

## If They Like You, They Learn from You: How a Brief Weathercaster-Delivered Climate Education Segment Is Moderated by Viewer Evaluations of the Weathercaster

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### ABSTRACT

Local television (TV) weathercasters are a potentially promising source of climate education, in that weather is the primary reason viewers watch local TV news, large segments of the public trust TV weathercasters as a source of information about global warming, and extreme weather events are increasingly common (Leiserowitz et al.; U.S. Global Change Research Program). In an online experiment conducted in two South Carolina cities (Greenville,  $n = 394$ ; Columbia,  $n = 352$ ) during and immediately after a summer heat wave, the effects on global warming risk perceptions were examined following exposure to a TV weathercast in which a weathercaster explained the heat wave as a local manifestation of global warming versus exposure to a 72-h forecast of extreme heat. No main effect of the global warming video on learning was found. However, a significant interaction effect was found: subjects who evaluated the TV weathercaster more positively were positively influenced by the global warming video, and viewers who evaluated the weathercaster less positively were negatively influenced by the video. This effect was strongest among politically conservative viewers. These results suggest that weathercaster-delivered climate change education can have positive, albeit nuanced, effects on TV-viewing audiences.

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### 1. Introduction

Extreme weather events provide opportunities to communicate about climate change. Extreme weather events, such as droughts and heat waves, are becoming increasingly common in the United States (U.S. Global Change Research Program 2009). Furthermore, extreme weather is a salient issue among members of the

American public. Approximately half of Americans say that extreme weather events have become more common in recent decades and believe that extreme weather is likely to cause a natural disaster in their community in the next year (Leiserowitz et al. 2012a, 2013). The majority of Americans say “global warming is affecting weather in the United States” (Leiserowitz et al. 2013, p. 7).<sup>1</sup> Specifically, nearly three-quarters of Americans believe there is a connection between the record high temperatures in the summer of 2012 and global warming, and nearly half of Americans say global warming exacerbated other recent extreme weather events, including the ongoing drought in the Midwest and the Great Plains, Superstorm Sandy, and Superstorm Nemo (Leiserowitz et al. 2012a, 2013).

Television (TV) weathercasts are a potential source of climate change education. Television weathercasters are important, but often overlooked, sources of scientific information (Wilson 2008). Local TV is a valuable source of information about the weather, with the majority of Americans (58%) turning to local television—more than any other source—for their weather news (Rosenstiel et al. 2011). Furthermore, television weathercasters are among the most trusted sources of information about climate change, with 62% of the American public reporting trust in them (Leiserowitz et al. 2012b). Thus, both the medium (local television news) and the messenger (television meteorologists) appear well aligned to offer climate education when extreme weather or climatic events occur in a given community.

We conducted an online experiment to test this proposition. Specifically, using a sample of two cities in South Carolina (Columbia,  $n = 352$ ; Greenville,  $n = 394$ ), we examined the effects of three video treatments (originally aired on a local weathercast during an extreme heat event in South Carolina in the summer of 2012) on risk perceptions of global warming: 1) a forecast that simply predicted more extreme heat; 2) Climate Matters, an educational segment linking extreme heat to climate change; and 3) a combination of both the forecast and the Climate Matters segments. Next, we examined the influence of messenger evaluation and political ideology on subjects' processing of information about global warming.

## 2. Climate Matters: Climate change education in television weathercasts

Climate Matters is an ongoing climate change education project at WLTX, a local TV station in Columbia,

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<sup>1</sup> While we acknowledge that the term climate change is more widely accepted in the scientific community, in this study we primarily use the term global warming because it is the term used in our survey and experiment.

South Carolina. As part of this project, the station's chief meteorologist, in collaboration with climate science and education experts, developed a series of brief segments (scripts and accompanying graphics) addressing the causes and local impacts of global warming, such as sea level rise on the coast of South Carolina, the increased risk of drought in a warmer world, and intensity of hurricanes (for examples of the segments, see <http://www.wltx.com/weather/climate/default.aspx>). These segments were developed for the weather forecast during the evening news, when local weather conditions created a relevant opportunity.

