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Overcoming skepticism with education: interacting influences of worldview and climate change knowledge on perceived climate change risk among adolescents

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Abstract Though many climate literacy efforts attempt to communicate climate change as a risk, these strategies may be ineffective because among adults, worldview rather than scientific understanding largely drives climate change risk perceptions. Further, increased science literacy may polarize worldview-driven perceptions, making some climate literacy efforts ineffective among skeptics. Because worldviews are still forming in the teenage years, adolescents may represent a more receptive audience. This study examined how worldview and climate change knowledge related to acceptance of anthropogenic global warming (AGW) and in turn, climate change risk perception among middle school students in North Carolina, USA (n=387). We found respondents with individualistic worldviews were 16.1 percentage points less likely to accept AGW than communitarian respondents at median knowledge levels, mirroring findings in similar studies among adults. The interaction between knowledge and worldview, however, was opposite from previous studies among adults, because increased climate change knowledge was positively related to acceptance of AGW among both groups, and had a stronger positive relationship among individualists. Though individualists were 24.1

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percentage points less likely to accept AGW than communitarians at low levels (bottom decile) of climate change knowledge, there was no statistical difference in acceptance levels between individualists and communitarians at high levels of knowledge (top decile). Non-White and females also demonstrated higher levels of AGW acceptance and climate change risk perception, respectively. Thus, education efforts specific to climate change may counteract divisions based on worldviews among adolescents.

1 Introduction

The potential impacts of global climate change include serious ecological, economic, social, and health consequences, yet concern over the issue may be on the decline in the United States (Smith and Leiserowitz 2012). This waning concern is particularly troubling because citizens will be more likely to act to address climate change if they believe it poses a risk. Research suggests this relationship applies to both collective (e.g., support for emissions regulations) and individual (e.g., driving less) actions (Alhakami and Slovic 1994; O'Connor et al. 1999).

A growing body of literature suggests that this apparent apathy within the U.S. is largely a product of low climate literacy and successful media campaigns designed to foster skepticism (Jacques et al. 2008; McCright and Dunlap 2011). Climate science includes complicated topics (e.g. the interaction between micro, regional, and global climates) which are associated with largely unfamiliar terms (e.g. solar vs. terrestrial radiation), making achieving climate literacy challenging. Further, many people hold misconceptions about climate change, such as attributing global warming to holes in the ozone layer or confusing weather and climate, that lead to misguided conclusions about the risk of climate change (Leiserowitz 2012). For instance, some point to an unusually cold winter as evidence that global warming is not happening (Egan and Mullin 2012). These misconceptions are strengthened by concentrated media campaigns that spread scientific-sounding but erroneous information in an effort to shroud climate change in doubt and controversy (Mccright and Dunlap 2003; UCS 2007). As a counter to these efforts, some suggest that climate scientists should concentrate efforts on distributing sound science in forums with considerable public reach (e.g. popular websites and social media) (Hamilton 2011; Wibeck 2013).

Though the need for climate literacy seems obvious, other studies suggest that increased climate literacy will have little impact on risk perception among adults because political ideology and worldviews have a larger influence over climate change risk perceptions than climate change knowledge. A clear partisan divide was identified among adults with Democrats significantly more likely than Republicans to acknowledge anthropogenic global climate change (Mayer et al. 2013). Hamilton (2011) found that education level was both positively and negatively related to climate change concern depending on political affiliation. He attributed this trend to the increasing availability of websites and cable news shows that allow educated people to readily find ideologically compatible information for their views (Hamilton 2011). Similarly, cultural cognition theory posits that individuals seek and integrate information that is congruent with their worldviews (Kahan 2012). Worldviews are general ways of seeing the world and distinct from political ideology, although they are correlated with it (Dunlap et al. 2000). Kahan (2012) posits worldviews can be measured using two scales – one ranging from hierarchy to egalitarianism and another ranging from individualism to communitarianism. People who have egalitarian communitarian worldviews generally perceive climate change as higher risk while those who are hierarchical individualists perceive it as lower risk. Individualists purportedly downplay environmental risks because they want to avoid restrictions on individual choices including those associated with commerce, whereas hierarchists deemphasize risk because it would cast blame on social elites (Kahan 2012).

