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Environmental Communication: Changing the Attitude-Behavioral Gap in Science Communication Utilizing Strategic Messaging

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Environmental Communication: Changing the Attitude-Behavioral Gap in Science Communication Utilizing Strategic Messaging

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Abstract

National Polls in the United States consistently find the public's beliefs and attitudes about climate change and other environmental issues significantly diverge from those held by the science community. A communication gap between the findings on the causes and effects of environmental issues and the public's inability to interpret or refuse to accept these findings are possible causes of this divergence. This communication gap constitutes a threat to society because of inaction to environmental problems and points to needed changes in scientific messaging that better informs and motivates behavioral change. The present research employed a strategic message design to affect environmental attitude and behavioral intent. A pre-and post-survey assessed the effectiveness of the message design as an Environmental Communication Teaching Tool using two groups of participants sampled from three enrolled university courses. The message design significantly influenced attitude and behavior intent to engage in pro-environmental actions. Analyses confirmed the Teaching Tool's effectiveness in reducing the attitude-behavior gap in science communication.

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Table of Contents

List of Tables

List of Figures

CHAPTER 1

Issues in Science Communication Messaging

According to Hulme (2009), “the science of climate change is not ‘a problem’ waiting for ‘a solution’; rather, it is an environmental, cultural, and political phenomenon which is re-shaping the way we should think about ourselves, our societies and humanity’s place on Earth” (p. 1). Similarly, Kahan (2015) examined this problem and concluded, “the failure of widely accessible, compelling science to quiet persistent cultural controversy over the basic facts of climate change is the most spectacular science communication failure of our day” (p. 2). As confirmed in Funk and Hefferson’s 2019 Pew Poll findings, cultural controversy over the causes of climate change showed that 49% of the United States population believed human activity contributed to climate change; whereas 30% and 20% of the public still believed humans contributed minimally or not at all. Similarly, in Funk and Kennedy’s 2020 Pew Polls, only a minority believed climate change had any measurable effect on their lives. These data confirm that science communication messages need to transcend research-level statements that can be translated in ways that the public would be more likely to comprehend. Climate change messaging has contributed to the public’s misunderstanding that they are not part of the problem. Science messaging could potentially engage more of the U.S. population to support the environment with behavioral actions that benefit the Earth if the public had a better understanding in the cause and effects to reducing their actions that enhance climate impacts.

Multifaceted social structures increasingly polarize political, social, ethnic, economic, religious, and territorial concerns. Clarke and Peterson (2016) stated, "environmental conflict is among the greatest challenges facing humanity in the 21st century" (p. 1) due to the issues involved in communication between government, private industry, and public interests. They concluded that traditional solutions to environmental conflicts have primarily failed because

"single disciplines are ill-equipped to deal with issues that are both technically and socially complex" (p. 4). Corner et al. (2018) stressed the need for effective messaging to bridge the gap between research and practice in science communication. Not surprisingly, numerous studies have pointed to better science communication messaging could garner increased public support by engaging public awareness and action with environmental communication and pro-environmental action (e.g., Kahan, 2010; Medin & Bang, 2014; Han & Stenhouse, 2015; Corner et al., 2018; Canfield et al., 2020; Horst, 2021).

Crate (2008) suggested promising solutions to the science communication problem by integrating art and social science to highlight the public's misunderstanding of ecological changes that threaten society. He attempted to draw attention to climate science misunderstandings by employing this narrative strategy. For instance, Balog (2009), a nature photographer, used his "lens" to illustrate this point in the documentary *Chasing Ice*. He spent more than 1000 days using time-lapse photography to capture the ecological changes of 24 glaciers to demonstrate the Earth's warming during glacier recessions.

This gap between science messaging and public interpretation has created, at times, an attitude-behavior dilemma between an individual's environmental beliefs and their subsequent actions (Kahan, 2013; Luers, 2013; Skocpol, 2013; Kahan, 2015). For example, the Intergovernmental Panel on Climate Change (IPCC) reports (2013, 2014, 2019) stated that human-caused emissions of CO_2 must be reduced by 45 percent based on the 2010 average of CO_2 389.9 parts per million by 2030 to decrease what was expected to be the most threatening effects of climate change. While intended to be an internal document, the IPCC (2019) report consisted of technical and complex language to deliver science terminology and analyses. The IPCC report suggested net-zero CO_2 emissions for the year 2050. To reach this goal, public

participation is necessary. However, this technical information did not achieve its purpose because much of the public either lacked the scientific knowledge or skill to grasp the findings or never received their claims. The technical IPCC report did not create an understanding with the public to reduce their CO_2 emissions. As a result, the public had minimal to no involvement in supporting the IPCC suggestions. This gap between the scientific community's recommendations toward climate change mitigation and the public's perception of climate change threats has created inaction. Han and Stenhouse (2015) stated that the "urgency of the climate problem suggests that this gap must be closed soon" (p. 397) and pointed to the importance of including social science fields to support strategic science communication messaging to increase public understanding and support.

With future problems associated with climate change, the public most affected has been identified as those between the ages of 12 and 24, representing today's young people. This age group will need scientific communication messaging that educates climate change action within their communities, and this population will be expected to collaborate to enact mitigation practices. The United Nations emphasized that these individuals between the ages of 12 and 24 would bear the impact of today's inaction toward climate change (Fry, 2020). Furthermore, young people were more likely to be distressed about climate change than older populations (Nelms et al., 2017). Unfortunately, few empirical studies have addressed this age group's environmental attitudes and behaviors (Strife, 2012; Nash et al., 2019; Lee et al., 2020). Lee et al. (2020) found low climate change beliefs and low concerns among young adults in high-income countries; furthermore, "as with participants' concepts of causes and impacts, concepts of solutions to climate change were held at a superficial level and featured misconceptions" (p. 8). Nelms et al. (2017) concluded, "if we are to better prepare young people to collaborate and

reduce future environmental challenges, we need to better understand how to educate this age group's awareness of environmental issues" (p. 537).

Climate Science Consensus and the Public's Belief

In analyzing the consequences of climate change, Cook et al.'s (2013) account of 12,000 peer-reviewed science articles calculated 97.1% agreement from scholars of anthropogenic global warming. Their testament provided sound reasoning for the public to believe that the world's temperature has increased due to human habits. Munich Re (n.d.), a leading expert on risk solutions and an insurance pioneer, had on its climate change webpage, "One of humanity's greatest challenges is climate change, predominantly the result of human activity. It is real and has a major influence on weather-related natural disasters. A thorough understanding of climate change is essential for an insurer's risk management" (para. 1). As cited countless times, the Intergovernmental Panel on Climate Change (IPCC) five reports (AR1, AR2, AR3, AR4, AR5) are considered the world's most comprehensive scientific information regarding climate change. Scientific information shared by hundreds of scientists concluded that anthropogenic warming was the cause of global temperature increase (IPCC, n.d.; IPCC, 2019).

The previous conclusions reflected results from the traditional scientific community. Carmichael and Brulle (2017) highlighted a different conclusion when they said that "the scientific consensus regarding climate change had increased; [however], a sizable proportion of the US population does not believe that anthropogenic climate change is happening" (p. 232). The public's beliefs surrounding climate change, global warming, and other environmental concerns do not reflect the science community's consensus that increases in global temperature result from human activity. While Cook et al. (2013) found that 97% of the science community recognized global warming and that it predominately was human-caused, the Funk and Rainie

(2015) survey found that only 50% of the public had similar beliefs. In the annual Gallup poll covering the public's view regarding the Earth warming, Saad (2021) found the public's attitude has been similar since 2016. These findings repeatedly demonstrate the perceptual distance between the public's disbelief in global warming and the scientific community's consensus.

The established science has been clear that human actions have increased the Earth's temperature. However, much of the public has not accepted the cause-effect relationship between human habits and Earth warming. Furthermore, the public's perceived understanding does not recognize this as a relevant threat. Since public involvement is needed to implement pro-environmental actions (e.g., reduce, reuse, recycle), there needs to be a better understanding of the gap between the public's beliefs and the science community's views along with ways to engage the public in environmental-friendly behavior. Additional research has been conducted into the probable reasons behind the gap in climate science communication and the public's lack of understanding to incorporate into a science communication teaching tool for practical solutions to this dilemma.

Climate Science Education and the Public

Climate change is defined as a change in international or local climate patterns attributed mainly to increased levels of atmospheric carbon dioxide generated from the use of fossil fuels (Climate Change, 2021). Climate change impacts would be the consequences of climate change (e.g., sea-level rise causing population displacement, desertification causing community loss of land use, increase in storms intensities causing coastal flooding). Climate science education includes teaching or discussing human impacts on climate systems and the Earth's climate systems' impact on humans such as topics like the enhanced greenhouse effect or the Earth's energy balance (NSTA, 2018). Environmental education (2021) refers to teaching or learning

about the Earth's environmental systems and engaging problem-solving for individuals to manage their impacts on the environment. Wilson's (2000) investigation found that the public's education in climate science literacy have stemmed from the mass media than from schooling or the scientific community's messaging efforts. The United Nations (2010) concurred that young people had not received climate science education or environmental education from traditional teaching platforms. In Mifsud's (2012) meta-analysis of environmental studies, the media are the primary source of environmental information on climate science.

Similarly, Vaidyanathan (2015) found that for "controversial topics such as climate change, a significant number of Americans do not use science to inform their views" (para. 2). Dawson (2012) discovered that science teachers indicated they lacked the confidence and knowledge to educate students regarding climate change. Dawson concluded students were not educated by their science teachers on climate change. Nelms et al. (2017) found that students used social media as their information source to share and educate themselves on environmental issues.

While numerous studies have found that individuals relied on the media as a primary source of environmental information, O'Hair et al.'s (2012) research argued that inaccuracies regarding climate change and environmental information in media sources have created confusion between the public consensus, creating a gap from the scientific consensus. As a result of inaccurate, incomplete, or inconsistent environmental information in media messaging, individuals have been mis-informed or lead astray about the seriousness of the personal relevance of "human-induced" climate change threats. Not surprisingly, Jennings and Hulme's (2010) concluded that the public's divided attitude regarding human involvement in causing climate change was connected to "how the risks associated with climate change and the

uncertainties in climate science have been represented in the media (e.g., Boykoff and Boykoff, 2004; Carvalho and Burgess, 2005; Boykoff, 2007; Sampei and Aoyagi-Usui, 2009; Boyce and Lewis, 2009) and also the effects of these representations on public understanding of climate change (e.g., Ungar, 2000; Sterman and Sweeney, 2002)" (p. 444). Media statements backed by special interest groups have also contributed to the public's views on global warming and other environmental threats.

In addition to the influence of the media, special interest groups (i.e., climate skeptics, anti-environmental think tanks, industrial lobbyists) have developed media campaigns regarding climate concerns to incite resistance, denial, or indifference toward environmental improvement in the public sphere (Feygina et al., 2010; Cox & Pezzullo, 2016). Zhao et al. (2011) uncovered that some interest groups may have intentionally selected partial segments out of climate science reports to create confusion and indifference. By manipulating the content and relevance in environmental messaging, some individual's understanding due to the fallacies in reasoning may have led to inaccurate beliefs as well as outright resistance. When reviewing the Federal Trade Commission allegations against petroleum companies, three of the largest oil and gas companies are being sued for false advertising, deceptive practices, and untrue environmental claims to intentionally mislead the consumer about the role their products play in the climate crisis (Coleman, 2021; "Chevron", 2021).

The following articles were examples of climate messaging that would have contributed to invalid conclusions, confusion, and indifference in the public's understanding of environmental problems. Two articles were published four months apart titled, "Polar bear numbers plummeting in Alaska, Canada – What about the rest?" in *National Geographic* (Qiu, 2014) and "Polar bear population bounces back despite climate change warning*"* in *Express*

(Ingham, 2015). Since the public opinion on climate change issues has been gathered from media outlets, the public would have uncertainty regarding an increase or decrease in polar bear populations caused by climate change warming based on which article they may have read. In two articles published one month apart, Pantsios (2015) cited fracking as the cause of earthquakes in Oklahoma, and in Bastasch's (2015) article, fracking was not the cause of earthquakes in Texas. Without further understanding or investigation into the science behind climate change or environmental issues that have been created, articles such as these would have caused misunderstandings and confusion within the public regarding the science.

Over 50 years, the tobacco industry notoriously created invalid messaging with unsound conclusions to prevent warnings from being placed on their cigarette packaging. Oreskes and Conway (2010) claimed these types of media campaigns created fallacies in reasoning to distort the public views on cigarette smoking by concealing the fact that smoking caused cancer to avoid profit losses. The same persuasive strategies have been used in environmental messages by interest groups to continue the status quo or inaction toward climate change in the public sphere. Kahan (2015) attested that false climate change claims had created stagnation within the public. Furthermore, he concluded that public opinion would not align with climate science while contamination is occurring within climate science messaging.

Problems Facing Science Communication

Han and Stenhouse (2015) asserted, "there is no shortage of evidence that a gap between scholars and practitioners exist in climate change communication" (p. 397). Kahan (2015) discussed a science communication problem in which a breakdown in communication of climate science literacy created public confusion. Alan Leshner, the chief executive officer of the American Association for the Advancement of Science (AAAS), emphasized that a top priority

for AAAS has been to train scientists on how to communicate with the public on controversial science issues (Vaidyanathan, 2015). However, Leshner continued that teaching scientists to communicate to the public has not been evaluated for effectiveness. In Kahan's (2010) early findings, he stressed that educators "…need to learn more about how to present information in forms that are agreeable to culturally diverse groups, and how to structure debate so that it avoids cultural polarization" (p. 297). Cox and Pezzullo (2016) found that apocalyptic environmental genres or fear-based messaging of an impending ecological crisis created public denial or paralysis. Carmichael and Brulle (2017) emphasized that "the failure of the public to possess a clear understanding of climate science underlies the difference between the scientific and public understanding" (p. 234). Canfield et al. (2020) determined that researchers' and practitioners' dialogue has complicated the ways individuals and communities perceive science communication. Furthermore, they concluded that the deficits in science communication involving the "how-to" address and engage the public in environmental topics lead to a need to integrate strategic message design to address science communication's systemic failures.

In teaching or training individuals on implementing effective science communication messaging, Kahan (2013) acknowledged that one needs to include the "human component," or social-cultural identities. In the summary of the National Academy of Sciences Colloquium (2014), they found the need for an organized effort to connect scientific information to individuals' lives so individuals would understand how to implement environmental actions in their daily routine. Han and Stenhouse (2015) believed social scientists and communication scholars could play a significant role in communicating messaging and using strategic message designs to assist in cultivating the public's understanding of how to engage in environmental communication and implement pro-environmental actions. Kahan (2015) argues that individuals

have levels of awareness of climate science. In addition, individuals need a better understanding of how to help with environmental solutions. Based on Kahan's assertions, what if individuals were provided with the knowledge in strategic messaging to understand and relate to how to reduce, reuse, or eliminate environmental destruction? When adding strategic messaging involving beliefs and values that align with a group, Cox and Pezzullo (2016) stated that this communication approach has shown promising reactions within the public.

