*(SD)	Ahwatukee, AZ *M*(SD)	Plainfield, IL *M*(SD)
13[a]	How often have you participated in the following actions?			
13a [Rev]	Turned off the lights when they were not needed, or when you left a room	4.10 (.84)	4.06 (.92)	4.17 (.67)
13b [Rev]	Turned off electronics, like TVs and computers, when they were not being used	3.80 (.98)	3.86 (.97)	3.70 (1.00)
13c [Rev]	Unplugged electronics or turned off power strips and surge protectors when they were not being used	2.54 (1.12)	2.61 (1.18)	2.40 (1.01)
13d [Rev]	In the winter, wore warmer clothes instead of turning up the heat	3.45 (1.01)	3.42 (1.08)	3.49 (.88)
13e [Rev]	In the summer, wore cooler clothes instead of using as much air conditioning	3.16 (1.21)	3.04 (1.20)	3.38 (1.21)
13f [Rev]	Walked or biked, instead of drove	2.54 (1.05)	2.50 (1.09)	2.62 (.97)
13g [Rev]	Took public transportation	2.08 (.89)	2.17 (.97)	1.94 (.70)

13h [Rev]	Carpooled with friends to school	3.09 (1.26)	3.01 (1.25)	3.23 (1.27)
13i [Rev]	Used as little water as possible, for example, when you showered, brushed your teeth, and washed dishes	2.78 (1.02)	2.76 (.98)	2.83 (1.09)
13j [Rev]	Ate meals that had no meat (vegetarian meals)	2.06 (1.11)	2.16 (1.15)	1.89 (1.01)
14[b]	How much do you agree or disagree with the following statements?			
14a	"What I do in my everyday life affects climate change."	2.50 (.96)	2.52 (.97)	2.48 (.96)
14b	"I personally feel that I can make a difference with regard to climate change."	2.68 (1.03)	2.79 (1.01)	2.52 (1.07)

[a] Response scale for this question included: 1=Never, 2=Not very often, 3=Some of the time, 4=Most of the time, 5=All the time.
[b] Response scale for this question included: 1=Strongly agree, 2=Agree, 3=Neither agree or disagree, 4=Disagree, 5=Strongly disagree.

Qualitative coding. To analyze the open-ended questions from the survey and the small group discussions, responses and transcripts were input into MAX QDA, a qualitative analysis software program. A codebook was created based on prior research and theory to deductively analyze the data, and categorize it into themes (see Appendix F for the codebook). The coding process was flexible, however, to allow additional codes and themes to be included that were not originally created based on the relevant literature. These inductive codes came from other common and interesting comments made by students, either in their written responses to the open-ended survey questions, or from their conversations during the small group interviews. These additional insights will be explained in more detail in the findings and discussion sections.

Analysis techniques by research question. The following paragraphs describe the statistical measurements and tests used to understand how American high school students think about climate change, form beliefs about the phenomenon, engage in sustainable behaviors related to energy, transportation, water use, and diet, and how those responses are similar or different between

students in AZ and IL. Research questions 1 and 2 are broken down into parts a) and b) to differentiate between descriptive analysis procedures and inferential statistical procedures. Question 3 uses comparative statistical techniques to distinguish whether or not there are significant location differences between the students surveyed in AZ and IL.

Research question 1a) What do American high school students know about climate change, and what do they believe about the causes, impacts, and potential solutions? To understand what high school students know about climate change, descriptive statistics were analyzed to show the median scores of the qualitatively "graded" knowledge score and the summative knowledge scale. The most common responses about whether students think climate change is happening because of human activities, natural trends, both, or not at all were also examined to shed light on the most common perception of the cause of climate change. Thematic analyses of student responses about what climate change/global warming means to them also provided insight into what young people know about climate change.

Young people's beliefs about climate change were observed by analyzing the individual means for survey items about what students think will be most affected by climate change. Similarly, most common responses (determined by comparing means) about the impacts students think are most likely to happen provided additional insight into beliefs. Influences are an important consideration when thinking about young people's beliefs, so a thematic analysis of the small group interviews and most commonly discussed influences was also addressed.

Research question 1b) Is knowledge about climate change related to beliefs about the phenomenon? Using the two knowledge scores/scales (the qualitatively "graded" knowledge score and the summative knowledge scale) and the two beliefs scales (beliefs about the global impacts on people, and beliefs about

personally relevant impacts), I ran correlations to understand the relationships between the scales.

Research question 2a) What types of behaviors are American high school students exhibiting in their lives that may affect climate change? Descriptive statistics were analyzed to understand the most common behavior responses to how frequently students partake in certain environmental behaviors. In addition to that, students were asked about what behaviors they think worsen or lessen climate change. A thematic analysis of these write-in responses showed what types of behaviors students most frequently associate with climate change. Along with understanding the most common behaviors students exhibit, this research addressed why young people act the way they do. Analysis of the content of the small group interviews also provided insight into what (or who) influences particular behavior choices (specifically those behaviors that were common or uncommon among students).

Research question 2b) How do beliefs about climate change impacts relate to behavior choices? An important part of this study is to understand how beliefs are related to behavior choices. A correlation matrix was created to show relationships between beliefs about global impacts on people, beliefs about personally relevant impacts, and various environmental behaviors. This analysis outlined potential associations that exist between whether students think climate change will globally impact other people, whether it will impact themselves personally, and what types of behaviors they are more or less likely to exhibit in their everyday lives.

Research question 3) Do climate change knowledge, beliefs, and behaviors vary between students in different geographic locations in the United States (who may experience different climatic elements)? The final

question addressed by this research compares student responses from AZ and IL. The descriptive statistics, as described above for research questions 1a) and 2a), were compared to show if and how students in the two locations responded differently to various individual survey questions or scores. To study the inferential statistical comparisons, a variety of tests were used to compare locations. Due to the nature of the data, nonparametric tests were employed for this analysis. Cross-tab tables with chi-square tests for independence of the "graded" knowledge score and the summative scale were analyzed to show if there was a significant difference between students' knowledge in these locations. Mann-Whitney U tests showed if there was a difference between AZ and IL responses of the two belief scales. Analysis of cross-tab tables with chi-square test for independence also showed if there were significant differences between the behaviors that AZ students frequently chose versus IL students.

The next section outlines the results of the previously described analysis procedures. By understanding what the data is saying with regards to knowledge, beliefs, and behaviors related to climate change, this research begins to inform communication and education strategies about reducing climate change and its impacts. Following the results section, the next section discusses these findings and potential strategies more in-depth.

RESULTS

In this section, findings are presented by research question. Descriptive and inferential statistics are included, as well as the qualitative analysis from related open-ended questions and the small group discussions. A section with broader discussion about what these findings mean follows the statistical results.

Research Question 1: Students' Knowledge and Beliefs about Climate Change

Descriptive patterns for question 1a) What do American high school students know about climate change and what do they believe about the causes, impacts, and potential solutions? *Knowledge.* Overall, for the entire sample, the qualitatively "graded" knowledge score showed that students tended to get 8 out of 15 points, or a 53% on a percentage scale; on the quantitative knowledge scale students tended to do better, with an average score of 7 out of 10 points, which is equivalent to a 70% (see Table 5). The most common misconception among students was that climate changes are changes in weather patterns (forty-eight students used phrasing like this in response to "what does climate change mean to you," out of 132 surveys, 36% of responses). While this is partially correct, it does not explain the whole phenomenon, and can misrepresent the full, long-term scope of climate change. Another unexpected finding was that four students (3%) referred to climate change *only* in terms of rising temperatures. If students referenced temperatures, they often noted increasing and decreasing temperatures rather than only increasing.

Students were also asked what they thought was the main cause of climate change. The results found that 54% of all students surveyed think climate change is

caused by both human activities and natural changes, 25% think it is caused by human activities, and 22% think it is caused by natural trends (see Figure 4).

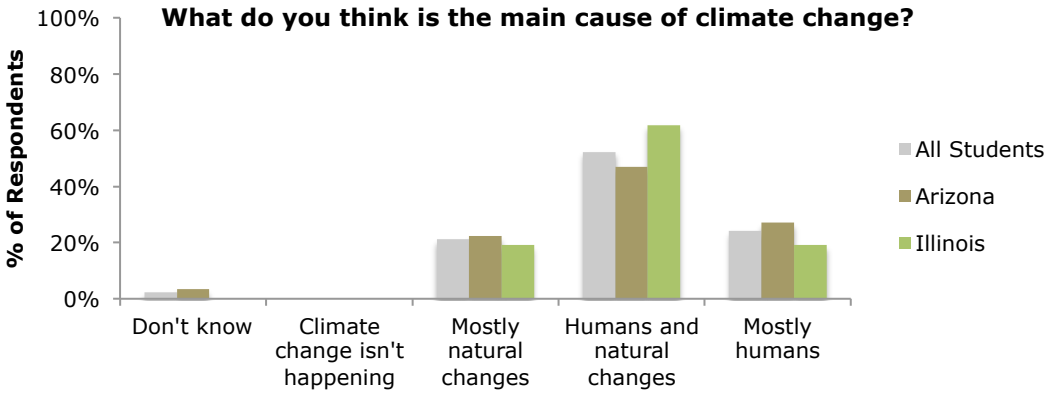

Figure 4. *Graph of responses to Question 6: What do you think is the main cause of climate change?*

When asked to write a response to the question "what does Climate Change mean to you," however, only eighteen students (14%) used language indicating they thought climate change was caused by human actions, by natural processes, or by both (see Table 9). Eleven of those students (8%) wrote that they thought human processes cause climate change (often referring to pollution as a cause), while six students (5%) noted natural cycles and trends. Only one student wrote that they thought both human and natural processes cause climate change.

Table 9

Thematic Analysis of Qualitative Coding

Themes	All Responses
Causes	Human-caused (37) (Pollution) Naturally-caused (9) Both Human and Natural (5)
Misconceptions of Climate Change	Climate = Weather (48) (Climate change is changes in weather) Rising Temps Only (5) Ozone (2) (CC caused by stronger sun rays due to ozone holes)

Influences on Beliefs and Behaviors	Parents/Family [24] (Talk about subject) (Family member reaction to behaviors) Media/Comm. Sources [19] (TV, incl. news) (Internet) (Magazines) (Movies/Videos) (Newspapers) (Media should do more) School/Teachers/Academic Sources [19] (Learned when younger) Religion [2] Friends/Peers/Social Group [1]
Value Orientations and Attitudes	Biospheric [33] (Save planet/environ.) (Impacts on animals, species, habitats) (Concern for changing environments) Egoistic [8] (CC/GW won't affect them) Altruistic [6] (How will CC impact other cities and people)
Types of Behaviors	Consumer/Household [68] (Driving and transportation choices) (Recycling/littering) (Thermostat settings) (Other household energy efficiency behaviors) Individual [29] (Riding a bike) (Recycling habits) (Clothing choices) (Conserving water) Society's Aggregate [19] (Using fossil fuels - driving) (Factory emissions) Technological Fixes [19] (Alt. fuel use) (Clean energy/solar) Policy Support [2] Environmental Citizenship/Political [1]

Behavioral Intentions	Non-Environmental Attitude (50) (Convenient/efficient) (Laziness) (Comfort) (Safety) (Meat tastes good) (Need proteins in meat) (Religion/culture) Economic (14) (Electricity is expensive) (Gas is expensive/ public transport is cheaper) (Keep electric/water bill down) Environmental Attitude (13) (Conserving resources: gas, electricity, water) (Raised to be environmentally conscious) Habit or Routine (7) (Raised to eat meat) Personal Capabilities (7) (Don't have resources – bike to ride or money for a car) Societal (3) ("That's how people get around" [re: public transportation in Europe and Oregon])
Consequences of Climate Change/Global Warming	Ice Caps Melting (32) Sea Level Rise (6)

Note. This qualitative analysis includes responses from all three open-ended questions, as well as the small group discussions.

Themes (##)	Coded responses within each parent code, and the number of times it was mentioned; number of mentions includes both the survey open response questions and the small group discussion comments.
(Subthemes)	Mentioned in reference to the coded responses as a descriptor of that particular theme; each subtheme was mentioned at least 2 times in the open response questions and the small group discussions.

Beliefs. Beliefs about climate change were measured using two questions on the survey, each with multiple items; one focused on general impacts and the others on local impacts (see Table 6). A means comparison indicated that students thought future generations and plants and animals would be most impacted by climate change, while their communities, family, and they personally would be the least affected. Industrialized countries, people in the United States, and people in developing countries fell in the middle, where students thought that they would be "somewhat" affected. In regards to local impacts, students overall thought they would be impacted most by hotter temperatures, then by less precipitation, the by more rain/snow, and least by colder temperatures. More precipitation and less precipitation were marked similarly, however, and closer in mean score to colder

temperatures, indicating students believed hotter temperatures were much more likely.

When asked to describe climate change and global warming in a written statement, forty-six students (35%) used consequences to describe the phenomenon – namely, damaging the earth and melting of ice caps. Thirty-two students (24%) mentioned melting ice caps and glaciers, six students (5%) referenced rising sea levels (all in conjunction with ice caps melting), and eight (6%) mentioned other consequences, generally on animals and habitats. That students are thinking mostly about the consequences of climate change and global warming in terms of consequences indicates they understand the broader, global impacts of it, but potentially not more local impacts, or the solutions that need to be employed to solve the problem. This will be addressed in more depth during the discussion.

Influences on beliefs are an important part of this research. During the small group interviews, students responded to discussion questions about what or who influenced their beliefs about climate change. The most common influences on beliefs seemed to be school and the media. Students mentioned school/teachers nineteen times during the small group discussions, in the context of influences on what they know and how that influenced what they think about climate change. Media sources accounted for nineteen comments during small group discussions as well. Television was the most commonly mentioned source of media influence, which included references to the Weather Channel, science channels, and the news (eleven comments). The Internet was the next most common media influence (five comments), followed by magazines and movies/documentaries (each with four comments), and newspapers (three comments).

Students connected school and media as different sources that explain different things about climate change: they mentioned that school tends to teach

them about why climate change is happening, and the media tends to show how it impacts people and the world. One student discussed how science classes share information about why climate change is happening, and then he mentioned that he learns about the consequences of it from TV or the Internet. Another student (in a different small group discussion) mentioned that different science classes talk about climate change differently, related to the subject at hand. He mentioned that he learned about how pollution happens (and about the gasses in the air) in Chemistry, and then in Biology he learned about how pollution affects the environment and ecosystems.

Personal experiences did not seem to be a significant influence of climate change beliefs with these high school students, but some students did mention specific instances. Two students (in separate interviews) mentioned that they think about emissions from vehicles while they drive. They seemed to be conscious about what was being put into the atmosphere from cars, but still tended to drive (for convenience – more on behaviors below). Related to personal experiences, personal passions also engaged students more enthusiastically in the conversations. In one small group discussion, a student who is passionate about fishing and hunting became more animated about how climate change might affect fishing locations in the future.

Family, friends, and peer groups were not noted as significant influences on these teenagers' beliefs about climate change. Some students mentioned talking about climate change with their parents at home, but not frequently, and it was often in the context of a parent's scientific job, or a recent weather event. With friends, if climate change came up in conversation, a student noted it was likely because of an event that happened or that they heard about on the news. She even went as far as to call conversations about it with her friends "teenage gossip."

Inferential analysis of question 1b) Is knowledge about climate change related to beliefs about the phenomenon? A correlation matrix showed no significant relationships between knowledge and beliefs (for all correlations, $r<.200$, $p>.05$; see Table 10), and that those relationships were positive but low. Due to the statistically insignificant findings, there seems to be no correlation between the amount of knowledge a student in this study has about climate change and their beliefs about it, which means my hypothesis (H1) was incorrect, and the null hypothesis is accepted. After removing missing values, the sample size for these tests ranged between N=86-88, and therefore was smaller than typically desired for statistical conclusions; a larger sample size would have provided more data to test, which would improve the confidence in the results (Cohen, 1992; Park, 2006).

Table 10

Non-Parametric Correlations (Spearman's Rho)

		Qual. "Graded" Know. Score	Quant. Summ. Know. Scale	Beliefs about Impacts on Others	Beliefs about Personal Impacts	Turn off the lights	Turn off elec.	Unplug elec. or turn off power strips	Wear warmer clothes	Wear cooler clothes	Walk or bike	Take public transit	Carpool	Use less water	Eat meals with no meat
Qualitative "Graded" knowledge score	Rho		.938**	.142	.109										
	Sig.		.000	.186	.311										
	N		130	88	88										
Quant Summative Knowledge Scale	Rho			.144	.144										
	Sig.			.187	.184										
	N			86	86										
Beliefs about Impacts on Others	Rho.					.113	.123	.133	-.010	.122	-.007	.044	-.091	.192	.084
	Sig.					.295	.253	.217	.925	.262	.949	.683	.403	.074	.439
	N					88	88	88	87	87	86	87	87	87	87
Beliefs about Personal Impacts	Rho					.059	.195	.176	.003	.107	.171	.188	.103	.084	.045
	Sig.					.586	.069	.101	.974	.325	.116	.082	.343	.442	.676
	N					88	88	88	87	87	86	87	87	87	87

** Correlation is significant at the 0.01 level (2-tailed).

Research Question 2: Climate Change Behaviors and the Influence of Beliefs

Descriptive patterns of question 2a) What types of behaviors are American high school students exhibiting in their lives that may affect climate change? The survey asked students about the frequency with which they participated in certain behaviors related to energy use, transportation, water use, and diet choices (see Table 8). As a reminder, the response scale for these questions ranged from 1=Never to 5=All the time. Turning off lights (M=4.10) and turning off electronics (M=3.80) were the two most common self-reported behaviors in which students participated, with means that indicated students generally performed these actions most of the time. The next two most common activities were wearing appropriate clothing for the season (warmer clothing in winter, M=3.45; cooler clothing in the summer, M=3.16); the means for these two behaviors indicated students performed these actions some of the time. The two least common behaviors for all students were taking public transportation (M=2.08) and eating vegetarian meals (M=2.06); these means indicated that students did not do these things very often.

Convenience and accessibility were critical motivators for teenagers when making decisions about behaviors. Fourteen comments from the small group discussions noted how teenagers chose to act in certain ways because it was easier, faster, or the resources were available to them. If it was not convenient to do something, people were less likely to follow through. "I think people want to help and stuff, but actually doing it is a totally different thing." This was particularly prevalent in responses about public transportation. In both Arizona and Illinois, neither Ahwatukee nor Plainfield has access to an extensive or convenient public

transportation system. Students talked about how the extent of the buses in their areas is limited, so they drive because it is easier and faster.

Family and culture were described as critical influences on eating meat. Many students talked about eating meat because that was how they were raised, or that was what Mom or Dad cooked for dinner. Eating meat is not always a behavior over which teenagers have control. One student noted that she is vegetarian for health reasons (although did not explain more about that), but her family eats meat. She noted that she grew up in the south (Tennessee), and it is difficult to eat vegetarian in her family, where barbeque is popular. "I'm from the South, so they always make barbeque. I'm like 'I can't eat that.' My dad is like 'I won't tell anyone.' I'm like 'I don't think that's how being vegetarian works.'" So while she had the desire and ability to avoid meat, she noted the difficulties and pressures she faces from her family because of their southern culture and lifestyle.

Students also noted that they eat meat because they think it is the best way for them to get protein. This was particularly important to one student athlete who participated in a discussion. "[Meat] tastes a lot better… [B]eing a football player, I need to take in so many calories so I cannot lose so much weight. That's why I can eat [meat], because it gives the most proteins, I think." Not knowing other ways to get protein could limit students' ability to reduce their meat consumption.

When students were asked to write in behaviors they think are associated with climate change, and what decisions or actions they think would lessen or worsen climate change, students most commonly thought of consumer/household level behaviors (33% of the sample). The most frequently cited responses included driving too much (21%), followed by waste management choices (e.g., littering or, on the other hand, recycling) (11%), and then other transportation decisions like carpooling and alternative transportation (10%). Similar to consumer/household

behaviors, students wrote down ideas about using fossil fuels and releasing emissions (from vehicles and factories) as actions that would worsen climate change. These types of behaviors were categorized as Aggregate Societal Behaviors, as they were referenced in broader social terms rather than at the household level. Fifteen students (11%) suggested aggregate behaviors like these in their responses. No one wrote in a response about policies or creating regulations about climate change actions.

Technological fixes were also suggested, usually in the context of things that could lessen climate change. Overall, 13 students (10%) made comments about technologies. These often referred to things like alternative fuels and clean energy solutions (for example, electric cars and solar power).

In terms of behavioral influences, parents seemed to have the most influence on how teenagers behaved. Many comments about behavior motivations from the small group discussions focused on how the way a family member (usually Mom or Dad) reacts usually influences how the student behaves. For example, one student said in our conversation: "My mom's kind of conscious of ways to sort of live more green" as a way of describing why she does things like turn off lights and turn off the water while brushing her teeth. However, that same student noted that her dad is less concerned about living sustainably, so she is not as diligent about turning off lights or electronics when she is at his house: "So, at my mom's house definitely I always turn off the computer, the radio, the TV, if we're not using it. But at Dad's, he doesn't really care. So we don't typically turn them off. Like, we'll leave to go get dinner or something and leave the TV on."

A few comments were made during the small group discussions about how some behaviors were habits. Often, these habits were formed at a young age, and therefore could be harder to break as students grew up. For example, a student

noted that because of parental influence, turning off the lights was "drilled into [their] brain." Recycling was another topic that came up during every small group discussion. Many students mentioned that they learned about recycling, and why they should recycle, at an early age, so now, it was just something they did.

Cost and saving money was also brought up in every small group discussion as a key reason why students turn off lights, electronics, and water in their house. Electric and water bills were mentioned by some students, usually because their parents were concerned about rising bills; for example, "my mom's always saying to watch the water bill, so I take short showers." While cost was coded separately from parental influence, in the context that many of these students brought up the subject, it seemed in reference to their parents' desire to save money so should also be considered part of parental influence. These students still lived with their parents, and were not paying their own electricity or water bills yet, so they were not directly responsible for the cost of electricity usage. Students brought up personal costs in the context of driving. One student noted that since she has to pay for her own gas, she tries not to drive as much. Another student also noted that a reason people may not drive is because they do not have money for a car. These reasons showed that cost in the context of transportation had more personal meaning to kids, even if cost in the household context did not.

Inferential analysis of question 2b) How do beliefs about climate change impacts relate to behavior choices? The correlations between Beliefs about Global Impacts on Other People, Beliefs about Personally Relevant Impacts, and the individual behaviors showed no significant relationships (for all correlations, $r<.200$, $p>.05$; see Table 10). These relationships were negative and positive (depending on the behavior), but all very small, ranging from -.091 to .195. Due to the statistically insignificant findings, there seems to be no correlation between

beliefs about climate change impacts and behavior choices for the students in this study, which means that my hypothesis (H2) is incorrect, and the null hypothesis is accepted. The sample sizes of these tests also ranged from N=86-88, which is considered adequate but small, and effected the confidence with which this data could be analyzed and conclusions could be made (Cohen, 1992; Park, 2006).

Research question 3: Climate Change Knowledge, Beliefs, and Behaviors in the Midwestern vs. Southwestern Study Sites

Knowledge. Comparison of knowledge questions between locations indicates that there were some differences between Arizona and Illinois, but none that were statistically significant. About 13% more students in Illinois thought that climate change is caused by both human activities and natural changes compared to students in Arizona, where 9% more students thought climate change is caused by humans (see Table 4 and Figure 4). However, the chi-square results indicated that differences in beliefs were not statistically significant (X^2(n=129)=2.11, p=0.35, Cramer's V=0.13).

The medians on the qualitative "graded" knowledge score for the two states did not differ, but Illinois students showed a lower median score on the quantitative summative scale (see Table 5). Chi-square tests for independence were conducted on both knowledge scales, which did not find statistically significant results. The results of the Chi-square test for independence on the qualitative "graded" score were X^2(n=132)=9.64, p=.56, and Cramer's V=.27. The results of the Chi-square test for independence on the quantitative summative knowledge scale were X^2(n=130)=5.90, p=.66, Cramer's V=.21. Thus, knowledge did not significantly differ between locations for students who participated in this study. However, when analyzing the qualitative data, there were some differences in the way students from

Arizona responded vs. students from Illinois. Students from Arizona were more likely to define climate change in inaccurate terms and use misconceptions in their response than students from Illinois; for example, thinking climate is equivalent to weather or that climate change is only about rising temperatures (see Table 11).

Table 11

Thematic Analysis of Qualitative Coding: Location Differences

	Location Highlights	
	Arizona	Illinois
Causes	• More students in AZ defined climate change and global warming as being naturally-caused (AZ: 6 vs. IL: 3)	
Misconceptions of Climate Change	• More students from AZ defined climate change using inaccurate terms or ideas (AZ:35 vs IL:18)	
Influences on Beliefs and Behaviors	• More comments in AZ small groups about school being an influence and learning about sustainability topics in school (AZ: 13 vs. IL: 6) • AZ students mentioned learning about sustainability topics earlier (5th, 6th, 8th grade)	• Only a student from IL mentioned religion, in 2 contexts – 1) as being an influence on the way she dresses (modesty), and 2) as a reference to religious relationships with the environment
Value Orientations and Attitudes		• Only students from IL wrote that they didn't think climate change/global warming would affect them in their lifetimes – egoistic values
Types of Behaviors	• More students in AZ made comments or wrote ideas for Behavioral Technological Fixes (AZ:16 vs. IL:3)	• Environmental Citizenship/ Political & Policy Support: Only students from IL mentioned (1 in small group, 1 in question 12 response) that people need to know more and raise awareness about the issue • More students in IL mentioned factories and industrial pollution as behaviors that worsen CC
Behavioral Intentions	• Habit/routine came up more often during conversations with AZ students than with IL students – many comments about learning it when they were young	• Students from IL mentioned electric and water bills more than students from AZ
Consequences of Climate Change/ Global Warming	• Many students in AZ defined global warming using images of ice caps melting	

Beliefs. When comparing beliefs about climate change, again, there were some differences between the means in the various locations, but Chi-Square tests for independence and Mann-Whitney U statistical tests did not reveal many statistically significant associations. Students in Illinois indicated that they were more likely than their Arizona peers to think that plants and animals and future generations would be more affected by climate change (see Figure 5). A Chi-square test subsequently revealed that only the perceived impacts on plant and animal species had a statistically significant difference between location responses (see Table 12).

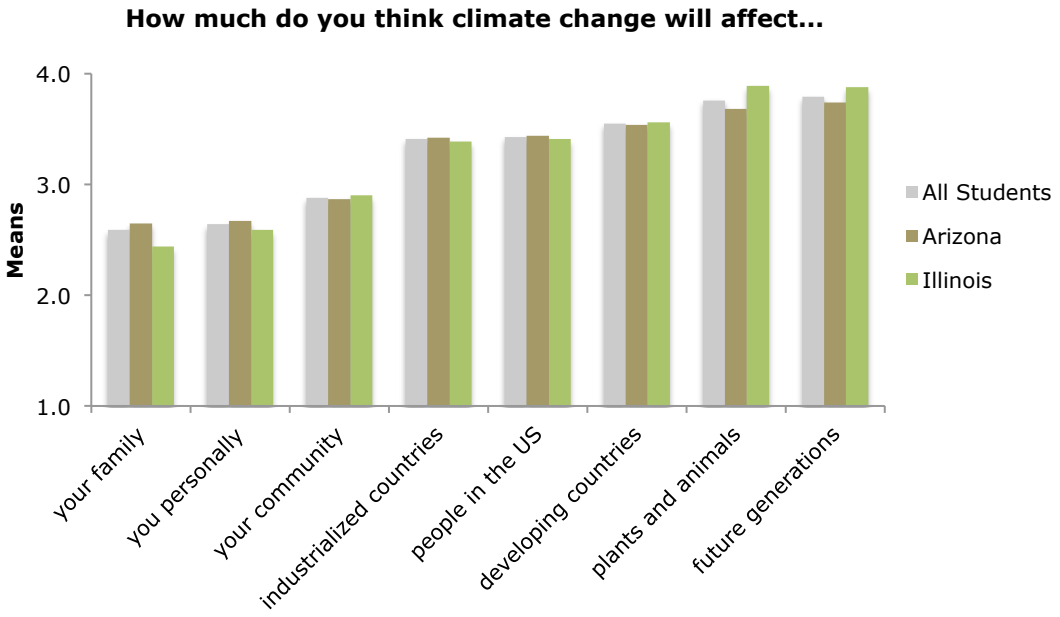

Figure 5. *Graph of responses to Question 9: How much do you think climate change will affect…?*
Note. Response scale for this question: 1=Not at all, 2=Only a little, 3=Somewhat, 4=A great deal.