Individuals scoring high on both scales incorporate both influences, and they tend to interpret new information on climate change in ways that support their existing beliefs (Kahan 2012). A recent study among adults suggests that increased science literacy polarizes people's perceptions of climate change with hierarchical individualists becoming more skeptical and egalitarian communitarians becoming more alarmed as scientific literacy increases (Kahan et al. 2012). These findings imply that climate literacy efforts may be ineffective among even the most scientifically literate hierarchical individualists, because they seek out ideologically compatible information and interpret new information in ways that support their pre-existing views.

Although science literacy appears to polarize and reinforce ideologically based perceptions of climate change among adults, the same relationship may not exist in the context of K-12 climate education. Worldviews are still forming during childhood and adolescence (Vollerberg et al. 2001), and may not dictate climate change risk perception among adolescents in the same way as among adults. Similarly, climate-specific literacy may not have the same polarizing effect as science literacy in general (Tobler et al. 2012). Given the interacting effects associated with science literacy (Kahan et al. 2012) or self-reported climate change understanding (Hamilton 2011) with worldviews among adults, research is needed to investigate the potential implications among adolescents, especially as many current climate literacy efforts focus on building knowledge. If climate literacy efforts are met with worldview-driven skepticism among hierarchical individualist adolescents as they are among adults (Kahan et al. 2012), climate literacy efforts in K-12 contexts will not work unless they are framed to be compatible with student worldviews. Although some climate educators utilize framing to reach K-12 audiences (Fleischer 2013), such framing efforts would presumably work more effectively if built on an understanding of how worldview and science knowledge interact to form climate risk perception among adolescents.

This study evaluated how worldviews and climate change knowledge affect climate change risk perception among adolescents with a case study of middle school students in coastal North Carolina, USA. We proposed a path model in which both climate change knowledge and worldview predicted acceptance of anthropogenic global warming (AGW), which in turn predicted climate change risk perception. We chose the phrase acceptance of "global warming" over "climate change" in this case for several reasons. Though the latter may facilitate more nuanced scientific understanding, the former has been used in previous studies with adolescents (Leiserowitz et al. 2011). Further, climate change was suggested as an alternative framing for AGW by political strategist Frank Luntz precisely because the public can interpret the phrase in multiple ways, many of which do not implicate humans or imply a global warming trend (Luntz 2003). The more narrow, though emotive, understanding of AGW limits this subjectivity problem thereby allowing us to capture potential relationships between worldviews and acceptance. Because higher levels of climate change knowledge have been associated with higher climate change risk perceptions (Tobler et al. 2012), we predicted that 1) adolescents with higher levels of climate change knowledge would be more likely to accept AGW. Because worldviews play such a prominent role in shaping climate change risk perception among adults (Kahan et al. 2012; Smith and Leiserowitz 2012), we hypothesized that 2) students who were hierarchical and individualistic would be less likely to accept AGW. Because worldviews are still developing during adolescence (Vollerberg et al. 2001), 3) we did not anticipate finding support for the polarized correlation between scientific knowledge and worldview found among adults (Kahan et al. 2012). In addition to testing these hypotheses, we controlled for student gender and ethnicity, as these have been associated with differing risk perception among adults (Finucane et al. 2000; Sjöberg 1999).

2 Methods

2.1 Theoretical model

Because environmental risk perceptions among adolescents are poorly understood, our model is grounded in environmental behavior theory and integrates current understanding of how adolescents perceive the environment. The Value Belief Norm (VBN) theory of environmentally responsible behavior draws on several behavior theories to form a causal chain of variables: personal values, a set of beliefs about the environment, awareness of consequences, ascription of responsibility, and personal norms for environmental action (Stern 2000). Slimak and Dietz (2006) propose that risk perception can be understood through the VBN framework as awareness of consequences; values help form beliefs which in turn influence risk perception (awareness of consequences). Their model explained 48.4 % of the variance in predicting of global environmental risk perception (global warming, ozone depletion, population growth, and acid rain) among adult populations. Environmental education research employs a similar causal chain but also includes the role of scientific knowledge. Hungerford and Volk's (1990) oft-cited model suggests threshold variables including environmental attitudes and environmental knowledge influence ownership variables (e.g., knowledge of consequences) among adolecents. Similarly, environmental literacy frameworks suggest that environmental knowledge and environmental attitudes influence understanding of issues (including inherent risks) (Hollweg et al. 2011).