A quasi-experimental evaluation of the first year of Climate Matters broadcasts used pre- and postsurveys conducted with local TV news viewers in Columbia and found that viewers of WLTX (compared to viewers of competing local news channels in Columbia)—and especially those viewers who remembered seeing Climate Matters segments—developed a range of science-based beliefs about climate change (Zhao et al. 2013). For instance, people who remembered seeing at least one special segment about global warming during the local TV weathercast became more certain that global warming is happening, and became more likely to believe that global warming would be harmful to themselves and to future generations (Zhao et al. 2013). In other words, the field evaluation of Climate Matters demonstrated that it had a positive education effect among viewers. In the current study, we tested the short-term effect on people's beliefs about the harm of global warming of a single Climate Matters educational segment that was aired during or soon after an extreme heat event, when presumably viewers were most interested in the information. Our hypothesis was that viewers who are exposed during a heat wave to an educational segment linking extreme heat to climate change will be more likely to develop beliefs about global warming as harmful than viewers who are exposed only to a forecast in which more extreme heat is predicted.

## 3. The role of peripheral cues in interpreting information about global warming

A variety of factors influence how people process media messages and this is especially true of media messages about global warming, given that public opinion about the issue has become politically polarized over the past decade and a half (Dunlap and McCright 2008). Therefore, we also wanted to test the effects of two information processing cues that are peripheral to climate change, but that we believed would be linked to how people processed the messages they encountered in the Climate Matters videos. Specifically, the literature

suggests that viewers' evaluations of the TV meteorologist (source evaluation), as well as their own political ideological orientation, are likely to influence how they formed judgments about the harm of global warming in response to the videos.

#### *a. Source evaluations*

The source, or the messenger, plays a crucial role in how individuals understand and learn from messages they encounter. Characteristics of a source, such as trustworthiness, influence learning of a message because they serve as a peripheral cue that people rely upon to understand the message (Hovland et al. 1953). More positive evaluations of a source can result in more persuasion. For instance, research has found that messages from a source that is likeable, attractive, or conveys expertise are more persuasive (O'Keefe 2002). In general, these positive evaluations lead to perceptions of increased credibility of the source, which then leads to greater learning of message arguments (Petty 1997). Given that perceptions of the source delivering the message are an integral aspect to how people interpret the message, it is likely that more positive evaluations of the meteorologist delivering the message about climate change during a weathercast will be linked to audiences developing more science-based beliefs about the harm of global warming.

Past research shows that television meteorologists can be a particularly valuable source of delivering climate change information. First, television is instrumental in shaping people's perceptions about the environment (Dudo et al. 2011; Dahlstrom and Scheufele 2010; Shanahan et al. 1997). Television news viewing in particular is related to concerns about the environment and proenvironmental behaviors (Holbert et al. 2003). Second, television weathercasters have significant potential as science communicators (Wilson 2008). The weathercaster is the most important on-air personality that influences an individual's selection of a local television news program (Lin 1992). Television viewers trust their local television weathercasters, and are therefore more likely to follow their advice during an extreme weather event (Sherman-Morris 2005).

#### *b. Political ideology*

Additionally, people often interpret information about global warming through the lens of their own political orientation. Global warming has become a highly politicized issue, with claims about it dramatized by liberal politicians, such as Al Gore in the movie *An Inconvenient Truth* (Revkin 2007). At the same time, politically conservative think tanks have attacked the conclusions of climate science and have contributed to

a general decline in Republican support for environmental issues (Jacques et al. 2008). This political framing of global warming by opinion leaders has encouraged partisan polarization among the public on the issue. As a result, many people in the United States tend to form their beliefs about global warming based on their political leanings, with Democrats' beliefs aligning with the scientific consensus on the impacts of global warming and its anthropogenic causes more so than Republicans (Dunlap and McCright 2008; Krosnick et al. 2000; Leiserowitz et al. 2011; McCright and Dunlap 2011). Therefore, viewers' political leanings likely play a significant role in how they evaluate messages about climate change.

Thus, we examined how both source evaluation and political ideology affected how people respond to the Climate Matters information.

## **4. Methods**

### *a. Experimental design*

A heat wave swept the United States from late June through July of 2012, with 3673 record nighttime and 4420 record daytime high temperatures set during the month of July (see <http://www.climatecentral.org/blogs/was-the-heat-wave-an-unprecedented-event/>). In the state of South Carolina in July of 2012, there were 88 record nighttime high temperatures recorded and 62 record daytime high temperatures (see <http://www.climatecentral.org/wgts/records/s10.php?state=sc&year=2012&month=7&go=GO>). From 16 to 31 July 2012, on the tail end of this heat wave, we conducted an online message experiment, where participants viewed one of three videos and answered a series of questions about their global warming beliefs and attitudes and about the video.