Science communication should include strategic messaging regarding environmental degradation and assist individuals on how to implement change in their environmental actions. Otherwise, science literacy will continue to be "lost in translation." Unfortunately, scientific communication has not included a place for human beings to be a part of nature or ecosystems; therefore, creating a psychological distance in the public's awareness of their impacts that increase climate change (Medin & Bang, 2014; Canfield et al., 2020; Horst, 2021).

The Public's Behavior Gap

Romm (2016) claimed there needed to be a call to action by the public toward climate change remediations. He (2016) stated multiple warnings from the IPCC report, the U.S. National Academy, the United Kingdom's Royal Society, and other scientific organizations for the need for public engagement toward pro-environmental attitudes and pro-environmental action. Kahan (2015) concluded that many individuals expressed a pro-environmental attitude but often exhibited inconsistent behavior. For example, when elementary school students were asked to raise their hands if they wanted to save the polar bears, most students raised their hands. However, after checking waste bins and local trash containers around their facilities, plastic and aluminum sorting for recycling is still an ongoing issue.

In Kahan's (2015) findings, the attitude-behavior gap was attributed to the lack of understanding or knowledge to implement environmental behavioral change. This was evident in the public's absence in practicing environmental actions. Cox and Pezzullo (2016) acknowledged that attitude might not directly influence behavior in specific settings. They did recognize that attitude can lead to corresponding behaviors. However, they discussed an attitudinal variable in the public's behavior toward environmental initiatives. If the individual did not reflect a pro-environmental attitude, their behavior showed minimal ecological behavioral change. In Nelms et al. (2017) findings, individuals with a favorable environmental attitude were more likely to act in pro-environmental ways.

Gardner and Stern (1996) found that pro-environmental attitudes influenced environmental beliefs and values toward a wide range of ecological concerns. Cox and Pezzullo (2016) suggested that cultural norms often had impacted behavioral change, especially under conditions that disrupted individuals' socio-economic conditions, such as climate change. When adding social-cultural content to science communication, the individual will more likely be engaged when the content is related to their beliefs and values, impacting their environmental behavior. Han and Stenhouse (2015) stressed the necessity of closing the attitude-behavioral gap due to the severity of climate change impacts and concluded there was a lack of research to support how to reduce the gap.

CHAPTER 2

Strategic Messaging in Science Communication

In the United Nations Environment Programme report, El-Hinnawi (1985) first defined the term "environmental refugees" as people who have been forced to evacuate or leave their home due to apparent environmental distress (i.e., natural environmental events or triggered by human causes) that disrupts their quality of life or their existence. However, there have been unequivocal statistics that support the mass numbers on the move from loss of securities due to climate change owing to human causes (Pinto-Dobernig, 2008; Riguad et al., 2018; Deshmukh, 2019; Podesta, 2019; IOM's GMDAC, 2020; Ropeik, 2021). In *Defense News*, Mehta's (2021) article outlined that the Pentagon has now made climate change a national security priority for the Defense Department due to the adverse impacts of climate change affecting populations' subsistence and causing displacement. When reviewing statistical data for global numbers of people displaced due to climate change, the figures vary within countries, nations, and continents. Climate change altering the global economic landscape has caused conflict amongst populations, and scarcity in recourses can be directly associated with violent conflicts (Homer & Percival, 1996; Jensen, 2012; Safarzynska, 2018). As Romm (2016) outlined, climate change has impacted public health, natural resources, food security, ecosystems, air quality, water resources, and infectious diseases. Typically, conflicts between the host community and the migrants involving political, societal, and economic resources have occurred.

In Nelms' (2014) example, the loss of land due to desertification and sea-level rise has created the problem of lack of land, forcing involuntary migration on neighboring hosts and sometimes to places very far from home. For example, a migration stream from the Marshal Islands in the Pacific Ocean to Springdale, Arkansas, has resulted in the second largest population of the Marshallese outside their atoll islands (Davis, 2013). Social integration has

been a source of conflicts between the Springdale "host" community and the Marshallese refugees due to cultural differences, unresolved needs, and lack of resources between the populations. Clarke and Peterson (2016) found that mediation measures that involve educating individuals about climate change impacts have supported climate change resolutions between parties. Han and Stenhouse (2015) claimed, "social scientists and communication scholars, in particular, have a key role to play in researching and disseminating strategies that can help to cultivate the public" (p. 397). As can be seen, many research lines demonstrate the gap in science communication between science educators and the public concerning climate change and its impacts. This breach has created a need for strategic messaging in science communication to bridge the gap between research and practice.

As stated in the previous literature, the problems facing science communication in climate change literacy need to be addressed for the public to respond toward participating in environmental actions. Han and Stenhouse (2015) asserted there was a lack of research to support how to close the attitude-behavioral gap in climate change remediation. As reflected in environmental communication, discussing social-cultural aspects with the public will help engage them in ecological solutions to climate change (Han & Stenhouse, 2015; Clarke & Peterson, 2016; Cox & Pezzullo, 2016). Based on the 2019 Pew Research Center date identification for generations aligning as Millennials (i.e., 1981 to 1996) and Generation Z (i.e., 1997 to 2012), the population bearing the most significant impacts of climate change due to the public's inaction will be young adults from where the younger Millennials end and the Generation Z begins (United Nation, 2010; Fry, 2020). Nelms et al. (2017) stressed the concern to better prepare and educate populations to "reduce, reuse, and recycle." Designing an effective messaging strategy to incorporate into scientific communication would address some of the

problems facing the public's skepticism in human-induced climate change and inaction toward environmental practices.

Could an Environmental Communication Teaching Tool (ECTT) be developed to help individuals understand the cause or effects of climate change? If effective, this tool would aid in science communication's public interpretation problem by involving the "human component" in strategic messaging in climate change literacy. The ECTT would contribute to messaging strategy for the public's comprehension of climate change and attempt to create public action toward engaging environmental communication and practices.

The ECTT consisted of a climate change case study using a communication theory for strategic message designs to persuade environmental attitudes and behavioral variables within the public. This section will discuss the development of the ECTT and the importance of the age group that would benefit from this intervention. Included in science communication will be socio-cultural values that are disturbed by the climate change issues that would be relevant to the localized population. Since young adults will be impacted the most by climate change, the ECTT was developed to affect their environmental attitude and behaviors.

Focus on the Young Adult

Focusing on young adults (ages 18 to 23) was significant due to their stage of development in expanding their own identities separate from their parents while taking on new responsibilities (Chan & Chan, 2008). Late adolescence and young adult studies showed that peers were more important sources of information when making decisions separate and distinct from their parents. Daddis (2011) stated that this age of development had an "increase in the salience of self-determination rights, involving autonomous control and agency over one's own life" (p. 1311) as opposed to following authority figures.

Nelms et al. (2017) research found the pressure on this generation to evaluate the information for ecological problem solving and communicating about environmental-behavioral change will be crucial for future environmental conservation since this population will live with the impacts of inaction toward climate change issues. This age group had an increased understanding of consequences and had a general shift toward expressing their rights and growing their domain. Strife (2012) asserted there were only a small number of empirical studies addressing environmental attitudes and perspectives for this age group and pointed out that many of these studies were based in countries outside the United States. Fielding and Head (2012) stressed in their findings "the need to gain a better understanding of the attitudes, knowledge, and practices of young people, with a particular focus on identifying the factors that help or hinder young people's environmental actions" (p. 171). This population was administered the ECTT due to this age group's natural developmental progression of autonomy from authority figures encouraging their thoughts on the subject. Furthermore, since this population was forecasted to be affected the most by climate change, the ECTT would demonstrate its ability to positively impact this age group's environmental attitudes and behavioral intent toward pro-environmental actions helping them prepare for their future.

Teaching Pedagogy Incorporated

The science of teaching or the techniques used to teach pedagogy was Aristotle's concept for teaching practical knowledge, referred to as phronesis or practical wisdom. Khine and Saleh (2013) defined phronesis as the ability to deliberate what is beneficial for oneself and conducive to the general welfare. Breier and Ralphs (2009) emphasized that the popularity in education increased in the concept of teaching practical wisdom but loses clarity in science teaching. Khine and Saleh (2013) emphasized the importance of understanding phronesis to provide better

science teaching pedagogy and practices, including societal impacts in climate science education. Anderson (2007) stressed that communities regularly face climate change problems, so socio-cultural information should be an invaluable resource added to research and teaching science education about climate change. Khine and Saleh (2013) argued that individuals' activities are embedded in the environment; therefore, the human component should be incorporated into science education. They continued that "good" teaching involved creating activities and social settings for student groups to work on collaborative efforts to reach higher levels of thinking and to "…promote both verbal and practical (through experimentation and inquiry methods) thoughtfulness" (p. 29). Since theoretical knowledge and technical skills need added delivery methods to make up effective teaching (Carr, 2007), the ECTT included peer-to-peer problem-solving using climate change impacts to promote group reasoning and higher levels of thought processes to encourage group communication in resolving issues.

The teaching of climate change resulting in global warming has become a socially controversial, political, and scientific subject. According to the *Next Generation Science Standards*, teaching socially controversial science topics should integrate five domains: conceptual, epistemic, socio-cultural, religious, and legal (Khine & Saleh, 2013). The design of the ECTT focused on the first three domains (i.e., conceptual, epistemic, and socio-cultural). Religion was integrated into the socio-cultural domain based on Zittoun (2019) findings that religion is both social and cultural by nature representing a mutual process of mind and society. Legal constructs could surface under the epistemic domain depending on the science knowledge of the participants using the ECTT.

Based on these science standards, the conceptual domain included grounded science research and understanding opposing views of these science conceptions (Khine & Saleh, 2013).

Educators needed to be apprised of these alternative views when teaching. In delivering persuasive communication practices, addressing the opposing view supplies individuals with both perspectives to help make decisions.

The epistemic domain refers to values and beliefs specific to science knowledge (Khine & Saleh, 2013). Students' values and beliefs about the subject matter play a crucial role in learning. The ECTT reflected the epistemic domain by incorporating instructions covering how to design a strategic message toward stakeholders' needs and role-playing activities in a group setting to produce a presentation that contains values and benefits of the intended audience which integrates the communication theory, Elaboration Likelihood Model (ELM).

The third learning domain included the socio-cultural realm. Feierabend and Eilks (2010) found that socio-cultural aspects typically do not enter the field of science education. Leden et al. (2016) observed from studies on teachers' perspectives that science education has little room for socio-cultural aspects. Still, students would be more engaged in science if socio-cultural topics were included in the classroom. Climate change has produced societal threats and has caused human crises, but science discourse typically does not engage in the socio-cultural issues that have stemmed from climate change impacts. Conflicts have developed between individuals affected by the climate change impacts due to the differences in social and cultural values. Teaching methods that include socio-cultural complexities could help minimize future disagreements.

The teaching methods included the social and cultural aspects of the population demographics in the ECTT case study to assist in strategic communication designs that would reduce conflicts or polarization in the chosen demographics. The ECTT incorporated a localized case study and persuasive message designs that included the social-cultural values and beliefs of

the community affected by climate change. Individuals would analyze the population dynamics recommended in the socio-cultural domain and discuss resolutions to the community's social and cultural aspects affected by climate change in their responses toward remediation.

Incorporated in the ECTT were instructional methods that supported effective learning in teacher-student interactions. Trigwell et al. (1999) defined teacher-student interactions as teacher-centered (i.e., students were asked to follow a set procedure from a textbook or traditional lecture) and student-centered (i.e., encouraging students to conduct group activities). The teacher-centered approach or traditional lecture was found not as effective in teaching environmental issues, including climate change (Haskett, 2001); however, teacher-centered instructional discourse did show increased levels of influence in students' cognitive engagement (Taylor et al., 2003). Trigwell et al.'s (1999) study found that teachers who participated in student-centered instructional approaches engaged their students in deeper learning or cognitive processing than in the teacher-centered approach, where students showed surface learning or processing.

The ECTT incorporated both teacher-centered and student-centered approaches. The traditional teacher-centered approach covered science knowledge through a localized climate change impact case study. Individuals will learn how to design strategic messages based on demographic analysis of the community's social-cultural values in the case study. A student-centered approach entailed group role-playing. Individuals would present a community action plan (CAP) that aided the community affected by climate change using the information provided in the localized case study.

Research supported the benefit of using a localized or place-based case study to aid individuals in showing the impacts of climate change. Leiserowitz and Craciun's (2006)

investigation found that 71% of the residents in the state of Alaska viewed global warming as a serious threat. Leiserowitz et al. (2010) conducted a study on climate change communication influences on local populations dealing with this issue. In their findings, individuals showed a better understanding of the climate system changes when participants engaged in place-based learning. In Borick and Rabe's (2010) study involving climate change education and engagement, their research concluded that direct observation of climate change linked people to the impact and relevance to their lives. Furthermore, they concluded that the localized relevancy of the impact on the individual transferred into concerns and immediacy toward mitigation practices due to the threat climate change had on their personal life.

In Borick and Rabe's (2010) results, participants affected by climate change showed increased knowledge of climate issues, shared their climate change experiences with others, and had pro-environmental behavior. Other studies also emphasized that relating climate science issues linked to people's lives would be an effective communication strategy in influencing localized populations to respond more toward mitigation practices (Borick & Rabe, 2010; Frantz & Mayer, 2009; O'Neill & Nicholson-Cole, 2009). For an issue as complex to explain as climate change, including the impacts created in communities, science education needs to incorporate communication involving localized case studies to bring out the socio-cultural aspects.

While teaching climate change in science education, a localized climate change case study should help illustrate the human issues climate change has created. Using these localized case studies, science literacy concepts "come to life" through actual natural events. Discussing views and solutions involving the case study have led to resolutions on the impact of climate change. For a better understanding of climate science education as well as encouraging active learning, the ECTT combined information from Nelms' (2014) case study, "Land Lock

Community Impacted From Sea Level Rise 6200 Miles Away: Teaching an Audience Centered Approach to Risk and Resilience in Environmental Displacement" and Nelms' (2015) case study, "Look Who's Coming to Dinner?" The localized case study used in the ECTT incorporated socio-cultural impacts of climate change from displaced populations to inform participants about the difficulties of integrating culturally diverse populations in communities.

Feierabend and Eilks (2010) were recognized for their innovative curriculum of teaching controversial societal issues framed around climate change called Climate Change Before the Court. This three-year project pinpointed two effective teaching methods for enhancing climate change teaching from a societal point of view: problem-oriented teaching and role-playing exercises. Griskevicius et al. (2008) used group activities to enhance decision-making and influence social norms among individuals in the group. When individuals are unfamiliar with information, they will become attentive and responsive to the decisions and social norms of the others in the group. This encouraged dialogue with their peers in their group and developed a better understanding of the content. Since this age group's peers influence their outlook and assert self-autonomy from an authority, the ECTT included role-playing exercises that encouraged solutions to environmental problems affecting local communities from Nelms' (2014; 2015) case studies.