Following Slimak and Dietz's (2006) application of the VBN framework to environmental risk perception and integrating current environmental education research, we propose a model for understanding how worldview and knowledge affect climate change risk perception among adolescents (Fig. 1). Though the terms values, worldviews, beliefs, and attitudes are often used interchangeably in the literature (Slimak and Dietz 2006), we see worldviews as they are

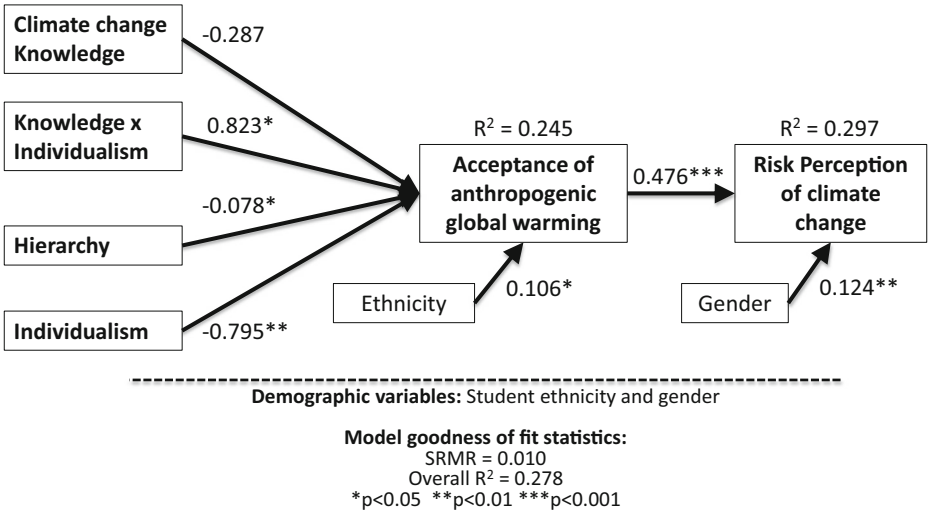

Fig. 1 Path diagram model for climate change risk perceptions among adolescents. Path coefficients displayed are standardized. We weighted our sample to reflect the population of coastal North Carolina before analysis (n= 378). Paths from each demographic variable to each endogenous variable were included in the analysis, but only the statistically significant paths are shown. For ethnicity, 0=White and 1=non-White. For gender, 0=male and 1=female

discussed in relation to climate change risk perception (Kahan 2012) as fitting into the values category of the VBN framework because they reflect "what is important to me?" (Slimak and Dietz 2006). Because scientific understanding is a threshold variable for pro-environmental behavior among children and adolescents (Hungerford and Volk 1990) we place climate change knowledge among the first steps of the causal chain leading to climate change risk perception. As Slimak and Dietz (2006) conceptualize "belief" in the VBN context as "what is the general pattern of human influence on the environment?" we saw acceptance of AGW as fitting into this area of the framework. Before we can assess degree of concern over climate change, we must account for whether individuals accept AGW. For these reasons, we saw acceptance of AGW as a precursor to climate change risk perception and propose it mediates the effects of climate change knowledge and worldview (Fig. 1).