Participants were recruited from Greenville ( $n = 394$ ) and Columbia ( $n = 352$ ) using the Harris Poll Online Panel, a voluntary, opt-in panel of several million Americans that receives small rewards for participating in survey or experimental research. Panel participants are recruited from a multitude of sources, including but not limited to coregistration offers on partners' websites, targeted e-mails sent by online partners to their audiences, graphical and text banner placement on partners' websites (including social media, news, search, and community portals), trade show presentations, targeted postal invitations, and telephone recruitment of targeted populations. When people join the panel, they are told they are joining a market research panel and that they will be asked periodically to participate in online research. When people are invited to a particular survey, they are

sent an e-mail with a brief summary of the survey topic, the average length of the survey, and the incentives respondents will receive for successful completion. Our survey was conducted using the online survey platform Qualtrics.

Participants were randomly assigned to watch one of three videos (the Weather forecast video, the Climate Matters video, and the Climate Matters-plus-Weather forecast video). Those who received the Weather forecast video saw a 2-min clip of a 72-h forecast. The date of the weathercast was not provided, but subjects were informed it was a recent weather forecast. The forecast predicted 3 days of extreme heat, 101°F or hotter. The second set of subjects saw the Climate Matters-only video. Climate Matters is an ongoing production that explains various aspects of global warming for viewers of WLTX in Columbia. In the experimental video, two previously produced Climate Matters segments on extreme heat were edited together. In the first segment, the meteorologist used the analogy of rolling snake eyes with dice (the outcome of rolling two one-dot sides simultaneously) to communicate the odds of Columbia having a 101° (Fahrenheit) day compared to previous years, and what the odds will become in future years if global warming continues at its current rate. The second segment presented information about deaths from extreme heat events associated with global warming. Both segments were aired during the summer heat wave of 2012, and—when edited together into a single 2-min video—explained the increasing frequency of and health risks associated with summer heat waves as a result of global warming. A third set of participants saw a 4-min video that combined the Climate Matters-only and Weather-only segments. All three videos featured the same meteorologist.

By design, the Climate Matters segments, and our survey questions, used the term *global warming* (rather than the potential alternative term, *climate change*). This was based on an assumption at the time that Climate Matters was developed—and the survey items were written—that the term global warming more familiar to the public, even though the climate science community preferred the term climate change. Later research has shown that most members of the public have no preference between the two terms, but there is an interaction with different segments of the public, including political party identification with Democrats preferring global warming and Republicans preferring climate change (Akerlof and Maibach 2011). Subsequent research has shown that Democrats treat the terms more or less as synonyms, while Republicans do not, being more likely to accept that climate change is occurring (Schuldt et al. 2011).

Approximately half of the subjects in this experiment live in the media market where Climate Matters airs (Columbia), and therefore they may have seen some or all of the Climate Matters and weather forecasts segments previously broadcast. It is unlikely, however, that the residents from Greenville had been exposed prior to the experiment either to either the Climate Matters video series or to the meteorologist, because they live in a different media market that is more than 100 miles away. At the time of their recruitment, participants did not know that they were participating in a study about the heat wave, weather, or global warming.

In the online experiment, participants were first shown a web page containing a head shot of the television weathercaster who appears in the Climate Matters segments followed by two questions asking if they recognized that person and what their best guess of the person's occupation was. On the web pages that followed, they were asked a range of media use items before being shown a new web page where one of the three videos was embedded. Immediately following the video, they were asked a series of items to evaluate their perceptions of the meteorologist featured in the video. Finally, they were asked to evaluate the video itself and rate several items about weather in South Carolina and the United States, as well as their perceptions about global warming. Demographic questions were asked last.

## b. Measures

### 1) INDEPENDENT VARIABLES

The *city* variable represented the city in which the participant lives, with Columbia residents coded as 2 and Greenville residents coded as 1.

Three dichotomous variables were created to represent exposure to the three different *videos* in the experimental manipulation [Weather-only (*W*),  $n = 267$ ; Climate Matters-only (*CM*),  $n = 248$ ; Climate Matters plus Weather (*CMW*),  $n = 231$ ].