The ECTT incorporated group activities that applied Bloom et al.'s (1956) taxonomy and Jagger's (2013) critical thinking methods. Peer-to-peer discussion over a topic in an educational program, regardless of the subject, is a "…powerful learning tool for promoting classroom interaction and the development of skills such as communication, discussion, and critical analysis" (p. 32). Bloom et al.'s (1956) taxonomy of learning domains confirmed that peer-to-peer discussions further student interaction toward critical topic analysis. Jagger's (2013)

research pointed to the importance of teaching students' free expression of their views, encouraging empathy for others, tolerance, and understanding of different viewpoints. The group activities and role-playing culminated in an oral presentation which again enhanced critical thinking with a student-centered approach. Oral presentations were also beneficial because they demanded challenging work, needed ownership from the presenter, and carried a higher degree of personal relevance, including a deeper understanding of the content. As a result, participants had increased critical thinking and were more motivated to learn; furthermore, this enhanced the combination of cognitive and affected domains calling for value-based teaching and content procurement.

Curriculum Evaluation

The ECTT was designed as a teaching tool to aid in strategic messaging to address science communication shortcomings for public's understanding. The ECTT provided scientific communication in a form that would improve the participant's environmental attitudes and actions. The curriculum blended traditional disciplines (social science theory with Earth science education) and was integrated into the ECTT to increase climate science literacy for future environmental preservation. This next section will discuss the curriculum evaluation used as guidelines in constructing the ECTT.

When reviewing the research on developing educational curricula for climate science and socio-economic issues, Harris et al. (2010) concluded that "relatively few reports of large-scale, broad-based evaluations have been published that may provide guidance" (p. 479). Additional obstacles included long-lead times for curriculum evaluations and often created obsolete content. School curriculums have been organized in courses that were based on traditional disciplines. Nodding (2007) emphasized that academic disciplines have drawn

territorial lines in their curriculums. All this research pointed to the problems encountered in climate change literacy. Science communication has needed academic unity and a joint academic curriculum to address the impact of climate change and environmental preservation.

In reviewing science-related curricula, the research for the construction of the ECTT employed the theoretical background in Roseman et al.'s (1996) science curriculum analysis, Project 2061. The analysis provided diverse ways of analyzing materials used for education in sciences, including curriculum, textbooks, modules, and classroom activities (McNeely, 1997). Project 2061 developed teaching protocols to implement within institutions focusing on content to meet course goals. The AAAS developed a website allowing access to Project 2061 (n.d.) research and development on improving science education. The AAAS Project 2061 was funded by the National Science Foundation and the U. S. Department of Education.

Project 2061 developed curriculum units for analysis. The curriculum analysis followed five steps which were: (a) identify specific learning goals to serve as the intellectual basis for the analysis, (b) make a preliminary inspection of the curriculum materials to see whether they are likely to address the targeted learning goals, (c) analyze the curriculum materials for alignment between content and the selected learning goals, (d) analyze the curriculum materials for alignment between instruction and the selected learning goals, and (e) summarize the relationship between the curriculum materials being evaluated and the selected learning goals (McNeely, 1997). The ECTT used the Project 2061 curriculum analysis only as a guideline since Project 2061 was intended for a different age, used units for application, and applied policy practices. The ECTT blended traditional disciplines focused on influencing environmental attitudes and behaviors.

Conceptualization of an Environmental Communication Teaching Tool

While the ECTT followed the guidelines of Project 2061 curriculum analysis during construction, climate science education was covered by integrating strategic messaging involving the participants in social science theory and practices. The ECTT involved content from interdisciplinary teaching of climate science literacy. However, by including social-cultural content and designing strategic messages built around the concept of a communication theory, the ECTT should affect the attitude-behavior gap and produce positive environmental participation. The ECTT' s goal was to improve participants' environmental attitudes and environmental behaviors through an operational protocol. (see Appendix A)

Localized Climate Change Impact Case Study

An instructor-based PowerPoint presentation employed a localized climate change impact case study to increase climate science literacy. As previously mentioned, the case study combined the "Landlocked Community Impacted from Sea Level Rise 6200 Miles Away: Teaching an Audience Centered Approach to Risk and Resilience in Environmental Displacement" (Nelms, 2014) and "Look Who's Coming to Dinner?" (Nelms, 2015). The case study (see Appendix B) was based on the Marshallese population to improve climate science literacy. This localized case study matched the criteria in the teaching pedagogy for curriculum design since Springdale, Arkansas, has proximity to the participants in this research. Due to social injustice from radiation contamination and sea-level rise on their atoll islands, the Marshallese population was displaced to a landlocked community (Springdale, Arkansas) for livability, including health care and economic drivers of migration. The case study brought "real life" examples to the participants of the political, societal, and economic challenges the land-locked community and the Marshallese inhabitants faced integrating two diverse populations.

The real-world complexity of climate science has resulted in difficulties in translation to the public due to a lack of familiarity and the entanglement of the issues. In Borick and Rabe's (2010) research, they suggested that linking participants to localized or place-based case studies allowed individuals to observe the impacts of climate change firsthand and increased their knowledge of the issues. They found that individuals affected by local climate change impacts had more positive views toward environmental preservation and believed humans contributed to the Earth's warming causing localized climate disasters. For the conceptualization of the ECTT, this case study was selected due to the local nature of the Marshallese population for the participants in this study. The case study incorporated the assessments of socio-cultural conflict and community efforts to bridge climate science literacy toward public understanding of sustainable outcomes. Stakeholders in the localized case study will have certain social-cultural characteristics that will need to be utilized for strategic message designs in developing a CAP.

Application of the Communication Theory Elaboration Likelihood Model

The ECTT included designing strategic messaging based on social-cultural aspects and incorporating a communication theory that involves the psychological persuasive dual processing theory, ELM (see Appendix C). In early social movements, social scientists recognized that when the public had similar values to a campaign and believed they were threatened, they seemed more inclined to support its movement (Stern et al., 1999). Abroms and Maibach (2008) suggested that the essential elements in communication are messages designed toward the individual's values, beliefs, and needs to create successful messaging for attitude and behavioral change. O'Neill and Nicholson-Cole (2009) expressed, "communication approaches that take account of individuals' personal points of reference (e.g., based on an understanding and appreciation of their values, attitudes, beliefs, local environment, and experience) are more likely

to meaningfully engage individuals with climate change" (p. 375). Allen (2016) concurred, "this will influence their attitude toward environmental issues and may improve their motivation to develop campaigns and other communication around environmental issues" (p. 115). Luong et al. (2019) concluded science communication tailored toward the audience's ideology persuaded individuals attitudes, support, and behavioral intent in the direction of the strategic message. They found that the tailored message design resonated with the audience and was beneficial with message reception toward those biased against environmental evidence. To motivate an individual to engage in environmental issues, the content in the message design should reflect the individual's values and perceived societal needs to assist in persuading pro-ecological change.

After reviewing different motivational theories, Petty and Cacioppo (1986) studied separate ways individuals process messages and the effects on attitude and behavioral change. Their model (ELM) proposed that individuals process messages through central or peripheral routes. Central processing is more likely to occur when an individual's values, beliefs, and norms are relayed in the message. Therefore, an individual would be more likely to engage in central processing of the content which could lead to critical thinking regarding the message. Subsequently, one would be more motivated to change their opinions and actions. However, if the message was too complex or lacked content relevant to the intended audience, the individuals receiving the message would shift toward peripheral processing. As a result, individuals would be less engaged in the issue and would experience minimal motivation with little reason to change their opinion or behavior.

The ELM theorized that central processing would be motivated by three core principles: (a) the personal relevance of the message (e.g., presenting values and beliefs of the audience relevant to the message, which draws out the personal issue), (b) varied sourcing of the

environmental message or diversity of the argument, and (c) clear, specific information about the goals and tasks to resolve the issue. Messages that consider the individual's values, norms, or beliefs should increase the likelihood that they would accept responsibility, distribute information, and conclude that the issues are personally relevant (Kassing et al., 2010).

When individuals understand that climate impacts have threatened their values and beliefs, they will experience increased motivation to learn how to incorporate tasks toward pro-environmental actions and typically engage in climate change resolutions (Cox & Pezzullo, 2016). Climate science message construction should include varied sourcing of information that appeals to the intended audience. Framing the message with multiple sourcing of the community value that is being threatened will increase the likelihood of central processing within the designated group. Furthermore, this message design could influence behavioral change in the designated group. Teaching audience analysis will uncover the intended listeners' values and cultural norms, which will help in message construction based on ELM principles.

In O'Neill and Nicholson-Cole's (2009) findings regarding message creation, individual's values, attitudes, beliefs, and experiences were constructions that incorporated meaningful participation. Recognizing the importance of messages designed to address values and cultural norms, the ECTT guided participants on how to analyze their audience for developing advocacy messaging. ELM offers a possible solution involving strategic message design that will assist individuals in science communication, so others understand and centrally process the information. Science messages relevant to their stakeholders will be more likely to encourage environmental actions. Simultaneously while learning how to design strategic messaging, individuals will be motivated to central process the scientific information involved to draw out

social-cultural issues. Individuals will increase their awareness of relevant climate change impacts while developing a solution to a designated localized case study.

Community Action Plan Informs, Persuades, and Creates Action

Cox and Pezzullo (2016) studied advocacy campaigns when reviewing effective movements which involved resourceful strategic communication and specific action to secure a specific outcome. Furthermore, they found that these types of campaigns aimed toward larger audiences, were institutionally sponsored (e.g., government agencies, universities, or corporations), legally acknowledged, and went beyond the ability of individual choices. However, advocacy campaigns did create behavior-change under broader practices. Cox and Pezzullo continued their pursuit of successful campaigns that involved environmental issues. In their findings, environmental campaigns differed in that concerned individuals, small-scale community action groups or environmental organizations were the ones leading the pursuit in environmental behavioral change. Additionally, individual's or community action group's personal choices led toward a drive for systemic changes in industry's environmental practices.

Clarke and Peterson (2016) focused their efforts on the process of environmental management and environmental conflict collaboration. They stated, "the most challenging aspect of any collaborative process is the communication between participants" (p. 141). Clarke and Peterson (2016) expressed that, "one of the most difficult challenges associated with environmental conflict management [was] how to validate and include cultural knowledge without ignoring formally recognized scientific knowledge" (p. 6). Traditional environmental approaches typically occurred thru a one-way transfer of communication from the scientific experts to the affected parties. In Clarke and Peterson's (2016) findings for environmental mediation, individuals need to communicate their differences, discuss each other's needs, and

identify possible agreements to solutions. They found that identifying stakeholders impacted by the climate issue, incorporating local public recommendations, and involving community participation would increase environmental awareness and engagement.

To incorporate Cox and Pezzullo's findings, the group activity centered around the community impacted by climate change in the case study and develop a CAP (see Appendix D). The ECTT incorporated group interaction to engage in peer-to-peer conversations around stakeholders needs and resolutions to the localized climate change impact case study. Clarke and Peterson's (2016) recommendations for successful environmental collaboration were followed by the groups working together toward discussing the values, needs, and cultural norms of the stakeholders involved in the case study (see Appendix C). The group activity was role-playing around stakeholder's resolutions toward a specific environmental conflict. The ECTT group activity included peer dialog around defining a goal that would resolve a social-cultural or economic issue that affected the population in the case study per Clarke and Peterson's suggestions. The ECTT intended for the groups to design a strategic message tailored to the stakeholders' interests to increase environmental awareness and engagement.

Evaluating the Effectiveness of the ECTT

If effective, the ECTT should favorably improve participants' environmental attitudes, encourage engagement in environmental communication, and increase behavioral intent to engage in pro-environmental actions. Furthermore, the ECTT addressed Han and Stenhouse's (2015) urgency in closing the public's attitude-behavioral gap within the climate change problem. The evidence overwhelmingly supports that a gap exists between science communication's research-level statements and moving the public toward actionable practices. The concern lies in the breakdown between science educators' messaging and the public understanding of climate

change communication allowing competing interests to interfere with public awareness. By reducing the attitude-behavior gap in participants, individuals would improve their environmental attitude and implement environmental actions. As the IPCC (2014, 2019) has asserted, public participation will be essential for reducing human-caused emissions of CO_2 to reach the goal of a 45 percent reduction from the 2010 average CO_2 of 389.9 parts per million by 2030. The ECTT will be evaluated to assess the effectiveness in closing the attitude-behavioral gap using environmental strategic messaging in science communication.

Attitude and Behavioral Measures

In order to examine the effects of the ECTT, three scales were used to evaluate environmental attitudes, willingness to engage in environmental communication, and behavioral intent toward pro-environmental actions. These three measures consisted of the New Ecological Paradigm (NEP) Scale, the Environmental Communication Scale (ECS), and Pro-Environmental Actions Scale (EAS).

New Ecological Paradigm Scale. Numerous articles have concurred that environmental resolutions created by ecological crises stem from society's attitudes, values, and beliefs prevalent at that time (Caldwell, 1970; Campbell & Wade, 1972; Dunlap, 1976; Dunlap & Van Liere, 1978; Dunlap et al., 2000). Pirages and Ehrlich's (1974) Dominant Social Paradigm (DSP) referred to the public's attitude and beliefs that technology and industry advancement would resolve environmental problems. However, Dunlap and Van Liere (1978) recognized an emerging societal shift in thought processes in human involvement in ecological resolutions, which challenged the belief that technology and industry advancement would solve environmental crises. The dated fundamental concepts of the DSP were insufficient in capturing society's change in their environmental attitudes and were replaced by new world views to

include human involvement in environmental issues to best capture the attitudinal change. Dunlap and Van Liere developed an instrument to measure the current environmental world views. They developed the New Environmental Paradigm scale to replace the DSP scale.

The New Environmental Paradigm scale added new and expansive issues related to ecological concerns (i.e., limits to growth, the balance of nature, anti-anthropocentrism. or humans are not the central entity in the world). The New Environmental Paradigm Scale was developed to measure the addition of the ecological limits and human disruption to ecosystems. The paradigm scale tapped global environmental issues with human involvement. The single-item scale significantly measured the differentiation between the general public's attitude and those that align as environmentalists.

Dunlap et al. (2000) updated, revised, and renamed from New Environmental Paradigm Scale to the New Ecological Paradigm Scale (NEP). The revised NEP is one of the most often used scales to measure an individual's attitude toward views of environmental concerns (Hawcroft & Milfont, 2010). Dunlap et al. wanted to improve the original scale in several aspects: (1) provide a more comprehensive range of ecological worldviews, (2) offer more balance in pro- and anti-environmental items, and (3) update the terminology to reflect current communication. Duncan (2008) conducted a comprehensive meta-analysis of NEP between 1987 and 2007 involving thirty-six nations and sixty-eight studies. The fifteen single-item scales tapped five key aspects: (1) limits to growth, (2) anti-anthropocentrism, (3) fragility of nature's balance, (4) rejection of human exceptionalism, and (5) belief in eco-crisis. From this reasoning, this study posed the null hypothesis that participants' environmental attitudes would not be affected by the strategic message design (ECTT) therefore:

$H1_o$: Exposure to a strategic message design (ECTT) will not affect participant's environmental attitude.

Environmental Communication Scale. The ECS was developed to address a need for an assessment tool that measured how people engaged in environmental communication. In developing this scale, Kassing et al. (2010) concluded that individuals motivated to act favorably toward the environment would be more likely to communicate about environmental issues. Areas of study in environmental communication characteristically focused on the individual's participation in environmental decision-making, collaboration, and conflict resolution (Cox, 2006).