2.2 Sampling

We chose to focus on middle school students for this study as they represent an intersection of cognitive abilities necessary to understand complex environmental challenges and a prime stage for influencing how students engage as citizens (McBeth et al. 2011). Though we only collected data from students for this study, we sampled in two stages – teachers and students. We compiled a list of all middle school science teachers in the 20 coastal North Carolina counties by visiting each school website, collecting faculty rosters, and calling the schools to confirm the faculty rosters. We randomly selected 150 of the 353 teachers to recruit for the study. Two area school districts would not allow teachers to participate, which eliminated 27 of the 150 from consideration. Of the remaining selected teachers, 36 responded and 24 consented to participate. The resulting schools were representative of the state in terms of ratios of locale and Title I status, and differences between the student sample and population was accounted for (see Data Analysis). The Title I program is authorized by the Elementary and Secondary Schools Act to give additional funding to schools with high percentages of low-income students (107th Congress 2002) and Title I status can be used as a measure of school-level SES. Each participating teacher was asked to randomly select one class to include in the study by flipping a coin. Between March and May of 2013, we visited all 24 classrooms and surveyed students in person. Our sample included 90 sixth graders, 102 seventh graders, and 186 eighth graders with the majority spanning ages 11–14 (17 students were 15 years old). Most students completed the entire survey (81.8 %). The majority of the 378 students in this sample were female (54.8 %), and White (60.5 %) with fewer African American (15.6 %), Hispanic (7.3 %), American Indian (1.3 %) and Asian (1.0 %) students. Some also identified as multi-racial (10.9 %) or other (3.4 %).

2.3 Instrument development

The lack of published studies measuring perceptions of climate change among adolescents required us to pre-test multiple scales designed for adults. Our pre-test instrument included the full-length individualism-communitarianism and hierarchy-individualism scales used by Kahan (2012) and individualism-communitarianism and hierarchy-egalitarianism scales in the form of the Culture Orientation scale (Singelis et al. 1995) and the Social Dominance Orientation scale (Pratto et al. 1994), respectively. We included the Tobler et al. (2012) scale to measure climate change knowledge, which includes questions on knowledge of the science, causes, and potential impacts of climate change. To measure acceptance of AGW and climate change risk perception, we drew on individual questions from the only large-scale survey instrument on the topic designed for adolescents (Leiserowitz et al. 2011). AGW was

measured by two questions – one asking whether students believed global warming was happening, and another asking whether they thought it was caused by humans.

The final instrument was based on several rounds of pretesting. First, we administered the draft instrument to two classes of middle school students (n=48). We asked students to circle questions that were difficult to understand and make notes on how to make improvements. After making adjustments to the wording of several items, we administered a second draft version of the survey to an additional two classes of middle school students (n=44) and asked for written feedback. Additionally, we completed cognitive interviews (Desimone and Le Floch 2004) with nine students to gather general feedback and identify which individualism and hierarchy scales were easier to understand.

In addition to the qualitative pretesting of the scales, we tested each for normality of responses and reliability. Histograms revealed normal distributions for student responses to each scale included in the instrument draft, consistent with a range of worldviews we would expect in a randomly selected population. Cronbach's alpha measurements indicate internal reliability, or the degree to which items within the scale measure the same construct (Gliem and Gliem 2003). In general, alpha scores reaching 0.7 and above are considered acceptable, 0.8 and above considered good, and 0.9 and above are excellent (Gliem and Gliem 2003). Cronbach's alpha measurements indicated the Kahan (2012) individualism-communitarianism scale to be more reliable than the Singelis et al. (1995) Culture Orientation scale among adolescents (α=0.81 and 0.75, respectively), but the Pratto et al. (1994) Social Dominance Orientation scale (α=0.93) was more reliable than the hierarchy-individualism scale used by Kahan (2012) (α=0.80). Risk perception reliability was lower than ideal (α=0.59) but on par with measures reported for other studies using a risk perception scale (Betz and Weber 2002). The acceptance of AGW scale had an inter-item correlation of 0.77. The final instrument consisted of modified climate change knowledge scale from Tobler et al. (2012), a hierarchy-egalitarianism scale modified from Kahan (2012), an individualism scale modified from Pratto et al. (1994), an acceptance of AGW scale, and the risk perception scale. For a final version of all scales included in the instrument, please see the online supplemental information.

2.4 Data analysis

Students self-reported gender and ethnicity at the end of the survey instrument. We included both of these demographic variables in analysis, and we collapsed ethnicity categories into White and non-White. We compared ethnicity and gender in our sample to values for the student population using data available through the North Carolina Department of Public Instruction, and found the sample underrepresented males (44.5 % in our sample vs. 51.0 % in coastal NC; t=2.37 p=0.018). We weighted our sample to adjust for this difference.