Table 12

Chi-Square Test for Independence for Question 9: How much do you think Climate Change will affect…

How much do you think climate change will affect…	N Valid Cases	X^2	*p*	Cramer's V
You personally?	115	.617	.89	.07
Your family?	111	2.03	.57	.14
People in your community?	114	4.13	.25	.19
People in the United States?	118	.12	.94	.03
People in other industrialized developed countries (like Canada, England, and Japan)?	115	3.38	.34	.17
People in developing countries (like Mexico, India, and Brazil)?	110	1.49	.47	.12
Future generations of people?	111	1.95	.38	.13
Plant and animal species?	127	6.14	.05*[a]	.22

* Correlation is significant at the 0.05 level
[a] This number has been rounded from .047.

Comparisons between individual questions about local impacts showed an interesting difference between the locations (see Table 6). Students in Illinois reported that they would be "somewhat" affected by colder temperatures and more precipitation as a result of climate change (see Figure 6). By contrast, Arizona students reported they would be affected "only a little" by colder temperatures and more precipitation. The chi-square test showed that these differences were statistically significant (see Table 13).

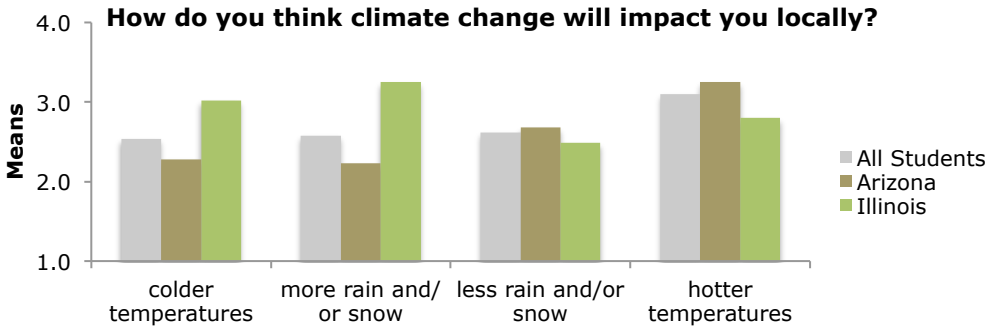

Figure 6. *Graph of responses to Question 10: How do you think climate change will impact you locally?*
Note. Response scale for this question: 1=Not at all, 2=Only a little, 3=Somewhat, 4=A great deal.

Table 13

Chi-Square Test for Independence for Question 10: How do you think climate change will impact you locally…

How do you think climate change will impact you locally…	N Valid Cases	X^2	*p*	Cramer's V
Colder temperatures?	119	13.45	.00**	.34
More rain and/or snow (precipitation)?	117	25.38	.00**	.47
Less rain and/or snow (precipitation)?	112	1.40	.71	.11
Hotter temperatures?	120	7.59	.06	.25

** Correlation is significant at the 0.01 level

To analyze whether the beliefs scales showed statistically significant differences between locations, the non-parametric Mann-Whitney U test was employed. The results of the Mann-Whitney U tests revealed no statistically significant differences between Beliefs about the Global Impacts of Climate Change on Other People and Location (U=820, z=-.32, p=.75), or between the Beliefs about Personally Relevant Impacts of Climate Change scale and location (U=770, z=-.759, p=.45). This result is counter to my original hypothesis (H3a) that students in Phoenix would have different and higher beliefs about global and personal impacts of climate change than their peers in Illinois. Instead, the findings showed that within this population, students did not have significantly different beliefs about impacts.

Behaviors. There were some small differences in the mean values of some of the behaviors between locations, such as wearing cooler clothing in the summertime and carpooling (see Table 8 and Figure 7). Interestingly, students in Illinois were more likely than students in Arizona to say they wear cooler clothing in the summertime. When asked about this during small group discussions, an Arizona student noted that "it's hard to get away from the heat and it's easier to get away from the cold... it's easy with a thin sweatshirt to get rid of it... But in the summer,

you could probably take off all your clothes and still be hot." However, the cross-tabulation tables and Chi-square tests for independence showed no statistically significant differences between locations and any of the behaviors (see Table 14). This finding indicates there were no significant differences between the actions these students in Arizona take compared to the students in Illinois, which means my original hypothesis (H3b) was incorrect.

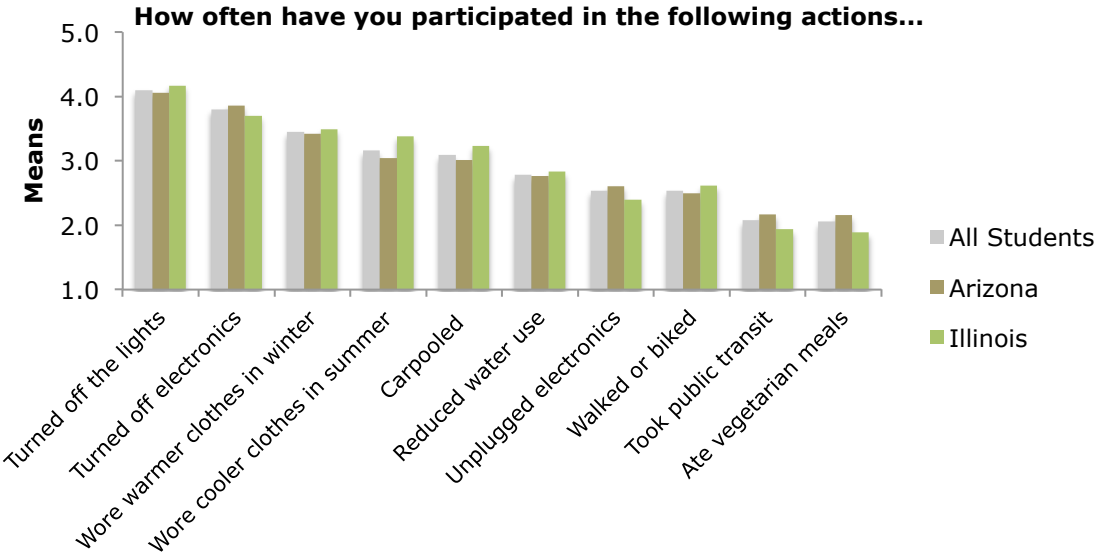

Figure 7. *Graph of responses to Question 13: How often have you participated in the following actions…?*
Note. Response scale for this question: 1=Never, 2=Not very often, 3=Some of the time, 4=Most of the time, 5=All the time.

Table 14

Chi-Square Test for Independence for Behaviors

How frequently do you participate in the following behaviors?	N Valid Cases	X^2	p	Cramer's V
Turned off the lights when they were not needed, or when you left a room	132	2.18	.70	.13
Turned off electronics, like TVs and computers, when they were not being used	132	3.54	.47	.16
Unplugged electronics or turned off power strips and surge protectors when they were not being used	132	2.56	.64	.14

In the winter, wore warmer clothes instead of turning up the heat	130	4.83	.31	.19
In the summer, wore cooler clothes instead of using as much air conditioning	130	4.61	.33	.19
Walked or biked, instead of drove	129	2.24	.69	.13
Took public transportation	130	5.09	.28	.20
Carpooled with friends to school	130	3.08	.54	.15
Used as little water as possible, for example, when you showered, brushed your teeth, and washed dishes	130	2.90	.57	.15
Ate meals that had no meat (vegetarian meals)	130	2.70	.61	.14

Conclusion

While much of these results were not statistically significant, there were some interesting findings that warrant more study. Students in this study were not very knowledgeable about climate change, but one location did not know more than the other; each location scored the same on the two knowledge scores/scales. Students tended to think that climate change would impact plants and animals more than themselves, and there was a statistically significant difference between what students in Arizona thought versus students in Illinois. When asked about local impacts, students in Illinois were (statistically) more likely to think colder temperatures and more rain or snow would impact them versus their counterparts in Arizona.

In regards to influences on beliefs about climate change, qualitative findings uncovered that these student participants frequently mentioned school (classes and teachers) and media as the most influential sources. Parents were not often

referenced as influences on beliefs, but were most commonly mentioned as the driving forces behind behavioral decisions.

Students were most likely to think of individual and household behaviors when thinking about actions that would worsen or lessen climate change; the most common behaviors were turning off lights and electronics, whereas the least common behaviors were taking public transportation and eating vegetarian diets. The following section will provide discussion about what these findings might mean, and potential future research agendas. The implications of this and future research could inform more effective youth communication and education strategies about climate change.

DISCUSSION AND CONCLUSION

Climate change perceptions and behaviors are important to study, especially in the context of younger generations. Young people will grow up to be the policy and decision makers of tomorrow, and thus, they need to be aware of and prepared to deal with climate change. The findings of this study suggest that teenagers are beginning to think about climate change, but still lack complete knowledge and the motivation to make behavioral changes that will impact and reduce the effects of greenhouse gas emissions. The results also lead to opportunities for environmental educators and communication specialists to create more effective strategies to inform and motivate this age group about climate change problems and solutions.

Knowledge and Education

The findings from this study corroborated findings from Leiserowitz et al. (2011) and Mower (2012) in which students knew about climate change, but did not thoroughly understand the concept, causes, and impacts. In Mower's (2012) study, his secondary school subjects from the UK seemed to have different levels of knowledge about different aspects of climate change; they tended to be most knowledgeable about climate trends and least knowledgeable about impacts. Students in this study seemed relatively confident that they knew something about climate change, but similar to Mower's (2012) subjects, were uncertain about its concepts, causes, and impacts. The percentages of correct responses for the objective knowledge questions were not consistent, ranging from 36% to 80% (see Table 4). The high school students tended to conflate weather and climate, and were also not consistently correct in their responses to the statements that addressed impacts specifically (as shown by their response rates to the true/false questions).

Even though it seems students think they know about climate change, these findings indicate that there is an opportunity to better inform young people about it. The Next Generation Science Standards (NGSS), the new science standards currently being reviewed and adopted by states throughout the United States, include standards that address climate science and climate change. Many states are adopting the NGSS, or standards based on them, but some states are pushing back, often due to political disagreement with the human-caused argument. Findings such as the ones from this study support the adoption of curriculum that teach young people about climate change because without this knowledge, they will not be adequately, or accurately, informed about the future.

As prior research suggests, formal education has a big influence on students' perceptions of climate change (Barraza & Cuaron, 2004). The students from Arizona and Illinois who participated in the current study indicated that school (teachers and classes) was a big influence on what they know and believe about climate change as well. Because formal education seems to play a big role, it is important to consider how school and classes can be more effective in guiding climate change understanding. The adoption of the NGSS in school curriculums can assist in helping students become more knowledgeable about the topic content; however, more engaging teaching strategies, not just declarative styles that emphasize textbook readings, memorization, and recitation, may be necessary to better help students retain the information provided to them in meaningful ways (Frisk & Larson, 2011). Providing students opportunities to have conversations and engage with climate policy is one way to support more active participation with the topic.

Students in this study did not refer to politics when discussing their influences on opinions, but often solutions to climate change are embedded in politics and policy actions. This missed connection between politics and climate change opinions

could be why students typically think about causes and impacts with regards to climate change, rather than solutions. By including more information in curriculum about climate policies, and encouraging students to critically think about local, national, and global climate actions, students can become active citizens and more effective problem solvers. This type of learning can engage students in a more informed way, and help them begin to think about how to support climate change mitigation and adaptation activities.

When comparing the quantitative summative knowledge scale and the qualitatively "graded" score, the scores differed by 17% (70% or 7/10 vs. 53% or 8/15, respectively). Both scores are measuring a similar concept (knowledge about climate change) but are producing somewhat different results. Students tended to score lower when they were asked to write a definition of climate change, as opposed to responding to only true or false or multiple-choice questions. Responding to true/false or multiple-choice questions gives someone a constrained list of potential answers, and a chance of responding correctly even when guessing. Written statements are more subjective, and students seemed to have trouble articulating what they think climate change means into writing. This could indicate that students are not effective written communicators about climate change, and may need more support in defining it in their own terms. These results also show an opportunity to find more consistent and effective ways to measure knowledge about this topic. The different results from the two scales indicate potential measurement error, where one or both of the scales are not actually measuring knowledge, or are measuring different aspects of knowledge. More iterations and testing of a knowledge scale would be beneficial to future research about this subject.

Beliefs and their Relationship to Knowledge

The results from this study about beliefs are similar to those of previous research. Students in Arizona and Illinois did not typically think about climate change as a personally relevant problem about which they were worried; this mirrors findings in studies by Feldman et al. (2010), Leiserowitz et al. (2011), and Mead et al. (2012). The students who participated in this study tended to think future generations and plants and animals would be the most affected populations, more so than themselves or their family. This finding indicates that these students could be distancing themselves from climate change, and while they may believe it is happening, they are less likely to think climate change will impact them personally. Not only is this sentiment found in research about young people, as noted above, it is a prominent finding in climate change perception literature in general (Leiserowitz, 2005, 2007).

Detachment from climate change and its impacts can lead to inaction. This presents the challenge of making climate change more personal and relevant to young people, which can hopefully lead to stronger engagement with the topic and solutions. One way to make climate change more relevant to young people is to connect the phenomenon and impacts to their everyday lives, hobbies, and passions. Similar to other research about climate change risk perceptions in adults (Leiserowitz, 2007), making these types of personal connections could help students get more involved, as can showing students how climate change can alter the way they live their lives and experience various activities.

Surprisingly, parents were not acknowledged by the students in this study as a significant source of climate change knowledge or beliefs. This is contrary to previous research, as parents are often very influential on what their kids think, value, and believe about the topic (Mead et al., 2012). Perhaps students at this age

do not overtly acknowledge that their parents influence them because they are trying to establish their independence, and may be unwilling to admit, or are unaware, that their beliefs are shaped (in part) by their parents. Some student participants in my study agreed that they listen to their parents about climate change, but do not often have conversations about it at home. If climate change is not a topic a family frequently discusses, there may be a less concrete connection between parental influences on beliefs. To better understand how parents influence their child's opinions about climate change, more research needs to be conducted. Whether direct questions are posed to parents and children about climate change, or whether the relationship and influence is measured indirectly, also needs to be considered in future research.

Similarly, peer groups did not play a significant role in this study population's climate change belief formation; very rarely did students say they talked about climate change with their friends. Bandura (2006) discussed peer social contexts as an influence on belief structures and habit formation in children, reporting that school was the prime location for youth interactions. Students in my study referenced teachers and classes when they mentioned school's influence, not their peers and the social context of school. Teenagers may not choose to discuss academic topics like climate change outside of school, so there are fewer conversations about it among friends. If students are not talking about it, there is less opportunity to be influenced by their peers' opinions about it. This highlights the challenge about how to get teenagers talking about topics like climate change in extra-curricular settings, outside of an academic context.

While social media was not directly addressed in this study, it may play a role related to the influence of new forms of media, as well as the influence of peers or others (such as celebrities). As part of the Millennial generation, today's youth are

often on their phones, paying attention to social outlets such as Twitter, Instagram, and Facebook. A better understanding of how prevalent climate change is on popular teenage newsfeeds and twitter handles could provide insight into additional peer influences on the topic. There could be opportunities to more effectively engage teens through these forms of social media, via short bursts of information (like tweets) or short videos on YouTube, rather than traditional strategies of peer and academic communication (i.e. lengthy news articles or textbooks).

Similar to findings from studies by Feldman et al. (2010), Leiserowitz et al. (2011), and Strife (2012), my research found that students in Arizona and Illinois do not have a solid grasp on climate change concepts and do not firmly believe that climate change is caused by human activities (as shown by the common response that *both* humans and natural trends are causing climate change). The aforementioned studies linked a person's understanding of climate change to whether they think climate change is a natural or human-induced phenomenon; i.e. the less a person knows about climate change, the less likely they are to believe it is caused by humans (Feldman et al., 2010; Leiserowitz et al., 2011; Strife, 2012). My research did not ask additional questions about why students think what they do about the causes of climate change. More research is therefore needed to better understand why my findings differ from previous findings. If students are not accepting that humans contribute significantly to climate change, while also blaming some of the impacts on natural changes in the environment, this could limit their sense of responsibility or efficacy in addressing the phenomenon. Believing that nature is causing climate change could mean these teenagers think nature will be able to restore itself, and therefore human intervention is not necessary. Without feeling personally responsible for climate change, complacency could become

common, which could inhibit future mitigation efforts and actions to adapt to impacts.

Other research has found youth are more likely than adults to think that humans cause climate change; specifically, Leiserowitz et al. (2011) reported that 57% of teens vs. 50% of adults thought global warming was caused by human activities, whereas 26% of teens vs. 35% of adults thought it was caused mostly by natural changes in the environment (Leiserowitz et al., 2011, pg. 8). One thing to note about the phrasing of this question in prior research is the use of the term "global warming" as opposed to "climate change," which was used in the current study. The difference in the responses of these studies could be due to the different interpretations of the terms. Future research should utilize the term "climate change" as it more accurately describes the impacts being observed around the world, rather then "global warming," which implies the issue is only about increasing temperatures. These findings could also point to a generational shift in beliefs about what is causing climate change. If the Millennial generation is more amenable to human-induced climate change arguments, this could influence how communication strategies are tailored towards different age groups. My research did not show the same trend of strong student belief that climate change is anthropogenic, so additional research on generational differences and shifts in beliefs would be beneficial as well.

Sustainable Behavior Choices

The behaviors that students in this study most frequently participated in tended to be behaviors they can personally manage and maintain – turning off lights and electronics and making clothing decisions. Mower (2012) found that individual and household behaviors were easier for young people to engage in as well. These

types of actions are more accessible to teenagers and allow them to feel more responsible and self-sufficient when they can do things on their own, rather than being told what to do or relying on others' oversight. By making climate change actions more feasible for students to participate in on their own, more young people might be more likely to make a pro-environmental decisions, thereby creating new habits in the long-term.

However, students in this study did not always make these behavior choices because they were directly concerned about the environment. Often, the behaviors they participated in were behaviors encouraged by an outside influence, or that have other impacts; for example, turning off lights and electronics was mentioned in conjunction with parental concern for electricity bills, and students' tendency to drive was due to it being easier and faster than walking or riding a bike. Fishbein & Ajzen (2005), Kollmuss & Agyeman (2002), and Stern (2000) noted similar motivations to behavior in their research as well; institutional, economic, infrastructural and emotional factors can influence behavior decisions. Understanding the various motivations behind decision-making can help ensure appropriate communication strategies for behaviors. For example, if accessibility and time are factors for teenagers when choosing how to get to school, highlighting the time it would take to ride a bike versus the time it would take to drive and park in school traffic might be more effective at encouraging a behavior switch than emphasizing environmental impact.

Infrastructure is a significant barrier, especially to actions such as using public transportation (Kollmuss & Agyeman, 2002). Students in Ahwatukee and Plainfield both noted that they do not often use public transportation because it is not readily accessible to them – the bus and transit systems in these areas are not conducive to getting students where they need to go. If the infrastructure was provided in these

locations, teenagers could be more encouraged to use it. As seen in studies about alternative transportation choices, there seems to be a relationship between new interventions (i.e. bus passes, or access to infrastructure), information, contexts, and behavior change (Bamberg, Ajzen, & Schmidt, 2003; Bamberg, Rolle, & Weber, 2003). However, installing the infrastructure will not automatically encourage people to use it; there has to be a new incentive and culture of alternative transportation use, which can take time to develop.

People in the study areas of Arizona and Illinois drive and use their personal vehicles for transportation, in part because it is convenient. So to switch that mentality and support more bus or light rail use would require a shift in attitude toward using alternative transportation. For example, in the Bamberg, Rolle, & Weber (2003) study, residents who relocated to a new area with better access to public transportation, and who were provided with communication about the transit system, were found to more often take alternative transportation than they were prior to their move. In the context of the students in this study, a public transportation system would need to be just as accessible and convenient to use as driving a personal car. Teenagers also need to feel safe and empowered to change their habits and use such a system, and they might need to be validated in that choice by their peer group. Parents also need to feel comfortable taking public transportation, and set an example for their children. As parents are a significant influence on their children's behavior, they need to display and support the action personally.

Peer influence could come into play with behavior decision-making as well. My study did not show that friends were a significant influence on these teenagers' behavior choices, but other studies have shown that peers can strongly influence decisions about actions (Bandura, 2006; Kollmuss & Agyeman, 2002; Redman,

2013). More research would be needed to show the extent of peer pressure on specific environmental behaviors, especially those visible or public (i.e. using alternative transportation rather than driving, or changing clothes to better adapt to temperature). Implications of findings like this could suggest potential culture change within a teenage population, either at a school or community level. If teenagers are influenced by their friends, a role model within the group needs to be engaged and excited about pro-environmental actions. This could require behavior modification strategies both within school, family, and peer contexts.

This study found that behaviors and actions are not strongly related to beliefs about climate change for these subjects. What these young people learn and believe about the issue and how they think it will impact themselves and other people around the world does not influence what action they decide to take. As Hungerford & Volk (1990) discussed, understanding the issue, being concerned about the issue, and knowing what to do and how to do it can strongly influence what type of behaviors a person might undertake.

In this study, the student subjects showed that they are not fully knowledgeable about climate change, and do not seem to be concerned about it as an urgent problem, so may lack the emotional connection and desire to make a difference. If ideas for enacting pro-environmental behavior change can be effectively incorporated into formal (or informal) educational settings, young people might become more engaged and excited about making an impact. As teenagers begin to understand that they have the ability to make a difference and contribute to the solution, they can more effectively form beliefs about the impacts of climate change, and how they can make choices to help solve the issue.

Role of Climatic Location and Local Context

Climatic conditions. Previous research found that recent personal experiences contribute to what a person thinks about climate change (Howe et al., 2012; Wolf & Moser, 2011). The results of this study less clearly show this correlation, potentially due to the limited life experience these young people have obtained in 16-18 years. Students in this study did not share many personal anecdotes as reasons why they believed (or did not believe) in climate change. Even though many students wrote in their survey that they thought weather patterns and climate change are similar and/or related, they did not often indicate that the weather they personally experience influenced what they believe. I expected that students in Illinois would reference the extreme cold temperatures of the 2013-2014 winter, and its colloquial name, the "Polar Vortex," in their written or verbal responses, but there were few mentions of that phenomenon.

However, other results from my study showed that students in Illinois were statistically more likely than their Arizona peers to believe colder temperatures and more precipitation would impact them. Even though students in Illinois did not mention the previous winter weather directly, their responses to the questions about local impacts show some location-specific trends. On the other hand, the extreme heat Arizona students experience every year seemed to influence students' behaviors more than students in Illinois. For example, students in Arizona made reference to choosing not to ride their bikes in the summertime because it is too hot. Studying how people in different locations perceive their local impacts could provide insight into how to frame climate change information and solution opportunities. Some mitigation and adaptation strategies may be more relevant and appropriate for populations in milder climates that believe they will be diversely affected by

temperature than for populations in hotter climates that are less likely to believe in fluctuating temperature changes.

Local educational context. When asked to define climate change, students in Arizona seemed to use misconceptions as descriptors more frequently than students in Illinois (see Table 11). There could be a few reasons for this discrepancy. The classes in Illinois were comprised of more senior students, so they could be more knowledgeable due to their age and having one more year of schooling. While Earth Science, Biotechnology, and Environmental Science classes all address climate change eventually during the year, students enrolled in Environmental Science (the classes that participated in the study from Illinois) may have more interest in climate change (an environmental issue), and therefore, could also know more about the subject. Students who enroll in Earth Science do so because they need an additional science credit and/or are interested in physical Earth systems; Biotechnology is a specialty science class that addresses different types of technological advancements, not just ones that are related to climate change. Class choice could have a significant impact on topic interest level. How climate change is taught or addressed in different classes could impact what students learn, so different educational strategies may be more successful in different class contexts.

Broader educational context may be a contributing factor to what students believe and how they behave with regards to climate change as well. Subjects in Arizona mentioned their exposure to sustainability in school more often, whereas students in Illinois mentioned it less frequently. This could be partially due to the public sustainability mission at Desert Vista High School, and that the student subjects in this study have more direct interaction with sustainability on a daily basis (due to the Sustainability Science fellow at the school, and more visible student clubs that take action on sustainability issues). Plainfield North High School does not have

overt sustainability initiatives throughout the school or district, so it is less available to students, and therefore may prevent students from thinking about it. These findings indicate that school missions and the learning environment in general could be influential in a young person's belief and habit formation. Schools and districts could provide more sustainability context for students, and promote more engagement with various topics like climate change.

Limitations of the Study

Limitations of this study inhibit the results from being generalizable to a broader population of students. Only specific classes were engaged and recruited to participate, which were determined by the science department chairs, with guidance about the research objectives. Because these were not randomly selected classes at randomly selected high schools, the findings from this study cannot be translated to represent the entire population of young people in the United States, or around the world.

The sample size was deemed large enough to use the statistical tests employed by the study, but may not be as large as often desired by scientists conducting social science research (Cohen, 1992; Park, 2006). The sample size for the small group interviews was small as well, and biased to the more advanced classes that participated in this research. Since only students from Biotechnology and Environmental Science classes participated in the discussions, this information cannot be generalized even to the population who participated in this study. However, the qualitative information gathered from those students is valuable and insightful for this population, and can inform future research.

The geographic contexts chosen for this study also limit the extent to which this research can be used to make conclusions. Phoenix, AZ and Plainfield, IL were

specific locations chosen for their different climate characteristics. To make this research more robust, further examination of additional locations would provide more information about geographic influence on climate change beliefs and behaviors. The demographic context of these two schools also limits the transferability of these results to other areas. These schools do not accurately represent lower income, diverse ethnicities, or significantly different political views, so the results should not be considered representative of those populations.

Future Research

There are a number of future research questions that could be developed as a result of this study. One such study area would be to examine more in depth the role educational context plays as an influence on sustainability and climate change beliefs and behavior choices. As findings in this study suggest, having a clear, public, and open sustainability mission (like at Desert Vista High School) may encourage students to think more about sustainability topics like climate change. It therefore seems interesting and relevant to examine how different schools or districts define "sustainability" in general, and what sustainability education may include or exclude in different contexts. While classes in particular may have a greater impact on objective knowledge gained and retained, sustainability missions and programs on high school campuses may influence what students believe about sustainability, and how they behave when considering how their actions may impact the environment. Case study comparisons about different schools or districts, their sustainability programs, missions, initiatives, and how involved and engaged their students are in the topics could shed light on the impact this has on children's beliefs and behaviors.

Findings from this study leave additional questions about belief influences open for further research. Results showed that beliefs about climate change are

influenced by school, but are also likely influenced by many other factors that this study did not address in depth. Supplementary research could be done into the influential nature of the following on belief formation about climate change: personal weather/climatic experiences, parents and family, friends and peers, and social media (i.e. Twitter, Instagram, Facebook, You Tube, etc.). A follow-up study about any or all of these influential outlets could shed light on the most appropriate and effective communication strategies and venues for encouraging teenager engagement with the topic.

Additionally, environmental behaviors in which teenagers participated were not linked to climate change beliefs, and were influenced by a number of factors other than environmental concern. To better understand and promote more effective behavior change, further research about specific barriers to action for teenagers (such as parental influences, accessibility, costs, etc.) would be useful. By studying these barriers more in depth, we could learn how to effectively minimize or remove them, and better inform strategies for behavior change. It would also be beneficial to focus on different types of behaviors; for example, a study could look at consumer behaviors, or collective policy-driven actions from young people in more depth. Taking a broader look at all types of behaviors, not just individual and household actions, can encourage youth to think about their place in the world and about the type of world in which they want to grow up. This type of research can provide insight into how to help young people feel empowered and competent to make a bigger contribution to climate change mitigation and adaptation.

The political context of the locations and schools was not a focus of this study. Future research might examine political beliefs and collective societal attitudes about climate change, and how these might influence young people. Older teenagers, as they come of age to vote and participate in community and broader

political activities, may begin to pay more attention to political conversations. As climate change is often discussed in political contexts, this could also begin to influence how young people form their opinions and consider solutions about the topic. Having a better understanding of how this might impact a young person's belief systems and behavior choices could help future policy-makers and environmental educators tailor communication strategies to youth.