The ECS consisted of a 20-item instrument that assessed an individual's environmental communicative behaviors by practicing, dismissing, or confirming various forms of environmental discourse. The scale tapped three dimensions: practicing, dismissing, and confirming. It measured "practicing" environmental communication by assessing the person's willingness to approach or engage in environmental discourse and consume environmental media. The "dismissing" dimension recognized environmental communication by an individual's cognitive hurdles or viewpoints. This dimension reflected people avoiding conversation and news about environmental issues. The "confirming" dimension recognizes an individual's favorable or unfavorable attitude toward environmental communication. The ECS signaled the degree to which people practiced environmental communication, avoided environmental conversations or issues, and had a positive attitude toward the need for environmental communication.

The ECS attempted to capture participants' fundamental environmental communication behaviors (i.e., practicing, dismissing, and confirming) by employing these three dimensions.

From this reasoning, this study posed the null hypothesis that participants' willingness to engage in environmental communication would not be affected by the strategic message design (ECTT) therefore:

$H2_o$: Exposure to a strategic message design (ECTT) will not affect participant's willingness to engage in environmental communication.

Environmental Action Scale. When individuals perceive an environmental event as more relevant to their own lives, they are more likely to become involved in related environmental affairs (Bratt, 1999; Guagnano et al., 1994; Nordlund & Garvill, 2002; Borick & Rabe, 2010). Nordlund and Garvill (2002) concluded that pro-environmental behavioral change was more likely when individuals' experience problem awareness which influenced positively their personal norm. Hence, individuals were more motivated to protect the environment and perceived a moral obligation to act for others' well-being. Subsequently, Hansla et al. (2008) found that environmental actions were motivated by a perceived environmental threat imposed on individuals' socio-economic needs.

Cox and Pezzullo (2016) theorized that an individual's attitude may not always directly influence their behavior. However, attitude and behavioral consistency are most likely to occur in situations where they have experienced intrapersonal conflict, perceived environmental threats, and personal relevancy to the impact. They are more likely to engage in environmental actions toward remediation. As referenced above, Kahan (2015) alluded to the public's awareness of environmental issues; however, individuals are not aware of specific behaviors to implement or actions within their framework of understanding that would be pro-environmental.

The EAS measure was created to assess an individual's behavioral intentions to engage in environmental activities such as recycling, resource management, and energy reduction. The

EAS was intended to measure behavioral intent toward obtainable environmental actions. Kahan (2015) found that whether individuals would implement specific environmental actions depended on their cultural identity, belief systems, and behavior or action. The EAS was created from Cheung et al.'s (1999) close-ended questionnaire constructed to measure behavioral intent and perceived behavioral control in wastepaper-recycling stemmed from Ajzen's (1991) Theory of Planned Behavior. In Cheung et al. (1999), as-expected attitudes, norms, and perceived behavioral control were all predictors of behavioral intentions. They concluded that behavioral intent significantly predicted self-reported behavior, while perceived behavioral control moderated the intention-behavior link (1999). The six-item EAS measured participants' behavioral intention and perceived behavioral control of their environmental actions in recycling, resource management, and energy reduction. From this reasoning, this study posed the null hypothesis that participants' behavioral intent toward environmental actions would not be affected by the strategic message design (ECTT) therefore:

$H3_o$: Exposure to a strategic message design (ECTT) will not affect participant's behavioral intent toward environmental actions.

CHAPTER 3

Methods

Participants

The participants were a convenience sample of undergraduate students enrolled in one of three courses at a large university in the central part of the United States. The sample size consisted of 158 participants from three courses: SUST 2103, GEOS 2003/GEOG 2103, and GEOS 1123/GEOS 1113; furthermore, participants were not offered compensation or credit to participate. The participants were divided into two groups based on the course enrollment for that semester. The first group consisted of 52 participants in SUST 2103 Applications of Sustainability (SS) in this study. SUST 2103 was one of the required courses for a minor in sustainability and required another sustainability course as a prerequisite. The second group was undergraduate non-sustainability students (NSS) enrolled in two courses: GEOS 1123/GEOG 1113 (Human Geography) and GEOS 2003/GEOG 2103 (World Regional Geography) totaling 106 participants. There were 59 participants enrolled in GEOS 2003/GEOG 2103 World Regional Geography and 63 participants in GEOS 1123/GEOG 1113 Human Geography in this study. Seven participants were enrolled in both geography courses received the treatment twice, so they were removed from the analysis. None of the NSS participants were enrolled in the sustainability course.

Each participant completed an informed consent form, approved by the university's institutional research review board IRB #15-11-298 (see Appendix E). Each participant selected a four-digit code on the returned survey to ensure confidentiality. The sample consisted of 39% (62) males and 61% (96) females with ages ranging from 18 to 23 (M = 20). Participants identified themselves as Caucasian (78.5%), African Americans (8.2%), Latino/Hispanic (6.3%), Asian (5.1%), and Native American (1.3%). The sample participants' political affiliations were

Democrats (27.2%), Republicans (27.8%), Independents (19.6%), and Others (25.3%). The S.S. participants' political affiliations were Democrats (31%), Republicans (33%), Independents (21%), and Others (15%). The NSS participants' political affiliations were Democrats (26%), Republicans (26%), Independents (19%), and Other (30%).

To be included in the analysis for this study, participants had to attend and participate in the ECTT administration. Participants voluntarily completed the pre-test questionnaire, signed an attendance sheet with their four-digit code, and completed the post-test questionnaire. Participants were excluded from the study if they were not present during the administration of the ECTT, which was monitored by the returned pre-test questionnaires, signed attendance sheets using their four-digit code, and returned post-test questionnaires. Participants missing responses in their questionnaire were filled in with the group mean for the missing answers and remained in the analysis. In the S.S. group, 52 participants turned in their pre-test, signed the attendance sheet, turned in their post-test, and completed all the survey questions. In the NSS group, 106 participants turned in their pre-test, signed the attendance sheet, turned in their post-test, and completed all the survey questions.

Procedure

The ECTT content was administered using a localized case study transitioning to teaching strategic communication message designs and included a peer-to-peer activity centered around developing and presenting a community action plan. The participants voluntarily completed a four-page questionnaire which included the survey protocol informed consent. Participants answered demographic questions, NEP, ECS, and EAS in the pre-test and the post-test.

Measures

Since the ECTT was designed to increase favorable environmental attitudes, willingness to engage in environmental communication, and increase environmental actions, the participant's means were measured before and after the treatment. The effectiveness of the ECTT on participant's environmental attitude, willingness to engage in environmental communication, and behavioral intent toward pro-environmental actions were measured by participant's self-reporting using the NEP, ECS, and EAS.

Participants self-reported their environment identity and attitudes using the 15 items in the NEP. Each participant was asked to rate the 15 items on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) from statements such as: *We are approaching the limit of number of people the Earth can support*, *Humans have the right to modify the natural environment to suit their needs* (reverse coded), and *Humans severely abuse the Earth*. The NEP was used to measure differences in participant's environmental attitude in the pretest and the posttest.

Participants self-reported their willingness to engage in environmental communication using the 20 items in the ECS scale. Each participant was asked to rate the 20 items on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) from statements such as*: I make it a point to discuss environmental concerns*, *Discussing the environment is important*, and *It is necessary to discuss environmental issues*. The ECS was used to measure differences in participant's willingness to engage in environmental communication in the pretest and the posttest.

Participants self-reported their behavioral intent toward environmental actions using the six items in the EAS. Each participant rated the six items on a 5-point Likert scale ranging from

1 (*unlikely*) to 5 (*likely*) or 1 (*never*) to 5 (*always*) from statements such as: *How likely is it that you will recycle every time you dispose of paper?* or *How frequently do you turn off the water while brushing your teeth?* The EAS was used to measure differences in participant's behavioral intent toward environmental actions in the pretest and the posttest.

Data Analysis

Data were collected from the measurements to evaluate the results of the ECTT[1] using paired t-tests to analyze environmental attitudes, willingness to engage in environmental communication, and behavioral intent toward pro-environmental actions of the participants in each of the two groups. Between-group effects were analyzed to assess similarities and differences in means from the pre-test to the post-test among the participants in the two groups. Statistical significance was determined at a p-value of .05 ($p<0.05$).

[1] The data set is available by request contacting the researcher.

CHAPTER 4

Results

The results were organized by examining each of the three hypotheses. The effects of the ECTT were assessed using three scales to measure participants in the two groups' environmental attitude (NEP), willingness to engage in environmental communication (ECS), and behavioral intent toward pro-environmental actions (EAS).

New Ecological Paradigm Testing

The null hypothesis $H1_o$ predicted exposure to a strategic message design (ECTT) would not affect participant's environmental attitude. A paired t-test was conducted to compare the effects of the ECTT on environmental attitude in the SS participants and in the NSS participants. There was a significant effect of the ECTT on the SS participants' environmental attitudes as shown in the t-test, $t(51) = 2.28$, $p = .01$ (see Table 1). There was also a significant effect of the ECTT on the NSS participants' environmental attitudes as shown in the t-test, $t(105) = 3.23$, $p = .000$ (see Table 1).

Table 1

NEP Mean From Pre-test to Post-test

	SS		NSS	
	M	t	M	t
Pretest	3.62 (.475)	2.28**	3.43 (.450)	3.23***
Posttest	3.71 (.431)		3.56 (.451)	

**p<.01, ***p<.001. Standard deviations appear in parentheses below means.

These results suggest that the strategic message design (ECTT) significantly influenced the participants' environmental attitudes in the SS and NSS groups. As a result, the null hypothesis $H1_o$ was rejected.

Environmental Communication Scale Testing

The null hypothesis $H2_o$ predicted exposure to a strategic message design (ECTT) would not affect participant's willingness to engage in environmental communication. A paired t-test compared the effects of the ECTT on the willingness to engage in environmental communication in the SS participants and in the NSS participants. There was not a significant effect of the ECTT on either the SS participants' willingness to engage in environmental communication as shown in the t-test, $t(51) = .59$, $p = .28$ or on the NSS participants' willingness to engage in environmental communication as shown in the t-test, $t(105) = .32$, $p = .37$ (see Table 2).

Table 2

ECS Mean From Pre-test to Post-test

	SS		NSS	
	M	t	M	t
Pretest	3.92 (.540)	.59	3.55 (.550)	.32
Posttest	3.90 (.590)		3.58 (.510)	

Standard deviations appear in parentheses below means.

The participants' willingness to engage in environmental communication behaviors did not significantly change from the pre-test to post-test. With a mean of 3.92 in the ECS pre-test, participants in the SS group already were partaking in environmental communication behaviors; furthermore, the SS group continued participating in the willingness to engage in environmental communication with a post-test mean of 3.90. The participants in the NSS group showed a slight increase in willingness to engage in environmental communication behaviors; however, the participants in the NSS group changes were not significant. As a result, the null hypothesis $H2_o$ was not rejected.

Environmental Action Scale Testing

The null hypothesis $H3_o$ predicted exposure to a strategic message design (ECTT) would not affect participant's behavioral intent toward environmental actions. A paired t-test compared the effects of the ECTT on behavioral intent toward environmental actions in the SS participants and in the NSS participants. There was a significant effect of the ECTT on the SS participants' behavioral intent toward environmental actions as shown in the t-test, $t(51) = 2.09$, $p = .02$ (see Table 3). There was also a significant effect of the ECTT on the NSS participants' behavioral intent toward environmental actions as shown in the t-test, $t(105) = 2.81$, $p = .003$ (see Table 3).

Table 3

EAS Mean From Pre-test to Post-test

	SS		NSS	
	M	t	M	t
Pretest	3.84 (.699)	2.09*	3.56 (.735)	2.81**
Posttest	3.96 (.614)		3.79 (.591)	

*p<.05, **p<.01. Standard deviations appear in parentheses below means.

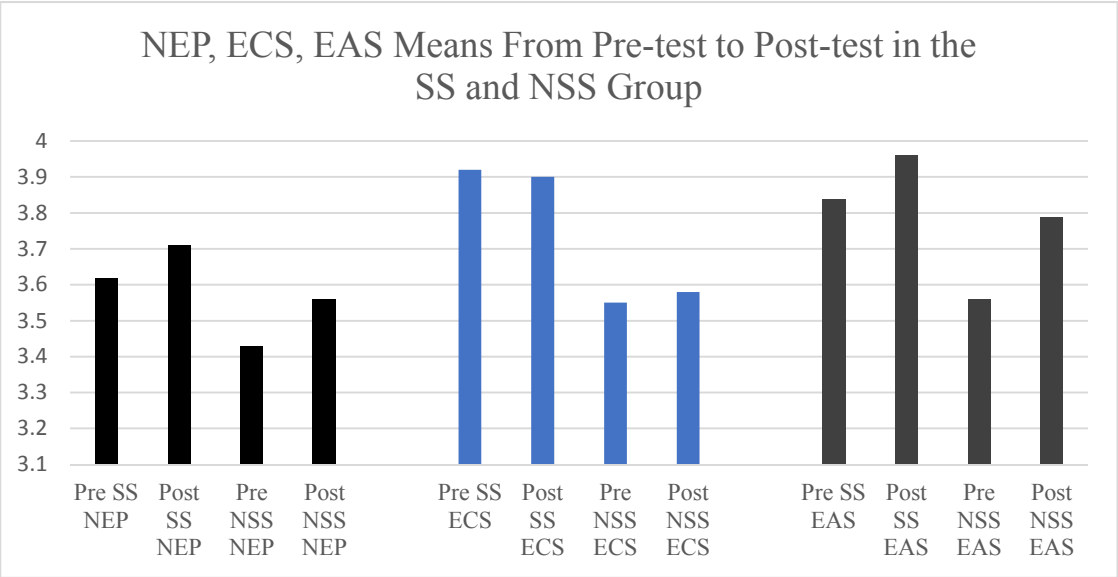
These results suggest that the strategic message design (ECTT) significantly influenced the participants' behavioral intent toward environmental actions in the SS and NSS groups. As a result, the null hypothesis $H3_o$ was rejected.

Summary of Results

In summary, two of the null hypotheses were rejected. The results failed to reject the ECS null hypothesis. The exposure to the strategic message design, ECTT, showed a significant favorable effect in both groups in pro-environmental attitudes and behavioral intent toward pro-environmental actions. The ECTT significantly improved participants' environmental attitudes and environmental actions. These results support the ECTT on closing the attitude-behavioral

gap in science communication in environmental attitude and pro-environmental actions. (see Figure 1)

Figure 1



CHAPTER 5

Discussion

This chapter provides a summary of the results, implications, and conclusions. The study's limitations are acknowledged, and suggestions for future research are offered.

The strategic message design indicated that participants in the SS and NSS groups showed a significantly favorable increase in their environmental attitudes and behavioral intent toward environmental actions. While not statistically significant, the strategic message design did produce a slight favorable change with the NSS group's willingness to engage in environmental communication. After the strategic message design exposure, participants in the SS and NSS groups showed favorable increase in their pro-environmental attitudes and behavioral intent to perform pro-environmental actions. In summary, two of the three proposed null hypotheses were rejected.