We completed a path analysis with the SEM command in STATA version 12.1. Path analysis is an extension of multiple linear regressions that allows for the analysis of several regression equations simultaneously, testing the likelihood that observations fit the proposed causal model (Garson 2008). We examined the goodness of fit for the model using the standardized root mean square residual (SRMR) measure. A perfect fitting model would have an SRMR value of 0, and a value less than 0.08 is considered acceptable (Hancock and Mueller 2006). We tested all hypotheses using SEM path estimates and p-values. To test for the interaction between climate change knowledge and worldview, we created two interaction terms – one between climate change knowledge and each of the worldview variables (hierarchy and individualism). We then included these interaction terms in the path model as predictors of acceptance

of AGW. Only the interaction between climate change knowledge and individualism was significant, so it was included in the final model.

2.5 Ethics statement

This study was approved by the North Carolina State University Institutional Review Board (IRB #2961, Assurance Number FW A000003429).

3 Results

Students in this study answered 74.7 % of the climate change knowledge questions correctly (mean=12.7 out of a possible 17, SD=2.75). Average scores on the worldview scales suggested students in the sample were slightly individualistic (mean=56.9 out of a possible 90, SD=10.3) and egalitarian (mean=53.8 out of a possible 112, SD=15.8). Chronbach's alpha scores suggested all scales in the instrument were reliable (hierarchy-egalitarianism α= 0.93, individualism-communitarianism α=0.81, and risk perception α=0.61). The AGW scale had an inter-item covariance of 0.78.

Our results largely supported the theoretical model predicting climate change risk perception among adolescents (Fig. 1). Specifically, an interaction between knowledge and worldview (individualism) predicted acceptance of AGW, which in turn predicted risk perception of climate change. This relationship was limited to individualism, as there was no direct or interacting relationship between hierarchy, acceptance of AGW, and climate change risk perception. Demographic differences among students also influenced acceptance of AGW and risk perceptions associated with climate change. Non-White students were more likely to accept AGW than White students, and girls perceived climate change as higher risk than boys (Fig. 1). All other variables held constant, non-White students scored an average of 3.7 percentage points higher than white students on the AGW scale. Girls scored 7.6 percentage points higher than boys on the risk perception scale.

Increased climate change knowledge was positively associated with acceptance of AGW, and this relationship was stronger among individualists than among communitarians (Figs. 1 and 2). For a student scoring in the 50th percentile on the individualism-communitarianism scale, acceptance of AGW (expressed as a percentage of the maximum score on the acceptance scale) climbed from 68.0 % of the maximum score on the acceptance scale at low levels of knowledge (10th percentile) to 76.9 % at a medium knowledge level (50th percentile) and 84.7 % at a high climate change knowledge level (90th percentile). For a communitarian student (scoring at the 10th percentile on the individualism-communitarianism scale), acceptance of AGW began higher and also climbed, with 78.5 % acceptance of AGW at a low climate change knowledge level, 84.6 % at a medium knowledge level, and 88.7 % at a high knowledge level. For an individualist student (90th percentile the individualism-communitarianism scale), acceptance of AGW was lower at low levels of climate change knowledge (54.8 %), but as knowledge increased, acceptance levels approached those of communitarians (68.4 % for medium knowledge and 79.3 % for high knowledge levels). Because the difference in acceptance levels was low at high levels of knowledge (Fig. 2), we ran a post-estimation test to determine if this difference was statistically significant. We failed to reject the null hypothesis that the difference was zero (p= 0.129), meaning there was no statistical difference in acceptance levels between individualists and communitarians at high levels of climate change knowledge.