*Meteorologist evaluation* consisted of a five-item index that asked participants their agreement with the following: This person is likeable, I would ask this person for advice, I would like this person as a coworker, This person is similar to me, and This person is knowledgeable (five-point scale; Cronbach's  $\alpha = 0.90$ ,  $M = 2.66$ ,  $SD = 0.81$ ).<sup>2</sup> These items were taken from the Reysen likeability scale (Reysen 2005).

<sup>2</sup>Cronbach's alpha is a measure of reliability, which analyzes the internal consistency among multiple items in order to assess whether each item represents a similar construct (Cronbach 1951).

*Political ideology* asked participants whether they were more liberal or conservative on a five-point scale (1 = very liberal, 2 = somewhat liberal, 3 = moderate, middle of the road, 4 = somewhat conservative, 5 = very conservative;  $M = 3.17$ ,  $SD = 1.11$ ).

## 2) DEPENDENT VARIABLE

*Beliefs about global warming as harmful* was measured as an index of four risk perception items for which participants were asked to respond on a four-point scale (0 = not at all, 1 = only a little, 2 = a moderate amount, 3 = a great deal) to the following questions: How much do you think global warming will harm you personally?, How much do you think global warming will harm people in South Carolina?, and How much do you think global warming will harm future generations of people? Respondents were also asked to answer the following question using a six-point scale: When do you think global warming will start to harm people in South Carolina? (0 = now, 1 = in 10 yr, 2 = in 25 yr, 3 = in 50 yr, 4 = in 100 yr, 5 = never). This item was reverse coded for the analyses. These items were standardized and then combined into a mean index (Cronbach's  $\alpha = 0.91$ ,  $M = -0.03$ ,  $SD = 0.91$ ).

## 3) CONTROL VARIABLES

In the model, we controlled for two variables: recognition of the meteorologist and heat index on the day of data collection.

*Recognition of the meteorologist* was measured using two items. Before subjects watched the video, they were shown a photo of the meteorologist and asked to rate their agreement with the statement, "I recognize this person" (five-point scale). Next, we asked them to write their best guess of the person's occupation in an open-ended response. The total number of correct responses was 222, while 436 people guessed a wrong answer, and 88 people either did not answer or reported they did not know. This item was coded into a dichotomous variable, with those who correctly reported his occupation coded as 1 and those who guessed the occupation incorrectly coded as 0. The two items were standardized and then combined into a mean index, which was used in the analysis for this study (Pearson's  $R = 0.71$ ,  $p < 0.001$ ,  $M = 0.80$ ,  $SD = 0.92$ ).

The *heat index*, which represents the temperature that people feel when heat and humidity are combined, was included in the analysis to control for how the weather on the date of the survey might have affected subjects' responses. It was calculated using the National Weather Service's heat index calculator (<http://www.hpc.ncep.noaa.gov/html/heatindex.shtml>) based on data taken from the National Oceanic and Atmospheric

Administration (NOAA) National Environmental Satellite, Data, and Information Service, National Climatic Data Center's Global Surface Summary of Day database (<http://www.ncdc.noaa.gov/cgi-bin/res40.pl?page=climvisgsod.html>). If any participants started and finished the survey on more than one day, then it was always on two consecutive days. Therefore, we averaged the temperatures across the two days for those participants.

## 5. Results

Using univariate analysis of variance (ANOVA), we first examined the main effect of video viewership on beliefs in the harm of global warming. In spite of having sufficient statistical power to detect a small learning effect [Cohen's  $f = 0.15$ ; Power ( $1-\beta$ ) = 0.88], we did not find a significant difference between those who saw the Weather-only video, the Climate Matters-only video, and the Climate Matters-plus-Weather forecast video on beliefs in the harm of global warming,  $F(2, 751) = 1.69$ ,  $p = 0.19$ .<sup>3,4</sup> Therefore, our hypothesis was not supported.

In the second part of our analysis, we tested the effects of two peripheral cues—source evaluation and political ideology—on perceptions of harm of global warming. The first step of the analysis was to assess whether the different videos had differing effects on subjects' evaluations of the meteorologist. Therefore, we estimated an ordinary least squares (OLS) regression, predicting evaluations of the meteorologist (see Table 1).<sup>5</sup> The control variable of meteorologist recognition was significantly related to evaluations of the meteorologist. Results show that those who were more confident that they recognized the meteorologist evaluated him more positively than those who did not recognize the meteorologist. Those who viewed the Climate Matters video alone, however, were less likely to evaluate the meteorologist positively than those who watched the Weather-only video. There was no difference between those who watched both the Climate Matters-plus-Weather forecast video and those who watched the Weather-only

<sup>3</sup> We replicated this analysis using only those who indicated they recognized the meteorologist and similarly found no differences in perceptions of global warming's harm between those in the various video conditions,  $F(2, 118) = 1.54$ ,  $p = 0.22$ .