Conclusion

As climate change becomes a more prominent issue in today's society, understanding youth perceptions and behavior choices is critical. The findings from this study showed that there are still discrepancies in what young people (specifically in Arizona and Illinois) know about climate change. In general, students knew climate change was happening, but often defined it using incorrect or incomplete information, and thought it was caused by both humans and natural trends. Beliefs about climate change impacts tended to be impersonal, with students more likely to think it would not affect them as much as it would affect plants, animals, and future generations. However, personal experiences with weather could have some influence on the impacts students perceive as most likely. Students from Illinois were statistically more likely than their Arizona counterparts to think they would experience colder temperatures and more precipitation as a result of climate change. While additional study would be needed to confirm, this could indicate local climate conditions and personal weather experiences may play a role in what people believe about impacts. This could have implications on communication and education strategies depending on location.

Sustainable behavior change is difficult to achieve, but there is more opportunity to encourage that change in young people than in adults. Students in

this study were more likely to take individual actions such as turning off lights and electronics, and were less likely to take public transportation and eat a vegetarian diet. While the reasons for these choices are not absolutely clear, it seems that parental influence, personal capabilities, and accessibility play large roles. Teenagers in this study referenced their parents as sources of behavior decisions, often doing things like saving energy or eating meat because their parents told them to do so. Having the personal ability to turn off a light or computer though makes those actions easier to complete on their own. Taking public transportation is a more difficult task to accomplish in the case of the students in this study because they do not have access to an adequate public transportation system. Making that choice was not convenient, so these teenagers chose to drive instead.

To more effectively address climate change and decrease its effects, supporting a shift to more sustainable behaviors is necessary. If we can engage young people in this conversation at an early age, through important influences like school and their parents, and encourage more responsibility and positive action towards the environment, we can create pro-environmental habits moving forward. Communicating action-oriented solutions that teenagers can participate in on their own (rather than relying on others) could create a sense of empowerment, and promote more positive environmental actions. We also need to acknowledge and find solutions to the challenges of accessibility and convenience. Once those behavioral barriers are removed, communication and education strategies will need to promote a shift in behavior.

With the wide range of teenage influences (parents, school, friends, media/social media outlets), the most effective ways to keep this population involved in climate change are vast and diverse. Considering and removing the climate change information gap and barriers to action that are hindering young people from

making appropriate decisions about climate change is critical. Doing so can help create a more informed and engaged youth, and encourage this generation (and future generations to come) to become active participants and champions of climate change solutions.

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APPENDIX A

SURVEY QUESTIONNAIRE

Part 1: Climate Change Knowledge and Beliefs

1. To what extent have you heard of "Climate Change" before taking this survey? **Please only mark the one response that best describes you.** [COGNITIVE]
   - ☐ Never heard of it
   - ☐ Heard of it, but don't know what it is
   - ☐ Know something about it
   - ☐ Know a lot about it

2. To what extent have you heard of "Global Warming" before taking this survey? **Please only mark the one response that best describes you.** [COGNITIVE]
   - ☐ Never heard of it
   - ☐ Heard of it, but don't know what it is
   - ☐ Know something about it
   - ☐ Know a lot about it

3. What does Climate Change mean to you? [COGNITIVE]

   _____

   _____

   _____

4. What does Global Warming mean to you? [COGNITIVE]

   _____

   _____

   _____

5. Do you think that climate change is happening? **Please only mark one.**
   (adapted from Feldman et al., 2010 and Leiserowitz et al., 2012) [COGNITIVE]
   - ☐ Yes
   - ☐ No
   - ☐ Don't know

6. What do you think is the main cause of climate change? **Please only mark one.**
(adapted from Feldman et al., 2010 and Leiserowitz et al., 2012) [COGNITIVE]
   - ☐ Caused mostly by human activities
   - ☐ Caused by both human activities and natural changes
   - ☐ Caused mostly by natural change in the environment
   - ☐ None of the above because climate change isn't happening
   - ☐ Don't know

7. Please respond "True," "False," or "Don't Know" to the following statements:
(Leiserowitz et al., 2011) [COGNITIVE]
(T = True, F = False, DK = Don't Know)

   a. _____ Climate and weather mean pretty much the same thing
   b. _____ Weather often changes from year to year
   c. _____ Climate often changes from year to year
   d. _____ The Earth is actually cooling, not warming
   e. _____ In the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase
   f. _____ Climate change will cause some places to get wetter, while others will get drier
   g. _____ Climate change will increase crop yields in some places, and decrease it in others
   h. _____ The record low temperatures and snow this winter in the Midwestern and Eastern United States prove that global warming is not happening
   i. _____ Climate change is happening, but will be more beneficial than harmful.

8. Personally, how well informed do you feel you are about the following issues… **Please only mark one for each question.**
(Leiserowitz et al., 2011) [COGNITIVE]

   a. How the Earth's "climate system" works?
      - ☐ Very well informed
      - ☐ Fairly well informed
      - ☐ Not very well informed
      - ☐ Not at all informed

   b. The different causes of climate change?
      - ☐ Very well informed
      - ☐ Fairly well informed
      - ☐ Not very well informed
      - ☐ Not at all informed

c. The different consequences of climate change?
   - ☐ Very well informed
   - ☐ Fairly well informed
   - ☐ Not very well informed
   - ☐ Not at all informed

d. Ways in which we can reduce climate change?
   - ☐ Very well informed
   - ☐ Fairly well informed
   - ☐ Not very well informed
   - ☐ Not at all informed

9. How much do you think climate change will affect… **Please only mark one for each question.**
   (Mead et al., 2012) [COGNITIVE]

   a. You personally?
      - ☐ Not at all
      - ☐ Only a little
      - ☐ Somewhat
      - ☐ A great deal
      - ☐ Don't know

   b. Your family?
      - ☐ Not at all
      - ☐ Only a little
      - ☐ Somewhat
      - ☐ A great deal
      - ☐ Don't know

   c. People in your community?
      - ☐ Not at all
      - ☐ Only a little
      - ☐ Somewhat
      - ☐ A great deal
      - ☐ Don't know

   d. People in the United States?
      - ☐ Not at all
      - ☐ Only a little
      - ☐ Somewhat
      - ☐ A great deal
      - ☐ Don't know

e. People in other industrialized developed countries (like Canada, England, and Japan)?
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

f. People in developing countries (like Mexico, India, and Brazil)?
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

g. Future generations of people?
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

h. Plant and animal species?
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

10. How do you think climate change will impact you locally? **Please only mark one for each question.** [COGNITIVE]

a. More rain and/or snow (precipitation)
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

b. Less rain and/or snow (precipitation)
- ☐ Not at all
- ☐ Only a little
- ☐ Somewhat
- ☐ A great deal
- ☐ Don't know

c. Hotter temperatures
   - ☐ Not at all
   - ☐ Only a little
   - ☐ Somewhat
   - ☐ A great deal
   - ☐ Don't know

d. Colder temperatures
   - ☐ Not at all
   - ☐ Only a little
   - ☐ Somewhat
   - ☐ A great deal
   - ☐ Don't know

11. When do you think climate change will start to affect… **Please only mark one for each question.**
(Feldman et al., 2010) [COGNITIVE]

    a. People in the United States?
       - ☐ They are being harmed now
       - ☐ In 10 years
       - ☐ In 25 years
       - ☐ In 50 years
       - ☐ In 100 years
       - ☐ Never

    b. Other people around the world?
       - ☐ They are being harmed now
       - ☐ In 10 years
       - ☐ In 25 years
       - ☐ In 50 years
       - ☐ In 100 years
       - ☐ Never

Part 2: Climate Change Behaviors

12. Please list and describe personal behaviors you think are associated with climate change? In other words, what decisions or actions do you think lessen or worsen climate change? **Please be as specific as possible.** [CONATIVE]

    _____

    _____

For the following questions, please think about the **last year…**

13. How often have you participated in the following actions? **Please only mark one for each question.** [CONATIVE]

    a. Turned off the lights when they were not needed, or when you left a room
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

    b. Turned off electronics, like TVs and computers, when they were not being used
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

    c. Unplugged electronics or turned off power strips and surge protectors when they were not being used
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

    d. In the winter, wore warmer clothes instead of turning up the heat
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

    e. In the summer, wore cooler clothes instead of using as much air conditioning
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

    f. Walked or biked, instead of drove
    - ☐ All the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Not very often
    - ☐ Never

g. Took public transportation
- ☐ All the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ Not very often
- ☐ Never

h. Carpooled with friends to school
- ☐ All the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ Not very often
- ☐ Never

i. Used as little water as possible, for example, when you showered, brushed your teeth, and washed dishes
- ☐ All the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ Not very often
- ☐ Never

j. Ate meals that had no meat (vegetarian meals)
- ☐ All the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ Not very often
- ☐ Never

14. How much do you agree or disagree with the following statements? **Please only mark one for each question.** [CONATIVE]
    a. "What I do in my everyday life affects climate change." (Mower, 2012)
    - ☐ Strongly agree
    - ☐ Agree
    - ☐ Neither agree or disagree
    - ☐ Disagree
    - ☐ Strongly disagree
    - ☐ Not sure/don't know

    b. "I personally feel that I can make a difference with regard to climate change." (GES, 2012)
    - ☐ Strongly agree
    - ☐ Agree
    - ☐ Neither agree or disagree
    - ☐ Disagree
    - ☐ Strongly disagree
    - ☐ Not sure/don't know

Part 3: A Little About You

15. In the past 2 years, have you experienced the following weather events? **Please mark all that apply.**
    - ☐ More snow than normal
    - ☐ More rain than normal
    - ☐ Higher than normal temperatures
    - ☐ Lower than normal temperatures
    - ☐ Extreme heat
    - ☐ Tornado
    - ☐ Dust storm
    - ☐ Other natural weather event
        - What type of weather event? _____

16. From which of the following sources have you learned about climate change? **Please mark all that apply.**
    (adapted from Leiserowitz et al., 2011)
    - ☐ School
    - ☐ Internet
    - ☐ Television
    - ☐ Family
    - ☐ Friends
    - ☐ Books or magazines
    - ☐ Movies
    - ☐ Museums, zoos or aquariums
    - ☐ Newspapers
    - ☐ Radio
    - ☐ Government agencies
    - ☐ Other
        - Please describe _____

17. Do you participate in the following extra-curricular activities? **Please mark all that apply.**
    - ☐ An environmental student group at school
    - ☐ A peer leadership student group at school
    - ☐ Student government
    - ☐ A sports team (in or outside of school)
    - ☐ A church group
    - ☐ A community volunteer group
    - ☐ Other student groups at school
        - Please write in name of other student groups _____
    - ☐ Other community organizations outside of school
        - Please write in name of other student groups _____

18. Are you a leader/president/captain/etc. in any of the following groups? **Please mark all that apply.**
    - ☐ An environmental student group at school
    - ☐ A peer leadership student group at school
    - ☐ Student government
    - ☐ A sports team (in or outside of school)
    - ☐ A church group
    - ☐ A community volunteer group
    - ☐ Other student groups at school
        Please write in name of other student groups _____
    - ☐ Other community organizations outside of school
        Please write in name of other student groups _____

19. **This question is optional: you can skip it if you do not want to answer.** Please mark your political affiliation.
    - ☐ Very conservative
    - ☐ Conservative
    - ☐ Moderate
    - ☐ Liberal
    - ☐ Very liberal
    - ☐ Don't know

20. **This question is optional: you can skip it if you do not want to answer.** Which political party do you associate with?
    - ☐ Republican
    - ☐ Democratic
    - ☐ Tea Party
    - ☐ Libertarian
    - ☐ Socialist
    - ☐ Independent
    - ☐ Other
        Please write in your political party affiliation _____
    - ☐ None/Don't know

21. Do you have access to a car that you can drive?
    - ☐ Yes
    - ☐ No

22. On a typical day, how long does it take for you to get to school by driving?
    - ☐ About 5 minutes or so
    - ☐ About 10-15 minutes
    - ☐ About 20-30 minutes
    - ☐ More than 30 minutes
    - ☐ I don't drive or get a ride to school
        Please tell us how you get to school _____

23. How long have you lived in [Phoenix, AZ/Plainfield, IL]?
    - ☐ Less than 1 year
    - ☐ 1 to 5 years
    - ☐ 6 to 10 years
    - ☐ 11 to 15 years
    - ☐ 16+ years

24. If you have not lived in [Phoenix, AZ/Plainfield, IL] for your whole life, where else have you lived?

    _____

25. What year were you born? Please write your response on the line below.

    _____

26. What grade are you in?
    - ☐ Junior (11th grade)
    - ☐ Senior (12th grade)

27. Please mark your gender.
    - ☐ Female
    - ☐ Male
    - ☐ Prefer not to answer

APPENDIX B

SMALL GROUP INTERVIEW AGENDA

Understanding Beliefs and Behavioral Choices about Climate Change in High School Students from Phoenix, AZ and Plainfield, IL

Small Group Interview Agenda

[This agenda includes general themes and topics to discuss, and will be modified based on the findings from the survey.]

1. **Climate Change Influences**

    a. Define Climate Change [use definition from National Research Council of the National Academies]

    b. What or who influences your opinion about climate change? (i.e. friends, family, media, personal/weather experiences) [reference Q15, common sources]

2. **Climate Change Behaviors**

    a. Let's talk about the top three most common behaviors, from Q12. Who here does [#1/#2/#3]? Why do you do this? For those of you who do not do these things, why not?

    b. Let's talk about the three least common behaviors, from Q12. Who here does [#1/#2/#3]? Why do you do this? For those of you who do not do these things, why not?

APPENDIX C

SMALL GROUP INTERVIEW TRANSCRIPTS

Small Group Interview #1 **August 19, 2014**

Interviewer: The recorder is going. Thank you guys for volunteering to join me today. As I noted last week when I met you all with my surveys, I am studying climate change and what young people and teenagers know, believe and how they behave in regard to climate change. Today I want to talk a little bit – you all took the survey. So today I want to talk a little bit about influences on your opinions about climate change, as well as motivations behind some of the behaviors that I found noted most frequently and least frequently on the surveys. That's what we're going to talk about today. I know we've only got about 20 or 25 minutes left. I will definitely let you guys go when the bell rings. If we're in the middle of a sentence, feel free to go. I think we'll get started. Do you guys have any questions before you going?

Participant 1: No.

Interviewer: Awesome. I wanted to start with defining climate change as the US EPA, the Environmental Protection Agency, defines it. They define it as any significant change in the measures of climate lasting an extended period of time. Climate changes include major changes in temperature, wind patterns, or precipitation, among other things, that occurred over several decades or longer. One of the misconceptions about climate change is that climate and weather are the same thing. They're related, the climate is a bigger than weather.

Participant 2: More permanent.

Interviewer: Exactly, it's a little bit more permanent. It includes weather, but it also includes a lot of other things. I just want to start with that because I think that impacts kind of what people believe about climate change. Moving onto the influences on various climate change opinions, one of the questions I ask you all of the survey is – what are the sources you get information about climate change from? The top three answers were very predominately school, Internet, and television. Those are the sources you get for information from. What I'm also interested in is – what are the sources that influence what you think about climate change? You don't have to tell us what you believe personally, but who or what are those things that impact your beliefs about that phenomenon?

Participant 2: I'm trying to think here. Can you repeat the question?

Interviewer: Absolutely. What I'm interested in hearing from you guys is what people or things or sources specifically influence your belief about whether climate change is happening are not happening.

Participant 2: I would probably say my family and what I learn school is the biggest influence, and occasionally what I see on TV.

Participant 3: Yeah, definitely hearsay. I will hear people talking about "Did you see the rain today? It was crazy. Way more often… It never rains this time of year."

Participant 2: Or you hear it on the news that Arizona has the highest temperatures in years, history.

Participant 1: I would probably say the news for me.

Participant 2: The news, too.

Participant 2: My dad talks about it a lot. That's the majority of what they talk about in the news. There's not much else going on.

Interviewer: What kind of stuff do you hear on the news? Are there any particular stories or any particular…?

Participant 2: It's always the weather patterns for the year, they always say that it's the hottest it's been since 1980…

Participant 3: They're always breaking records now.

Participant 2: Or about record changes in temperature or the record snowfalls.

Participant 3: I was watching the news this one time, and there was this video. Some people send in this video about a boiling cup of hot water, and they threw it up in the air. That it totally frozen the middle of the air – that kind of stuff on the news. They'll be like "It's the coldest. It's record cold." It makes it sound really extreme. It doesn't look like a good outlook.

Participant 2: We are all over here in Arizona, where gets hot every summer and stays pretty nice the rest of the year.

Participant 1: But it's been excessively hot lately.

Participant 3: Yeah, it's really…

Participant 2: Also it's been really rainy and humid lately, so they have been talking about that a lot.

Participant 3: Is it still in the midst of monsoon season, or to that end already?

Participant 2: No, I'm pretty sure. I moved here three the years ago, but I'm pretty sure that it still in the midst of monsoon season.

Participant 1: I moved here last year.

Participant 2: Where did you move from?

Participant 1: Washington.

Participant 3: Oregon! L

Participant 2: East Coast

Participant 1: What part of Oregon?

Participant 3: I'm from kind of central Oregon, Portland.

Participant 3: You move your last year. You moved your sophomore year. I moved here the day before freshman year.

Participant 2: We know information about other places, too.

Interviewer: I think it's really interesting to hear that you guys haven't lived in Arizona for a long time. Do any of your experiences – we talked about hotter than normal summer here, humid, rainy here. Do any other personal experiences or things that you experienced either here or back where you used to live, does that impact what you think about climate change at all?

Participant 2: I remember a year in Connecticut, we had temperatures up to 100 and some degrees, and our school's air conditioning broke down. That was a big thing on the news for a couple of weeks about how Connecticut had never seen temperatures like that. That was back when I was in fifth grade. That was a couple of years ago. They haven't seen temperatures like it since, which is kind of weird.

Participant 1: I remember one year in Barney Lake, Washington. I was probably like eighth grade. We had a whole week of snow days, which is so uncommon up there. It's usually all rain. It got to where was cold enough to have a whole week of snow, and it was like rain that froze on top of the snow. Then there was more snow on top of that, and then more rain that would freeze. It was just ridiculous.

Participant 1: The same thing happened to me Eighth grade year, but it was in Pittsburgh. It was like two weeks of not being able to go school because the buses couldn't even get up the hill.

Participant 3: I think there were three in a row snow days, and that's really uncommon. Anytime you get freaking three feet of call, they don't care. They're like "Go to school anyway. You're used to this."

Participant 2: Yeah, it's like "Two-hour delay guys. It's all right." And then it's like up to your hips. Seriously, I can't go to school, guys.

Participant 2: And then last weekend I went to Fry's. It's on Chandler, no, the Safeway on Chandler. I go into the parking lot, we're in this huge truck, and it looks like a lake in the parking lot because there's so much rain. It was ridiculous. It was so cool, but it was crazy. It was a lot of rain. I've never seen that before. It was really insane.

Participant 3: I think it did that last year, too, though. DV Park flooded the bottom area.

Participant 2: I saw that, too, DV Park – that's right across the road. I saw that, too. It's the kind of looking like a lake. It's crazy. It's nice.

Interviewer: There isn't a lot of time for the rain or puddles are small ponds to dry out when it rains here.

Participant 2: Which is ironic. It gets really dry here all the time. I guess during this season, a gets really humid.

Interviewer: And sometimes it's hard because the ground has been so dry, it doesn't have the capability to soak up that much water that quickly.

Interviewer: Any other thoughts about what influences your opinions or what other sources of information or what other sources you get information from? You guys mentioned a little bit about family and school. Do you have any other thoughts about how family or school influences what you're thinking?

Participant 2: My dad used to work for General Motors, but it was for the alternative fuels wing. He would go around to do presentations and events and stuff. They always talked about climate change caused by the vehicles that run on gasoline and stuff like that. He worked with the hydrogen fuel-cell cars, so he would always come home and talk about with our family about what we think is happening with global warming and stuff like that. That was a big topic when he worked there, back in the 2008-2009 timeframe. After that, he worked and worked for the Department of Energy. And a lot of similar thoughts about global warming there, too. They thought it was more of a naturally occurring thing in the Department of Energy; where General Motors – whether they believed it or not, they passed it as vehicle-caused the things so they could promote the hydrogen fuel-cell cars and the electric cars, like the Chevy Volt and stuff like that.

Participant 3: Whatever happened to that?

Participant 2: The Chevy volt is still around. There's just not a lot of hydrogen vehicles. Those are just concepts. They made only like 100 or 200 of them. I don't know what happened to all of them. They're around.

Participant 1: The electricity fueled cars – there are couple parking spaces over the theater where you can charge them.

Participant 3: There are only some of the airport, too. At Oregon, they always have a whole bunch of them at the airport.

Participant 2: People get electric vehicles mixed up with hybrids all the time, and they park their Priuses. You're just like "No, that's not how that works."

Interviewer: Are there any other final thoughts on family or school and their influences?

Participant 2: Last year we did our sustainability unit with Ms. Russell.

Participant 3: Yeah.

Participant 2: We had to go to an elementary school and present about sustainability.

Participant 3: That was fun. That was a fun time.

Participant 2: It was a fourth grade class. We did games and stuff. We did reduce, reuse, recycle type of things.

Participant 3: Keep it simple.

Participant 2: We learned about climate change and sustainability with water systems and fish and stuff. We talked about the different types of nuclear, different types of power.

Participant 3: And how buildings can be more efficient and how they can go about things in different ways. We had to do the energy pyramid. That was so confusing.

Participant 1: Last year in school they had a presentation at the auditorium about sustainability and different types of energy. I kind of got interested in this field.

Interviewer: Was that for the whole school or for certain classes?

Participant 1: I think it was. I think it was all the science classes. Did you guys do that?

Participant 3: I don't think we did. We had a guy come in and talk about it.

Participant 2: We came from ASU, some professor. His name was Scott something.

Interviewer: Are you talking about Mr. McClintock?

Participant 2: Yeah.

Participant 1: I was a sophomore last year, so it might've been all the sophomore bio classes. That makes more sense.

Participant 2: [inaudible] Yeah, that makes more sense. It's amazing we didn't do that sophomore year though.

Interviewer: I want to make sure that we can get to the next topic before the bell rings. The other thing I wanted to talk to you guys about is behaviors. I ask you guys a lot on the survey about what kinds of behaviors you exhibit and do in your everyday life. These were the three most common behaviors – turning off lights, turning off electronics, and wearing warmer clothes in the wintertime – between all five of Mr. Williams' classes. And then the least common behaviors between all five classes were eating meals with no meat, taking public transportation, and walking or biking instead of driving. What I was wondering from you guys was – first of all, let's talk about the most common behaviors. Which of these three do you personally do? Why do you choose to do them?

Participant 3: My dad replaced a couple of our lights in our house with the ones that turn off automatically if they don't sense a human in the room. I guess we kind of do that in a way. And then turning off electronics – I would say we do for the most part. Sometimes our TV – the actual monitor gets left on, while the rest of it is turned off, but that's more of an accident. Some of us don't know how to properly turn it on because I got so complicated. And then wearing warmer clothes in the winter, I would say yeah because my dad doesn't like us touching the thermostat.

Participant 2: Yeah, that's definitely my family. It's like "Go get a blanket. Are you cold, that sucks."

Interviewer: On that note what I thought was interesting just looking through the responses was that this [wearing warmer clothes in the winter] was very common. This was a commonly marked action, but wearing cooler clothing in the summertime was not.

Participant 2: That's because it's hard to get away from the heat and it's easier to get away from the cold, especially in this state because the cold in this state is not drastic. It's more – it's easy with a thin sweatshirt to get rid of it, or with a blanket. But in the summer, you could probably take off all your clothes and still be hot.

Participant 1: Wearing cooler clothes is a little difficult for some of us if we're dressed modestly. I don't like wearing shorts at all. I try to wear pants as much.

Participant 2: I never wore shorts until I came here. I love pants.

Participant 3: Our dress code where I used to go is that you had to have pants that were on your knee or just below your knee. You couldn't have them above your knee. It was pretty funny. And turning off the lights, it's an OCD thing. I have to do. It just irritates me. I know the electricity costs money. It just irritates me to know that we are kind of wasting money and not using it. It's the same with turning off electronics. I just kind of want to save the battery. If I'm not using it, what's the point of it being on?

Participant 1: The problem with electronics is like computers, you often put him on sleep mode instead of just turning them off.

Participant 3: Yeah. It's still going and using electricity.

Participant 3: My laptop gets really hot if I don't turn it all the way off.

Participant 2: My mom never turns off her computer.

Participant 3: I usually do. I'm pretty good at turning it off, unless I'm in the middle of an essay and I don't feel like saving it and relocating a later on, I'll leave it [my computer] on for a day or two.

Participant 2: It's the same for the school, too, we always have to turn off our laptops when we're done, but that it takes three hours to turn their back on. It takes so long to turn them back on.

Participant 3: It makes sense why they make us turn them off.

Participant 2: They might as well not even work at all during the period because it takes forever. You just sit there. Whatever. It's not even worth my time.

Participant 3: That's getting harder and harder as more schoolwork is going on the computer.

Participant 1: It's frustrating, and I can't find anything on Canvas.

Interviewer: Just really quick, these were the three least commonly marked behaviors or the behaviors people said they either really better never did – eating meals with no meat, taking public transportation, and walking and biking. Do any of you do these activities? Why do you choose to do it?

Participant 1: I often eat meals with no meat because I'm a really, really picky eater. I'm not a big fan of most meats. I'll go with vegetables and fruit.

Participant 3: Same here. I like bread.

Participant 2: My family doesn't really eat meals without meat. We usually prefer poultry because it's healthier. I also read this article on CO_2 emissions from food. We don't eat beef. I know we have farm fish in our freezer, but I refuse to eat it

Participant 3: It's hard on your digestive system.

Participant 2: I refuse to eat the farm fish. I just don't trust them. I don't know what kind of chemicals they're putting in there. We usually try to stick with poultry. Chicken, turkey, some pork

Participant 3: I don't eat fish at all. Not even just that, it's just that because they're overfishing. I think I ate fish like twice in my life. I eat turkey on rare occasions. The most I've taken public transportation was my trip to Europe this year because that's how a lot of people get around there. And then walking or biking instead of driving – I used to bike to school before I got my license, but it was too hot.

Participant 2: Yeah, but I live all the way in the foothills which is way way out there, that way.

Participant 3: I lived pretty close, from freshman thru sophomore year.

Participant 3: It was too hot to bike in the summer. It was surprisingly, in the morning, that it got pretty cold, so you would have to wear gloves to ride your bike to school. At least I did because my hands would get really cold.

Participant 1: In the winter, I'll be biking to work a little more than driving because it saves gas obviously. I have to pay for all my gas.

Participant 2: Gas is expensive.

Participant 1: I think that's a good tactic, to make kids pay for their own gas because it made me a lot more conscious. I used to drive friends around a lot, but I don't anymore.

Participant 2: I think with college students, that would've been a lot different with them – the walking or biking. A lot of college students don't drive to their classes. There are thousands of bikes everywhere. I don't know how they find theirs.

Participant 3: As far as public transportation, I use it only in Portland because that's the main way to get around. That's how we get around everywhere. That's how we get to downtown, to where I lived. I love taking the tram because it's so fun. You meet some crazy people.

Participant 2: They have those in a lot of the bigger cities, like Detroit – people use the L train. Or is that in Chicago?

Interviewer: The El in Chicago.

Participant 1: The Spokane transit authority – we would always use the bus because everything's really close together, but there a lot of hills. It's difficult to walk or ride your bike, but it's easy to take the bus because it's not expensive, and you don't waste gas.

Participant 2: The annoying part of this school though is that their buses don't really reach a lot of pieces places that people live. There's a very limited amount of places that they go. They don't go to my house, probably because we're little too close. I drive every day simply because I have to take my brother's friend because he lives too far. They have a very limited space around Ahwatukee that the buses go.

Participant 1: My bus is really cramped now because they took up an extra stop.

Participant 2: I know exactly what about you're talking about. That's why I don't take it anymore.

Interviewer: Thank you, ladies, so much. I really appreciate your participation here. If you have any questions, you all have my email. Mr. Williams has my email. Any questions about my research or anything, let me know.