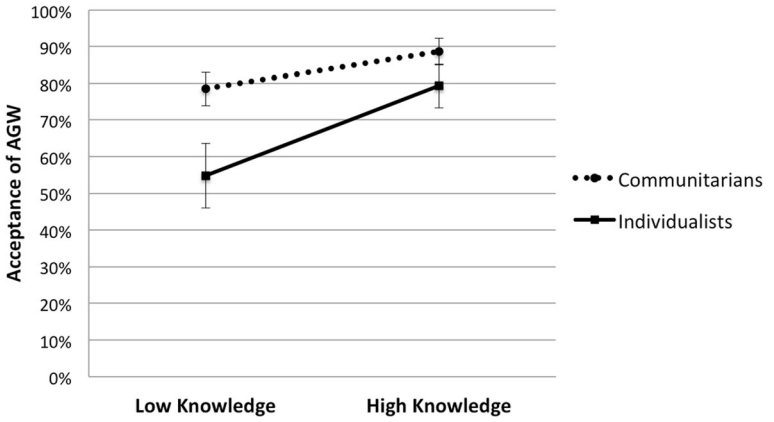

Fig. 2 Effect of increased climate change knowledge on acceptance of anthropogenic global warming among students with differing worldviews. Both regression lines predicting acceptance of anthropogenic global warming (AGW) (n=378) were generated from the regression equation implied by Fig. 1 where climate change knowledge, worldview, and demographic variables predict acceptance of AGW. Predicted values and 95 % confidence intervals (represented by error bars) of acceptance of AGW have been converted to percentages of maximum scale score (max=13). Communitarians and individualists are represented by individualism-communitarianism scale scores in the 10th and 90th percentiles, respectively. Similarly, low knowledge is represented by a 10th percentile score and high knowledge as a 90th percentile score. Error bars represent a 95 % confidence interval

4 Discussion

The potential for climate literacy efforts to overcome skepticism among adolescents may reflect an age-related window for influence. For adults, worldviews are well entrenched (Schultz and Zelezny 1999) and exert considerable influence over climate change risk perception (Smith and Leiserowitz 2012). During the teenage years, however, worldviews are still forming (Vollerberg et al. 2001), and this plasticity may explain why climate change knowledge overcomes skepticism among individualist adolescents as well as why hierarchy does not seem to factor into perceptions of climate change. Further, the individualism-communitarianism scale is heavily tied to American politics, suggesting that though adolescents may be already adopting political ideologies, these ideologies do not dictate perceptions of climate change as strongly as among adults (Hamilton 2011). Overall, students in our study displayed low levels of climate change knowledge, similar to those reported in a national survey of teens (Leiserowitz et al. 2011). Almost 20 % of teens in our study and 46 % of teens in the national survey (Leiserowitz et al. 2011) either thought global warming was not happening or did not know if it was happening. Together, these results highlight an opportunity to build concern for climate change by addressing low levels of climate literacy among adolescents. Climate literacy efforts designed for adolescents may represent a critical strategy to overcoming climate change related challenges, given stable or declining concern among adults that is driven in part by entrenched worldviews (Smith and Leiserowitz 2012).

Another explanation for the impact of climate change knowledge on risk perception among individualist-leaning adolescents may have more to do with the type of knowledge than the age of the learner. Previous research suggesting that scientific understanding polarizes worldview-driven risk perceptions measured scientific literacy and numeracy instead of knowledge specific to climate change (Kahan et al. 2012). Without education specific to climate change, adults may be unable to "connect the dots" provided through general science education. There

is some evidence that climate change knowledge increases climate change risk perception among adults (Tobler et al. 2012), and future research should explore whether this effect is especially pronounced among hierarchical individualists, as we found with individualist adolescents. Further, it is possible that adolescents are learning information about climate change from more reliable sources than adults. Adolescents spend a considerable amount of time in schools, perhaps increasing the likelihood that their climate knowledge is based on information reviewed by experts rather than from politically charged news and web sources that seem to be contributing heavily to skepticism among adults (Hamilton 2011; UCS 2007). This possibility underlines the importance of quality professional development for teachers as well as assurance that teachers have access to climate literacy materials based on sound science. Future research should address whether findings in this study represent an age-related tipping point for the potential influence of climate change education or point to the importance of reliable climate-specific education campaigns.