<sup>4</sup> ANOVA is used to assess the differences in means for a dependent measure across different categories of an independent variable (Girden 1992).

<sup>5</sup> OLS regression uses a generalized linear model to predict the line of best fit for a single response variable using either single or multiple explanatory variables (Craven and Islam 2011).

TABLE 1. Predicting levels of meteorologist evaluation and perceptions of global warming harm. Entries are unstandardized regression coefficients.

	Predicting evaluation of meteorologist	Predicting perceptions of global warming harm
Constant	2.23 <sup>a</sup>	3.74 <sup>c</sup>
Video <sup>e,h</sup>		
CMW vs Weather	-0.05	0.06
CM vs Weather	-0.22 <sup>d</sup>	-0.03
City (Columbia coded high)	-0.11	-0.21 <sup>a</sup>
Heat index	0.01	-0.03 <sup>b</sup>
Recognition of meteorologist	0.20 <sup>d</sup>	0.04
Political ideology <sup>f,i</sup>	-0.01	-0.29 <sup>d</sup>
Evaluation of the meteorologist <sup>g,j</sup>	—	-0.11
Video by Evaluation Interaction <sup>e</sup>		
(CM)(Evaluation)	—	0.18 <sup>b</sup>
(CMW)(Evaluation)	—	0.31 <sup>d</sup>
(Ideology)(Evaluation)	—	0.06 <sup>b</sup>

<sup>a</sup>  $p < 0.10$ .

<sup>b</sup>  $p < 0.05$ .

<sup>c</sup>  $p < 0.01$ .

<sup>d</sup>  $p < 0.001$ .

<sup>e</sup> The Weather video condition is the reference category.

<sup>f</sup> Very conservative coded high.

<sup>g</sup> Evaluation was centered at the mean.

<sup>h</sup> In the equation predicting perceptions of global warming harm, the coefficients for the video contrasts are *conditional effects*; in this case, they are conditioned on evaluation being at the mean level. Therefore, the coefficient of 0.06 for CMW vs Weather indicates that at the level of average evaluation of the meteorologist, those who saw the Climate Matters-plus-Weather forecast video were more likely to indicate global warming harm than those who saw the Weather-only video condition, although this difference does not reach statistical significance. See Table 2 for all conditional effects of video contrasts.

<sup>i</sup> In the equation predicting perceptions of global warming harm, the coefficient for political ideology is a conditional effect; in this case, it is conditioned on evaluation being at the mean level. Therefore, the coefficient of -0.29 for political ideology indicates that at the average level of evaluation of the meteorologist, increasing political conservativeness is negatively related to perceptions of global warming harm.

<sup>j</sup> In the equation predicting perceptions of global warming harm, the coefficient for meteorologist evaluation is a conditional effect; in this case, it is conditioned on political ideology being zero and on the video shown (with Weather as the reference category). Therefore, the coefficient of -0.11 for evaluation indicates that among those shown the Weather video who were also a “0” on political ideology (not an actual survey value), increasingly positive evaluation of the meteorologist was unrelated to perceptions of global warming harm. See Fig. 1 and Table 3 for all conditional effects of evaluation.

video. Political ideology had no effect on the evaluation of the meteorologist. The heat index control variable was not significantly related to meteorologist evaluations. City of residence was also unrelated to how positively one evaluated the meteorologist.

The second step of our analysis was to predict perceptions of global warming harm. There was a marginally significant relationship between city and risk perceptions of global warming, showing people in Greenville are more likely to have higher risk perceptions than people in Columbia.