Small Group Interview #2 **August 19, 2014**

Interviewer: We are recording. Thanks again for coming. I really appreciate your participation in my research. You took the survey last week. As you know, I'm studying what teenagers know and believe about climate change. I also want to understand some of the behaviors that teenagers do and what motivates you to do them. That's what we're going to talk about today. We're going to talk about some of the influences on your opinion about climate change, as well as some of the influences and reasons behind why you might do some of the things that you do in your everyday life. To start, I wanted to quickly – I asked a little bit on the survey about what climate change means. What I thought might be interesting is to kind of start with the definition of climate change. This is the definition of climate change by the US Environmental Protection Agency, and it basically refers to any significant change in the measures of climate lasting an extended period of time. The climate changes include major changes in temperature, wind patterns, and precipitation among other things that occur over several decades or longer. One of the things that people think about with climate change is that it has everything to do the weather. Weather has a lot to do with it, but it's not just about weather. It's a little bit broader and over a longer period of time. Any thoughts or questions about climate change?

Participant: No

Interviewer: I wanted to jump right into – what influences your opinions about climate change? You don't have to tell me whether or not you believe or not in climate change. What I'm interested in knowing is – what or who are the things that influence your belief? One of the things I had here – one of the questions I asked you all was – from one of the following sources have you learned about climate change? Where did the information? Predominantly the top three resources were school, Internet, and television. This is just where you get your information. I would really love to hear about where you form and how you form your opinion about it.

Participant: I don't learn that much from school, but I do learn a lot from articles on the Internet or television or even my family. My family is very scientific, and I know my sister wrote a paper for her junior year on whether or not climate change is happening and stuff like that and global warming and everything.

Interviewer: Your sister wrote a paper on it?

Participant: Yeah.

Interviewer: Going off of the family, are your parents scientists? Are they professionals?

Participant: My dad is an engineer, but my aunt is a chemical engineer. I think my uncle is an ecologist.

Interviewer: You have people kind of in the area. You said you read articles on the Internet. What kind of articles are you reading?

Participant: I like to read the science-y ones. I like the ones that are all about science and everything.

Interviewer: Are you getting them from newspapers or in the magazines?

Participant: Usually they're from newspapers or magazines, or even from TV. I watch the Science Channel all the time.

Interviewer: All right. Those are where you hear about it. Have the things you read or things you learn from these sources – they help form what you believe about it?

Participant: Yeah.

Interviewer: Cool. What we'll do is we will jump right into behaviors. If you think of anything and you want to go back to this, we can. I asked you guys questions on the survey about the frequency or how often you do certain actions. Going to the survey's this past week, what I did was I sorted them out into the top three behaviors that people do all the time or do most of the time and the top three behaviors that people never do or that they do rarely. The top three behaviors that people do most of the time are turning off lights, turning off electronics, and wearing warmer clothing in the winter. On the other side of the spectrum, people tend not to eat meals with no meat, don't take public transportation very often, and they don't walk or bike instead of drive very often. What I would really like to hear from you is about – which of these behaviors do you find yourself doing? Why are you doing them? Is there a reason, or are they kind of unconscious? Why are you doing what you are doing?

Participant: I do turn out the lights every time I leave the room because it helps me save electricity, and to feel good. Now it drilled into my brain. My friends look at me because I go over to their house and turn off their lights by accident. It's kind of a habit. As far as electronics, I turn off most of them and unplug a lot of things, but I don't unplug fridges and a couple things like lamps, I never unplug. I do wear warmer clothing in the winter because my parents don't really turn on the heat that much.

Interviewer: One of the things I thought was interesting was that one of the top actions people do is wear warmer clothing in the wintertime, but not many people said they wear cooler clothing in the summertime. I am wondering if you had some thoughts on why that might be.

Participant: I don't know why a lot of people don't do it in the summer. It's really hot here. I notice a lot of my friends wear jeans in the summer. They'll just wear jeans year-round. I don't know if that's just because they don't want to wear less clothing or cooler clothing, or they just – I think they just don't want to. A lot of people do wear warmer clothing in the winter because we have no other choice really. I'm pretty sure they'll probably just use the same clothing in the winter that they wear in the summer.

Interviewer: You mentioned that you turn off most of your electronics and unplug what you can – not the big things, but what you can. Is that a similar reason behind that as turning off lights? You want to save electricity and save money? Are there other things that you think of when you do that?

Participant: It's mostly just to save electricity and get things out of the way.

Interviewer: Also kind of a cleaning up things, like if there's stuff all over. You can unplug it and put it somewhere else?

Participant: Mm-hm.

Interviewer: Any other thoughts on most common behaviors? Is there anything else that you can think of that you do that isn't necessarily a most common behavior, but something that you do or maybe you remember from the survey or something else?

Participant: I think it's kind of common, but it's not in there. I'm really careful about water. If I'm brushing my teeth or something, I'll turn it off between. Whenever we do laundry, I try and do as many loads as I can together. And take shorter showers. I do try and do that.

Interviewer: Is there a particular reason why you're conscious about water?

Participant: I think so. There's a lot about water conservation. I know you can never really truly run out of water, but you can run out of clean water. That's probably going to be a big problem in a couple, in actually many, many years. I would rather at least try and feel like I'm doing something about it.

Interviewer: Going back to some of the influences on your opinions and the information that you get, do you read about water a lot? Do you watch it on TV? Is that is something you hear about?

Participant: It's kind of just something I hear about. I hear a lot about it in school. I don't really see that much about it on TV – every once in a while.

Interviewer: It's talked about here [at school]?

Participant: Mm-hm.

Interviewer: That's interesting. Anything else related to water or anything else that you find yourself doing? No? Let's talk a little bit about the three least common behaviors - eating meals with no meat, taking public transportation, and then walking or biking instead of driving. Do you do any of these behaviors?

Participant: No.

Interviewer: Why don't you do these behaviors?

Participant: As far as meat goes, I don't know, that's just kind of how I was raised. It's hard to break the habit. And then public transportation – the only way to take public transportation from my house is to walk four miles and then take a bus. It's not the most efficient. I do drive, I have my own car. But, usually when I do drive somewhere, I carpool with people because I don't really like driving that much. Sometimes when I go over to a friend's house, I will go over to their house and walk somewhere, but I do drive a lot.

Interviewer: One of the things that I thought was interesting was that on the survey there was a question about – fill in some actions are behaviors that you think are related to climate change. I asked a lot of these questions about how frequently you do various things. One of the things that people mentioned a lot was they think that cars and driving and fossil fuels are something that's affecting climate change. However, lots of people didn't say that they walk or bike very frequently. I thought that was kind of interesting – an interesting difference between what people were responding. I was interested why you think that might be.

Participant: That's kind of what we were taught in school, since we were little. That's basically what we were taught when we are little.

Interviewer: So you are taught that…

Participant: That you need to reduce your carbon footprint and all the stuff about CO2 emissions and such.

Interviewer: You're taught all this, but maybe it's more difficult to make a change and take the action.

Participant: Yeah.

Interviewer: Do you have any other thoughts about the less common behaviors? Actually you mentioned water as one of the things that you do a lot. Why do you think others might not do that as much? That wasn't on the list. It was kind of in the middle. What do you think?

Participant: A lot of people – I feel like they don't really think about it. It's such a habit. They're so used to taking – a lot of my friends are like "Yeah, I take like hour-long showers." Or you hear people say they do laundry every day, or they do all their colors separately, or they don't feel like using a ton of water. I think it's probably because one, they don't want to change, and two, I feel like they're kind of thinking that the issue about water is that there's not going to be enough. They're like "That doesn't make sense because of the water cycle. There's always going to be a constant amount of water." I don't think what they think about a lot is – I don't think they're thinking more about the clean water side of things.

Interviewer: Any other thoughts on either of the behaviors, things that you do a lot, things you don't do, things you see your friends doing and you wonder why?

Participant: I don't think so. Other than recycling. A lot of people recycle, but that's not really related I don't think.

Interviewer: Why don't you think that's related?

Participant: It kind of is, but it's kind of like a small effect a climate change, but it's not one of the larger pictures that everyone looks at. Most people do recycle. It's just a lot of times they're not aware of what they can and can't recycle. I have friends trying to recycle Styrofoam, and obviously other places you can't do it here, but you can recycle it in other places. A lot of people don't know that you're not supposed recycle wrapping papers or something. Something about the way they treat the paper, you're not with the recycling.

Interviewer: Interesting. I actually didn't know that. Recycling is always kind of a tricky issue because each city does it differently. Even within the same area. I know Phoenix is probably slightly different from Tempe. I'm from the Chicago area, and I know Chicago proper is different than the suburb I grew up in. That's definitely a tough one. Not knowing what you can and can't recycle is always a tough deal. Then there's the contamination you if you do recycle something that you can't. It's a lot about awareness. From what you're saying, you're thinking recycling is important, even if it's not a huge part of climate change. Why do you think people do it so frequently? Do you think they think it's impacting climate change?

Participant: I don't think they really think it's impacting climate change. Most of them probably do it by habit, and the city supplies you with recycling and garbage. I feel like a lot of people do it out of habit. Especially from when you're really young, even in school, you're taught about how recycling is good and what you can and can't recycle and everything. It goes back to what we were taught when we are little. It just keeps going.

Interviewer: Okay. That was a good topic to bring up [recycling]. Any other thoughts about behaviors, reasons why people do or don't do things, or any thoughts on information sources or influences behind your beliefs?

Participant: I don't think so.

Interviewer: All right. Because it was just you and me, we got through the topics pretty quickly. Do you have any questions about this topic or my research or anything?

Participant: My dad actually said something about it last night. He said that there is a factor that affects climate change, and that might be – I think it's one of the magnetic poles is moving. Do you think that affects it at all?

Interviewer: The magnetic poles shifting, I have not heard much about that. I hear about the ice in the Arctic melting, but I have not heard about that magnetic shift. I have to look that up.

Participant: I think my dad – he didn't remember what number it was, but it was crazy. It was like 40-something miles per year.

Interviewer: I'll have to look into that. I haven't heard much about that. I'll look into that. Your dad sounds like a very interesting guy. Is this something you talk about a lot with your parents? Or just because you are doing this, it kind of came up?

Participant: Science comes up a lot. Mostly because my stepmom isn't that into science. It mostly just happens; it was just the timing because she's out of town, and my dad and my sister and I are all there. It kind of comes up a lot in our family, where I will read something or watch something, and they will talk about it.

Interviewer: You said you dad was an engineer?

Participant: Yeah.

Interviewer: What kind of engineering does he do?

Participant: Mostly – I don't know how to describe it. It's mostly electrical and designing. He designs circuit boards for nurse call systems and stuff.

Interviewer: That's interesting.

Interviewer: Okay. Again, thank you guys so much for volunteering and participating in talking with me today. I really appreciate it. As I mentioned last week when I did my surveys and I was just mentioning to you, my research is about climate change and what young people like yourselves know and believe about climate change it, and what influences some of the actions you take in your everyday life. That's really what we're going to talk about today. I want to talk about influences. Who or what influences your beliefs about climate change? And then also, who and what and why do you choose to do some of the things you do in your everyday life? That's we're going to talk about today. We have about 20 minutes, but I think what will be able to cover it. This is very informal, so if you have any questions or have any thoughts, feel free to yell them out. What I wanted to quickly start with – on the survey, you'll remember I asked you to write down what you think climate change means. What I thought we would start with was the Environmental Protection Agency's definition of climate change, just to get us thinking about what it means as we start to talk about beliefs and behaviors around it. The Environmental Protection Agency defines climate change as any significant change in the measures of climate lasting an extended period of time. Climate changes include major changes in temperature, wind patterns, or participation – among other things – that occur over several decades or longer. A lot of people have this misperception or misconception that climate change is all about the weather. Weather is a very important factor, but it's not everything. Weather changes very quickly. We had different weather yesterday than we're having today. But climate is really over a longer period of time. That's really what we want to think about as we talk over the next couple of minutes. Another one of the questions that I asked on the survey was about information sources and where you learn about climate change. Overwhelmingly, most people who took the survey said that they learned about it from school, the internet, and television. What I would like to get a little bit more and talk to you guys a little bit more about is – not only where you get your information, but what sources of information influence what you believe about climate change. You don't have to say, you don't have to tell us what you believe. I'm interested in knowing who and what influences that belief. What do you guys think?

Participant 1: I first learned about sustainability and climate change in, I think sixth grade. We read this thing in the New York Times about global warming. That was the first thing I saw about climate change. I don't know. What I believe, I guess, about it…

Interviewer: Are there people, or are there sources? Did this newspaper article really influence what you started think about it?

Participant 1: Yeah, and then my teachers kind of backed on that. A lot of articles and news reports and things like that, documentaries.

Interviewer: What documentaries have you seen? Can you remember the names?

Participant 1: Not really.

Interviewer: That's all right. I'm always interested to see what people are watching.

Participant 1: There was one about penguins, I think.

Interviewer: I know which one you're talking about, but I can't remember.

Participant 2: Was it "March of the Penguins"?

Participant 1: It might've been.

Participant 2: I watched that one.

Interviewer: Welcome [to new student who walked in]. We were just talking about what influences your opinion about climate change. You don't have to tell us what you believe, but we're just wondering – we're talking about what is an influence. [Participant 1] was just telling us that newspaper articles, documentaries, teachers, influence her. [Participant 2], what do you think?

Participant 2: It first started at the end of fifth grade. That was the last subject we started talking about. I was in fifth grade. We watched these movies basically. At the start of sixth grade, we started watching a movie about polar bears. I was in six grade, and I was all sad for the polar bears. Their homes are getting lost and melting. That's when I started thinking about it. It was, like, whatever we should do to help, we should, because I was in sixth grade and wanted to save the polar bears.

Interviewer: That's kind of stuck with you, and you thought about it and kind of shaped about what you think. Cool. What about you?

Participant 3: What was the question again?

Interviewer: I asked the question on the survey about where you learn about climate change. A lot of people said school, the internet, and television. What I'm also interested in knowing is based on what you know about climate change, who or what influences that particular believe? Is it some of the sources where you get information? Or is it other sources? We've been talking a lot about movies. Movies weren't very high on the list of information sources, but it was very influential in what some people believed. What kinds of things or people influenced what you think?

Participant 3: I learned about climate change as well in school. Mostly like global warming and climate change – I learned that in fifth grade or sixth grade. Yeah, I know that there are other ways that we can – not stop it, but slow it down. Recycle and stuff like that. The media doesn't really talk about that very much, which is kind of a shame. They really should. Instead of talking about the Kardashians and whatnot.

Interviewer: Do you guys ever talk about it with your family at all – brothers and sisters or your parents? Or not really at home?

Participant 2: Not really.

Participant 3: Not really. We have a recycle bin and a trashcan. We put stuff in that. Nothing really. I haven't said "We should have CFL light bulbs." I always forget to mention that we should actually have those because they cost less money and stuff, and they last longer.

Participant 1: I sometimes talk about it with my family, when we're sitting at the dinner table and it comes up. We started turning off lights whenever we're in different rooms because we figured out we don't do that a lot. The same with water. When you're brushing your teeth, you turn off the water and then turn it back on. Different things like that. My brother loves to take the bus, but I really don't like it. I know probably I should because it's not using as much gas. It's one of the big things for our family, transportation.

Participant 2: When it comes to climate change, my family doesn't talk about it often. The most we will talk about it is when it's monsoon season here. We'll start talking about how much rain were getting and how it only lasts like 10 minutes or less. That's the most we get though. When it comes to turning off lights and saving electricity, my family is always doing that. We try to stay on top of that as much as we can.

Interviewer: You guys just brought up turning off lights and some of the things you do around your house, so we're going to move over into talking about some of the behaviors and why you do that. You guys were just mentioning that you guys turn off lights and do some of those things because that's what your family has always done. Some of the other – these are the top three behaviors that you all it took the survey said that you do most frequently or that the classes do most frequently. Turning off lights, turning off electronics it, and putting on warmer clothing in the wintertime. And then these three over here are the three that people said they do the least frequently. They either never do or very rarely eat meals with no meat, take public transportation, and walk or bike instead of drive. What I would really like to know – we've already talked about turning off lights and that you kind of do it because up to your family does. What are some of the other motivators or reasons why you do any of these activities that you do? Or you don't do them?

Participant 2: To save money.

Interviewer: If you wear warmer clothing in the wintertime – well, I guess I should ask, did I find yourself doing these? Or these things that you actually don't really do very often?

Participant 1: I do them, but usually it's to save money. It goes to the other that we should save electricity, but I think the number one priority is saving money.

Interviewer: One of the things I found kind of interesting as well is looking through the responses, lots of people where warm clothing in the wintertime, but not a lot of people marked that they wear cooler clothing in the summertime. I talked a little bit about it yesterday with some of your fellow students. Why do you think that might be? People wear more clothing in the winter, but don't necessarily wear cooler clothing in the summertime? What are some of those reasons? Why might the season choices be different?

Participant 2: It could be anything – not just global climate change. It could be, like, if they have scars on their arms from something, from an accident. They may want to wear sweaters or jackets all the time. Yeah, and I wear pants all the time. I'm more of a jeans type of person. I never really wear shorts. It's really just people's preferences and stuff.

Interviewer: I used to do that all the time, too, wear jeans. Then I moved here, and sometimes I can't because it's too hot.

Participant 1: Warmer clothing is more comfortable. Sometimes not having as much clothing on isn't as comfortable.

Interviewer: We can jump back to this, but I don't want to run out of time before we get here [next question]. Do you guys do any of these behaviors?

Participant 3: I'll take public transportation if I need to. I don't do it often. It's just that if I need to get somewhere walking or skating is going to take too long, I find the little bus that makes rounds around here.

Interviewer: If walking or biking takes too long…

Participant 2: I also take the bus as well. Sometimes I usually carpool with a friend since we're going to school, the same place. It's also a very long walk from my bus. If I had to guess, it would probably be, like, a block or two.

Interviewer: That's why you prefer to carpool because it's a little bit longer?

Participant 2: Mm-hm.

Interviewer: [Participant 1], what were you going to say?

Participant 1: I prefer to carpool because – I don't know. In this day and age with technology and cell phones, I don't really like to be around people I don't know that often. It's just more comfortable going to school with one of your best friends, instead of sitting next to a person you don't know.

Interviewer: What about eating meals with no meat? Are any of you vegetarian? Have you ever thought about it or thought about why you don't want to do it?

Participant 1: Because meat is great and really good.

Participant 3: I've thought about it, but I always came back to the conclusion that I don't think I could be able to last that long. My family is accustomed to grilled meat or something like that. It would be really hard.

Participant 2: Yeah, most of my – whenever we have dinner, it usually involves meat. There will be some meals where it doesn't involve meat, and I'm fine with that. Again, I don't know if I could last – not last, but I don't know if I could adjust to having meals without meat, like, full out a week or month or even a year.

Participant 1: Do you think that you could maybe do one meal every day without meat? Or one with meat…

Interviewer: There's a movement out there called Meatless Monday. It's been started by – I don't actually know who it's been started by. There's a group out there who try not to eat meat on Mondays, but they eat meat the rest of the week. Again, it's an awareness thing. I'm not sure how far it's gotten. I learned about it when I lived over on the East Coast. I don't know if you guys ever heard of that. Have you ever heard of Meatless Monday? You have? It's just trying to eat no meat on Mondays, and that's one way to incorporate it into your life.

Participant 3: I guess I could go one day or one week out of a month or whatever. It all depends. I don't pick my meals, like my dinners. My parents get home, look in the pantry, see whatever we have, and then just decide on that.

Interviewer: I want to ask you a quick question about this walking or biking instead of driving. One of the questions on the survey asks you all to write in what you think behaviors might affect climate change. A lot of people wrote in cars, driving, fossil fuels. What I'm interested in is that a lot of people wrote that in, but a not a lot of people see they walked or biked instead of driving. I have some ideas, but I would love to hear what you guys think that might be.

Participant 1: Exercise.

Interviewer: No exercise or people don't want exercise?

Participant 1: People are lazy. I'm lazy. I'll admit it.

Participant 3: It's, like, in Arizona, it's real hot outside. Nobody wants to walk anywhere in the middle of the day.

Participant 2: Yeah, I can't really walk from where I live. I live at the end of Pecos, so that's a really long walk. It takes me like 10 or 15 minutes to get to DV.

Participant 3: After school I do walk home, but that's because I have to. I walk with some friends. We pick up our little siblings at the other school down there. We walk home from there, but that's the most walking I do in a normal day.

Participant 2: I don't have a bike.

Interviewer: That makes biking hard.

Participant 1: I live all the way at the end of Pecos, so it's about 5 to 10 minutes away from anything. There's other people's that I could walk to with my friends, but other than that, there's not really anything around.

Interviewer: These are all really great ideas. Are there any behaviors not on either of these lists that you guys find yourself doing really frequently?

Participant 2: Recycling. I do that a whole lot.

Interviewer: Why do you recycle?

Participant 2: I drink a lot of water bottles. Some of them are plastic. Why not just put them in the recycle bin instead of putting them in the trash can? Also, it makes me feel a lot better, like, "Oh, I'm recycling".

Interviewer: All right, I want to keep you guys. I know you only have a couple minutes to get the class. Thank you guys so much. Take some candy. Don't eat it if your teachers don't let you, but keep it for later. Thank you guys. I really appreciate it. This is really helpful. You guys have my email. Mr. Williams also has it. If you have any questions about anything or you want to know about the program, I think you guys are getting someone in class this afternoon will tell you more about that. Feel free to email me questions.

Interviewer: I think we'll get started. I know we only have about 20 more minutes. We talked a little bit about the definition of climate change [previously]. As I mentioned, some of the things I want to talk about are the influences behind your beliefs and the actions that you may or may not take. What I thought we would start with is talking about influences on your opinions about climate change. You don't have to tell us what you believe if you don't want to, but I would love to hear about what influences that. If there's a specific person or a thing that has triggered a specific belief over time. As background, one of the questions I asked you guys on the survey was about sources of information. The majority of people said they got a lot of their information from school, the internet, and television. But whether or not you get information from a source doesn't necessarily mean it influences what you believe. Do those sources influence your beliefs about climate change? Or do you form your beliefs about the topic from a different source or from other multiple sources?

Participant 1: I have two other sources. My parents believe totally about climate change, like, trying to conserve water and turning off the lights in a room and trying to carpool instead of using a bunch of different cars to go to the exact same place. Also, we get National Geographic magazine. There was this one issue that really interested me. If we keep going down the track we are with global warming and climate change stuff, certain cities will be underwater because the ice caps are melting. Oh my gosh, this is bad. My favorite cities, New York City and LA, are going to be underwater. Don't do this.

Participant 2: I saw something like that, but it was like the year 2050 or 2025 was the point of no return. Sustainability came and talked to us in eighth grade. If we keep going down the path we're going, once we hit that year, there's no going back.

Interviewer: You heard about that in eighth grade?

Participant 2: Yeah, high schoolers came and talk to us.

Participant 3: We never got that.

Participant 2: Yeah, it was [kids] two years older than me.

Interviewer: Very cool. What about any other sources?

Participant 3: Just my parents.

Interviewer: All right, cool. Have you lived in Arizona for a long time?

Participant 3: I moved here almost 5 years ago.

Interviewer: Where did you live before that?

Participant 3: Lots of places. We lived in Florida, Washington state, New Hampshire, and Costa Rica – so a lot of different climates.

Interviewer: Yeah. One of the things that sometimes influences what people think about this topic is personal experiences with different types of climates. Have any of those influenced the way you think about it at all or not really?

Participant 3: Not really. When I was in New Hampshire, we had winters that were super strong and blizzards and stuff. I remember going back last year or the year before that, and it wasn't as strong. There was less snow. It wasn't the same as when I was a little kid. We had, like, 4 feet of snow and we could make forts and snowball fights and stuff. When I went back a year or two ago, there wasn't really that much. That was kind of disappointing. Were you born in Arizona?

Participant 1: Yeah, I've lived here for 16 years, it's kind of depressing.

Interviewer: What about you guys? You lived in Arizona for a long time or your whole life. Does living here make you think about climate change differently or at all or not really? That really has nothing to do with what you think about it?

Participant 2: Not really. I was born in Tennessee. Don't bring home acorns, [some type of] worms come in.

Interviewer: Note taken.

Participant 2: It's really humid there. I don't think climate change has really affected anything there, not to the point yours has. I never – the past few times I visited there, it hasn't been snowing. I don't know if the snow's been affected at all.

Participant 1: So, climate change is when the climate changes for a really long time.

Participant 2: There's a lot of water there.

Interviewer: Yes, over a long period of time.

Participant 1: It's been humid here recently, but that's not climate change because…

Participant 2: There is more precipitation.

Participant 1: Yeah, but it also it's over several decades. It's rained this year more than any other year. My dad said something about – what is it? It hasn't happened in 100 years, but one of the lakes here overflowed because it rained so much.

Participant 3: Tempe Town Lake?

Participant 1: I don't think it was that. I don't remember what it was called. Something about the moisture. I don't even know. Do you know what that is? Do you know what I'm talking about?

Interviewer: I have not heard about the overflowing lake, and I don't think it was Tempe Town Lake because I live right next door to it.

Participant 1: It happened like over 100 years – no, it was 1980 something.

Interviewer: Okay, so it didn't just happen recently.

Participant 1: No. It hadn't happened recently.

Interviewer: I haven't heard about that particular moment, but you do bring up a good point. Some people think that these heavy rains might be a factor or an effect of the climate changing. Those are some of that – heavier rains in places that are typically dry, like Phoenix, is sometimes seen as an effect of climate change. Part

about climate change is about is just the shifting of a climate because it's typically been one way, and it's changing and different than it used to be. Heavier snows are sometimes thought of as an effect of climate change. Heavier rains can be considered an effect of climate change. The thing about climate change is when they say over longer periods of time and over several decades is if Phoenix starts to see a heavier monsoon season than standard and it continues for multiple years and a decade or longer, that could be considered climate change. Now this might be a contributing factor, or it could be an unusual year. That's kind of the trick with [thinking about] climate change. It is kind of a difficult thing to nail down because it could be an anomaly. It could be something that just happened this year, and next year to go back to the typical monsoon season. Or it could continue to get heavier monsoons every year. Then that could be the way that Phoenix sees as their change in their climate. It's a very good point and a very good question. I'm intrigued by what your dad was saying about overflowing lakes. That would be interesting to see if that happens. Is there anything else that you guys can think of that might influence what you think of climate change or any sources that you get your information from that influence? That maybe isn't school?

Participant 3: I never see it on television or the Internet. It's never come up. I'm on the Internet all the time. I've never seen it. I've never seen anything on climate change. And I watch the news all the time, too.

Participant 1: California is in a drought. My dad made me watch these really… Netflix – there are a bunch of videos on Netflix about climate change and stuff. That influences me. There was this one that said that there is not going to be enough water to sustain Phoenix, so we are going to have to move away. Let's all move to Brazil.

[Everyone talking at once.]

Participant 1: Don't go during the World Cup though. There will be riots. You will get squashed. We're getting off topic.

Interviewer: Quite all right. What I think I would like to do, just to make sure we have enough time to cover everything, is talk about some of the behaviors. Here are some of the behaviors that I talked about or that I asked you guys about in the survey. On the left-hand side we've got the top three behaviors that people say they did most frequently, so either they did all the time our most of the time. Those are turning off the lights, turning off electronics, and wearing warmer clothing in the wintertime. The behaviors on the right-hand side are the behaviors that people did the least frequently. They either marked that they never did it or they very rarely do it. Those are eat meals with no meat, take public transportation, and walk or bike instead of drive. I would like to know – let's start talking about the top three behaviors first.

[Everyone talking at once.]

Participant 2: What you mean by turning off electronics? Like turning off my stove and stuff? Electronics, like I turn off my phone, but does that do anything?

Interviewer: Turning off electronics – just turning them off in general, not leaving your TV on, or leaving your computer on all the time – or if you unplug your stuff. There's something called…

Participant 3: Doesn't it still radiate electricity?

Interviewer: Even if you don't turn off your computer, there's still a tiny bit of electricity that it still sucks in…

Participant 2: Don't they make ones that don't do that now? I know with cell phone chargers, if you plug it in and keep your phone off, it will still suck out power. I think my dad told me that they do make ones that don't do that.

Interviewer: I think you're right. I think I have heard that, but I'm not totally positive.

Participant 2: I don't unplug my computer

Interviewer: That's kind of why – but you turn off your computer?

Participant 2: Yes, definitely. But I leave it plugged in. Then I just have to flip the switch to turn it on.

Interviewer: Why? Why do you turn off your computer?

Participant 2: Because I'm not using it. Because my dad yells at me if I don't. It's just a habit, I guess, something I've always done.