Although existing and expanded climate literacy efforts will likely be effective at raising climate change concern among adolescents, worldviews still deserve consideration in climate change education. Though increased climate change knowledge may bring students with different worldviews to similar levels of acceptance of AGW (Fig. 2), individualist students with low levels of climate change knowledge enter the conversation more skeptical. The guiding document for climate education, *Climate Literacy: The Essential Principals of Climate Science*, acknowledges climate change as a "significant part of public discourse" (US GCRP 2009) but it does not address how to encourage climate change communication among different worldviews. Similarly, less than 40 % of earth science teachers surveyed nationally reported addressing the controversy over climate change in the classroom (Johnson 2012).

In addition, ethnicity and gender should be considered as climate literacy efforts are developed. Our findings extend previous research in adult populations that suggest non-Whites perceive climate change as a higher risk than whites (Smith and Leiserowitz 2012). Some have explained this difference by noting that some non-White populations are disproportionately exposed to the negative effects of climate change as minority populations are more likely to live in inner cities affected by air pollution and heat-island effects (Younger et al. 2008) or in areas more prone to sea-level rise and storm surges (Kleinosky et al. 2006), risks which are projected to be exacerbated by climate change (Michener et al. 1997; Younger et al. 2008). As individuals who personally experience adverse effects of a specific threat are more likely to perceive that threat as high risk (Slovic and Weber 2002), similar factors may partially explain why non-White adolescents in our study appear more likely to accept AGW. However, as these effects have not been previously documented among adolescents more research is needed. The higher levels of climate change risk perceptions we identified among girls reflects findings in numerous studies where women perceive climate change and a host of other environmental threats as higher risk than men (Finucane et al. 2000; McCright 2010; Smith and Leiserowitz 2012; Zia and Todd 2010). McCright (2010) suggested gender differences may stem from differing socialization experiences between men and women, which can lead to differing levels of environmental concern or trust in science. Finucane et al. (2000) suggest that as women and minorities often hold positions of less power than White males, cultural socializations make both these groups more likely to assign higher levels of risk in a host of contexts. It is possible that our results extend these findings associated with gender and ethnicity socialization to adolescents. Future research could address the degree to which parents, peers, and other socialization mechanisms influence gender and ethnicity differences in perceptions of climate change, particularly among adolescents.

If educators want to engage all students in discussing climate change, they will need to employ strategies to reach students who are less likely to accept AGW. Among adults, reframing discussions of climate change mitigation efforts as economic improvement measures boosted the likelihood that climate change deniers would support those efforts (Bain et al. 2012). Similar framing efforts should be fruitful for adolescents given that climate change knowledge and worldviews interact to reduce divisions in acceptance of AGW and perception of risk associated with climate change. Researchers participating in a conference on K-14 climate change education suggested treating controversy as a teachable moment, using inquiry-based pedagogy, inviting outside speakers, and discussing solutions to specific climate change problems as strategies for including all students in climate change discussions regardless of their level of belief or risk perception (Buhr 2011). Another recent study suggested reframing the climate discussion away from factuality and toward analyzing mitigation strategies (Feldpausch-Parker et al. 2013). Although these strategies may not impact risk perception directly, they may offer ways to overcome barriers to engagement in climate change solutions associated with worldviews.

Overcoming challenges associated with climate change will require a public that is informed and concerned about the issue, and our results suggest that efforts should focus on adolescents. Despite an overwhelming consensus among the scientific community that global warming is happening and caused by humans (Cook and Evans 2000), skepticism among adults is stable or on the rise (Smith and Leiserowitz 2012), and this skepticism is driven in part by hierarchical-individualist worldviews (Kahan 2012). Climate literacy efforts can overcome, worldview-driven skepticism among adolescents, making them a receptive audience for building climate change concern. Future research should explore whether climate change perceptions formed in childhood persist as worldviews become more stable. As the scales we used in this study displayed high levels of reliability, they may be helpful in these efforts. Also, more insight is needed into the congruency and relative influence of climate literacy, scientific literacy and numeracy as well as the source of climate change information on climate change risk perception among all age groups. Finally, we should identify strategies to engage students regardless of their level of acceptance of AGW or risk perception, paying special attention to the specific perspectives of adolescent populations. Building concern about climate change is critical to spurring individual and collective action. Although perceptions of climate change are complex and likely influenced by several factors, building climate literacy is an essential tool for ensuring future generations are fully engaged in adapting to and mitigating the effects of climate change.

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