We also examined the influence source evaluation of the meteorologist had on risk perceptions of global warming, by video condition. Results of an OLS regression (see Table 1) show that the relationship between the video seen and risk perceptions of global warming depended on meteorologist evaluation [ $\beta_{(CM)(Evaluation)} = 0.18, p < 0.05, \beta_{(CMW)(Evaluation)} = 0.31, p < 0.001$ ], setwise  $\Delta F(2, 731) = 5.49, p < 0.01$ ]. Those who saw the

Climate Matters or the Climate Matters-plus-Weather forecast videos were more likely to perceive global warming as more harmful if they evaluated the meteorologist positively—and conversely less harmful if they evaluated the meteorologist negatively. At low levels of meteorologist evaluation (one standard deviation below the mean), those who watched either the Climate Matters segment alone or in combination with the Weather segment were less likely to perceive global warming as harmful in comparison to the Weather-alone condition, although the differences were only marginally significant ( $\beta_{CM-W.-1SD_{Deviation}} = -0.18, p < 0.10; \beta_{CMW-W.-1SD_{Deviation}} = -0.20, p > 0.10$ ; see Table 2). However, among those who rated the meteorologist more positively (one standard deviation above the mean), those who watched the Climate Matters-plus-Weather forecast video were more likely to perceive global warming as harmful than those who watched the Weather-only video ( $\beta_{CMW-W.-1SD_{Deviation}} = 0.31, p < 0.001$ ).

TABLE 2. Differences in means of perceptions of global warming harm by video seen and by evaluation of the meteorologist.

Levels of meteorologist evaluation	Climate Matters vs Weather video [CM–W]	Climate Matters and Weather vs Weather video [CMW–W]	Climate Matters and Weather vs Climate Matters video [CMW–CM]
Minimum	−0.52 <sup>a</sup>	−0.77 <sup>b</sup>	−0.27
−1 standard deviation	−0.19 <sup>c</sup>	−0.02 <sup>c</sup>	−0.02
Mean	−0.04	0.05	0.09
+1 standard deviation	0.10	0.30 <sup>b</sup>	0.20 <sup>c</sup>
Maximum	0.20	0.47 <sup>b</sup>	0.27 <sup>c</sup>

<sup>a</sup>  $p < 0.05$ .

<sup>b</sup>  $p < 0.01$ .

<sup>c</sup>  $p < 0.10$ .

We also examined whether the effect of meteorologist evaluations on people's perceptions of global warming harm depended on a person's political ideology. Across all levels of meteorologist evaluation, having a more conservative political ideology was associated with lower global warming risk perceptions, while having a more liberal political ideology was associated with higher risk perceptions. For those who evaluated the meteorologist relatively lower (one standard deviation below the mean), political ideology was more strongly related to risk perceptions ( $\beta_{\text{Ideology}, -1\text{SD}} = -0.34$ ,  $p < 0.001$ ) than for those who evaluated the meteorologist relatively more positively (one standard deviation above the mean;  $\beta_{\text{Ideology}, +1\text{SD}} = -0.24$ ,  $p < 0.001$ ).

These results demonstrate that these two peripheral cues—source evaluation and political ideology—together influenced subjects' risk perceptions after viewing the different videos. Turning first to those who were shown the Weather-only video, as shown in Fig. 1 and in Table 3, for almost all levels of political ideology (very liberal to conservative), meteorologist evaluation was unrelated to global warming risk perception—meaning that evaluation of the meteorologist had no effect on their risk perceptions. However, among those who were very politically conservative, evaluation of the meteorologist was positively related to global warming risk perceptions.

The story was different for those shown either of the videos that included the Climate Matters segment—in both of these video conditions, evaluations of the meteorologist were positively related to global warming risk perceptions, regardless of political ideology. This positive effect of evaluation of the meteorologist was weakest for those who were very politically liberal and strongest for those who were very politically conservative. In other words, for those subjects who saw one of the Climate Matters' videos, perception of the meteorologist influenced their belief that global warming is likely to cause harm; those who had a positive evaluation

of the meteorologist were more likely to believe that there would be harm from global warming. Evaluation mattered most for those who were politically conservative and least for those who were politically liberal.

In summary, our results showed the following:

- Exposure to a weathercast that contained information about global warming did not have a direct main effect on people's risk perceptions about global warming; however:
- Those who liked the meteorologist featured in the weathercast were significantly more likely to have higher perceptions about the harm of global warming following exposure to one of the Climate Matters videos;
- The effect of positive meteorologist evaluations on risk perceptions held for people of all political ideological backgrounds, and was strongest for people who are politically conservative and weakest for those who are politically liberal.

## 6. Discussion

Risk perception is a key belief that is positively associated with support for taking action against climate change (Krosnick et al. 2006; Ding et al. 2011). In this study we examined whether local television weathercasts can be an effective means to educate the public about the risks of climate change. Our study found that local TV weathercasters can be effective climate educators to the extent that their viewers evaluate them positively (an assumption that is likely warranted, given that viewers choose to watch the weathercasts they deem reliable, with meteorologists they like). Furthermore, evaluation of the meteorologist had the strongest influence on beliefs among politically conservative viewers.