Participant 3: At my house from 3 to 6, it's, like, our high time hours for energy or something. I don't know. We turn off everything. The fridge, everything, for like three hours.

Participant 1: You turn it off?

Participant 3: Yeah.

Participant 1: Doesn't your stuff go bad?

Participant 3: No, not in a span of three hours. We have this really cool fridge

[Everyone talking at once.]

Participant 3: We don't use computers or anything that's plugged then. Everything is turned off.

Interviewer: Between three and six?

Participant 3: Yeah.

Participant 1: Isn't that when your house is really hot, too?

Participant 3: Yeah. The AC's not on.

Participant 2: I'm not going to go to your house between three and six.

Participant 1: My house is very eco-friendly because we got our little SRP bill for electricity, and we are below. We are the green, solid [green].

Participant 2: You look at your bills?

Participant 1: I'm so interested in stuff. Do you know Central College about their sustainability program?

Interviewer: Central College? No. I don't know.

Participant 1: I thought it was there. I got a pamphlet in the mail.

Interviewer: I don't know anything about that one.

Participant 1: It might be in Iowa. I know it Central College, but I don't know where it is.

Interviewer: I never heard of it, so it's very possible.

Interviewer: You actually pay attention to your electricity bill.

Participant 1: Yeah. Is that normal? No, houses like yours and our neighbors – it compares your house to what you should be tell your neighbors are and what we are. We're like super, super good.

Interviewer: I had no idea SRP did that.

Participant 1: Yeah. It's like a little chart.

Interviewer: What about wearing warmer clothing or in the wintertime? Do you guys do that? Instead of turning on the heat…

Participant 3: Last year and this year – the winter in Arizona was really cold for a couple weeks.

Participant 1: Yeah, it was the coldest I've ever seen.

[Everyone talking at once.]

Participant 1: But during school, I have to walk from the C building to the H building, and it's freezing.

Participant 2: We put flannels on our beds in the winter, so we don't have to turn the heat on.

Participant 3: It was un-normally cold in the winter.

Interviewer: Why do you guys do that [put flannel sheets on the bed]? So you don't have to turn the heat on basically?

Participant 2: Mm-hm. To be comfortable.

Participant 1: I like being cold in my house and wearing sweaters. It feels good.

Participant 3: We have a fireplace, too.

Participant 1: I believe everyone does. Do you use your fireplace?

Participant 2: No, it's like a big event when we use hours.

Participant 3: We have a bonfire in our backyard too.

Participant 1: My brother wants to get one… My dad talks about it all the time.

Interviewer: One of the things we found interesting is that a lot of people said they commonly wore warmer clothing in the wintertime so that they could not turn on the heat, but not very many people said that they frequently wear cooler clothing in the summertime so they don't have to use the air-conditioning. Why do you think? Do you do that?

Participant 3: I have to because from 3 to 6, I'm sweating.

Participant 1: I just don't really have a high tolerance for heat. My house is freezing because my dad is warm-blooded.

Participant 2: Same. If I get above a certain temperature, I hate when my house is above 78. If it's above 78, I'm like "No, I need to go to someone's house."

Participant 1: We keep [ours at] 73, and you go to 78

[everyone talking at once]

Participant 3: Ours is that 83, and whatever goes to 84, the AC kicks on. I get used to it.

Participant 1: I can't.

Interviewer: So it's better in this climate, in this area, it's almost too hard to stay cool.

Participant 3: You can push a little. Your AC's on at 75?

Participant 2: If you manually set it.

Participant 1: I think people don't realize it's a luxury. My dad could use it being cooler than that. We are just like a baby when it comes to heat.

Participant: Yeah, seriously.

Interviewer: We talked about behaviors that people frequently do. Let's talk about behaviors that people say they don't frequently do. These are kind of the top three that people don't do or rarely do, I should say. Do any of you guys do any of these three things?

Participant 2: I'm a vegetarian.

Interviewer: Can I ask why you are vegetarian?

Participant 2: Health reasons.

Interviewer: Ok. Is your family vegetarian as well?

Participant 2: I'm the only one in the family. My parents often forget, too. It's kind of bad.

Participant 1: I don't eat dark meat. I just eat chicken. I love chicken. Every time my parents make hamburgers, they make me chicken.

Participant 2: I'm from the South, so they always make barbecue. I'm like "I can't eat that." My dad is like "I won't tell anyone." I'm like "I don't think that's how being a vegetarian works."

Participant 1: The public transportation thing – I used to a ton before I got my car. There's an Alex bus or whatever it's called.

Participant 2: The Circulator?

Participant 1: Yeah. It's called the Circulator. There's a bus around Ahwatukee. I used to take that all the time. In the winter, I love riding my bike because outside, it's just nice.

Participant 2: I ride my bike a lot.

Participant 1: Me and my little brother go to the park every day.

Interviewer: You ride your bike a lot, but only in wintertime?

Participant 3: Yeah, no – I do sometimes in the summer when it's like 80 or something when it's not as hot.

Participant 1: It's never 80 in the summer. Maybe at 4am.

Participant 3: I mean, when it's not as hot.

Interviewer: You guys just said you don't really ride the bike or stuff during the summer time because it's too hot. One of the things on the survey – not only did I ask you fill out the frequency that you did a number of these activities, but I also ask you to write in what you thought might be behaviors that lesson or worsen climate change. A lot of people wrote in that they think cars and pollution and fossil fuels [are] worsening climate change; yet I notice on the survey that a lot of people said that they don't typically walk or bike instead of drive. Why do you think that is? We talked about it being too hot. Other than that, do you think there's any other reason why people might not?

Participant 3: I think people want to help and stuff, but actually doing it is a totally different thing. You say "Yeah, I'm going to help the earth and do this," but like "Okay, yeah we are taking three cars to the certain event."

Participant 2: I walk or bike just exercise. I don't do it for transportation.

Participant 1: I think it's too inconvenient. I don't know. At college, I can see people riding bikes and stuff. I think that's the college thing. The distance from me to the school is like a 15 minute car ride, so riding my bike would not be very… I live like down in Ahwatukee, and it's kind of isolated. I'm not near anything, so riding my bike would not – I would have to leave like two hours early to get somewhere. My parents are also like "It's probably not safe." My parents are like super strict. I would have to carry pepper spray or something.

Participant 3: You can buy mace. Trust me. I have some. It's on my keychain; it's my moms. Or, I would have to go with someone, and I don't always have someone to go with. I can't ride my bike on my own because my mom – they're a bunch of different factors.

Participant 2: Safety.

Participant 1: People are lazy.

Participant 3: If it requires any energy to walk or bike, you feel like "No, I'll just drive." I'm afraid to drive. I had a dream that I drove into a lake. It was terrible.

[everyone talking at once]

Participant 1: But I do carpool a lot.

Participant 2: She drives me everywhere.

Participant 3: I carpool sometimes.

Participant 2: My neighbor drives me to school, too.

Interviewer: Are there any behaviors that you do frequently that aren't up here?

Participant 2: I don't know. Turning off the water when you brush your teeth. I'm really bad about doing that though.

Participant 3: Yeah but my showers

Participant 1: I take time in my showers

Participant 3: It's hard.

Participant 1: I take cold showers. I don't know if that has anything to do with anything.

Participant 3: Cold showers are nice in the summer.

Participant 1: I take cold showers year-round. It's weird.

Interviewer: You're saving energy on not heating water.

Participant 3: So how do you shave your legs? Don't your legs get cold?

Participant 1: I don't ever get cold. I wear shorts in the winter.

Interviewer: When you turn off water to brush your teeth, is that just habit or you been used to it? That's just kind of how you do it? Or do you think about it?

Participant 2: I don't do that.

Participant 3: That was a really big thing when we were 8. When we are little, our parents were like "Save water. Turn it off." It just became habit.

Participant 1: I think turning off the water as your brushing your teeth hasn't always been a big thing. But I feel like it, recently, it got big when I was like 8 or something.

Participant 3: Whenever you pay attention to it, I never remember them telling me…

Participant 1: [inaudible] save water by not brushing my teeth. What if I didn't brush my teeth? It would be so gross. I brush my teeth all the time.

Participant 3: I just had a cavity.

Participant 1: I've never had a cavity.

Participant 3: They really hurt if they don't numb it… I'm one of those people that pee outside so they don't have to flush the toilet.

Participant 1: We hang a lot of our clothes dry so we don't use the dryer a lot.

Participant 3: We do, too.

Participant 1: I didn't want to be like – I want to say something, but it had nothing to do with it.

Interviewer: No, honestly anything goes here. I want to hear what you do, what your family does.

Participant 3: We don't have a microwave either.

Participant 1: [inaudible] How do you make popcorn?

Participant 3: You put the kernels on the stove, and then you pop them.

Participant 1: What is this? The 1980s? What is this?

Participant 3: My dad just is anal about those kinds of things.

Participant 1: We're not in the 1920s. Where have you been? Do you have electricity?

Participant 3: Yeah.

Participant 1: Oh! I've been trying to convince my parents to get an eco-friendly car.

Interviewer: How's that going?

Participant 1: It's going ok. The ones that you have to – like about Civic. I know there's a super eco-friendly one, like the Nissan or whatever it is.

Participant 3: The Nissan Leaf.

Participant 1: Yeah, the Nissan Leaf.

Participant 3: Or the Volt.

Participant 1: The charging station is right next to my dad's work – or the gas station or whatever. My neighbor has one. So I've been trying… And you get to go in the HOV lane whenever you want.

Participant 3: Oh, yeah.

Participant 1: That helps. I'm literally all about saving the planet. I think my teacher last year hated me because she would never recycle anything.

Participant 3: Do you like my new recycling bin?

Participant 1: Yeah, I do.

Participant 3: Do you wear green because of your favorite color?

Participant 1: Green is my favorite color. Oh my God. But recycling is Blue

Participant 3: We recycle, like, a lot.

Participant 1: Me too.

Participant 2: Ok, we don't.

Participant 1: You are awful.

Participant 2: I have a bunny, and when I clean out his cage, I put it in the trash thing. I used to recycle, but that was when it was my job. My parents never really thought about it. Now that I'm all-consumed in taking care of this beast, I have to, I don't think about recycling anymore.

Participant 3: Recycling is a huge thing in my house.

Participant 1: We do box tops.

Interviewer: Okay, box tops are great.

Participant 1: We literally have like 1000.

Participant 2: We do the pop tops on the soda can.

Interviewer: Do all you guys live in the city of Phoenix? Within the city of Phoenix? Ahwatukee?

Participant 3: Ahwatukee

Participant 1: Is Ahwatukee in Phoenix?

Interviewer: I think Ahwatukee is technically part of Phoenix.

Participant 2: Do you know where Club West is?

Participant 1: Yeah, I think I live in Phoenix.

Participant 3: Yeah, you're in Ahwatukee.

Interviewer: Do you guys know – on top of recycling, does the city of Phoenix make it easy for you guys recycle? Do you know, at your house?

Participant 3: We have a recycle bin and I had trash bin. We put them both that on the same days now.

Participant 1: I know. It's awesome.

Participant 3: It's nice cause you only have to do it once. I feel like people when they did it on separate days would be like "I'm just going to put it all in the trashcan" because going out two days is just too much. Now it's on the same day, and they

work on holidays, so you don't have to work on... And they have a huge once a month thing …

Participant 1: The bulk trash pickup?

Participant 3: Mm-hm.

Participant 1: Yes! They call about that all the time.

Participant 2: What the heck? Why do so involved in your trash days? I don't even pay attention.

Participant 1: [inaudible] is my goal in life.

Participant 3: If you put plastic in the ground, it will take thousands of years to dissolve.

Participant 1: And Styrofoam, right?

Participant 2: What do you want to be when you grow up? Does it have anything to do with what you…?

Participant 1: I actually want to do something with climate.

Participant 3: You go, girl.

Participant 1: I would totally go into sustainability. Other than that, I have no clue. What jobs can you…? I can ask that later.

Interviewer: That's okay. I was is going to say, unless there other behaviors you guys can think of that you do or don't do or if you have any other thoughts on influences…

Participant 2: I really should recycle.

Participant 1: What do solar panels do? If you have solar panels and you…

Participant 3: Do you have solar panels?

Participant 1: No, my dad really wants them. If you have solar panels and you're totally off the grid and you have a totally electric car like a Nissan Leaf, you wouldn't be giving waste to the planet.

Participant 2: My family is so bad to the planet, we use a ton of plastic bottles. My mom buys them all the time. She throws them all away, and I'm hurting the planet.

Participant 1: Do you go to California ever?

Participant 2: Sometimes.

Participant 1: Take them there because you get $.05 for each one. It's cheating because if you don't pay their taxes. But you get $.05 per bottle.

Participant 3: We go there every summer.

Participant 2: Why would California use my plastic bottles?

Participant 1: Because you get five cents per bottle. Wait, what was your question?

Interviewer: I just want to know if you guys have any other thoughts, but keep going with the plastic bottles.

Participant 3: I was thinking about all the things of my family. We do turn off all the electronics though, and the lights.

Participant 2: I'm really bad about turning off the lights, and the tv, and radio.

Participant 3: I recycle. I recycle.

Participant 1: And I make sure the school [inaudible] but it kind of pisses me off. I heard they just throw it all in the trashcan, so all my hard work …

Participant 3: I don't think they have the time to separate it.

Interviewer: The school actually has a new program that is being rolled out. It will be better than it has been in the past.

Participant 1: There is a recycle bin in every classroom, but I heard that they just throw it all in the trashcan. About the separating thing, they shouldn't have to separate it if there's a recycle bin and a trash bin. I just think they're lazy

Participant 3: Yeah, students are the worst. It's so easy. I mean, I do it [inaudible].

Participant 2: I don't have a separate recycle thing in my house. I feel like if I did…

Participant 1: You don't?

Participant 2: Nuh-uh, that's the problem.

Participant 1: We reuse plastic bags.

Participant 3: Some people get two trash bins and have one for recycling and one for trash. We just put all our recycling things in a bag. And once it gets full, we take it out…

Participant 1: We have a box in the kitchen, like this is recycling.

Participant 3: Oh is that the bell?

Interviewer: What I want to talk about today – you took the survey a couple weeks ago. I want to focus on the topics of influences on your climate change beliefs, and also some of the behaviors and motivations and influences of some of the behaviors you said you did or didn't partake in. I don't have your particular survey because those were also anonymous. But just thinking back on the surveys as a whole, I set up some of the analysis. The three most popular information sources were from school, TV, and the internet. These are just the sources that people said they got their information from. I was wondering if these are the similar sources that are influences on your opinions or if there are other influences on your opinions on climate change. [Participant 1 nodded]. It's those ones?

Participant 1: Yeah.

Interviewer: What about – do you ever talk about climate change or anything with your family or anything like that?

Participant 1: Not really. It might just come up here and there, but not regularly.

Interviewer: What kind of – when you think about school, is it from classes or from friends?

Participant 1: Classes.

Interviewer: Okay. Mostly APES [AP Environmental Science]?

Participant 1: Yeah.

Interviewer: What about TV? Are there certain programs or anything like that? Is that one of your major influences?

Participant 1: Yeah. Just Weather Channel. That's probably it.

Interviewer: Internet – do you read news stories about it?

Participant 1: No. Not the internet.

Interviewer: Not internet, okay. Cool. Do you ever think about climate change when you think about any of your personal experiences with weather or this region's climate? Do you ever think about that as an influence on your belief about whether climate change is happening or not?

Participant 1: No. As in – do I think about it before I go and do something?

Interviewer: Well, does what you've experienced here living here influence what you believe about climate change – or what you've experienced in traveling or anything like that? Has that influence what you believe, or not really?

Participant 1: No, not really.

Interviewer: Okay. It sounds like maybe school is a big influence. Have you taken any other classes other than environmental science that has talked about climate change or other similar topics?

Participant 1: Maybe biology.

Interviewer: Did you take a general or honors or AP biology?

Participant 1: General.

Interviewer: What did you guys talk about in there? Do you remember?

Participant 1: It was freshman year. Just what it does to the ecosystems, I guess, environmentally.

Interviewer: Thinking about your personal experiences, we were talking about your fishing and hunting passions. Does interest and passion about that influence what you believe about climate change?

Participant 1: Yeah. With the climate changing, it can really change the environment whether you fish or hunt. For instance, if you're fishing – I don't know. There are certain climates that are good for fishing, and some that you should stay away, like lightning and stuff like that. Other than that …

Interviewer: Have you ever hunted or fished anywhere else other than this Illinois, Midwest area?

Participant 1: No, just basically the Midwest.

Interviewer: I'd be interested if there's a difference between what it's like fishing around here versus maybe fishing down on a southern coast or something. That would be interesting if that were different. The other thing that I want to talk a little bit about are some of the behaviors. I have two different lists of behaviors. These are all based on all of the surveys. This was over here, the three most common behaviors that were listed on the surveys, and these are the least common behaviors. The most common behaviors, being turning off the lights, turning off electronics, and wearing warmer clothing in the winter. Then the three least common being eating meals with no meat, taking public transportation, and unplugging electronics or turning off power strips. Let's start with the most common behaviors. First of all, are these behaviors that you do yourself? Or are there any of these behaviors that you don't do?

Participant 1: Turning off lights, I do. Electronics is kind of on and off. I don't do it every time. But warmer clothing in the winter, yeah.

Interviewer: Why do you choose to, for example, wear warmer clothing in the winter instead of turning up the heat?

Participant 1: Costs more money when you turn up the heat.

Interviewer: That's a big one. Costs are a really important thing.

[New student just walked in]

Interviewer: We're just talking about the most common behaviors. He has to leave in a few minutes for a college visit, so we got started. We'll kind of roll back around to it. But feel free to pipe in about these behaviors.

Participant 2: Are these just behaviors that would help?

Interviewer: On the survey, these were the three most common behaviors that the whole group of students who responded to the survey indicated that they do most frequently. So turning off lights, turning off electronics, and wearing warmer clothing in the wintertime instead of turning up the heat. And this list was the least common. The fewest people indicated that they frequently do these, or that they rarely or never do these three behaviors – eating meals with no mean, using public transportation, and unplugging electronics. We were just talking about the most common behaviors and which ones you guys do or don't do. I want to understand why and what influences why you might make a decision to turn off the lights or wear warmer clothing in the winter. [Participant 1] and I were just talking about the cost. It costs more money to turn on the heat in the wintertime, so it makes more sense to wear warmer clothing. You also mentioned that turning off electronics is kind of a sometimes thing and sometimes not. What motivates the decision to turn off electronics or not?

Participant 1: Probably laziness. Other than that, it's probably the main thing.

Participant 2: Sometimes you just forget about it. You walk out of the room and it's left on.

Interviewer: When you guys think of electronics, are you thinking … what are you thinking about?

Participant 2: My Xbox, TV maybe.

Participant 1: Yeah. Same.

Interviewer: Cool. Computers – do you guys turn off your computers every time you use them?

Participant 2: Yeah. I make sure to turn off my computer, unless it's the same thing – unless I leave the room, so I go downstairs and get something to eat, and I totally forgot about it.

Participant 1: Yeah

Interviewer: Another thing that was interesting is one of the most common behaviors was wearing warmer clothing in the wintertime. Behind, the fourth or fifth one, the most popular behavior was wearing cooler clothing in the summertime instead of turning up the AC. Do either of you find yourself doing that or choosing to do that? Is it a similar reason for warmer clothing? It wasn't as popular. I'm interested as to why people choose to wear warmer clothing in the winter, but choose less often to wear cooler clothing in the summer.

Participant 2: I think it's easier to wear more clothes to stay warm, as opposed to – even though you're wearing less clothes, if it's hotter – sometimes you're still not going to be cool. It's just how hot it is. Sometimes you're forced to turn on the AC, as opposed you can just keep layering it on until you feel comfortable. Yeah. My family is totally against using the AC. So windows are open, fans on.

Interviewer: Do your families have ceiling fans?

Participant 2: Yeah. Ceiling fans, sometimes the fans you plug in, too – get a couple of those in your room.

Participant 1: Yeah.

Interviewer: Now let's talk about these three least common behaviors – eating meals with no meat, taking public transportation, and unplugging electronics or turning off power strips. This is the next step of turning off electronics, would be actually unplugging them. This kind of relates to that idea of vampire loads. Have you guys heard about that?

Participant 2: Yeah. I forgot what it's called, but when you're getting charged for leaving things plugged in or whatever.

Interviewer: Yeah. Even if these computers are turned off, even though they're plugged into the wall, they're still sucking a tiny little bit of electricity. This idea is to turn off, unplugging them completely stops that. Even if it's minor or miniscule, it does stop that pull – that's where that comes in. These are the three least common behaviors. Most people said that they rarely or never eat meals with no meat and rarely or never take public transportation. That's what those responses are there. Do either of you do any of these three?

Participant 2: I do none of those.

Participant 1: Public transportation maybe.

Interviewer: You do take public transportation?

Participant 1: Yeah. Do school buses count?

Interviewer: Sure.

Participant 2: I just feel like Plainfield, there's not really any public transportation. Maybe if I'm in the city …

Participant 1: The train or something.

Participant 2: Yeah. I'll take the train and some buses. Here if I'm going somewhere, I'll just take my car because I'm not going a very long distance.

Interviewer: You said you do take public transportation though when you're in the city?

Participant 2: Yeah.

Interviewer: Do you take the train down to the city? Or typically you're going to the city and you drive there and …?

Participant 2: No, I'll take the train.

Participant 1: Train, yeah. Usually a little of both.

Participant 2: I guess it depends what I'm doing, if I need a car. I don't know.

Interviewer: What about eating meals with less meat or eating vegetarian? Do you guys ever do that or think about that?

Participant 2: Nope.

Participant 1: I always eat meat.

Interviewer: Why do you always eat meat?

Participant 2: When my mom makes food, usually the main course is meat, and then there are just sides of maybe a salad or potatoes or vegetables or whatever. I don't know.

Participant 1: The same.

Participant 2: My family is big meat eaters. We like meat.

Interviewer: Do you guys ever help cook dinner?

Participant 2: Yeah.

Interviewer: Mom cooks dinner or dad cooks dinner …

Participant 1: I cook on the grill sometimes on the weekends.

Participant 2: Yeah. I'll grill sometimes or help cook.

Interviewer: What about unplugging electronics or turning off power strips? Do you ever do that?

Participant 1: No.

Interviewer: It kind of goes off number two?

Participant 1: Yeah.

Participant 2: Pure laziness probably. It's not something that I think of.

Interviewer: What about some other behaviors that you guys do that maybe aren't listed on here? Maybe you marked something you frequently do that wasn't one of the top three. Can you think of any other behaviors or choices you make that may relate to climate change in terms of energy or transportation or water use or waste?

Participant 2: I try to carpool if I'm going to school. I usually maybe get a cycle going of who will drive.

Participant 1: I do that every morning with my neighbors.

Participant 2: With water use, I try to take shorter showers. I personally like cold showers, so I don't know if that helps.

Interviewer: Yeah. It actually requires less of the water heater going.

Participant 2: My mom's always saying to watch the water bill, so I take short showers.

Interviewer: The short showers have to do with cost, the water bill?

Participant 2: Yeah.

Interviewer: What about you, [Participant 1]? Can you think of any other behaviors or activities?

Participant 1: No.

Interviewer: All right. Any other thoughts on any of the behaviors that are least common or most common? If not, that's totally okay. Don't worry. I do want to understand why students like yourself make these choices. That's really what this conversation …

Participant 2: I would say the main reason I would do most of these is for cost. It's not entirely for the environment, but it's just a plus that it helps the environment. Most of the time it's just thinking about the cost.

Interviewer: That's a huge thing. That's a huge motivation in a lot of these choices. That's great to know. Have you ever looked at your family's electric bill or your family's water bill or anything like that?

Participant 2: No.

Interviewer: I'm not sure I ever did before I had to pay my own rent either.

Participant 1: My mom says sometimes "Oh, the water bill went up". I don't see it.

Participant 2: Consciously when I'm doing things, I'm not totally thinking that my water bill's going to go up.

Participant 1: Yeah.

Interviewer: Yeah. Awesome. That's all I really wanted to talk about in terms of behaviors. There was another topic that we talked about before you came in.

[Participant 1 leaves]

Interviewer: We started by talking about some of the influences on climate change – influences on what you believe. One of the questions that was on the survey was about information sources and where you get a lot of your information from. The top things that were significantly higher than the other ones were school, TV, and the internet. Interestingly, these were the same sources that the students in Phoenix also said were their top three most important sources that they get information from. Are these information sources the same ones that influence your opinions on climate change?

Participant 2: Yeah. I would say it was these three, but I would say it's in like a totally opposite order with internet as the top, TV as the second, and maybe school was the third. I would say school kind of taught me on how the weather was changing, but not totally what's going on. You know what I'm saying?

Interviewer: Yeah. School almost gives you the …

Participant 2: The reason why it's happening, and then the TV and internet are the consequences. I can see polar ice caps melting or whatever. I can see that on the internet and TV. I can connect that with school because it's like greenhouse gases or whatever.

Interviewer: That's interesting. You're connecting the consequences, which are highlighted more in the media. They talk about what's going to happen, maybe some negatives, maybe some positives. And then connecting it to what you're learning in school. That's an interesting way of looking at it. Are there any sources that influence your beliefs about climate change?

Participant 2: Probably magazines.

Interviewer: What kind of TV shows or internet blogs or newspapers or magazines do you read about this topic?

Participant 2: Probably Time magazine, see articles about it. TV is just like if my mom's watching the news, and I happen to catch something. I'll see it. But I'm not directly watching programs about it. If I see it, I see it. As far as movies go, movies I watch don't really deal with climate change.

Interviewer: There are some movies out there, but some of the main ones are a little bit older. Have you heard or seen "The Day After Tomorrow"?

Participant 2: Yeah. I've never really seen it, but I've heard about it.

Interviewer: Yeah. I actually had never seen it either. But that's a movie that often comes up. "An Inconvenient Truth" is an easy one that most people think of. What about your family? Does your family ever talk about this topic or related topics?

Participant 2: No, not really. They talk about how this year the weather was kind of crazy, like the seasons were – the winter was pretty bad. This year, the summer – we didn't really have that many hot days. Last year, it was so many days over 90 degrees, and this year we probably had five. I guess we talk about the weather, but we don't really talk about global warming or anything like that.

Interviewer: Okay. What about any personal experiences? Are there any things – do you think about climate change differently because of weather you've experienced or travel that you've done or any activities that you might do in your spare time or anything? Do you ever think about those in relation to climate change?

Participant 2: If I'm driving on the highway, and I see all these cars, I think of all the emissions they're producing. I'll think about it then. But other than that, not really. I don't really see anything that's happening.

Interviewer: Mm-hm. We were talking about school. [Participant 1] and I were talking about school. You mentioned the [ape] class I know you guys are all in environmental science. Are there any other classes that talk about climate change that you remember?

Participant 2: Yeah. What class was it? I think biology maybe, as far as that goes. Chemistry – no, I don't remember talking about the climate change. Physics, I definitely didn't. No classes that I've taken. Maybe there are other classes out there, but none that I've taken.

Interviewer: Okay. Is this a topic that you've been interested in and thought about in the past, or is it kind of a new topic?

Participant 2: I've thought about it because I want to know if it's really happening because other people are like "Oh, that's a bunch of BS, it's not happening." I want to know if it really is happening, or if it's just like naturally occurring changes, just natural causes. I don't really know. Yeah. It's interesting.

Interviewer: Yeah. You're interested in continuing to learn whether or not, you're still trying to figure that out.

Participant 2: Yeah.

Interviewer: Cool. It's definitely a tricky topic. There is science leaning one way and opinions and politics arguing a different one. It's a tricky field to navigate. Have you thought about any of the – you were mentioning you hear about the consequences of global warming and those kinds of things. Have you ever thought about any of the solutions out there? Have you ever heard about anyone talking about solutions to climate change or helping that? Or not really, still learning about it.

Participant 2: On a small scale, like all the things that you were talking about – like carpooling and wearing warmer clothes in the winter. But no major, to fix the problem right now. Yeah. I don't know. There's no solutions that I've heard of that they're trying to do reverse the effects that are already happening, just things we can do to help right now.

Interviewer: Okay. So small scale things right now.

Participant 2: Mm-hm.

Interviewer: All right. Those were the main topics I wanted to specifically address and talk about with you all. I wanted to leave a little bit of time open for you to ask questions about the topic or any additional thoughts in general from taking the survey. If you have any questions about either or these topics or anything additional that you wanted to mention.