Participants' environmental attitudes were favorably affected by the strategic message design incorporated in science communication. As a result of the messaging strategy, the SS participant's environmental attitudes reflected a significant increase concern about the results of human interference with nature along with the NSS participants. Based on Dunlap et al.'s (2000) findings, individuals exposed to ecological and environmental concepts would have more favorable environmental attitudes, which was confirmed in the pre-test means ($M = 3.62$) and the post-test means ($M = 3.71$) in the SS participants. The SS group had taken a sustainability course as a prerequisite and was enrolled in this course as a requirement for a sustainability minor. These participants had prior exposure to ecological and environmental concepts from their education in their sustainability courses. Not surprisingly, the SS group participants displayed the highest environmental attitudes before exposure to the intervention; however, they continued to

show significant increase in their pro-environmental attitudes after the strategic message design exposure.

As Dunlap et al. (2000) found, individuals lacking education in environmental principles and concepts would be less favorable toward environmental attitudes as did the NSS group. The NSS group participants were not enrolled in sustainability courses and reflected the lowest scores (M = 3.43) in environmental attitudes. In the attempt to make an inference to the public in environmental attitudes, the NSS group appeared more reflective of public opinions regarding climate change and human involvement, as previously shown in the Pew Polls. However, after the exposure to the strategic message design, the NSS participants displayed the most favorable increase (M = 3.56) in pro-environmental attitudes among the two groups.

The SS group started with favorably high engagement toward environmental communication practices (M = 3.92) and finished with favorably high engagement toward environmental communication practices (M = 3.90). The SS group aligned with Kahan's (2015) assertions that individuals with favorable environmental attitudes were more likely to engage in supportive environmental communication practices. Not surprisingly, the SS participants did not increase in their environmental communication practices, they were already practicing. This could be from the SS participants having preexisting pro-environmental communication experiences due to their knowledge acquisition from their course work toward a sustainability minor. Furthermore, the SS participants had less distance on the scale to change in their environmental communication continuum than participants who started with a low motivation to communicate about environmental issues. Though not significant, the messaging strategy had slightly influenced the NSS participants' willingness to engage in environmental communication.

After exposure to the strategic message design, the NSS participants expressed a slight increase in willingness to discuss environmental concerns and issues.

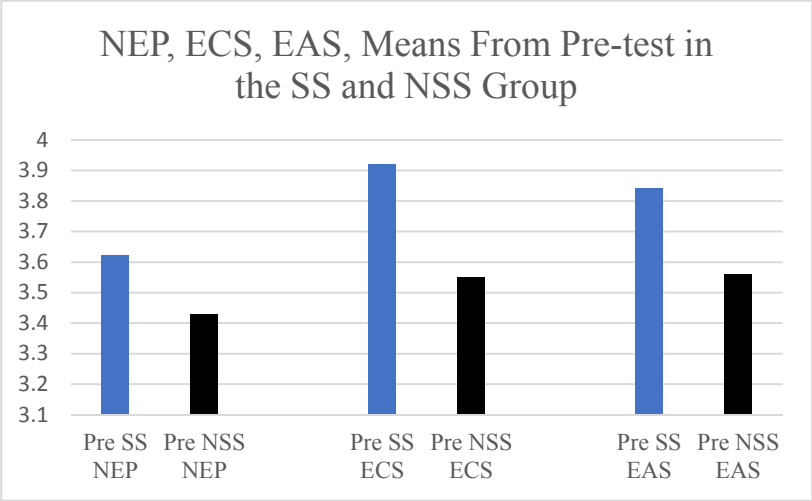
While the ECTT had positive effects on environmental attitude, one of the other outcomes of the strategic message design was to increase the participants' behavior to act in pro-environmental ways (e.g., recycle, reduce water usage and electricity, avoid using plastic bags). Dietz et al. (2005) concluded that individuals with pro-environmental attitudes would be more likely to be influenced toward conservation efforts, the protection of natural resources, and the guardianship of local ecosystems. Kahan (2015) found that environmental attitudes can be a precursor toward pro-environmental behaviors when measured alongside other scales resulting in similar inferences (i.e., willingness to engage in pro-environmental actions). Furthermore, individuals that have positive environmental attitudes showed "active participation in environmental discourse utilizing persuasive tendencies [and have] the potential to raise environmental awareness and promote behavioral change amongst their peers" (Nelms et al., 2017, p. 548). By showing that human actions have negatively affected nature, participants increased their concern about present ecological conditions.

This intervention aimed to close the attitude-behavioral gap reflective in a favorable increase in each group's pro-environmental actions. After exposure to the strategic message design, the SS group and the NSS group had significantly increased their behavioral intent toward pro-environmental actions. While the SS group's behavioral intent was higher from the start than the NSS group, the NSS group displayed the greater increase in pro-environmental actions. When exposing the strategic message design to the NSS participants, they responded with more of a favorable increase in pro-environmental actions than the participants in the SS group. In Cheung et al.'s (1999) findings, individuals that increased their knowledge of

environmental issues were more likely to engage in pro-environmental actions. Furthermore, Kahan (2015) mentioned earlier that individuals would choose to engage in pro-environmental actions if taught or shown how to implement pro-environmental activities.

The NSS started with the lowest scores in the pre-test in all three measures; NEP, ECS, and EAS. (see Figure 2) When exposed to the strategic message design, the NSS group showed a significant favorable increase in environmental attitudes and a significant favorable increase in environmental actions which concurred with Cheung et al.'s results. The NSS group's lack of scientific knowledge had no effect on their favorable increase in environmental attitude, environmental communication behavior, and environmental actions compared to participants with a background in environmental science knowledge. This also affirmed Kahan's (2015) assertion that if an individual is shown how to implement pro-environmental change, he or she would participate in sustainability practices or pro-environmental actions.

Figure 2



After the exposure to the strategic message design, the NSS group had more of a favorable increase in all three measures over the participants in the SS group. This is important since the NSS group started this intervention with the lowest environmental attitudes and

environmental actions. Yet, they significantly had the most favorable change in both pro-environmental attitudes and actions. This supports the premise that science communication incorporating strategic message design (i.e., social-cultural issues relevant to the individual) can impact environmental attitudes, communication behavior, and pro-environmental actions to reduce the attitude-behavioral gap making implications to the public.

It was essential to determine if the strategic message design would reduce the attitude-behavioral gap in science communication in the NSS group. If the treatment were successful, strategic messaging would have affected participants' environmental attitudes and behaviors that reflected the publics (e.g., NSS participants). The NSS showed significance in their change toward favorable environmental attitudes and had increased their willingness to engage in communication behaviors. They also showed significant in favorable change in behavioral intent toward pro-environmental actions. Strategic message design had the most favorable effect on the NSS participants than the SS participants overall. As mentioned above, the NSS participants reflected the lowest environmental attitudes and behavioral actions at the start of this study. However, with exposure to a strategic message design that included both social-cultural content and climate science information, this group was impacted the most toward closing the attitude-behavioral gap. This finding was substantial since this study was trying to close the attitude-behavioral gap using a strategic message design in science communication to create positive environmental change in participants that simulated public environmental views.

Kahan (2015) addressed the science communication problem by emphasizing that science messaging should include communities' social-cultural contexts to safeguard the public from choosing their knowledge of science or being who they are. When the public perceived a threat or experienced an intrapersonal conflict due to environmental impacts, they would be moved

toward pro-environmental behaviors to preserve their cultural values and norms. Communities would be more likely to understand the message and increase their intentions in pro-environmental behaviors if the scientific knowledge were strategically designed toward public relevancy, therefore, not forcing a choice over or against group identification. Messaging strategy integrated into this fashion should show positive results in closing the gap in environmental attitude, communications, and actions. The strategic message design employed in this intervention improved the attitude-behavioral gap in both of the participant groups. Strategic messaging that included social-cultural relevancy to the participants showed potential in closing the attitude-behavioral gap from traditional science discourse.

Future Research

To better examine the effectiveness of the ECTT, some aspects should be further studied. Future research should examine the experimental treatment using other communication scales or environmental measurements to evaluate effective communication behavior relevant to the participants' demographics. In the ECS, researchers designed the items in the scale instead of a public survey asking for standard practices in environmental communication (Kassing et al., 2010). Since social generations differ in their form of communication engagement, some of the items in the instrument (e.g., "change the channel," "news reports") might not have relevance to the current communication practices of the participants (e.g., use of social media sites for environmental communication).

To improve environmental communication, participants could be trained on how to function and improve group discussions. Brady and Nelms (2017) found evidence from the Quality Movement that organizational communication with quality circles enhanced lateral communication, increased group participation, and created organizational change. The circles

impacted decision-making to help others in the group discuss uncertainties within topics and encourage dialogue for better understanding. As was found successful in quality circles, incorporating training in group discussion in the experimental treatment would be a link to enhancing environmental discourse.

Future research might consider reviewing another environmental measurement to assess participants' intentions to act. The environmental action questions used to measure intent did not consider if participants had the ability to act. For example, participants may want to report that they would like to recycle more, but they were not able due to the lack of recycling bins in apartment buildings or living spaces. They may want to turn off lights when they leave a room; however, many places they reside may not give them control over the light switches (i.e., libraries, classrooms, communal areas). The questions themselves might have issues in the ability to give an individual the intent to act.

When looking at young people's environmental attitudes and behavior, the Gen Z population should not be overlooked. For future application, the Generation Z population should be considered for further investigation into their environmental attitudes, willingness to engage in environmental communication, and behavioral intent toward environmental actions. They, too, will suffer the effects of inaction toward climate mitigation. Reflective in the research, the Gen Z population will be larger in the world than the millennials (Gherini, 2018; Duffin, 2020).

Study Limitations

Even with the best efforts, this research study is not without limitations. Due to multiple waves of data collection from the same participants, this research suffered from attrition. Since this research lacked the element of random assignment and did not provide a comparison group, this quasi-experimental design raises concerns about internal validity (Campbell & Stanley,

1963). Because a convenience sample was used, generalizations to larger populations should be made with caution. Further experimental research is needed on whether the outcome could be generalized to other populations.

Another limitation of this study was in two of the primary dependent measures, willingness to communicate and behavioral intent. In practice, collecting direct behavioral data would be ideal. However, this has proved to be exceptionally difficult.

The importance of strategic messaging framed in science evidence was not separated into different components for evaluation. The intervention was not designed to be separated into components to assess the effects on environmental attitude, communication behaviors, and actions. This could be considered a limitation.

Conclusion

Historically, science communication messaging has had limitations on the public's understanding of climate change and other environmental issues (i.e., air and water pollution, desertification, energy reduction, natural resource depletion, waste disposal). The purpose of incorporating strategic messaging with social-cultural relevancy in science communication was to improve public understanding of science research statements. The "human component" or social-cultural norms has been "flagged" as the missing content in science messaging, which has caused an attitudinal-behavioral gap in the public's beliefs in climate change and other environmental issues. Furthermore, this attitude-behavioral gap has created inaction toward environmental practices within communities. When the public understands that their actions affect climate change and recognize the impacts climate change has caused on their wellbeing, they should be more motivated to consider their environmental attitudes and be more likely to

engage in pro-environmental behaviors. However, strategic message designs should be included in science communication for this to occur.

When science communication incorporates social-cultural aspects to scientific research statements to improve the public's understanding, individuals will be more likely to increase their awareness and concerns of the personal impacts of climate change and other environmental issues. Furthermore, they will be more alert to the perceived threats to their existence encouraging pro-environmental behaviors toward remediation. This research design developed strategic messaging incorporating scientific evidence to motivate participants to increase their environmental attitudes and behaviors. Furthermore, this research offered empirical support that such strategic message designs can increase pro-environmental attitudes, willingness to engage in environmental communication behavior, and environmental actions. This study provided more insight into this age group's environmental perspectives that addressed Strife's (2012), Nelms et al.'s (2017), and Canfield et al.'s (2020) concerns regarding limited research regarding young adults' environmental views.

Science communication problem is the presumption that the public hears and understands the same message. Research has supported that science communication often lacks the "human component" in message constructs delivered for the public's understanding of science information. Therefore, the public's reception of the information becomes "lost in translation." Science-driven information has lacked relevancy in message content of social-cultural aspects for the intended public. This has formed dissension and indecision within the public regarding their environmental beliefs creating a behavioral gap in climate change remediations. This indecision has also created a dualist competition between the public's lack of pro-environmental action and elevated expectations of compliancy with climate change reductions.

Without strategic messages involving social-cultural values, scientific communication becomes intrusive on the public's cultural norms, which has developed this status quo in the public's environmental behavior (Kahan, 2015). Strategic messaging appeared to close some of the attitude-behavioral gaps in science communication by translating research results into public understanding and action. When the content in the message provided relevancy to an individual's social-cultural needs, they were more likely to respond with favorable environmental attitudes and increase their pro-environmental behaviors. Messaging strategies toward the public's needs showed statistical results in closing some attitude-behavior gaps in science communication. Horst (2021) referenced this boundary space created by the public in science communication and argued that science communication should practice societal messaging due to its importance in science information. In the Department of Defense Climate Adaptation Plan (2021), climate change literacy and a climate-informed workforce are the top three adaptation strategies to be integrated across their five-tiered climate framework. One way to achieve a climate-informed workforce would be to incorporate the "human component" in science communication. The ECTT showed improvements in closing the attitude-behavioral gap with the strategic message design in climate change literacy increasing climate-informed participants' willingness to pro-environmentally act.

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Appendix

Appendix A

Operational Outline of the Environmental Communication Teaching Tool

I. Participants voluntarily completed a series of questions and measures which included the last four digits of individual's school identification.

   A. Individual's completed six demographic questions (see Appendix F).

   B. Individual's completed a 15 item New Ecological Paradigm Scale (see Appendix G).

   C. Individual's completed a 20 item Environmental Communication Scale (see Appendix H).

   D. Individual's completed the six measures in the Pro-Environmental Actions Scale (see Appendix I).

II. Participants were exposed to a localized climate change impact case study consisting of PowerPoint slides (see Appendix B).

   A. Slide 1: The title slide showed the overview of the ECTT.

   B. Slide 2: The title slide showed "Case Study of Climate Change and Social Injustice".

   C. Slide 3: This slide gave a quote from 1911 that addressed the reason for population displacement to better living conditions.

   D. Slide 4: This slide gave the top global impacts from climate change (Global Impacts, 2009) and the top countries in the world at risk under each category climate change impacts. Discuss coastal islands on the top of the list for countries that will be impacted from sea level rise due to climate change. The Marshal Islands was one of the low-lying island states that the ECTT discussed regarding population displacement due to sea level rise from climate change impacts. The Marshallese population was displaced due to sea level rise to Springdale, Arkansas.

E. Slide 5: This slide gave the number of people that will be displaced due to climate change impacts. This number represented the population of three United States moving somewhere else in the world. Where will that many people go? What country has the resources to support the population from three United States? Metaphorically speaking, how many chairs will be needed to accommodate that number coming to dinner.

F. Slide 6: This slide gave a depiction of the social injustice between industrial countries and developing countries in relation to economies and impacts of climate change. Industrial countries have more resources to aid their populations when affected by climate change. Developing countries endured the most of inaction toward climate change due to lack of resources.