Although our hypothesis—that weathercaster-provided information about the connection between heat waves and global warming would lead to greater concern about

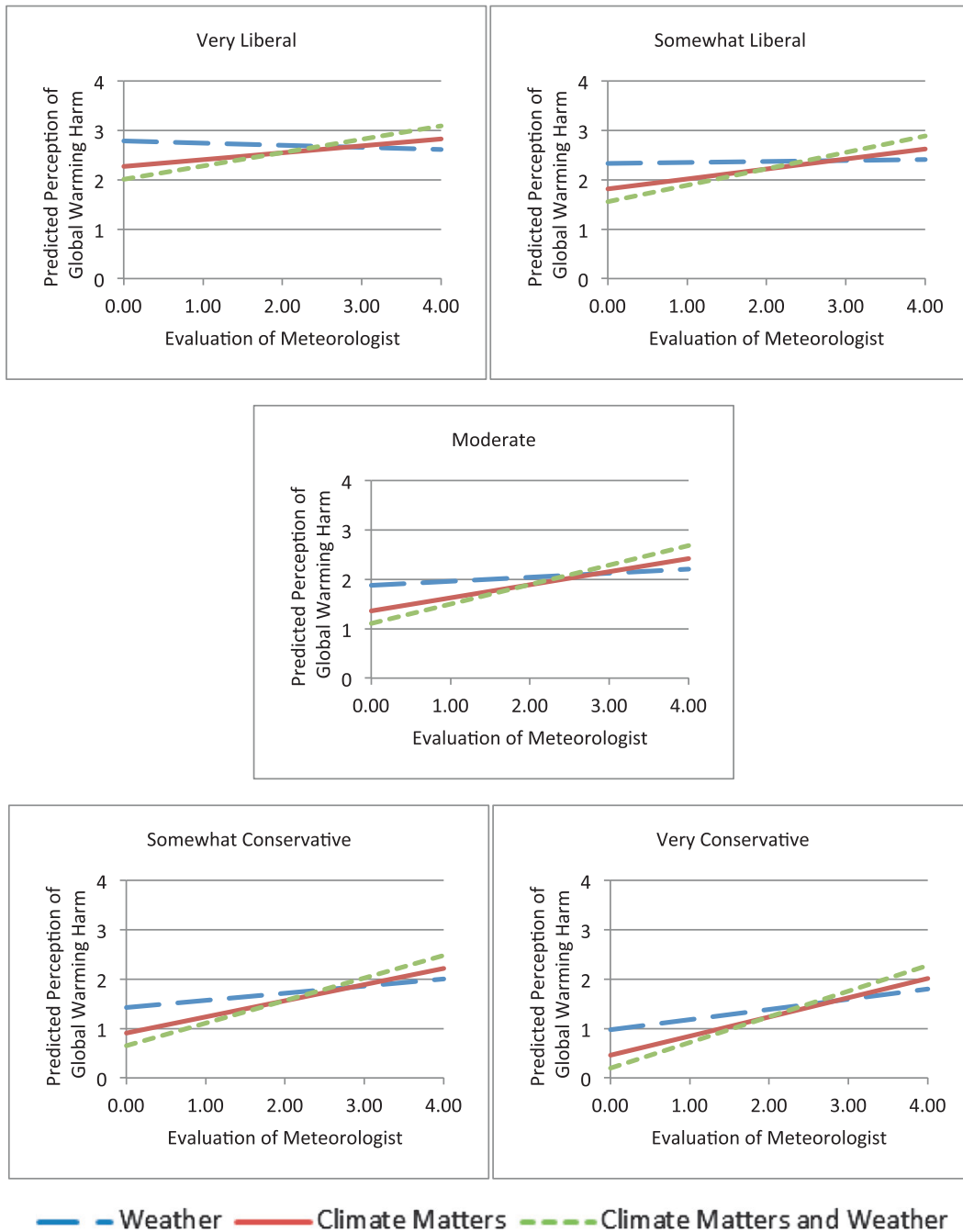


FIG. 1. Effect of evaluation of meteorologist on perception of global warming harm, by political ideology and video condition. Note: Perceptions of global warming harm was centered to make all values positive in an effort to make the graphs more interpretable; 2.05 was added to all scores to render the minimum possible value as zero.

global warming—was not supported, this finding is not surprising considering our additional finding that a positive weathercaster evaluation plays an important role in moderating the effect of the educational information. Many of the participants in the current study—specifically, all of the participants from Greenville, and any from

Columbia who are not regular viewers of the station that airs the Climate Matters segments—had no prior basis to hold positive evaluations of the weathercaster featured in the videos. The prior *in vivo* evaluation of Climate Matters did show a learning effect, presumably because Climate Matters viewers did have considerable



TABLE 3. Effect of evaluation on global warming harm at different levels of political ideology and by video.