Participant 2: How did the students here compare to the students in Arizona as far as what they do, like the top three things that they do? Were they about the same?

Interviewer: They were. It was interesting. In terms of behaviors, the students in Arizona – these two were also their top two, eating meals with no meat and taking public transportation. Their third top one was wearing cooler clothing in the summertime. Whereas with you guys, wearing cooling clothing in the summertime was, as I mentioned, fourth or fifth. It was more of a common behavior for you guys. Other than that, those three were the top for Arizona as well. Some of the things you were talking about with the cooler clothing versus warmer clothing that you guys mentioned – easier to pile on clothes than it is to wear less clothes. That was kind of the response from the students in Arizona as well. It's obviously …

Participant 2: Their summers are hotter, too.

Interviewer: Yeah. Right now, it's still 100 degrees there. As they said, hot is hot. There's only so much you can take off while still being modest. They said that's something that they don't do very often because it's so hot there.

Participant 2: You have to use AC.

Interviewer: You have to use AC to survive almost. That was kind of the main difference that I saw in behaviors. Other than that, those were the most common. These were relatively the least common ones. And for similar reasons. Cost is always a big thing. You guys have to also kind of listen to your parents. They're the ones paying the bills, and so if they say "Turn off the water because the water bill is getting high." The other thing that we talked a lot about was the vegetarian diet, eating meals with no meat. Similar responses with that as well. Your families choose the meals you eat, and sometimes that's hard to change if you want to or if you think about it. Sometimes you don't have that choice necessarily.

Participant 2: Would you say that they were more educated as far as global warming and climate change than we were? Or was it about the same?

Interviewer: I haven't gotten all that analysis done yet. They took their survey about two or three weeks before you guys took your survey, so I haven't done all the analysis yet. I've only analyzed these particular questions because I wanted to talk about them with you guys. But I will have that analysis done in a couple weeks. Great questions though. It's going to be interesting to see what the differences are.

Participant 2: Yeah. I'd like to know. It's kind of like west coast. Not really, but …

Interviewer: Southwest. Yeah. Certainly, they're living in a desert, and you guys are living in a kind of temperate climate, milder climate.

Participant 2: So would you say the temperature is kind of changing there? Here, I know the summers when it's hot. It wasn't as snowy during the winters. I don't know what the seasons are in Arizona. Is it more of like a summer all year round?

Interviewer: What you guys consider summer, yeah. Their wintertime is about 60 to 70 are the highs. Then the lows – the desert is interesting. The lows can be about 40 degrees.

Participant 2: During the nighttime?

Interviewer: Yeah, overnight. It cools off really fast, but it also heats up really fast during the day. So there are huge temperature differences between night and day there. Here, it's less of that, during the same day. Their summers get to be 110, 115, 120 degrees.

Participant 2: Is it more like a humid heat or dry heat?

Interviewer: Dry heat. So it's a little bit different heat than what we experience here.

Participant 2: It's been really humid here.

Interviewer: Yeah, exactly. We actually had some monsoon rains about a week and a half ago, where they closed down schools. They closed down highways that were flooded. Then it was humid for a couple days. Then we had 100 and 105 degrees with humidity. It gets to be a little bit much. I think you guys get here a couple times during the summer, but it's not typically a consistent heat – unless we're going through a heat wave here. It's just a little bit of a different climate. They're experiencing different climatic changes as well. It's getting a little bit dryer there. Other than the crazy monsoon season that we've been having this year, there's

typically been less and less rain over time. Temperatures obviously are increasing. The heat island effect is a big thing there. Do you know the heat island effect is?

Participant 2: No, what's that?

Interviewer: The heat island effect takes place in cities where the city has trouble cooling off at night because of all the manmade structures and all the dark blacktop and dark surfaces.

Participant 2: Kind of retaining heat.

Interviewer: Exactly. It'll soak in all the heat during the day, and then at night it has trouble releasing all the heat back into the atmosphere. I mentioned that the desert temperatures change during the wintertime, but during the summertime it's difficult to get the temperature of Phoenix down below 90 in the summer at night because of this heat island effect, where the city and the surrounds are kind of soaking in all the heat. It makes it hotter. Actually we have that same heat island happen in all major cities. Sometimes the city of Chicago – if you're in the city of Chicago, it might feel hotter there than it would out here because out here there are less of the compact structures that the urban city has. It's easier to release the heat.

Participant 2: That's like trapping all the heat in all the buildings?

Interviewer: The buildings and the manmade materials and all that kind of stuff helps soak in the heat. That's the general idea behind the heat island effect. That's another thing that major cities have to think about. The Chicagoland area also does experience it. Again, it's slightly different ways and different temperatures.

Participant 2: It's depending on how many structures it has.

Interviewer: Exactly. Great question.

Participant 2: Is this for a project you're doing at your school?

Interviewer: It's for my master's thesis. I'm getting my master's degree in sustainability. I'm doing a master's of arts, which requires a thesis at the end, which is basically a really long – research and then a really long paper, writing and defending it.

Participant 2: So this is the research about it.

Interviewer: Exactly. I'm interested in what high school students know and believe about climate change and what motivates behavior choices that relate to energy, transportation and diet choices and things like that. I'm doing the research with your classes and some classes in Phoenix. Then will be comparing the data and writing a final paper, which is due when I graduate in May. I have to write that and defend before I graduate. That's what all this is for.

Participant 2: Are there students that research the east coast and New York and Texas? Or is it just what you chose to do?

Interviewer: This is what I chose to do. This is my personal research. As I'm doing my own research, some students when they do their theses do maybe literature reviews or review a bunch of different opinions or articles or stuff like that. I chose to

do firsthand research. But this is my own thing. There are students kind of all over the place studying similar things, but doing it in different ways.

Participant 2: You have a lot of freedom with what you can do?

Interviewer: Mm-hm.

Participant 2: That's cool.

Interviewer: It was really nice. The program that I'm part of is very broad. They let us kind of go in the direction we want to go in. I'm the only one doing this particular type of research. Some of my fellow students are doing research on ecosystems. One of my friends is doing research on environmental justice and social issues surrounding waste and waste facilities. Some other friends are doing anthropological research, so kind of human systems and geography. It's a broad range of topics. But we're all in the same program, which is kind of cool. We have a lot of people to bounce ideas off of.

Participant 2: But they all kind of relate …

Interviewer: Exactly. They're all related to the topic of sustainability. We talked about that while I was here a couple weeks ago.

Participant 2: Are there a lot of jobs you can get into with that sustainability?

Interviewer: Yeah. It's a growing field. It's absolutely a growing field. I don't have any concerns about after I graduate. I'm interested in education and communication about these topics. So there's a lot of new things going on in that field within schools or universities. A lot of companies have sustainability departments now and corporate responsibility, CSR. Those are all very pertinent departments in the topics these days in big companies. I think there's definitely a growing demand for professionals who have these skills and have this knowledge and this drive.

Participant 2: Because you guys are going to save them money, too, right?

Interviewer: That's the plan. That's one thing. It used to be expensive to do environmentally friendly things and use environmentally friendly materials. But over the past few years – 10 or 20 years.

Participant 2: A lot of new, innovative ways to do it.

Interviewer: Exactly, it's becoming more popular, so it's becoming cheaper, which is nice.

Participant 2: Do you think in the near future, sustainability will be a class at the high school levels?

Interviewer: I think there's definitely a chance. There are some high schools that are already doing it down in the Phoenix area, there are high schools that have a sustainability class.

Participant 2: Would you say Phoenix and Arizona in general are like the main point where sustainability is really getting big?

Interviewer: Not necessarily. There are a lot of small areas where it's kind of growing. I think that the Phoenix area is doing what it's doing I think partly because of the influence of ASU and the huge research institution that's right there and the growing sustainability program that's part of it. I think that's the influence for Phoenix. There are also lots of other cities that are doing their environmental things. I don't think it's just the southwest. Mayor Daley, the old mayor of Chicago, he was really big on sustainability and green initiatives. Some other mayors of big cities are really trying to sign onto these environmental initiatives as well.

Interviewer: Okay, all right. I really appreciate you coming to talk with me today.

Participant 1: No problem.

Interviewer: You know, as I mentioned when we did the survey, I'm doing my Master's Thesis in Sustainability about Climate Change, trying to understand what high school students know and believe about climate change and what some of the behavior choices are that you guys––what kind of behavior decisions you guys make. And today, as I mentioned, I'm going to talk about the influences behind those beliefs and those decisions and really just understand, you know, where you're coming from. So, we've got a couple things to talk about. Do you have any questions about what we're going to talk about today or anything else before I just get started? All right, awesome. So, I thought we'd start with influences about your climate change opinions and your climate change beliefs. One of the questions that I asked on the survey was about information sources and where you learn about climate change. And the top 3 places that students here in the Environmental Science classes learn about climate change are from school, TV and the Internet.

Participant 1: Yeah.

Interviewer: Are those the 3 big sources for you as well or are there other sources that you get your information from?

Participant 1: Yeah. I would say those are the big 3 right there.

Interviewer: Okay. Now, the question was about where do you get your information.

Participant 1: Yeah.

Interviewer: Are those 3 also sources that influence your opinion on climate change and how you formed, you know, the belief about whether or not climate change is happening?

Participant 1: Yeah. I would say that yeah, exactly. I don't know why. Yeah. And that would be the exact order too.

Interviewer: Oh really? Awesome. Do you ever talk about climate change or global warming with your family?

Participant 1: No.

Interviewer: What about––are there any personal experiences either with living here in Plainfield or, you know, with weather experiences or with any travel or any other activities you might do that make you think about climate change or that might influence what you believe about climate change?

Participant 1: Not really. Not off of the top of my head. Maybe when I'm driving or something, I just see all of the smoke come up from the exhaust or whatever, just a little bit.

Interviewer: Yeah.

Participant 1: That's about all I can think of off the top of my head.

Interviewer: Okay. So, thinking about the exhaust and emissions out of a car and stuff like that?

Participant 1: Yeah. Oh, any time that I pass by, you know, I'm like the [part of] Naperville with all that smoke coming out [inaudible]… I don't know what it is. I think it's a power plant. I don't know.

Interviewer: Okay.

Participant 1: But just the smoke, just like––it looks like a city and it's just a bunch of smoke going up in the air, but I can't really explain it.

Interviewer: But you think like it's some sort of power plant or something like that?

Participant 1: Yeah.

Interviewer: Where did you say it was, in Naperville?

Participant 1: Naperville or Lockport. I can't remember.

Interviewer: Okay.

Participant 1: I just know we pass by it sometimes.

Interviewer: Yeah. Okay. So, in school, as one of the main places or things that you––that have helped form your belief about climate change – is there a particular aspect of school that makes you, that has influenced that opinion?

Participant 1: Probably like a class or whatever.

Interviewer: Yeah.

Participant 1: Probably Biology or Chemistry. Both of them because Chemistry teaches you about all that, how the pollution is formed, and then in Biology, that's, like, how pollution affects all the life and eco system.

Interviewer: Okay. So, in Chemistry, you learn about pollution and how that happens and that kind of thing?

Participant 1: Yeah. Like how the gasses are formed and all that.

Interviewer: Yeah.

Participant 1: Basic chemicals. Matter or whatever it is.

Interviewer: And then you said in Biology, it's about how that pollution effects––

Participant 1: Yeah. How pollution can affect that. That's like a section about… yeah.

Interviewer: All right. Are there any other classes or, you guys haven't talked about this in Environmental Science yet… Have you?

Participant 1: Not to great length.

Interviewer: Yeah. Okay, great. What about TV influences or the Internet? Are there programs, or…

Participant 1: Just with the Internet, there're so many things you can go to. Most would be, like, you're scrolling through some stuff and then you see something. It's like, oh, that's interesting and you click on and read, and you're like oh, [inaudible]. TV, if they had more commercials about it, I think it would be more successful to get to the masses. And then most of the commercials are really boring. They don't really catch anyone's eye. That's what I like.

Interviewer: So, you're saying more commercials. There aren't enough about that stuff.

Participant 1: Yeah.

Interviewer: Okay. Now back to the Internet. When you say, you know, scrolling through, do you find yourself reading blogs or newspapers or online magazines or you know, what kind of Internet?

Participant 1: Mostly just articles.

Interviewer: Articles?

Participant 1: Yeah.

Interviewer: Just your Google searches or off of––

Participant 1: Just like going on Yahoo and you just through all of the different stories.

Interviewer: Yeah. Okay, all right. So, all the surveys were anonymous and I don't remember your particular answers. So, I apologize for re-asking, but were any of these other information sources anything you marked or anything that influence belief opinions, in addition to school, TV and Internet?

Participant 1: Yeah. Not that I know of.

Interviewer: Okay.

Participant 1: Yeah. Those are the main 3. I think I might have… I don't know if I put Government agencies or not, just like the EPA.

Interviewer: Okay.

Participant 1: And that's about it. Yeah.

Interviewer: Okay. So, when you say the EPA, are there specific things about the EPA or policies that you've heard of or anything like that or just the idea of the EPA?

Participant 1: The idea.

Interviewer: Okay. Cool, awesome. Do you have any other thoughts on influences about your opinions or anything in addition that, you know, about this topic or idea you want to add?

Participant 1: Not really. No.

Interviewer: Okay. Cool. The other thing then, the other topic I want to get into is really talking about behaviors and behavior choices. I asked a bunch of questions on the survey about which behaviors you do frequently or rarely, and on that scale of I do this all the time down to I never do this. So I analyzed the data from all of the Plainfield North classes and these were the 3 most commonly done behaviors – turning off lights, turning off electronics, and wearing warmer clothing in the wintertime. And these were the 3 behaviors that were least common and that the most students say they either rarely do or never do. And so, those were, eating meals with no meat was the 1 that the most students said they rarely or never do, taking public transportation was next, and then unplugging electronics or turning off power strips was third. And so, let's start with the most common behaviors. Do you do those 3 behaviors or do you not do them?

Participant 1: I do them.

Interviewer: All of them? Okay. Cool. Why do you choose to, let's start with turn off lights. Why do you choose to turn off lights?

Participant 1: Well, that's just because I just get really annoyed. It will rack up all the electric, and my mom will yell at me if I have them on.

Interviewer: Yeah.

Participant 1: Plus it just raises the bills for the electric company or whatever.

Interviewer: Yeah.

Participant 1: And with 3 [wearing warmer clothing in the wintertime], that's self-explanatory. I hate cold.

Interviewer: You hate the cold, so you'd rather be, rather bundle up?

Participant 1: Yup.

Interviewer: All right. What about turning off electronics?

Participant 1: I do that.

Interviewer: Yeah.

Participant 1: Just all of them. Like the X-Box and the PS-3s, I turn all those off like right after I'm done with it. There's no point in keeping that on, so––

Interviewer: Awesome. Now 1 of the, you know, interesting things I asked wear warmer clothing in the wintertime and there was another 1 that said wear cooler clothing in the summertime. But that 1 isn't 1 of the most common behaviors. What do you think of as, you know, why might that be that people tend to wear warmer clothing in the wintertime, but tend to less often wear cooler clothing in the summertime?

Participant 1: Because the weather's always varying. Like, this September has been so cold, like, it was in the 40s a couple weeks ago. It was ridiculous. So, I think that would be one reason. Like, you know that it is wintertime, it's always going to

be cold. So, but the fall and the spring, it's all over the place. It can be 80 one day and 50 the next, another day.

Interviewer: Okay. Are there any other behaviors that you find yourself commonly doing that aren't necessarily on this list or that you think of when you think of global warming or climate change or, you know, energy or transportation or waste or water or anything like that? Are there other behaviors that you find yourself doing a lot?

Participant 1: Turning off water, the faucets.

Interviewer: Yeah?

Participant 1: I [inaudible] off. Not even, like, dripping. I don't really like wasting water. Like, you don't keep the water on when you're brushing your teeth. I always turn it off right after I do it.

Interviewer: Yeah. So, is it just, what kind of, what motivates that kind of decision?

Participant 1: I don't know. It's just like, I don't understand why you should keep it on when you can just turn it on and turn it right back off. When you keep it on for longer you're wasting more water. That's just wasteful. And when you, whatever, when you spit in the sink, when you're, all you have to do is move it up for a second, it'll all go down and turn it off.

Interviewer: It's kind of wasting water. There's no point in, why would you waste all that water? Yeah, awesome. Are there other things you can think of or––

Participant 1: Not really. Oh, maybe, well, never mind. That goes along the lines of turning off electronics.

Interviewer: What are you thinking of?

Participant 1: Like turning off the TV. Yeah, that's about it.

Interviewer: Okay. Now why, if there were some of the these common behaviors, you know, if someone didn't do these, what do you think might be a reason why they might not do them?

Participant 1: They're not very smart. That's all I can think of because––

Interviewer: Yeah.

Participant 1: You just waste more money if you keep on the lights and you don't turn off your electronics, and the electrical stuff. And like I said, with the water before, that all adds up and for a monthly payment or so, you're saving money when you turn off your electronics and turn off your lights and you can make sure that water is turned all the way off.

Interviewer: Yeah. Saving money and wasting resources are definitely big drivers of why people do some of these things.

Participant 1: Yeah.

Interviewer: So, what about these least common behaviors? Eating meals with no meat, taking public transportation, and unplugging electronics completely or turning off power strips? Do you do any of these?

Participant 1: I do three a little bit.

Interviewer: Okay.

Participant 1: I unplug the electronics.

Interviewer: Okay.

Participant 1: That's just a lot like, that'll be my phone chargers. They don't really need to be plugged in at all times.

Interviewer: So, is that the main thing that you find yourself unplugging, is a phone charger or something like that?

Participant 1: Just a little. Yeah. It's like, why is it in there anyway?

Interviewer: Okay, all right.

Participant 1: I also like moving it around and stuff like that.

Interviewer: Oh yeah.

Participant 1: So––

Interviewer: So, almost makes it a little bit more convenient.

Participant 1: Yeah.

Interviewer: Unplug it, have it with you. You can plug it in wherever you need to.

Participant 1: Yeah.

Interviewer: Yeah. So, what about the other 2? You mentioned, you know, you kind of mentioned that you do number 3, but not so much eat meals with no meat, or take public transportation. Why do you not choose to eat meals with no meat?

Participant 1: Why do I choose to eat meals with meat or––

Interviewer: Yes. It's a double negative. I'm sorry.

Participant 1: Yes. It tastes a lot better. I need, being a football player, I need to take in so many calories so I cannot lose so much weight. That's why I can eat that, because it gives the most proteins, I think.

Interviewer: Okay. Yeah.

Participant 1: And the, like, the vegetarian choices just, I don't think, I've never tried. This is probably just straight opinion, but I don't think it'd be that good, per se.

Interviewer: Okay. Like taste wise?

Participant 1: Yes. I'm a really picky eater too. So, that also factors in.

Interviewer: What about taking public transportation?

Participant 1: Almost never.

Interviewer: Yeah?

Participant 1: Like a bus? Maybe, I'll take… oh, like the football team, we take the bus. I mean, having all those people, it'd just take up way too much parking spots.

Interviewer: Sure.

Participant 1: And stuff like that. So, you all take the bus. It's about it though. My mom always made me and my brother take a bus when we were in sixth, seventh, eighth grade.

Interviewer: Take a school bus to school?

Participant 1: Yeah. That's about it though.

Interviewer: So, do you drive to school now?

Participant 1: Yeah.

Interviewer: Okay. When you drive to school, do you ever carpool with anybody or do you find yourself driving yourself?

Participant 1: Just drive by myself.

Interviewer: Okay. What about riding bikes or walking or skateboarding? Are those other modes of transportation that you consider or do or anything?

Participant 1: I ride my bike. Oh.

Interviewer: Yeah.

Participant 1: It's like, you know, my bike broke when I was a freshman so I couldn't really ride it. The pedal fell off, and… And now that I have my car, I think it just made me more lazy. That's what I'd like to think. Cause instead of riding my bike all the way to my friend's house, it's just a 5 minute car ride, all the way.

Interviewer: So, having a car is more, you know, efficient, if you will.

Participant 1: Yeah.

Interviewer: You get there faster. Yeah.

Participant 1: But I, when I was younger, I always rode my bike. Like, my mom never, she never wanted to drive me to anywhere, so I would ride my bike all around. That's probably why it's broken. But, and now I could see why because it would just, be kind of perfect and just do it to make me do something. I could just ride my bike and I'd get there maybe 10 minutes later.

Interviewer: Yeah. So, when your bike broke when you were a freshman, you just never got it fixed. It was not really something you needed, I guess?

Participant 1: Yeah. Because I was also, you know, getting my license or whatever. So––

Interviewer: It makes sense, all right. What about, do you ever go into the city, into Chicago, and ever take any of the public transportation down there? Because I know the other thing about public transportation which is difficult is that it's not accessible everywhere. You know, there isn't really much public transportation out here in Plainfield.

Participant 1: Yeah.

Interviewer: But some people have mentioned that, you know, if you go into the city that has the accessibility to public transportation, they would sometimes choose to take that when they're down there. Do you ever go in the city or do you not really get into the city that often?

Participant 1: I haven't been to the city in forever.

Interviewer: Okay. Cool.

Participant 1: Yeah.

Interviewer: All right. Do you have any other thoughts about any other, anything about your particular, you know, reasons for not participating in some of these? Are they any other reasons you can think that some people might choose not to do one of these things that we haven't really talked about?

Participant 1: I guess for, like, the eat meals without meat, that's just like, you don't believe in the way some meats are made, like with the slaughterhouses or whatever, and they choose not to do that because they don't like the animal abuse. I can see why that, or else they think it's inhumane to do that. But the public transportation maybe they just don't, either a) they don't like the emissions from their car, or [b)] they don't have enough for a car, so they have to take the public transportation.

Interviewer: Okay.

Participant 1: And with three, that's just now if they knew that would help with the climate change or environment or whatever, then they would do it. But they just don't know. They just think it's plugged in so it doesn't do anything, like it's not on, but it still does. Yeah, if they could do that, would be really helpful.

Interviewer: Yeah. It sounds like you know a lot about that. But yeah, I think they're called… I was trying to remember the name of this during the last discussion. I think they're called vampire loads and that's where it's plugged in... these computers [in the room of discussion] are all off… well, they're not actually off… But if they were turned off, even though they're plugged in, they're still sucking a little bit of power out and that's what we were talking about. Unplugging of electronics is just one step further than just turning them off because of that. You know, it sounds like you heard of that before.

Participant 1: Yeah.

Interviewer: And you're aware of that and conscious of that. So, that's great. Are there any other behaviors for either of these, things that you do or things that

maybe your friends do, that you see them doing, or that your parents talk about, that we haven't talked about yet? Or maybe one of the behaviors that was on the survey that isn't listed up here that you might do that you remember?

Participant 1: Behaviors, I would say recycling.

Interviewer: Recycling, yeah.

Participant 1: I know my family––we always, we re-use those plastic bags we get from the grocery store and we put our, we put all the bottles in there, in that plastic bag and we put them in the recycling bin and so that's one thing. We recycle those plastic bottles and then we re-use a lot of––I like to re-use a lot of stuff.

Interviewer: Like what kind of stuff do you––

Participant 1: Like plastic water bottles.

Interviewer: Yeah?

Participant 1: I know, well, I mean, it's not really re-using, I guess, but we always get those, just like the plastic containers, and we always use those.

Interviewer: Oh yeah.

Participant 1: I don't think we've gotten new ones in forever.

Interviewer: Okay. From restaurants and stuff like that? Those plastic containers?

Participant 1: Yeah.

Interviewer: Okay.

Participant 1: I'm just trying to think what else.

Interviewer: Recycling is a great one. Waste is definitely an important thing to think about, and recycling and consuming in general. So, that's a great one to bring up.

Participant 1: I think the least common I see with people is re-using.

Interviewer: Re-using?

Participant 1: Yeah. I don't see, just a lot of––

Interviewer: And why do you think that is?

Participant 1: Because the stuff that they don't reuse is mostly inexpensive, like a water bottle. It's not really expensive. Using, like, butter, you know, a big tub of butter to put like food in there. They don't... they think you can just get another tub of butter… I don't know what I was saying there...

Interviewer: Yeah, that makes sense, why would you, maybe some people think, I don't need to re-use this because it's so inexpensive. I'll just buy a new one or something like that. Yeah, that makes sense.

Participant 1: Like milk cartons. You can re-use those, you can put water in there. Put a lot of water in there. You can just keep re-using that.

Interviewer: All right. Before the survey, before today's discussion, have you thought about global warming or climate change very much? Or was this one of the first times you've really thought about it?

Participant 1: I've thought about it. I know it's like global warming, it's a big issue cause you can tell the polar ice caps are melting. That's because there's holes in the ozone, right? There's holes, and those caps, and that's causing the sunlight… [inaudible] the pollution, [inaudible] the ozone. I think, it's just from what I think off the top of my head. The ozone is thinner now. First of all, the pollution so there's more of those UV rays coming down that's affecting all the warmth and the average temperatures around the world.

Interviewer: Yeah. The ozone is part of it. The ozone, it's actually a smaller part of it than sometimes we think. I used to think a similar thing and yeah, it's definitely a part of it because, you know, the ozone is the layer that filters UVA, UVB and then I believe there's something called… there's another type of UV light… that the ozone filters out completely and then we get UVA and UVB and the thinner the layer is the more about UVA and UBB light gets in and one of those is more dangerous to us than the others.

Participant 1: Yes.

Interviewer: And so that's definitely part of it. But a lot of global warning has to do with the greenhouse effect in general and just the amount of carbon dioxide in the air and the amount that's remaining in the air. All those greenhouse gases, carbon dioxide and methane, water vapor, ozone trap the heat and then, you know, warm everything and stuff like that, so––yeah.

Participant 1: That's mostly what I thought. I think I know.

Interviewer: Yeah. That's great. And it's great that you've thought about it and you do know a little bit about the topic and have a little bit of interest in it which is always a good thing. Have you ever thought about or you know, learned anything or heard anything about some of the solutions out there? You know, we've talked a little bit about these particular behaviors, but have you ever thought or heard more about those or––

Participant 1: Those electric cars or whatever?

Interviewer: Yeah. Like that. That's definitely one of the things out there that they're promoting.

Participant 1: Trying to get out there, but the people just, they think it's more inexpensive to use the gasoline car than the electric car which yeah, that is true. Aren't the hybrids… I don't know how hybrids work, but you know, does it have something to do with filtering out the gas or something like that?

Interviewer: So, a hybrid car uses both gas and electricity to power. At certain – I don't know if it's at certain speeds, or certain horsepower, or… I'm not a hugely technical car person, but there are certain times when the hybrid cars work off of electric and then when it needs a little bit more power, it goes to gas.

Participant 1: Yeah.

Interviewer: So, it switches back and forth. And so, the idea with a hybrid car is that you need less gas because your car will work off of electric more frequently than obviously a regular gas car.

Participant 1: Do you think if they were to go completely electric cars, it would be really, at first, it would really effect the economy and everything because you have charge, whatever they are, charge stations, I guess there is?

Interviewer: Yeah.

Participant 1: That you'd have to put more, way more of those if they completely switched, so that would affect everyone in general, moneywise. But it would be, if they committed to it, it would be a short term loss, for a long term gain.

Interviewer: That is very insightful.

Participant 1: Or just slowly phase them out. That would be another idea. Just slowly phase out the gas cars because you're going to need––feel for other things. You can't go completely electric for everything today. That's just how everything works.

Interviewer: Right.

Participant 1: Like oil isn't going to be here forever. You got to make a switch sometime.

Interviewer: So, you're saying phasing out, make it a little bit of a slower process.

Participant 1: Yes.

Interviewer: Let people adjust to it a little bit easier, something like that?

Participant 1: Or yeah, or like I said, just completely start from electric cars and then make everyone adjust. Which probably won't be the best idea in hindsight because there would be a lot of angry people.

Interviewer: All right, you were talking about the electric cars. Any other solutions?

Participant 1: Not that I know of.

Interviewer: Okay. There are sometimes different things brought up in the news and stuff like that. If you're not paying attention, it's sometimes difficult, or you're not looking it up. So––

Participant 1: I mean I don't know if this is anything, but maybe because… 50% of all the species are in a tropical rain forest, and there are not a lot of tropical rain forests, and people are cutting them down, that's not good. Like, that gets rid of a lot of the species in the world.

Interviewer: Yeah, absolutely. Deforestation is a huge issue around the world. Especially right now, tropical rain forests is always a big topic because we don't have very many, like you said, and they're home to lots of species. That's also, cutting down the trees takes away habitat, but also takes away trees that suck up some of

the carbon dioxide in the atmosphere. So it removes that aspect of the carbon cycle and that whole idea.