G. Slide 7: This slide gave a definition of an environmental refugee. These individuals were not recognized by governments due to the mass number of people being displaced from climate change impacts and the remediation cost to care for the multitudes. The picture was of the Marshall Island's during a King tide in which they were having multiple times a year due to sea level rise.

H. Slide 8: This slide showed population displacement has formed two directions of issues. One direction of issues is created from the populations that moved due to the climate change impact and must change their social-cultural norms in order to integrate to another region's political, societal, and economic cultures. The other direction of issues has been developed from the host community that will be needed to adjust to sharing resources, cultural changes, and supply-demand concerns from the integrated population. Political, societal, economic, and religious issues could be two directional when a population moved to a host community that practiced different social-cultural behaviors compared to the host

community. For example, some of the population from Bangladesh moved due to loss of land from sea level rise, desertification, etc. The predominate religion from Bangladesh was Islamic. Some of this population has moved next door to India. India's predominate religion was Hindu. Muslims and Hindus have had a long history of conflict due to their beliefs and cultural values. This slide illustrated population displacement to population integration caused two directional distress (e.g., population that moved to the community and the population that lived in the community). The populations displacement demonstrated two different sets of political, societal, and economic issues that must be mediated, or conflict will arise.

I. Slide 9: This slide showed information of the localize case study that was used for the ECTT. The Marshall Islands were affected by climate change and social injustice. The picture on the left of the slide was a high tide on the island and the picture on the right of the slide was a nuclear testing site on the Marshall Islands in the 1950s.

J. Slide 10: This slide showed saltwater intrusion onto the islands from sea level rise during a high tide.

K. Slide 11: This slide illustrated an overview of the Marshall Islands topography and population distribution on the twenty-nine atoll islands.

L. Slide 12: This slide highlighted the history of the social injustice the Marshall Island populations incurred during nuclear testing on their islands and how they arrived in United States thru the Compact of Free Association bypassing immigration policies.

M. Slide 13: The Marshallese buried their family members by the sea. Due to sea level rise, their grave sites have been washed away during high tides and King tides. This slide also showed that the Marshall Islands were ranked number 10 for islands vanishing due to sea

level rise. Their population growth has declined due to moving to Hawaii or Springdale, Arkansas for a better chance of living.

N. Slide 14: This slide gave the major impacts of climate change that were happening on these islands. Marshallese drinking water is provided from the rain. They store freshwater in wells. During King tides and some high tides, the Marshallese have saltwater intrusion in their freshwater wells. Due to sea level rise, King tides have occurred more often on the islands every year.

O. Slide 15: Some of the demographics of the islands were on this slide. This should give background information on the differences of the Marshallese Population's lifestyle compared to living in Springdale, Arkansas. The population has been dependent on imported food due to nuclear contamination still in the soil impacting local food (e.g., fruit, coconut crabs). Their food supply and finances were provided from fishing. Due to commercial fisheries diminishing the Marshall Islands of the fish population, fishing has declined. Poverty on the islands has been prevalent and high unemployment has existed due to lack of industry and fishing. There has been limited access to the internet and the population has lived more on an 'island time' schedule. Traditionally, they have had a matriarchal society. (Davis, 2013)

P. Slide 16: This slide offered more demographics about the Marshall Island population.

Q. Slide 17: This slide transitioned to the Marshallese population displaced 6200 miles (about twice the width of the United States) away to a land-locked community; Springdale, Arkansas. The Arkansas Marshallese have been integrated to a completely different political, societal, and economic culture transitioning to a land-locked community in America.

R. Slide 18: This slide gave information that populations will be displaced due to climate change effects and social injustice bringing them to better lands and easier conditions of living to raise a family. In this case study, the Marshallese integration to Springdale contrasted to their island life habitat. However, the new location offered more financial gain to support a family and easier conditions of living once adjusted to the new setting.

S. Slide 19: This slide listed the demographics of the Arkansas Marshallese.

T. Slide 20: This slide showed how both populations, the integrating Marshallese, and the host Springdale community, adjusted to changes of contrasting lifestyles. This has created issues coming from the population that have been integrated. This slide provided information to open discussion comparing political, societal, and economic issues between the two populations. The Marshallese language has created a barrier in communication. Participants were asked how Marshallese can acquire a driver's license when driving examinations were all in English. Recently, they have started offering driving exams in the Marshallese language in Springdale, Arkansas. During this slide, participants were presented information regarding the Marshallese were anglers on their islands; however, Springdale was a landlocked community so fishing skills would not have provided gainful employment in Springdale. Springdale does have the corporate office for Tyson Foods which has offered employment opportunities at the chicken processing plants. However, language barriers have been an ongoing issue at the job sites.

U. Slide 21: This slide displayed specific issues that both populations were impacted by the integration. This slide also provided discussion points in comparing the differences in adjusting to integration. For example, the Marshallese buried their family members by the sea. In Springdale, funeral costs are incurred to bury the deceased. Other examples to

mention and discuss would be one season on the island versus four seasons in Springdale. Wearing seasonal clothing and shoes has been an issue in wintertime for the integrated Marshallese in Springdale. Marshallese would still wear flip flops in wintertime in Springdale when the temperatures were below freezing. Since another issue with the Springdale Marshallese population was having their children arrive to school on time, this question was asked to the participants for feedback. How would "island time" be compared to Springdale time when school will begin in the mornings

V. Slide 22: This slide showed some of the adjustments that the host community, Springdale has provided to help with the integration process.

W. Slide 23: This slide provided the web site to Kathy Jetnil-Kijiner's (2014), a Marshallese islander, presentation to the UN Climate Leaders' Summit of the climate change impacts on her community and home.

III. Participants were exposed to the communication theory application of Elaboration Likelihood Model consisting of PowerPoint slides (see Appendix C).

A. Slide 1: The title slide showed the overview of the ECTT.

B. Slide 2: The title slide showed "Know your stakeholder!".

C. Slide 3: This slide offered a fill-in-the-blank as to what type of communicator one may become (e.g., environmental communicator); however, the learning parameters Kahan's (2015) quoted in this slide applied to all communicators.

D. Slide 4: This slide showed the need-to-know information to design a strategic message involving social-cultural content. This slide offered the design of a CAP from a climate change impact that disrupted both populations from the localized case study. The climate change impact created multiple issues in this specific case study with the displaced

population integrating into the host community. This slide provided participants the general overview in the development of a CAP (e.g., selected stakeholders that engage in a specific climate change issue that participants attempted to resolve). Participants were provided information from this slide to start thinking about a specific issue that they would choose to resolve between both populations that were affected by climate change. For the CAP, the stakeholders were already selected (i.e., Springdale Marshallese and the Springdale Chamber of Commerce). Again, students reviewed the Springdale Chamber of Commerce website to learn about this organization's values and needs.

E. Slide 5: This slide gave political, societal, and economic concerns regarding the Marshallese being displaced to Springdale, Arkansas. The participants reviewed the concerns and narrowed them down to a specific issue. Before the participants finalized an issue to resolve between both stakeholders, they determined how stakeholders would be interested or would be benefited if they engaged in resolving the issue. The alignment of both stakeholders to show how they will be benefited from the resolution would encourage them to partake in the CAP.

F. Slide 6: This slide provided a reminder from the localized case study of the societal aspects that occurred with Marshallese that lived on the islands.

G. Slide 7: This slide included societal differences between the Marshallese and the Springdale community from the case study. Participants were encouraged to learn about both the Springdale Marshallese and the Springdale Chamber of Commerce to understand which of these societal difficulties affected both stakeholders.

H. Slide 8: This slide addressed the issues that have been improved with the integration of the Marshallese. This slide provided ideas of issues that have been resolved between the

Marshallese and the Springdale community to help the participants think of problems that have not been addressed.

I. Slide 9: This slide provided a review covering earlier content participants were exposed to in developing a CAP from the localized case study regarding the Marshallese population.

J. Slide 10: This slide transitioned into how to analyze both stakeholders. Participants provided the Chamber's mission statement, their role in the community, their group membership, and their economic interests. This information was found on the Chambers web page.

K. Slide 11: This slide gave the "Why do we need to know so much about the Chamber?" This slide provided the information about ELM and how individuals processed a message. Based on Petty and Cacioppo (1986) theory, individuals processed a message on a dual continuum. In theory, the individual receiving the message will shift more toward central processing if the message was constructed with their values, needs and norms. The individual that shifted to central processing the message was more likely to be motivated toward attitude and behavioral change. In theory, the individual receiving the message would shift toward peripheral processing if the message designed lacked relevant content to the individual. Therefore, the individual would become less engaged in the issue and would lack the motivation to act or change. Participants were encouraged to choose a specific issue that was relevant to both the Marshallese and the Chamber's values, and interests. The closer the issue aligned to the relevant goals and benefits to the Marshallese and the Chamber; the more inclined both stakeholders would want to participate in resolving the issue.

L. Slide 12: This slide supplied more information needed to design a strategic communication message that would motivate both stakeholders. This slide also supplied information needed to implement relevancy in the message to the stakeholders.

M. Slide 13: This slide provided an overview of the information needed to start developing a CAP.

N. Slide 14: This slide covered the elements needed to develop a CAP. Participants should have a promising idea of what specific issue they will address that will benefit both stakeholders. This slide addressed goal setting based on the issue, outlined objectives that are needed to be completed to reach the goal, tasks needed to be accomplished to complete objectives and strategic messaging that discussed the gain to both stakeholders.

O. Slide 15: This slide provided the outlined diagram of issue, goals, objectives, stakeholders, and strategic gain statements in the CAP.

P. Slide 16: This slide provided an in-class exercise called Exercise Our Wit slide! The exercise discussed the development of a CAP with the participants. The issue and stakeholders were provided. The issue was the Marshallese students were arriving late to Springdale schools due to “island time.” The stakeholders were the Springdale Parent Teacher Organization and the Marshallese parents. The goal and objectives were defined in class on how the Marshallese students would get to school on time. Participants suggested strategic messaging that would encourage the Marshallese student body and the Springdale Parent Teacher Organization to get involved in the remedy of Marshallese students arriving to school before the tardy bell rang. There were hints on the slide on how to resolve this issue that were discussed with the participants. Participant discussed the

objectives to accomplish this goal and provided gain statements for both stakeholders, Springdale Parent Teacher Organization and Marshallese parents.

Q. Participants included the last four digits of their student ID on a sheet.

IV. Participants were exposed to the development of their own community action plan consisting of PowerPoint slides (see Appendix D).

A. Slide 1: The title slide showed the overview of the ECTT.

B. Slide 2: The title slide showed "Community Action Plan Informs, Persuades, and Creates Action".

C. Slide 3: This slide summarized the basics in designing a CAP.

D. Slide 4: This slide repeated the issues both populations face due to the population integration from the impacts of climate change.

E. Slide 5: This slide reminded the participants of the two stakeholders (Springdale Chamber of Commerce and the Marshallese population) they analyzed and will be used for the development of the CAP. example: Springdale Chamber of Commerce is a business membership group so they would be interested in job skills, employment, and skilled labor.

F. Slide 6: This slide provided a reminder of the demographics of the average Marshallese population in Springdale, Arkansas for stakeholder analysis. This could be helpful in the development of a CAP.

G. Slide 7: This slide provided again the diagram of developing a CAP. Participants were reminded in the development of a CAP to choose one specific issue to address since trying to resolve multiple issues was not realistic in this exercise. After the issue has been decided, a goal was set to be accomplished in helping resolve the issue. Objectives were

needed to be outlined to accomplish the goal along with strategic message designs to entice the Marshallese and the Chamber to participate in the CAP. Participants listed tasks to be completed to finish each objective. Participants provided a strategic message that discussed the benefits to both stakeholders if they participate in the CAP.

H. Slide 8: This slide provided guidance covering group presentations. Participants were randomly divided into groups. Each group was given a "Know Your Stakeholder" Rubric to help them formulate their Cap presentation (see Appendix J). The facilitator of this group exercise used the assessment protocol for "Know Your Stakeholder" Rubric to evaluate and discuss group presentations that covered the CAP along with other participant groups provided feedback (see Appendix K).

I. Slide 9: This slide covered the implementation of group presentations.

J. Slide 10: This slide was displayed while groups developed their Caps and presented them.

V. Participants voluntarily completed a series of questions and measures which included the last four digits of the individual's school identification.

A. Individuals completed six demographic questions (see Appendix F).

B. Individuals completed a 15 item New Ecological Paradigm Scale (see Appendix G).

C. Individuals completed a 20 item Environmental Communication Scale (see Appendix H).

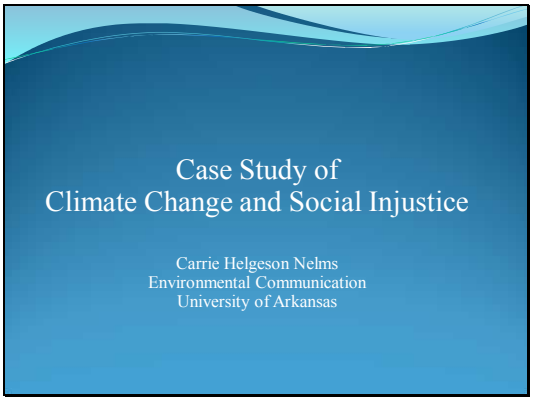
D. Individuals completed the six measures in the Pro-Environmental Actions Scale (see Appendix I).

Appendix B

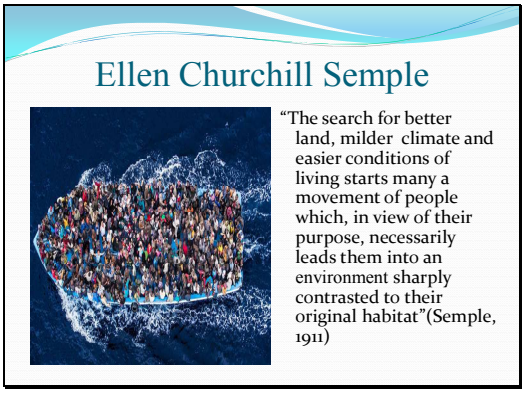
PowerPoint: Case Study of Climate Change and Social Injustice

Slide 1

Slide 2



Slide 3



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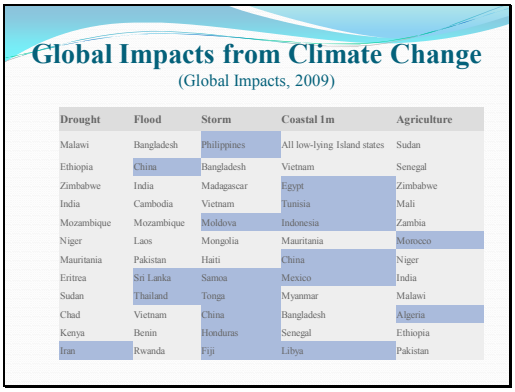
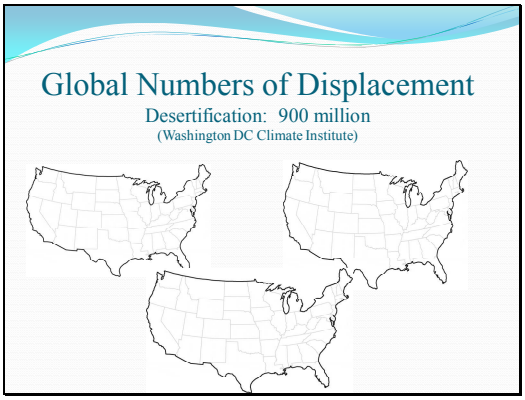
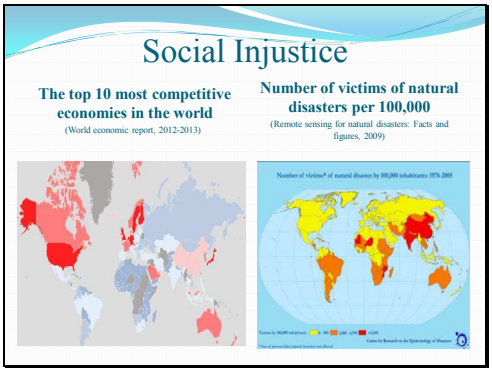


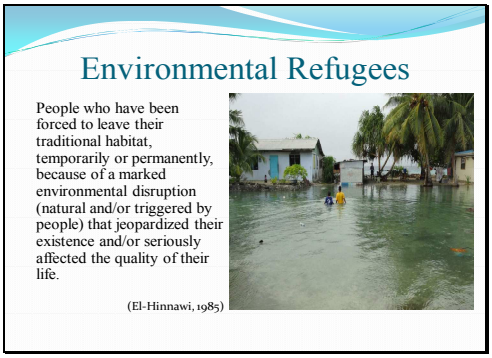
Slide 5



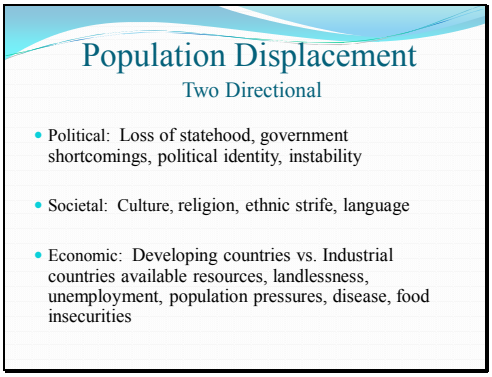
Slide 6



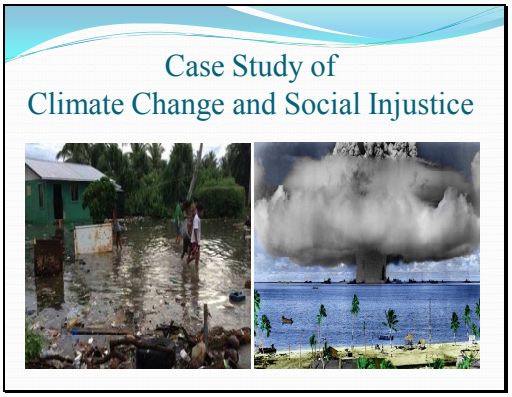
Slide 7



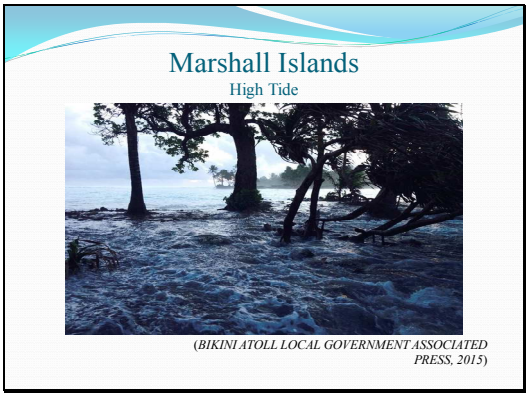
Slide 8



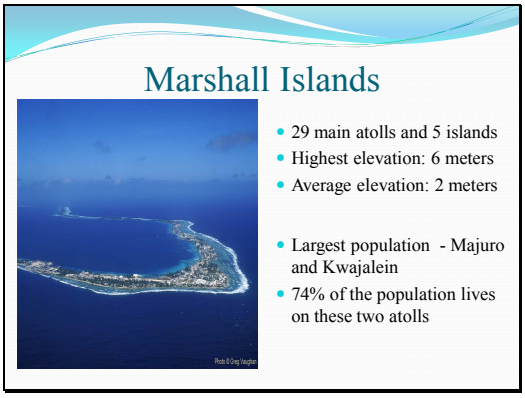
Slide 9



Slide 10



Slide 11



Slide 12

Marshall Islands History

- 1914 islands captured by Japan
- 1945 islands controlled by United States
- 1946 US nuclear testing
- 1954 US detonated most powerful bomb on Bikini atoll
- 1983 Compact of Free Association: US entry bypassing immigration policies; noncitizens not eligible for most federal public benefits expires 2023.

Slide 13

Marshall Islands

Sea Level Rise

Islands Vanishing As Sea-Level Rises

1. Kiribati
2. Maldives
3. Seychelles
4. Torres Strait Islands
5. Solomon Islands
6. Micronesia
7. Tuvalu
8. Marshall Islands

1990 Growth rate 4.3%
2015 Growth rate 0.38%
(Worldometers, 2016)

Slide 14

High Tides and Storm Surges

- Sea Level Rise
- Typhoons
  - Vertigo Evacuation
- Drought
  - Fresh water from rain
  - Salt water intrusion in wells
- King tides more frequent
  - 5 to 6 times a year

(Davis, 2013)

Slide 15

Marshallese Population

- Population dependent on imported food and goods
- High poverty and unemployment
- Matriarch society
- Ocean navigators and fishermen
- Limited access to internet
- Island time
- Not appropriate to show shoulders or knees

Slide 16

Marshallese Island Demographics

Median Age:	21
Unemployment:	36%
Religion:	Church of Christ
Health Issues:	Import food due to nuclear contamination
	e.g .spam, ramen noodles
	50% diabetic, obesity, thyroid issues, teenage pregnancy, tuberculosis, non-communicable diseases
Education Level:	8th grade

Slide 17

Land-Locked Community Impacted By Sea-Level Rise 6200 Miles Away

Slide 18

Population Displacement

Migration to Springdale, AR started in the mid-1980

"The search for better land, milder climate and easier conditions of living starts many a movement of people which, in view of their purpose, necessarily leads them into an environment sharply contrasted to their original habitat" (Semple, 1911).

(UWTODAY, 2009)

Slide 19

Springdale Integrating Marshallese Populations

2 Directional

Springdale, Arkansas has the largest population of Marshallese within the United States and the second largest population in the world (Davis, 2013).

2015 Springdale, Arkansas population 75,088 (U.S. Census Bureau)
2015 Marshall Islands population 57,439 (World Bank.org)

- Political: loss of statehood, government, identity
- Societal: culture differences, language i.e. drivers' license, education, housing, health and dietary issues, population pressures
- Economic: developing vs industrial resources, landlessness, unemployment, job skill sets as former fishing culture

Slide 20

Arkansas Marshallese Demographics

- 60% below the age of 25
- Average family size is 6
- 93% of the Marshallese rent
- 2500 students in Springdale Public Schools (Sdale.org, 2017)

Slide 21

Slide 22

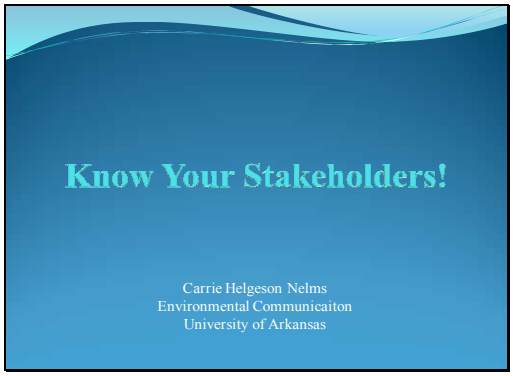
Slide 23

Appendix C

PowerPoint: Know Your Stakeholder!

Slide 1

Slide 2



Slide 3

Communicators

"…need to learn more about how to present information in forms that are agreeable to culturally diverse groups, and how to structure debate so that it avoids cultural polarization (Kahan, 2010, p. 297)"

Kahan, D. (2010). Fixing the communications failure. *Nature* 463: 296- 297.

Slide 4

Climate Change Impacts Causing Population Displacement to Integration

Need to Know:	Specific Issue
Need to Know:	The Stakeholders Involved for the Design of the Communication Message
Define the Purpose:	Develop Community Action Plan to Inform, Persuade, and Create Action

Slide 5

The Issues

But Which One?

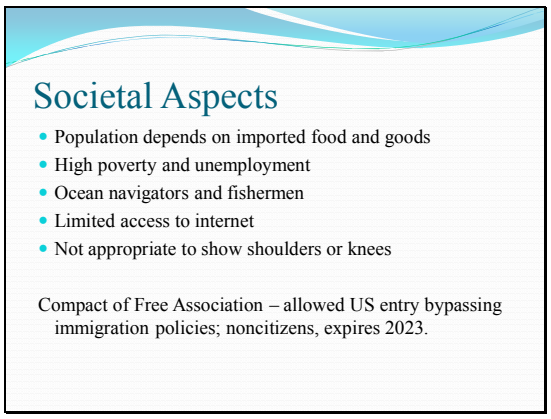
Climate Change and Social Justice

↓

Population displaced to a land-locked state due to sea-level rise

- Political: loss of statehood, government, identity
- Societal: culture differences, language i.e. drivers' license, education, housing, health and dietary issues, population pressures
- Economic: developing vs industrial resources, landlessness, unemployment, lack job skill sets as former fishing community

Slide 6



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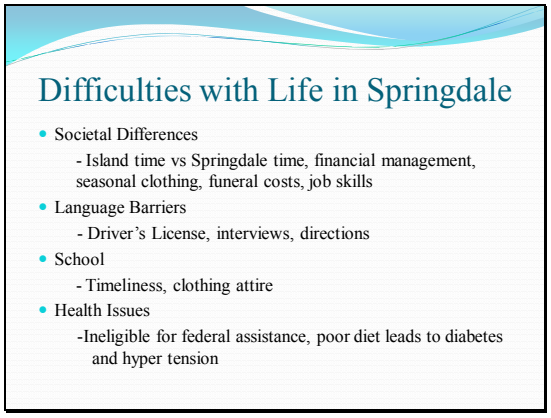

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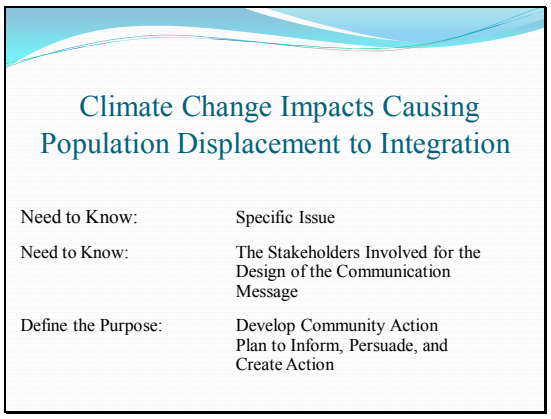

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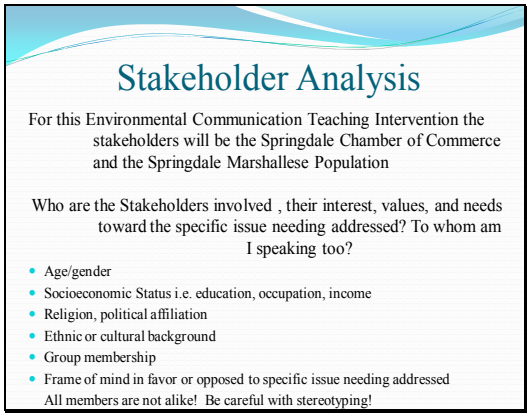

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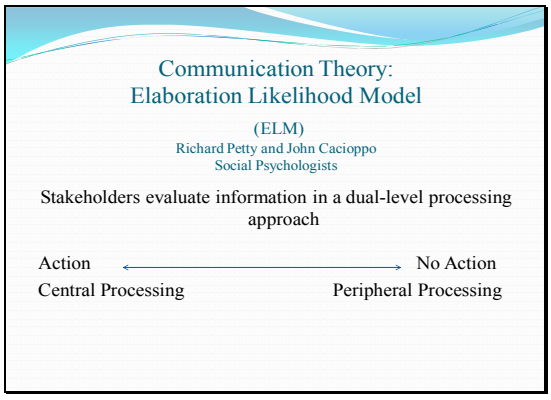

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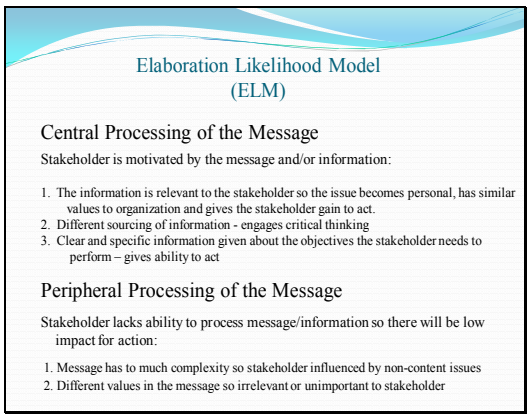

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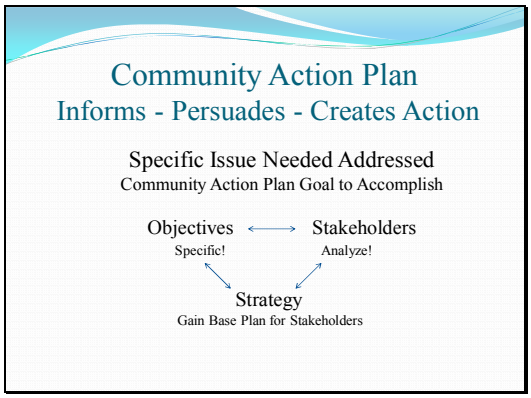

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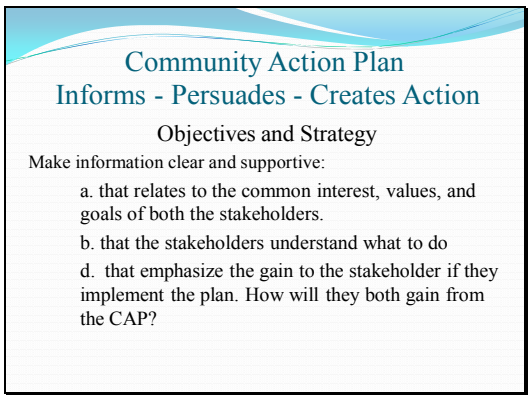

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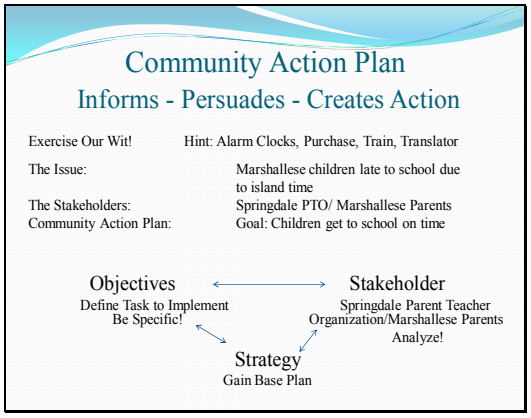