Participant 1: It doesn't help that the population of the world is growing exponentially.

Interviewer: Yeah, we have to somehow accommodate for all those people.

Participant 1: It's really depressing the way you look at because we have to, in order to do that, we have to cut down some forests. That's depressing, but I don't know how you're going to counter that. That's going to come in the future. There are too many people.

Interviewer: Right. We have to start thinking about it now to make sure we can accommodate all of the people. Are there different ways that we can build our cities or expand our cities or accommodate for people within our cities. Yeah. But I wanted to also leave some time, if you had any questions, if you had any additional thoughts on anything we've talked about or if you have any additional thoughts or questions about the survey, or anything else about the topic.

Participant 1: Yeah. I can't really remember the survey. How much would electric cars affect the economy in the short term? Like, I know it wouldn't be that bad, but like how worse off would we be in the beginning?

Interviewer: If, in which situation, with electric cars? Like if we were to only use electric cars?

Participant 1: Yeah, only use them.

Interviewer: You know, that's a great question and I am not that familiar with the automobile industry and the economic impacts of that. So, I don't really, I don't have a definite answer.

Participant 1: Okay.

Interviewer: I think you were right when you said we can't cut out oil and gas completely. There are some things that we need that for.

Participant 1: Yeah.

Interviewer: So, I'm not sure if that would ever be a viable option, to cut out electric or cut out gas altogether, but––

Participant 1: If there was maybe 35% or something? That might work.

Interviewer: Yeah. I think there's some merit to – and this is all personal opinion – I think there's merit to electric vehicles. I think there's more research and more technology that needs to be done and made, yeah, exactly. I think the electric cars that are out there, and the hybrids, are great. And they certainly reduce gas use and that's… the short term thought about that is just reducing our consumption of gasoline and our exploitation of the natural resources that we need to make gasoline. And so, I think that is successful and I think it's obvious it's growing. There are more of them now than there were 5 years ago or 10 years ago. So, I think it's definitely a viable option, but like you said, it would be hard to force

everybody over. It's definitely a slow process and not everybody can use that. I think that's a great question. I think it's definitely a field that needs a little bit more research and needs people looking into that and thinking about the economy and thinking about the impact, benefits and negative impacts, of that kind of an economic push.

Participant 1: How do you think they can, like all those EPA or all those government agencies, how do you think they can, if they're smart enough, how could they raise awareness, so more and more people understand it's not going to be pretty in the next 50 years if we don't stop using all, consuming all this, putting the pollution in the air, consuming all the energy for no reason, like with the unplugging the chargers or… Why can't they, I don't know, raise awareness for something like that?

Interviewer: You ask the million dollar question. It's really tough because the government agencies are split. You have two sides of a political spectrum and therefore various opinions and various beliefs working within one governmental agency. It's always hard to kind of come to a) come to 1 conclusion, and then b) communicate that conclusion to everybody, right?

Participant 1: Yeah.

Interviewer: So, you ask a really good question. I think that government agencies, international agencies are working on it and it's a slow process.

Participant 1: Okay.

Interviewer: And awareness is one thing, but I think it's also just making sure the resources are available. We have a lot of research about it, but is it available to the public? Is it available to the government agencies and the politicians and the policy makers and all of them? So, you ask a very good question and that is, I mean, that's what people in my position are studying. Some of my colleagues are studying policy and how decision makers make policy and then how the public perceives policy. So, you ask a great question that doesn't really have an answer. So, I mean, it's awesome that you're thinking about that because that's, even asking that question, is being aware of the situation. So, I think that's great.

Participant 1: Yeah. So, that's about all the questions I have.

Interviewer: Yeah?

Participant 1: Yeah.

Interviewer: I really appreciate your participation in this. It is really helpful in my research and hopefully, I hope you enjoy participating as well and are getting something out of it. So, you took a survey about a week and a half ago and what I've done is I've taken a look at some of the questions from the survey and I want to go into some of the questions a little bit more in depth. Specifically, about influences on climate change, opinions and knowledge and then also influences and motivations about behavior choices and some of the decisions in terms of energy and transportation and some other things we can talk about as well. So, that's what I want to cover today. Why don't we start with a definition of climate change. Are you pretty familiar with climate change or a little bit or––

Participant 1: Kind of. I mean, I understand that it's like, you know, obviously, the climate is changing and so, I mean, water patterns going, whatever, so I understand that that's happening.

Interviewer: Okay. So, that's a very broad, simple definition of it, that's great. The EPA, the Environmental Protection Agency, defines it similarly by saying that climate change is any significant change in the measures of climate lasting over an extended period of time. So, for example, that may include changes in temperature, wind patterns, wind speeds, precipitation, and some of these other kind of weather-related phenomenon but that lasting over a longer period of time. Weather happens daily and kind of changes by the day, by the week. Climate is more of a long term regional thing. So, that's just the EPA's definition of climate change. People think about it differently, but that's a way that people in the US think about it. So, that is to get us both thinking about it. So, in terms of influences on climate change, opinions and beliefs, what I'm interested in understanding is how you formed your belief about whether or not climate change is happening. One of the questions on the survey was from which sources have you learned about climate change. This is about getting specific information and the top 3 for the Environmental Science classes, were school, TV and Internet. You can see they are way higher than most of the other ones. That's where students get their information. So, first of all, are those 3 ones that you also find are, for you personally, are those where you get your information or are there other sources?

Participant 1: I'm pretty sure those were the 3 I checked off.

Interviewer: Oh yeah? Okay, awesome. Are those also 3 major influences that have helped you shape what you believe about climate change or are there other influences as well?

Participant 1: Pretty much those, what were the other ones? I guess family maybe. Maybe some books and magazines, maybe friends. But not newspapers, Government agencies, radios, movies, musicians. Oh, it says museums, my bad. Yeah, I guess museums too.

Interviewer: Okay. So, when you say your family, do you guys talk about it? Like, is this something your parents are interested in or talk about or––

Participant 1: No. My mom's kind of conscious of ways to sort of live more green. So, you know things like turning off lights, not running the water while brushing teeth and taking shorter showers and stuff like that. My dad wants to take us to

museums so we, like, visited a thing called the Greenhouse at MSI [Museum of Science and Industry in Chicago, IL].

Interviewer: Oh, okay.

Participant 1: So, we've done stuff kind of like that.

Interviewer: Okay.

Participant 1: And that's how the family [inaudible].

Interviewer: Cool. You said your dad took you guys to MSI. Is it a greenhouse exhibit or is it–?

Participant 1: No, I think it's just called the Greenhouse.

Interviewer: The Greenhouse. Okay. Is it a permanent exhibit or a traveling exhibit? Do you know?

Participant 1: I'm not sure, it might have moved.

Interviewer: Okay.

Participant 1: But it was like an actual house.

Interviewer: Okay.

Participant 1: So, it was like on the Museum Campus. I'm pretty sure it was that way.

Interviewer: Okay. Now, did your dad take you to see that specifically or was that kind of a family trip to MSI and it happened to be there, so you guys did it?

Participant 1: Yeah. We went there with like my great aunt, my cousins and whoever and they're like oh, this looks cool, so we just went and took a look at it.

Interviewer: Okay. Cool. Do you remember anything about it? Do you remember thinking anything while you were there?

Participant 1: Yeah. I remember we talked about how that was like really expensive to get everything set up and they ended up saving money.

Interviewer: Oh, okay. Good.

Participant 1: I remember they talked about there was a polar bear rug and how they did something green-ish with the polar bear rug.

Interviewer: Okay. What do you mean a polar bear rug? Is it––

Participant 1: It was like the skin of a polar bear.

Interviewer: Okay.

Participant 1: But like they had done something to it. So that it was dying polar bear or something, so they used the skin and fur as, like, a rug.

Interviewer: Okay. Oh, interesting. Okay.

Participant 1: So, they reused it, whatever.

Interviewer: Okay.

Participant 1: And they talked about vampire energy. How leaving things plugged into the wall still uses energy. They had, there was, like, a panel on the wall by the front door that could turn off all energy supply. I thought that was really cool. And they talked about, like, using energy that had a windmill in the back yard.

Interviewer: Oh.

Participant 1: They had clotheslines, I believe. They had energy efficient sinks. That's about all I remember.

Interviewer: Okay. Cool.

Participant 1: Oh and they had those, I think it was some Dyson fans that don't have blades. It was supposed to be economical or whatever.

Interviewer: Oh. I hadn't heard of those. All right, awesome. What about books and magazines? Is there a specific book or a specific magazine you find yourself typically reading or have read?

Participant 1: I'm trying to think. I know I marked books and magazines, but I can't remember specifically which ones. Sometimes I'll just flip through my mom's Home and Garden magazines and stuff like that.

Interviewer: Oh, okay. Yeah.

Participant 1: Magazines I usually read don't specifically talk about climate change.

Interviewer: Okay, what magazines do you typically read?

Participant 1: I like Seventeen. That's pretty much it. It's the only one I really subscribe to.

Interviewer: Okay.

Participant 1: I've done projects in school. There was 1 my sophomore year where I used various magazines to create a tree collage and so I used various, you know Home and Garden magazines, agriculture magazines, things like that, to learn more about––I was using it for pictures, but then there were things in there like sustainability whatever. I didn't learn anything specific from that.

Interviewer: Okay. With the project, what was it? You just had to create a tree out of the magazine photos? Is it for a unit on trees or plants or––

Participant 1: No, it was for a history project.

Interviewer: Oh.

Participant 1: Some religion that was really popular system called trans…something. But it was basically a religion all about going into nature and being in touch with nature, being one with Mother Earth.

Interviewer: Oh, okay. So, you were learning, so it was a history project learning about a religion, but that religion had to do with kind of being one with nature. Okay, interesting. I can't think of the name either. I feel like I've heard about it before, but yeah.

Participant 1: I'll remember it in like half an hour…

Interviewer: That's all right. What about with your friends? You said that your friends also influence your belief about climate change. Do you guys talk about it or is it more like, in class, you maybe talk about it or––

Participant 1: Yeah, well, kind of. You know, every once in a while we'll sit there and we'll be like oh, I heard such and such is going on in the news and like oh, I don't think they should be doing that, or oh, they could do something more. Things like that. Just like teenage gossip, or the happenings that do with climate change, so, yeah.

Interviewer: Okay.

Participant 1: We don't talk about it that much.

Interviewer: Okay. Yeah. Sometimes, I'm sure like maybe it's a big news story, maybe––

Participant 1: Yeah, occasionally that will...

Interviewer: What are any personal experiences that you had, either activities or living around here or any travel, have any of those kind of experiences influence what you believe about climate change?

Participant 1: I don't know. I mean, I didn't really think about that hard until recently. I don't know.

Interviewer: Was that recently because I came into your class or because of other stuff?

Participant 1: No. Well, environmental science class in general.

Interviewer: Okay. Cool.

Participant 1: But yeah. I guess more people have just sort of been, not really vocal, as much as, like, trying to change whether they live to be more green, environmentally friendly, and stuff like that. Yeah, I guess, I'm really into watching YouTube videos and stuff like that. Some YouTubers will be like "Oh yeah, I'm trying to do this, this and this. I'm trying to be more green and be healthier…" and things like that. So, that's been sort of an influence as well.

Interviewer: Okay. Are those just YouTube videos that you kind of stumble upon or have you ever searched out living healthy, living green or anything? How do you usually come about them?

Participant 1: Yeah, no. It's sort of random. I'll subscribe to a certain person and they'll happen to do a video on whatever. So, a specific example would be, like, I subscribe to Zoella, so I happen to see that she [inaudible] little ways to change your life and I'm like, well, that sounds interesting. So, I click on it and she was talking about things like, you know, just drinking more water, exercising, things like that. But then if I remember correctly, she was talking about maybe like… [inaudible] I can't remember. It was just things about like being healthier.

Interviewer: Okay. Was that Zoella?

Participant 1: Zoella. Z-o-e-l-l-a.

Interviewer: Okay. Cool.

Participant 1: She does a lot of videos about that, so [inaudible].

Interviewer: Yeah. What are her usual videos about?

Participant 1: Like products, health, pretty much. So, like, she'll talk about things she just got for her apartment, or she'll talk about new skin products to try or whatever.

Interviewer: Okay, fun. Very cool, that's interesting because it kind of goes along with some of those topics. Like, lifestyle and that kind of thing. Living green, being green, it's related to climate change and so that goes into the whole idea of lifestyle and that kind of thing.

Participant 1: Yeah.

Interviewer: Interesting, very cool. So, any other thoughts about influences on your opinions or your beliefs? Or any other personal experiences that may influence it?

Participant 1: I'm trying to think. For a while, I wanted to be a farmer. Kind of weird, but––

Interviewer: No, that's cool.

Participant 1: Thank you. I sort of got a little more into agriculture at that point. Now it sort of changed. You know, this career. Yeah, so that was sort of another influencing factor I guess, where I just more interested in like learning about the environment, and like how it affects us in our daily lives. And, yeah… I had thought where I was going… but yeah, so I guess that was sort of like a turning point, or not a turning point as much as it was an eye-opener, like, oh, this stuff actually happening, and it actually matters. Whereas before it was like oh, well, the Earth will sustain itself for long enough and I don't have to worry about it because nobody's going, you know… well, people die from climate stuff, obviously [inaudible], but, like, it's not going to affect me or anything like that. So, I was getting more into agriculture, and it was like, oh actually it does. And the project, my sophomore year, I kept live chickens in 1 of the chemistry classes upstairs––

Interviewer: Oh wow.

Participant 1: And I was studying the effects of phosphates on the environment. Yeah, and so I was collecting manure samples from the chickens and testing them

for phosphorus and adding phosphates to their diets. As I was researching for that project, I was realizing how much phosphorus is being thrown into streams and stuff like that and affecting our drinking water. That was around the same time that I realized that I wanted to do something with animals and agriculture. So that was probably the biggest turning point, was realizing that it actually does affect us whether, you know, it's little things like, you know, our everyday drinking water, or like even things like the meltdown of the nuclear reactor site in Japan. It was [inaudible] obviously. So, you know, whether it was the major or minor things that sort of started to become more visible to me… yeah, so––

Interviewer: So, what prompted you to get interested in agriculture? What it that particular project or was it something other than that?

Participant 1: No. I was messing around on the computer one day and I always loved horses and riding, and sort of also was interested in architecture in some way.

Interviewer: Oh yeah.

Participant 1: So and just like, you know, sketching, and designing buildings. So, I was just, you know, horsing around, looking for stuff online, and I ended up finding barn floorplans and I, the more I looked into it, I was like oh, this would be really cool, to have my own barn or whatever. I could design it myself and everything. So, I was like, what would I put in there and so, I was thinking oh, I could have horses and sheep and goats and I was like oh my gosh, this is actually really cool. And so then, for a good solid 2 years, I was like I'm going to be a farmer. I'm going to have a barn, and have my own business. Then I was like wait, but I have to run my own business and I hate business. So, you know, I kind of gave up that, but I still, I have a fascination with animals and stuff like that. And some of the environmental ramif… well, I don't have to worry about it, but the realization is that what is happening in our environment actually affects us sort of stuck with me.

Interviewer: Very cool. What are you interested in now? Are you interested in, you know, design and that kind of thing or––

Participant 1: You know, I've been sort of struggling with that. The past few weeks, few months, I guess. I'm changing career paths every other day.

Interviewer: Yeah. Totally acceptable. I'm still doing it.

Participant 1: Yeah. So, I'm still thinking about it.

Interviewer: Yeah.

Participant 1: I'm still into the animal stuff.

Interviewer: Oh fun.

Participant 1: Maybe a veterinarian, maybe just a veterinary technician. Depends on, you know, how I'm feeling on a certain day.

Interviewer: Yeah.

Participant 1: Yeah. But, I don't know if I'm going to go into a field that deals with the environment necessarily directly… or I guess everything kinda directly deals with

the environment. But directly deals with how I handle the environment. It's still, I think it's a main interest on mine because, you know, now that I understand that it affects us whether [inaudible] or out doing whatever in nature and I don't know. I mean, so it's going to stick with me.

Interviewer: Yeah.

Participant 1: Because it was, you know, it's tough.

Interviewer: Yeah. That's great to be aware of that, and that you have this idea and you're thinking about it. We talked about it after the survey a couple of weeks ago. You can include this kind of an interest, this kind of a passion, into any field. If you want to become a vet, you can become a vet and still be interested or include some of these environmental ideas into your vet practice, or whatever it ends up being. So, that's a cool part about this field, it's like you said, the environment effects everything, and so, any field, whether it's business, whether it's agriculture, whether it's design, whether it's veterinary medicine, it all is affected by it and can be somehow incorporated into that sphere. That's cool. Any other thoughts on influences?

Participant 1: No. Don't think so.

Interviewer: All right. We can always come back if you have anything else to add or if you have any questions or anything else. But why don't we talk a little bit about behaviors. On the survey, I asked some questions about how frequently you find yourself performing certain behaviors in your everyday life and the 3 most common behaviors, the 3 that people marked "I always do" or "I do most of the time" were turning off lights, turning off electronics and wearing warmer clothing in the wintertime. The 3 least common behaviors – so these are the ones that people marked "I never do" or "I rarely do" – most often were eat meals with no meat, take public transportation and unplug electronics or turn off power strips. So, I want to start with the most common behaviors. Are these 3 behaviors that you find yourself doing or are there 1 or 2 of those or all of them that you don't find yourself doing?

Participant 1: Actually, I do all of those.

Interviewer: Awesome.

Participant 1: Actually, no, turning off electronics… I'm really bad about unplugging, like, extension cords.

Interviewer: Oh, okay.

Participant 1: But, well, I guess that would be here [points to unplug electronics]. But normally, I am like OCD about turning off lights.

Interviewer: Yeah?

Participant 1: My sister always leaves lights on in the morning. Every time I have to go find her and turn off every single light.

Interviewer: Yeah.

Participant 1: And so, yeah, I'm really OCD about that. Then, warmer clothing in the winter, yes, specifically because my room does not get heat.

Interviewer: Oh, yeah.

Participant 1: So, you know, pile on like 4 fleece blankets and wear like 3 pairs of pants, 2 shirts, and yeah. So I definitely wear warmer clothing in the winter. And then, yeah, for that, that's about it.

Interviewer: Okay. Now, you were saying you were OCD about turning lights off and you follow your sister and make sure she turns them off too, why is that?

Participant 1: My mom, actually, is really, she's really OCD about it too.

Interviewer: Okay.

Participant 1: She's like, we would actually get in trouble for that if we didn't turn off lights. And I used to be really bad about it when I was younger. I would leave the lights on in my room for like 3 hours while I went downstairs and watched TV. My mom would always get mad at me because our electricity bill would be so high.

Interviewer: Oh, okay. So, she was concerned about the electricity bill and making sure you were turning off lights being financially efficient.

Participant 1: Yeah.

Interviewer: Cool.

Participant 1: So, yeah, a lot of it had to do with the finances.

Interviewer: Yeah. That's always the big one that I've talked about with most people in these discussions, we turn off lights because it saves money.

Participant 1: Yeah.

Interviewer: And that's big to mom and dad and it's big to us or that kind of thing. So, it's always a big factor

Participant 1: Yeah, a big one.

Interviewer: Oh, now what about turning off electronics? You said you're bad about unplugging extension cords, but do you turn off your TV or and the computer and all that? Or is it, sometimes?

Participant 1: Yeah. Normally… well, it depends on where I'm at. At my mom's house, yes, I always turn off the electronics. My dad it comes down to finances again. My dad lives in a condo where we get like, I think, unlimited… like, we don't get an actual bill, so…

Interviewer: It's included in his rent or his homeowner's fee or something?

Participant 1: Yeah.

Interviewer: Okay.

Participant 1: So, at mom's house definitely I always turn off the computer, the radio, the TV, if we're not using it. But at dad's, he doesn't really care. So we don't typically turn them off. Like we'll leave to go get dinner or something and leave the TV on.

Interviewer: Okay.

Participant 1: Leave on whatever show we're watching on Netflix.

Interviewer: Yeah. Okay. And then, wear warmer clothing in the wintertime. It's interesting. So, I asked wear warmer clothing in the wintertime and then I also asked wear cooler clothing in the summertime and this one [wearing more clothing in the wintertime] was more frequently done by students, more so than wearing cooler clothing in the summertime. So, both of them are about, you know, wear warmer clothing in the wintertime so we don't have to turn up the heat and wear cooler clothing in the summertime so you don't have to turn the AC as high. Do you find yourself wearing warmer clothing in the wintertime more frequently than thinking about wearing cooler clothing in the summer?

Participant 1: Yeah, probably.

Interviewer: And why would that be?

Participant 1: Because I just have a lot of clothes that are, like, winterish. Because we don't have long summers here. We have, you know, really long winters.

Interviewer: Yeah.

Participant 1: Yeah. And we get into those spring days where you can kinda keep wearing long sleeves and stuff like that. So, it's just, I think it has to do with just the Illinois climate I guess. But yeah, I try to make a point to wear more tank tops and shorts and stuff like that in the summer. But also some of that has to do with modesty, I guess, where it's like, I don't know. I was brought up in a, well at my mom's house at least, was always religion-centered and so it was like, you know, not necessarily like you have to be modest, but it's just like, it probably should be done. So I guess that was sort of another influencing factor in wearing more clothing, I guess. Yeah. For the longest time, I wouldn't wear shorts, like, above 4 inches above my knee either.

Interviewer: Yeah. We had the rule where, do you guys have this here? When I was in high school, we had the rule where if you were standing, your shorts had to come past your fingertips.

Participant 1: Yeah. But nobody follows it.

Interviewer: I remember that, and there were some teachers in my high school who made us test it. No, I understand that. That's something I've talked about with some other folks as well.

Participant 1: Yeah. And also, my elementary… well, yeah, I went to a school for 10 years where it was a private school and so your shorts had to be within 4 inches of the knees. And that was another influencing factor. Just, you know, modesty, I guess.

Interviewer: All right, any other thoughts about any of these 3?

Participant 1: No. I don't think so.

Interviewer: Okay. What about the least common behaviors? Eating meals with no meat, public transportation and unplugging electronics. Do you do any of these 3?

Participant 1: Yes. We tend to eat meals with no meat just because it's faster.

Interviewer: Okay.

Participant 1: I work a lot. So, you know, it's pretty much as soon as I get home, I have to make myself dinner right away and so it's usually like making myself, like, a little mac and cheese or spaghetti or something like that. We'll have chicken every once in a while, but yeah. But I do eat meat when I can, I guess, just like to get the proteins.

Interviewer: Yeah.

Participant 1: But yeah, even then, I'm not a huge meat person. So, if I could choose between like eating steak or like spaghetti, I would choose the spaghetti.

Interviewer: So, do you cook for yourself frequently?

Participant 1: Kind of. My mom, what usually happens is that like I re-heat whatever my mom makes the night before. Or, like, find a way to incorporate it into whatever. It's like, the other day, she made chicken and I put it in a quesadilla.

Interviewer: Yeah.

Participant 1: So, that's usually how it goes. And on nights I don't work, I'll eat whatever she made. But it just depends on the day and how fast I need to get somewhere.

Interviewer: Yeah. Time is always a factor.

Participant 1: Yeah.

Interviewer: What about taking public transportation?

Participant 1: All right. So, I take the bus every morning.

Interviewer: The school bus?

Participant 1: Yes, the school bus. But I wouldn't do that if I had a parking spot.

Interviewer: Okay.

Participant 1: We have really limited parking spots and the ones left are really far away and I'd rather just take the bus than walk far and then be stuck in traffic and whatever.

Interviewer: Yeah.

Participant 1: Yeah, so I take the school bus in the mornings… or, sorry, in the afternoons. Then my mom drives me to school in the mornings, my sister and I. And

then I take my own car to work because it's just faster. We don't really have that much public transportation around here. I mean, it's Plainfield. Everybody just uses their own cars. We don't really have buses or taxis or anything like that, and everything is too far with a bike, and then winter, it gets too cold to bike or even be outside for more than 5 minutes. So, yeah, I'm really bad about taking transportation out here. But in the city, we tend to either walk or take a bus. And if it's too cold to go outside, then we will order in or something, or make food ourselves, or go to the gym downstairs instead of go across street. So yeah, we, you know, it depends a lot on the weather.

Interviewer: Yeah. It also sounds, you know, accessibility is a big deal too. You know, if you don't have public transportation here in Plainfield, you don't have that opportunity.

Participant 1: Right.

Interviewer: But you have the opportunity in the city, it sounds like, so that makes it easier to take.

Participant 1: Right. Yeah. Usually we'll take like a bus after concerts or stuff like that and we'll walk back, so [inaudible] concert venues are right there.

Interviewer: Oh yeah, that would be fun.

Participant 1: Yeah.

Interviewer: Oh, and you said you drive yourself to work. Okay.

Participant 1: Sometimes we'll car pool with, like, someone else if we happen to be working the same shift. Or also, like, if my car needs something repaired.

Interviewer: Sure. We talked a little bit about the unplugging electronics and turning off power strips with the extension cords. Is it something you've ever thought about really or you do (other than extension cords)?

Participant 1: Yeah. Everything I have plugged is usually, like… I'm very conscientious about what I need to use and what I don't. So, like, I never use my iPod, so I never plug it into anything. But my phone, I plug it in when, like, it's 10%, 20% and I leave it overnight. My alarm clock, I leave it in all the time, and it's also, you know, my regular clock. I don't have any lamps because I have just an overhead light in my room. We keep lamps in other parts of the house, but they're on timers. So, they go on and off at a certain time and I don't know if that's [inaudible] or not, but, you know, we try to be conscientious about that too.

Interviewer: Yeah, we have a bunch of those too. Yeah. Those are nice to have because I need to have light when you come late, or something like that.

Participant 1: Yeah. Oh, for most common behavior, turning off lights, we always have our front lights on.

Interviewer: Okay.

Participant 1: Or at least, like, one light in the house, especially at night. Just for protection.

Interviewer: Yeah.

Participant 1: But, yeah. I just remembered that one.

Interviewer: Yeah. That makes sense. So, that's a safety thing.

Participant 1: Correct.

Interviewer: Making sure, you know––

Participant 1: It looks like someone's home.

Interviewer: Looks like someone's home, and that you can see when you get home. Yeah, I have a light on a timer in Arizona for that reason. Safety is a big thing to think about. So, I'm sure you probably don't remember the whole list of behaviors that I asked on the survey, but are there any behaviors that aren't on either of these lists that you either frequently do or maybe consciously think about not doing?

Participant 1: Like what?

Interviewer: Like, maybe thinking about, you know, are there any behaviors that aren't on this list that you find yourself doing a lot, having to do with energy or transportation or waste or anything related to environmental or climate change ideas?

Participant 1: Right. Like what?

Interviewer: Some people think about, you know, water use or recycling or, you know, things like that.

Participant 1: Okay. Yeah. I don't… I tend to turn the faucet on too much. So, you know, I use a lot of water, but in a short amount of time.

Interviewer: Okay.

Participant 1: So, yeah, and so, also because of our water bill, I try to keep my showers under 15 minutes. I'm really bad about that. Recently, I've been making sure it was under 10 minutes, which is an accomplishment for me. And then also, turn the water off when I'm brushing my teeth and stuff like that.

Interviewer: And you mentioned the water bill, that's another, along with the electricity bill, those are big factors?

Participant 1: Yeah.

Interviewer: Have you ever looked at one of your electric or water bills with your mom?

Participant 1: No. My mom's kind of private about what she's spending money on.

Interviewer: Yeah.

Participant 1: So, I don't think I've ever seen a bill.

Interviewer: Yeah. To be honest, I never looked at ours until I rented my own apartment, so it is not uncommon. Any other things, any other behaviors, or activities that you do that we haven't talked about?

Participant 1: Recycling.

Interviewer: Yeah.

Participant 1: If there is an accessible recycling bin, I will tend to recycle more often. And I think it's just, like, convenience, if I'm like in a conversation and there's a trash can right next to… particularly in the lunchroom, if there's trash can right next to me, I'll just throw whatever needs to be recycled in there because [inaudible] recycle outside the cafeteria. So yeah, a lot of it is just convenience and accessibility.

Interviewer: Yeah, absolutely.