Appendix D

PowerPoint: Community Action Plan Informs, Persuades, and Creates Action

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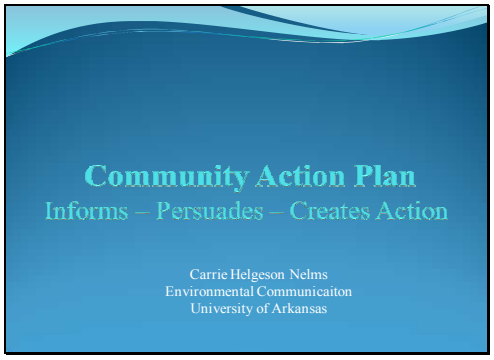

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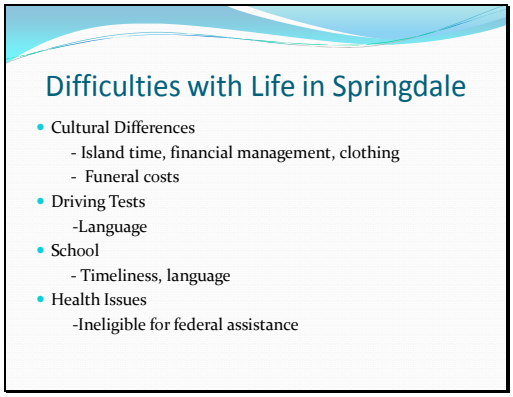

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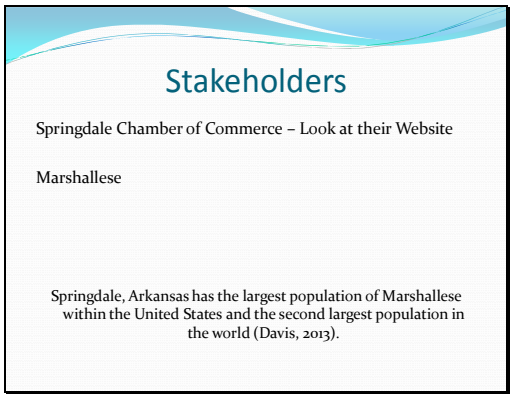

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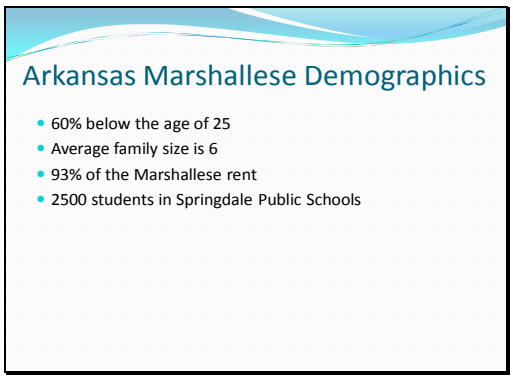

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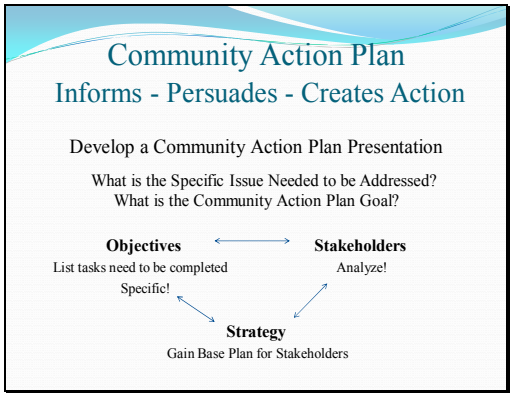

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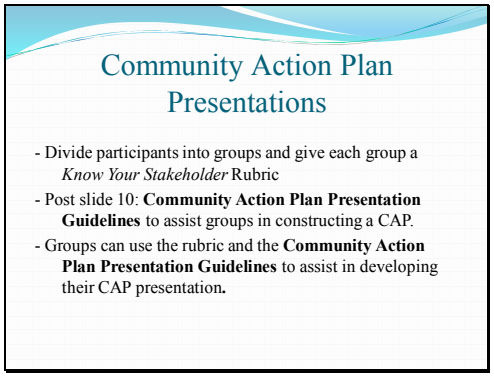

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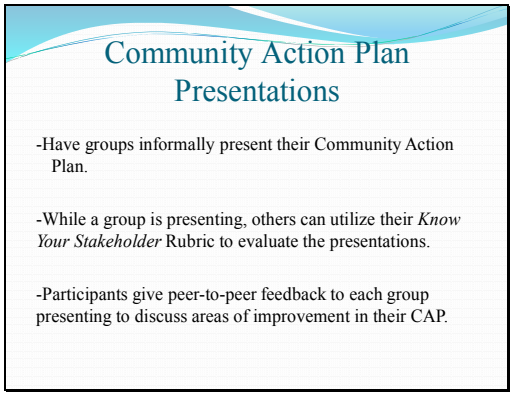

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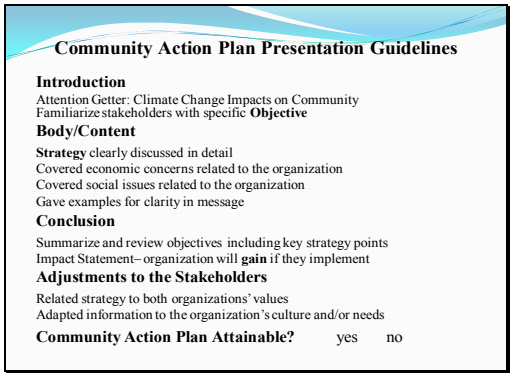

Appendix E

IRB Board New Protocol Approval and Extension

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

November 24, 2015

MEMORANDUM

TO:	Carrie Nelms Steve Boss
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Approval
IRB Protocol #:	15-11-298
Protocol Title:	*Science Communication Problem: The Attitude Behavioral Gap*
Review Type:	☒ EXEMPT ☐ EXPEDITED ☐ FULL IRB
Approved Project Period:	Start Date: 11/24/2015 Expiration Date: 11/23/2016

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (https://vpred.uark.edu/units/rscp/index.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 200 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

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

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

November 9, 2016

MEMORANDUM

TO:	Carrie Nelms Steve Boss
FROM:	Ro Windwalker IRB Coordinator
RE:	PROJECT CONTINUATION
IRB Protocol #:	15-11-298
Protocol Title:	*Science Communication Problem: The Attitude Behavioral Gap*
Review Type:	☒ EXEMPT ☐ EXPEDITED ☐ FULL IRB
Previous Approval Period:	Start Date: 11/24/2015 Expiration Date: 11/23/2016
New Expiration Date:	11/23/2017

Your request to extend the referenced protocol has been approved by the IRB. If at the end of this period you wish to continue the project, you must submit a request using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. Failure to obtain approval for a continuation on or prior to this new expiration date will result in termination of the protocol and you will be required to submit a new protocol to the IRB before continuing the project. Data collected past the protocol expiration date may need to be eliminated from the dataset should you wish to publish. Only data collected under a currently approved protocol can be certified by the IRB for any purpose.

This protocol has been approved for 200 total participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or .

Appendix F

Demographic Questions

1. Gender: ____Male ____Female

2. Age: 18 19 20 21 22 Over 22

3. Year in School: Freshmen Sophomore Junior Senior Graduate

4. Race: Native American Asian African American Pacific Islander Latino White

5. Are you a registered voter: Yes No

6. Are you: Democrat Republican Independent Other_____

Appendix G

New Ecological Paradigm Scale
(Dunlap et al., 2000)

1. We are approaching the limit of the number of people the Earth can support.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

2. Humans have the right to modify the natural environment to suit their needs.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

3. When humans interfere with nature, it often produces disastrous consequences.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

4. Human resourcefulness will ensure that we do not make the Earth unlivable.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

5. Humans severely abuse the Earth.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

6. The Earth has plenty of natural resources if we just learn how to develop them.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

7. Plants and animals have just as much of a right to exist as humans do.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

9. Despite our special abilities, humans are still subject to the laws of nature.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

11. The Earth is like a spaceship with very limited room and resources.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

12. Humans were meant to rule over the rest of nature.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

13. The balance of nature is very delicate and easily upset.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

14. Humans will eventually learn enough about nature to be able to control it.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

*These questions were reversed coded; 2, 4, 6, 8, 10, 12, 14.

Appendix H

Environmental Communication Scale
(Kassing et al., 2010)

1. I make it a point to discuss environmental concerns.

Strongly Disagree _____ ____ ____ ____ ____ Strongly Agree

2. I ignore people who talk about the environment.

Strongly Disagree ____ ____ ____ ____ _____ Strongly Agree

3. Conversations about environmental issues can make a difference.

Strongly Disagree ____ ____ ____ ____ _____Strongly Agree

4. I start discussions about environmental issues.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

5. I disregard news reports about environmental concerns.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

6. It is necessary to discuss environmental issues.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

7. I find myself regularly discussing the environment.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

8. I skip over news stories about the environment.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

9. I usually learn something when I listen to others talking about the environment.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

10. I like to get people talking about environmental concerns.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

11. I change the channel when a story about the environment airs.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

12. Discussing the environment is important.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

13. I enjoy listening to discussions about the environment.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

14. It bores me to hear others discuss environmental issues.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

15. Talking about environmental concerns is important to our future.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

16. I enjoy discussing the environment.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

17. I ignore online stories about environmental issues.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

18. Listening to discussions about environmental issues energizes me.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

19. Talking about the environment is unimportant.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

20. I discuss news reports about environmental issues.

Strongly Disagree ____ ____ ____ ____ ____ Strongly Agree

*These questions were reversed coded; 2, 5, 8, 11, 14, 17, 19.

Appendix I

Pro-Environmental Actions Scale

1. How likely is it that you will recycle every time you dispose of cans, bottles, and/or glass?

   Unlikely ____ ____ ____ ____ ____ Likely

2. How likely is it that you will recycle every time you dispose of paper?

   Unlikely ____ ____ ____ ____ ____ Likely

3. How frequently do you turn off the water while brushing your teeth?

   Never ____ ____ ____ ____ ____ Always

4. How often do you shut down your computer before leaving for an extended period of time?

   Never ____ ____ ____ ____ ____ Always

5. How often do you turn off the lights before leaving temporarily?

   Never ____ ____ ____ ____ ____ Always

6. How often do you avoid taking a store's free plastic bags?

   Never ____ ____ ____ ____ ____ Always

Appendix J

Know Your Stakeholder!
Community Action Plan Rubric

Rating: E=excellent; G=good; A=average; F=fair; P=poor

CATEGORY	RATING	COMMENTS
Introduction		
Attention getter – Climate Change Impacts on Community	E G A F P	
Familiarize stakeholders with specific **Objective**	E G A F P	
Body/Content		
Strategy clearly discussed in detail	E G A F P	
Economic concerns related to the organization	E G A F P	
Social issues related to the organization	E G A F P	
Gave examples for clarity in message	E G A F P	
Conclusion		
Summarize and review objectives including key strategy points	E G A F P	
Impact Statement– organization will **gain** if they implement	E G A F P	
Adjustments to the Stakeholder		
Related strategy to both organizations' values	E G A F P	
Adapted information to the organization's culture and/or needs	E G A F P	
Community Action Plan Attainable	Yes No	

Appendix K

Assessment Protocol for Know Your Stakeholder Rubric

CATEGORY	EXCELLENT	GOOD	AVERAGE	FAIR	POOR
Introduction to the Group's Presentation					
Attention getter – Climate Change Impacts on Community	Tell a specific story of an individual impacted in the community by CC issue	Describe the damage report of the CC impact on the community	Describe overall climate change impacts in the world	Describe what needs to be done about climate change	Introduce your group before any discussion about CC
Familiarize stakeholders with specific Objectives	Describes specific issue group going to resolve caused by CC in community and objectives needed to be met to reach goal by specific stakeholders	Describes specific issue groups going to resolve and how they need stakeholders help to reach this goal	Describe multiple issues CC creates in this community and needs everyone to help	Describes general message about CC issues that need to be addressed by the community	Describes what can happen to communities caused by CC impacts
Body and Content of the Group's Presentation					
Strategy clearly discussed in detail	Give specific objectives for stakeholders to complete that relate toward stakeholders' values and interests	Give specific objectives they need stakeholders to do	Give objectives to stakeholders	Give objectives that need to be done to community	Describe goal of plan

Covered economic concerns related to the organization	Discuss cost to the stakeholders to do objectives and give specific benefits/gains stakeholders will receive by implementing them	Discuss cost to the stakeholders to do objectives and mention general benefits.	Discuss cost to stakeholders to do objectives and they will feel better for helping others.	Tell stakeholders they need to pay this cost for the Marshallese	Ignore cost concerns
Covered social issues related to the organization	Describe specific societal issue related to both groups and how both will benefit from resolved issue	Describe specific societal issue the Marshallese face and how they will benefit	Describe societal issue that Marshallese face	Discuss general issues in the community	Ignore societal issues
Gave examples for clarity in message	Give 'story with a point' benefiting the stakeholder's interest if goal is accomplished	Give 'story with a point' on how the community would benefit if goal reached	Give examples of other communities impacted by same issue	Give example of what happen to you	Ignore examples for clarity
Conclusion					
Summarize and review objectives including key strategy points	Review specific objectives stakeholder needs to do and how they will benefit related to their interest	Review specific objectives stakeholder needs to do	Review objectives that need to be accomplished and how everyone needs to get involved	Review goal of this CAP	Review the Issue the community is facing due to CC impacts

Impact Statement– organization will gain if they implement	Restate the specific benefits to the stakeholders' interest if they implement plan and give a related quote.	Describe benefits to community if plan is implemented and give a quote.	Describe how this is necessary for the community to get involved.	Restate CC issue and how it will not get better.	Close with "That's it." Or "Thank you for your time"
Summarize and review objectives including key strategy points	Review specific objectives stakeholder needs to do and how they will benefit related to their interest	Review specific objectives stakeholder needs to do	Review objectives that need to be accomplished and how everyone needs to get involved	Review goal of this CAP	Review the Issue the community is facing due to CC impacts
Impact Statement– organization will gain if they implement	Restate the specific benefits to the stakeholders' interest if they implement plan and give a related quote.	Describe benefits to community if plan is implemented and give a quote.	Describe how this is necessary for the community to get involved.	Restate CC issue and how it will not get better.	Close with "That's it." Or "Thank you for your time"
Group's Message Adjustments to the Stakeholders					
Related strategy to the organization values	Gave specific gain statements that related to stakeholder's values, interests, norms if they	Gave gain statements to the stakeholder if they participate in the CAP	Gave general gain statements to stakeholder.	Gave gain statements to the community	Discussed the problems both stakeholders are facing

	participate in the CAP				
Adapted information to the organization's culture and/or needs	Specific objectives were related to stakeholders involved	Objectives were beneficial to the community	Objectives addressed issue	Objectives did not relate to organization's business	Objectives did not relate
Community Action Plan Attainable	**Yes**		**No**		
	Objectives benefited both stakeholders and both would gain from CAP	Economically feasible and beneficial to community	Objectives did not relate to both stakeholders involved so only one side or neither side would gain from CAP	Economically to costly and would not benefit both parties	