Participant 1: At home, we tend to keep our trash and our recycling pretty close to each other. My dad only has recycling, or, I'm sorry, a trash can, and so I never know what to do with recyclables, so I just throw them in there. Sometimes his, well, his fiancé now, sometimes she'll be like "No, we're supposed to put that in the recycling bin." "Well, I don't know what to do with this." "Well, just give it to me." So, I don't know what I'm supposed to do when, with that sort of thing.

Interviewer: Okay. Yeah.

Participant 1: The same with the glass bottles. Like, I don't know what to do with the glass bottles. And, like, what can be recycled and what can't be recycled. Also, with, like, aluminum, and other metals and stuff like that. And I never know what plastics can be recycled. I don't know if it's better to, like, put it in the landfill, because I know it takes a lot of energy to recycle plastics and so I never know, you know, what the best option would be. And reusing, I guess, would be another one.

Interviewer: Yeah.

Participant 1: Yeah. I'm really bad about reusing the stuff.

Interviewer: What do you mean?

Participant 1: Like plastic bottles, glass bottles, things like that. Usually, I don't know. I like glass bottles, I think they're really great. So, sometimes I'll try to use them as little mini vases.

Interviewer: Yeah.

Participant 1: For flowers, but we don't have flowers that often. So, I always have to end up throwing them out. My mom throws them out or something, because like we just don't end up reusing them. And also, I'm not a terribly creative person when it comes to like figuring out ways to reuse things. I've heard people making entire houses out of like glass beer bottles or whatever. I'm just not that creative and not that handy that I can do that, so––

Interviewer: Yeah.

Participant 1: Creativity plays a role in that.

Interviewer: Yeah. That's an interesting way to think about it. I'm not that creative either. I do the glass bottle thing. I do like that, but yeah, if you don't have flowers, they just kind of sit there.

Participant 1: Right, exactly.

Interviewer: And they take up space. Yeah.

Participant 1: Yeah. But the sparkling cider ones, oh my gosh, I love those. They look so pretty and green and everything. Sit them on a window sill. They're so pretty.

Interviewer: Oh yeah.

Participant 1: But, you know, my mom hates having clutter, so…

Interviewer: Yeah. Any other reasons why you would think people may or may not do either of these behaviors, that you haven't already mentioned?

Participant 1: I think, like, accessibility.

Interviewer: Yeah.

Participant 1: That's the biggest one, also safety sometimes. And like, also comfort. Like, especially for meals with no meat. If they were raised in a family where meat's, like, an everyday sort of thing. My anatomy and biology teacher is like this, where he just eats meat all the time because he grew up like that.

Interviewer: Okay. Yeah.

Participant 1: So, yeah, I think a lot of it has to do with also how you were raised to respect the environment or not respect the environment. Also, lifestyle. If you're raised in 1 of those families, or you're having 1 of those families, that like go hunting all the time and loves of fish and things like that. They're going to be a bit more environmentally conscious maybe, than let's say someone who's been in the city their whole lives. Not necessarily more respectful, but just more conscious about what's going on.

Interviewer: Yeah, and maybe look at it in a different way too. Look at it in a different way than people who grew up in the city or something like that.

Participant 1: Right. Yeah. Almost like cultures too. It's city people versus suburban versus country. And also versus, like, Asia and America, well, North and South America, Europe and Africa. Everybody has, like, a different idea of how the environment should be treated. Like, the Native Americans really super into protecting their environment, and stuff like that. But, you know, obviously, Europeans not so much. So, yeah, I think that kind of plays a role too. Religion and culture.

Interviewer: Yeah. Culture and religion are definitely interesting facets to study with this particular topic because you're absolutely right. People look at it differently and it's because of either the way they were raised, the traditions for their particular culture or religious beliefs, or something like that. So, yeah, excellent insight. Any other thoughts about behaviors?

Participant 1: I don't think so.

Interviewer: All right. Have you ever thought about solutions to climate change? You said you thought about climate change a little bit …

Participant 1: No.

Speaker1: And being aware of the environment. Have you ever thought much about the solutions to these challenges, or really just learning about the challenges? And thinking about the issues?

Participant 1: I don't feel like I'm educated enough to be able to say "oh, this is a definite solution." What I am familiar with is livestock diets. There's a lot of unnecessary nutrients that go into animals' diets, and then whatever they excrete is potentially harmful; like, you know, with the chickens, their manure, and all that. It was then reused to be fertilizer, but then, like, everything not used by the plants ended up going into the streams and rivers and things like that. I mean, farmers definitely have like a huge role in the environment and how, I mean, because there's so… not like around here… well, kind of around here… but like, there's so many farms and like each one has sort of its own footprint on the environment. I don't know. I guess farmers need to be more aware of what they're putting into the environment. I understand that there's, you know, the whole need to make money and stuff like that. But I think there could be like a whole field just dedicated to formulating diets for livestock animals, just, you know, to make sure that our environment is being taken of and protected.

Interviewer: Yeah.

Participant 1: I'm not sure if there is one actually.

Interviewer: Yeah, I don't know. That would be interesting.

Participant 1: There probably are people that, like, formulate this stuff, obviously, because, you know, go to Farm and Fleet or whatever, and you'll find whole bags of, like, or whole aisles full of, like different kinds of cattle feed.

Interviewer: Yeah.

Participant 1: But I don't know if there's a whole field dedicated to it.

Interviewer: I don't know. It's probably some part of the veterinary field, veterinary medicine. Within regular medicine, there are all different fields and nutrition is one of them. I don't know much about veterinary science but maybe there's like a nutrition parts of veterinary science.

Participant 1: I'm pretty sure you can major in livestock nutrition.

Interviewer: Oh.

Participant 1: I don't know if there's anyone… well, there are probably people who are… but, you know, like a field of scientists that are just dedicated to studying how the stuff that they're putting in is then effecting the environment. I can imagine them being like "oh, this is how it's going to affect the animals," but then after that, I'm not sure if they care.

Interviewer: Oh, interesting. Yeah. I don't know. There are definitely studies about how animal byproducts effect the environment, but I don't know what field those people come from, if they come from the veterinarian's side or if they come from the environmental science side or anything like that.

Participant 1: Yeah.

Interviewer: That's really interesting. So, that's it for the topics I wanted to address today. I wanted to also leave a little bit of time at the end, if you had any questions about anything we talked about today, about the topic, about my research, or about anything really. I just wanted to make sure I give you time to do that.

Participant 1: Thank you. Yeah. I have a few questions about recycling. Like, what is best to recycle, what's best to reuse, and what's best to, like, throw away? Because, like, with plastic bottles, I never know what to do with them. I know it's bad to keep reusing the same plastic water bottle, but it's so much easier to, you know, switch it out, but I know also, like, I'm putting chemical bleach into my blood stream, so I don't know. Should plastic bottles be recycled, or should they be thrown out, or…?

Interviewer: With the plastic bottles, I would say the standard would be to recycle them if you can. When you were mentioning that when you think about it, it takes so much energy to recycle a water bottle, so maybe just throwing it in the landfill would take less energy. The things to think about in that respect is… you're right. It does take a lot of energy to recycle various products, not just plastic. It does take a lot of energy to recycle paper and glass and all that, but it gets reused into another product which will then have another lifetime. Whereas in the landfill, it just stays in the landfill. And plastic doesn't disintegrate. And so plastic will remain in the landfill… I mean, maybe not forever, but forever basically. For a really long time. So, that's a tradeoff, with recycling and whether you throw something out or whether you put it in the recycling bin; while it might take energy to make that into something else, it's getting another life and it's not just going to sit in the landfill and take up space. I hadn't really looked and thought about landfill waste and that kind of thing. My family recycled when I was little, so it's just been something we've been doing. But I never really thought about it until the past year or so. Landfills and waste are a huge issue because there's not a lot of space available for it in some places. So, the faster our landfills fill up, the faster we need to create new landfills because when it's in the landfill, it doesn't go anywhere. It just sits and piles up and you have to cover the landfill and keep piling up and eventually the landfill gets full. You can't just keep piling on that 1 landfill. So, that's 1 thing to think about, how long our garbage is going to stay in the landfill. So, that's why I would always recommend recycling plastic bottles if you can. Just because they will be made into something else. And the technology is getting better all the time, in all areas, so, the technology is getting better in terms of being able to recycle things.

Participant 1: Okay. And everything that goes in, let's say like a plastic bag or whatever, in the garbage can, then would that guaranteed go to a landfill? Everything that goes in the garbage goes to a landfill?

Interviewer: Pretty much.

Participant 1: Okay.

Interviewer: So, if it goes in the garbage, it goes to the landfill. If you have a separate recycling, it goes to the recycling center.

Participant 1: Okay.

Interviewer: There are some places as well, where if there's a recycling bin that has trash in it, that has food or other kinds of non-recycling materials, that whole recycling bin has to go into the landfill because the maintenance staff, or the recycling collectors, or whoever, can't sort through every single recycling bin. This is particularly the case in large buildings, like a school or an office building or an apartment complex or something like that. It's considered contaminated, so they just have to throw all that recycling into the garbage if there's garbage in that recycling bin..

Participant 1: Yeah. [Inaudible]

Interviewer: Washing stuff out is always a good thing, and just being aware of what you're tossing into recycling versus trash.

Participant 1: Okay.

Interviewer: And there are some places that are able to sort a little bit better than others, but it all depends on the city. It all depends on the system.

Participant 1: Got you.

Interviewer: Yeah. Great questions. And thank you again. I really appreciate it.

Participant 1: You're welcome. Thanks a lot.

APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Kelli Larson
Sustainability, School of
480/727-3603
Kelli.Larson@asu.edu

Dear Kelli Larson:

On 6/13/2014 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Beliefs and Behavioral Choices about Climate Change in High School Students from Phoenix, AZ and Plainfield, IL
Investigator:	Kelli Larson
IRB ID:	STUDY00001129
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• AppendixC_ParentalConsent, Category: Consent Form; • AppendixD_ChildAssent_Survey, Category: Consent Form; • AppendixE_ChildAssent_FocusGroup, Category: Consent Form; • 140606_Kruke_IRBSubmission, Category: IRB Protocol; • AppendixA_SurveyQuestionnaire, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • AppendixB_FocusGroupAgenda, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • AppendixG_DVHSResearchApproval, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • AppendixF_RecruitmentScript, Category:
	Recruitment Materials;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (1) Educational settings on 6/13/2014.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Laurel Kruke
Laurel Kruke

APPENDIX E

INITIAL FACTOR ANALYSIS RESULTS

Initial Factor Analysis Results: Loadings for All Variables for Beliefs about Effects and Impacts of Climate Change

Variables Q9: How much do you think climate change will affect… Q10: How do you think climate change will impact you locally…	**Global Impacts**[a] **1**	**Personal Impacts**[b] **2**	**3**	**4**
Q9: …You personally?		**.745**		
Q9: …Your family?		**.721**		
~~Q9: …People in your community?~~	~~**.531**~~	~~**.548**~~		
~~Q10: …Less rain and/or snow (precipitation)?~~[c]		~~**.612**~~		
Q10: …Hotter temperatures?		**.720**		
Q9: …People in the United States?	**.854**			
Q9: …People in other industrialized developed countries (like Canada, England, and Japan)?	**.837**			
Q9: …People in developing countries (like Mexico, India, and Brazil)?	**.739**			
~~Q9: …Future generations of people?~~				~~.834~~
~~Q9: …Plant and animal species?~~				~~.685~~
~~Q10: …More rain and/or snow (precipitation)?~~			~~.922~~	
~~Q10: …Colder temperatures?~~			~~.876~~	
Eigenvalues	3.770	1.705	1.569	1.102
% Variance	31.4%	14.2%	13.1%	9.2%
Cumulative % Variance	*31.4%*	*45.6%*	*58.7%*	*67.9%*
Cronbach's Alpha	.84	.682	NA	NA

Note. Initial factor analysis was completed on all student responses, using Principal Components Analysis with a Varimax Rotation. Variables that are struck out above were not used in the final scale construction due to their loadings or subsequent reliability testing. Factors 3 and 4 were also not used in subsequent analysis due to their inclusion of only 2 variables.

[a] Full description of this factor would be "Beliefs about Global Impacts on People"

[b] Full description of this factor would be "Beliefs about Personally Relevant Impacts of Climate Change"

[c] This variable was removed from the final scale due to a higher scale reliability without it.

APPENDIX F

QUALITATIVE CODEBOOK

Guiding Principles for coding

General principles:

1) HOW TO CODE: You only need two resources to code: (1) the Climate Change Beliefs codebook, (2) the Survey and Focus Group scripts. Do not use knowledge outside of these three sources (other than basic knowledge of English language semantics) in your coding.

2) WHAT TO CODE: Code only the **PARTICIPANTS** text. Interviewer text is there for context in case there is a subject implied in the interviewer's question. Do not read into the participant's language for hidden subtext.

3) WHERE TO CODE: The unit of analysis for this project is a question response.

4) COOCCURENCES: Please note that all codes may co-occur and none are exclusive.

5) QUESTION PROMPTS: Pay close attention to the survey and small group interview questions for context; please reference the question which respondents are answering and pay attention to implied subjects. Responses should have been recorded verbatim, but that may not always be the case, so pay attention to the question, and what might be implied in response to the question.

Cheat Sheet

Question 3	**Question 4**	**Question 12**	**Small Group Text**
Causes of Climate Change	Causes of Climate Change		
Misconceptions about Climate Change			Misconceptions about Climate Change
Influences on Beliefs	Influences on Beliefs		Influences on Beliefs
Environmental Concern	Environmental Concern		Environmental Concern
		Types of Behavior	Types of Behavior
			Environmental Behavior Intentions

Variable name	Causes of Climate Change *(Applies to Questions 3 & 4)*
Theory area	Climate change beliefs
Detailed description	Climate change can be natural or anthropogenic; it can be due to fluctuations in the earth's atmosphere and ecological systems as a result of natural cyclic trends that have been seen throughout history, or as a result of human contributions to the carbon dioxide levels in the atmosphere (Hulme, 2009, p. 39-60); uncertainty about the causes of climate change, how serious the effects will be, and how critical it is to take action is also something to consider; can be related to climate change skepticism (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007, p. 450)

Naturally Caused

Inclusion criteria	Mention that climate change is a result of natural cycles of the earth's climate system; mention of trends, cycles of ecological systems, not relating to human interference; examples of major climatic events not caused by humans (i.e. the ice age)
Exclusion criteria	Mention of cycle or trend is not sufficient, must state (or imply) that the cycle or trend is natural, or something that has occurred previously in the Earth's history

Human-Caused (Anthropogenic)

Inclusion criteria	Mention that climate change is caused by human contributions to carbon dioxide to the atmosphere; reference can be made to specific human activities that result in the production of carbon dioxide (i.e. driving, flying, industrial production) to indicate belief that humans contribute to a majority of climate change
Exclusion criteria	Some mention of naturally-caused climate change negates this code; see the following code for both natural and human-induced causes

Both naturally and human-caused

Inclusion criteria	Mention of both natural cycles or trends and human contributions; must mention both beliefs, and imply that both are causing climate change
Exclusion criteria	Must mention both; if both are not mentioned or implied, see above two codes

Uncertainty

Inclusion criteria	Mention of uncertainty about beliefs about climate change; must specifically reference uncertainty about beliefs, and that they are unsure about whether climate change is caused by humans, nature, both or neither
Exclusion criteria	Does not include uncertainty in general; must be in reference to beliefs; does not include lack of knowledge, or not having enough information to form a belief

Variable name	Misconceptions about Climate Change *(Applies to Questions 3 & Small Groups)*
Theory area	Climate change knowledge, or lack of knowledge
Detailed description	Young people have misconceptions of climate change and global warming, such what it is, what causes it, and what its effects will be; misinformation can include, for example, the ozone's impact on climate change, or that climate and weather are the same thing (Leiserowitz et al., 2011, p.5, 14, & 23; Mower, 2012, p. 4-6, & 21)

Ozone

Inclusion criteria	Mention of the ozone hole, or use of aerosols, as a cause of climate change
Exclusion criteria	Must mention something related to the ozone hole as a cause related to or an effect of climate change

Weather and Climate are the same thing

Inclusion criteria	Mention of weather and climate being the same thing; can include statements about the changing weather in a narrow context (i.e. day-to-day weather)
Exclusion criteria	Does not include mention of regional or annual weather changes (i.e. statements about changing snow fall during winters, or noticeably hotter or wetter summers over time

Climate Change is about rising temperatures

Inclusion criteria	Mention of climate change being just about rising temperatures, or that it is the same thing as Global Warming
Exclusion criteria	Does not include statements that include rising temperatures as part of a longer list of climate changes (i.e. rising temperatures can be included in a list of effects such as changes in precipitation, extreme weather events, etc.)

Variable name	**Influences on Beliefs** *(Applies to Question 3, 4 & Small Groups)*
Theory area	Beliefs and Values, and Information Seeking Behavior
Detailed description	Various value systems and worldviews can influence what a person believes about a controversial topic like climate change; these value systems can be a cause for confirmation or debate about a particular point-of-view (Hulme, 2009). There are multiple sources that teenagers access to get information about various topics (Leiserowitz et al., 2011, p. 3 & 44-47). Teenagers tend to seek out information about topics they are interested in, or that their parents discuss at home (Mead et al., 2012, p. 34-36). People often selectively seek or internalize information that corresponds with their value systems, which influences their beliefs about a particular topic (Stern & Dietz, 1994, p. 67-68).

Politics

Inclusion criteria	Mention of politics, political parties, or political figures as an influence on what a person believes about climate change
Exclusion criteria	Mention of politics alone is not sufficient; must be implied (within text, or through the question) that political affiliations or politicians influence student's opinion

Religion

Inclusion criteria	Mention of religion, church, or symbols related to a specific religious denomination as specifically influencing what a person believes about climate change
Exclusion criteria	Mention of religion is not enough; influence on opinion/belief must be implied in response or through the question

Parents/Family

Inclusion criteria	Mention of parents, mom, dad, other family members specifically as providing information, or having an opinion that has influenced student
Exclusion criteria	Mention of family is not sufficient unless it is implied that they have influenced the student in their belief system

Friends/Peers/Social Group

Inclusion criteria	Mention of friends, classmates, specific peer group members as having an influence on climate change beliefs and opinions; classmates (people) would be included in this category, other references to school in general, or topics learned in school would be included in "School" category
Exclusion criteria	Mention of peers is not sufficient, must be implied that they have an influence on student's opinion; must be a member of peer group – family (i.e. brother/sister) would be consider as above.

School/Teachers/Academic Sources

Inclusion criteria	Mention of teachers, other staff or administrators at school, topics learned during classes (specific or general), textbooks, or other resources that are referenced at school; student must imply that these have an influence on their opinions; scientists are considered an academic source
Exclusion criteria	Mention of school, teachers, etc. alone is not sufficient – must imply the influence on beliefs and opinions

Media/Communication Sources

Inclusion criteria	Mention of various media sources as having an influence on beliefs about climate change – sources can include news, newspapers, magazines, TV, internet, books (non-textbook), documentaries
Exclusion criteria	Mention of media is not sufficient, must be implied that the media reporting has an impact on beliefs

Variable name	**Environmental Concern** *(Applies to Questions 3, 4, & Small Groups)*
Theory area	Values – Beliefs – Norm Theory
Detailed description	People prioritize values differently, and attribute varying levels of concern to themselves, other people, and non-human objects differently (Stern & Dietz, 1994, p. 69-71).
Egoistic Values	
Inclusion criteria	Mention of concern for themselves, how the environmental changes could affect them personally; concern about the personal costs or impacts of acting a particular way (i.e. they think the cost of acting in a pro-environmental way may be too high)
Exclusion criteria	Mention of themselves is not sufficient; must be clear that they are concerned or not concerned with the environment because of how it will impact them personally
Altruistic Values	
Inclusion criteria	Mention of concern for others, and how other people will be affected by environmental actions; concern for the well-being of others; statement of importance to protect others, society, and/or the environment
Exclusion criteria	Mention of others is not sufficient, must state or imply the they are acting in a pro-environmental way because of their concern for others, or that they are aware of how an action might impact other people
Biospheric Values	
Inclusion criteria	Mention of concern for the earth, animals, plants, ecosystems, etc., and that they will be impacted by environmental actions; feelings that they act a particular way because of the costs, benefits, and impacts to non-human entities
Exclusion criteria	Mention of non-human objects is not enough; must imply that there is concern for the well-being and a need to protect these objects from environmental harm and consequences

Variable name	Types of Behavior *(Applies to Question 12 & Small Groups)*
Theory area	Significant Environmental Behavioral Types
Detailed description	Based on different factors and contextual elements, environmental behaviors can be generally grouped into different types: activism, public and private sphere environmentalist behaviors, organizational/institutional behaviors, household behaviors (Stern, 2000, p. 409-411); these types of behaviors can also be classified as individual behavior choices, or collective behavior strategies.
Consumer/Household Behaviors	
Inclusion criteria	Mention of behaviors relating to personal consumer choices and household decisions; includes purchasing decisions (i.e. clothes, food, other items), electricity and energy usage (or savings), transportation decisions, waste or recycling actions
Exclusion criteria	Behaviors must be mentioned in the context of environmental actions (as should be implied by Question 12); does not include membership in clubs or organizations
Environmental Citizenship/Political Behaviors	
Inclusion criteria	Mention of behaviors relating to voting, signing petitions, or taking other action to support environmental campaigns or causes; includes membership in a school club, community organization, or the like, related to the environment
Exclusion criteria	Does not include membership in other clubs that are not related to environmental stewardship (i.e. sports teams, musical groups)
Policy Support (Collective Strategies)	
Inclusion criteria	Mention of support or a positive attitude for national or international policies about climate change, or related topics; willingness to sacrifice economically (i.e. paying higher prices for consumer goods and services)
Exclusion criteria	Mention of policies must imply support for the environment; does not include general policies or regulations that not related to the environment

Individual Behaviors

Inclusion criteria	Mention of behaviors that can be accomplished by one person; mention of specific behaviors that an individual undertakes on their own
Exclusion criteria	Behaviors must be mentioned in the context of environmental actions (as should be implied by Question 12); does not include behaviors mentioned in the context of more than one person, or if they are referred to as behaviors of a group

Society's Aggregate Behaviors

Inclusion criteria	Mention of behaviors that are undertaken by a group, or that are (or should be) accomplished by more than one person; reference of a group needing to do something, or an action that is done by a group of people
Exclusion criteria	Behaviors must be mentioned in the context of environmental actions (as should be implied by Question 12); does not include behaviors that are mentioned only as personal individual actions

Technological Fixes

Inclusion criteria	Mention of technology as a solution or a behavioral strategy; for example, mention of fuel efficient cars, or installing solar panels would be considered technological behavioral fixes
Exclusion criteria	Technologies must be mentioned in the context of a behavior choice that would help reduce or solve climate change; mention of technology as a cause of climate change is not included; mention of technology in general is not included, must refer to it as a solution strategy

Variable name	Environmental Behavior Intentions *(Applies to Small Groups)*
Theory area	ABC Theory (Attitudes, Behavior, Context); Reasoned Action
Detailed description	Behavioral intent does not always parallel behavioral impact; environmental actions may be motivated by other influencers, not always a pro-environmental value or attitude – context and value prioritizations may have a stronger influence than environmental attitudes (Stern, 2000, p. 415-418, 421). The Reasoned Action approach implies that people's behavior is influenced by their intentions to act, which can be motivated by the perceived consequences of their behavior, social approval, or performance barriers (Fishbein & Ajzen, 2005, p. 193-195).

Attitudinal Factors – Environmental

Inclusion criteria	Mention of how positive personal and societal norms, beliefs, values, attitudes towards the environment have influenced behavioral actions of students; this can be implied through references to personal commitment to the environment, a desire to protect the planet, or similar comments
Exclusion criteria	

Attitudinal Factors – Non-Environmental

Inclusion criteria	Mention of how a personal or societal norm, belief, value, and/or attitude not related to the environment impacts a person's behavior; examples of non-environmental attitudes could be about safety, speed, or similar; this would include convenience, as an attitude about available time and priorities of time spent; also included would be social approval or fear of disapproval of peer group (i.e. peer pressure), a desire to "fit-in"
Exclusion criteria	Mention of norms, beliefs, values or attitudes is not sufficient, must imply that they motivate a behavior or action

Habit or Routine

Inclusion criteria	Mention of acting in a particular way because of habit, or a standard way of behaving; statements about the way they have acted in the past, or being used to a certain behavior would be included
Exclusion criteria	Mention of a habit is not sufficient, must imply that they are behaving or not behaving in a particular way because of the routine to which they are accustomed

Societal Factors

Inclusion criteria	Mention of personal and interpersonal societal influences on a person's behavioral choices; could include community expectations (general expectations, different from personal desire to fit in), institutional regulations (i.e. in school or family contexts), technological influencers or restrictions, infrastructural restrictions or access (i.e. roads, public transportation), and other social factors; includes comments about behaving in such a way because others are doing it
Exclusion criteria	Mention of a social context is not sufficient, must imply or state that the context has an impact on a student's behavioral choice or action

Economic Factors

Inclusion criteria	Mention of economic influences on a person's behavioral choices; could include monetary costs and incentives for behavior (i.e. higher or lower costs of items), and other economic factors
Exclusion criteria	Mention of economics is not sufficient, must imply or state that the economic context has an impact on a student's behavioral choice or action

Political Factors

Inclusion criteria	Mention of political influences on a person's behavioral choices; could include policies (government, school, community), regulations (i.e. in community contexts), and other political factors
Exclusion criteria	Mention of politics is not sufficient, must imply or state that the context has an impact on a student's behavioral choice or action

Personal Capabilities

Inclusion criteria	Mention of having the knowledge or skills to perform a particular action, availability of time to act, access to general resources like money, power, education, social status; this can also include socio-demographic factors like age, educational attainment, race, etc.
Exclusion criteria	Mention of personal resources and availability is not sufficient, must imply that these had an influence on a student's behavior in a particular way

APPENDIX G

RESEARCH QUESTIONS AND ANALYSIS OUTLINE

1a. What do high school students know about climate change, and what do they believe about the causes, impacts, and potential solutions?

- Descriptive Statistics for:
  - Know: Comparison of qualitative knowledge score [Q1, Q3, Q5, Q7] and quantitative knowledge score
  - Cause: Common response to Question 6 – main cause of climate change
  - Beliefs: Responses to Question 9 – what will be most affected?
    - Analyze mean of each variable separately, and compare which students believe will be most affected
  - Beliefs: Responses to Question 10 – which one is most common?
    - Analyze mean of each variable separately, and see which response is more commonly believed to happen
- Qualitative Analysis
  - Know: What do students commonly discuss when asked to define "climate change" and "global warming"? (Q3 & Q4)
  - Beliefs: What influences students beliefs about climate change (small group discussions)

1b. Is knowledge about climate change related to beliefs about the phenomenon?

- Using these scores/scales:
  - Know: qualitative score of Q1, Q3, Q5, Q7
  - Beliefs [global impacts on others]: Scale of Q9 variables
  - Beliefs [personally relevant impacts]: Scale of Q9&10 variables
- Conduct these statistical tests
  - Correlation between Knowledge Score and Global Impacts (Q9 scale)
  - Correlation between Knowledge Score and Personally Relevant Impacts (Q9&10 scale)

2a. What types of behaviors are high school students exhibiting in their lives that may affect climate change?

- Descriptive Statistics:
  - Behavior: most common responses to Question 13
- Qualitative Analysis:
  - Behavior: What do students think about when asked to name behaviors that worsen or lessen climate change (Question 12); do these behaviors correspond to Question 13 responses?
  - Behavior: What influences behavioral choices in high school students (analysis from small group discussions)

2b. Is belief about climate change related to behavioral choices?

- Using the Impacts and Behavior scales, conduct these tests:
  - Correlation between Q9 scale and Q13 scale(s)/ind. variables
  - Correlation between Q9&10 scale and Q13 scale(s)/ind. variables

3. **Do climate change knowledge, beliefs, and behaviors vary between students in different geographic locations in the United States (who may experience different climatic elements)?**
    - Location differences between responses to Q3 (qualitative)
    - Location differences between responses to Q12 (qualitative)
    - Using the scores and scales, conduct these tests between locations:
        - Know: Crosstab with Chi-Square of Know Score between AZ and IL
        - Belief: Mann-Whitney U of Q9 Scale between AZ and IL
        - Belief: Mann-Whitney U of Q9&10 Scale between AZ and IL
        - Behavior (most common differences): Crosstab with Chi-Square of Q13 Scale(s)/ind. variables and location (AZ/IL)