	Unstandardized coefficient for meteorologist evaluation		
	Weather condition	Climate Matters condition	Climate Matters + Weather condition
Very liberal	-0.04	0.14	0.27 <sup>a</sup>
Somewhat liberal	0.02	0.20 <sup>a</sup>	0.33 <sup>b</sup>
Moderate	0.08	0.27 <sup>b</sup>	0.40 <sup>b</sup>
Somewhat conservative	0.14 <sup>c</sup>	0.33 <sup>b</sup>	0.46 <sup>b</sup>
Very conservative	0.21 <sup>c</sup>	0.39 <sup>b</sup>	0.52 <sup>b</sup>

<sup>a</sup>  $p < 0.01$ .

<sup>b</sup>  $p < 0.001$ .

<sup>c</sup>  $p < 0.05$ .

prior basis to have a positive evaluation of the weathercaster featured in Climate Matters—because they seek him out (on average several nights per week) to learn about tomorrow's weather. Our experiment shows that those same positive evaluations—whether developed over time by those experimental participants who regularly watch the meteorologist or by those who formed an immediate positive evaluation—lead people to accept climate change messages in the weathercast. The rapport meteorologists establish with their viewers goes a long way toward effectively utilizing the local TV weathercast as a venue for climate change education.

An alternative explanation is that prior global warming beliefs influence how people perceive the meteorologist, and thus the video. For instance, if viewers already believed global warming is harmful and saw the meteorologist present a video about climate change, then they would tend to develop positive evaluations of the meteorologist. Conversely, if they already believed global warming is not harmful and saw the meteorologist present a video about global warming, then they would tend to develop negative evaluations about the meteorologist. Our results, however, do not provide evidence that those who viewed the Climate Matters videos formed different evaluations of the meteorologist based on their political ideology—a rough proxy for prior global warming beliefs [setwise  $\Delta F(2, 733) = 2.17, p = .12$ ]. Furthermore, we tested whether the interactive effects of evaluation and ideology on global warming risk perceptions depend on recognition—that is, we examined whether the patterns we observe differ among those who recognized versus those who did not recognize the meteorologist. There was no evidence of interactions with recognition [(Recognition)(Evaluation) (\*Ideology),  $p = 0.84$ ], indicating results consistent with our reported model. These null findings give increased confidence that the results we report are not dependent on prior recognition or evaluation of the meteorologist.

Although our study was conducted on the Internet, we can assume that these findings would likely be replicated in a more traditional television environment. One of the main differences between watching a video on television versus online is the social conversations that happen alongside a video online. Our experiment presented the video on its own web page not surrounded by other hyperlinks, text, or social media feeds. Therefore, it was similar to how people view videos on television.

Our findings provide particularly interesting evidence regarding the use of weathercasts as a tool for educating politically conservative viewers about climate change. When conservative viewers evaluate the meteorologist highly, they respond well to climate change information in the weathercast. Of course, our findings suggest the converse is also true. Highly conservative viewers who hold negative evaluations of the meteorologist are less likely to form science-based beliefs about global warming. Furthermore, the effect among conservative viewers who have positive evaluations of the meteorologist on developing science-based beliefs was not as strong as the effect among conservative viewers who hold negative evaluations of the meteorologist. Thus, weathercasts containing climate change information can have a boomerang effect, reinforcing nonscience-based beliefs among those who do not evaluate the meteorologist highly. This is bolstered by the tendency of individuals to employ confirmation bias, in which people seek out evidence that is partial to their existing beliefs, when they select information sources (Nickerson 1998). This poses a potential challenge in using television weathercasts as a source for communicating about climate change. However, conservatives who already like a meteorologist are likely to be on and stay on a channel that the features that meteorologist. Those meteorologists with an established rapport can be effective climate educators, particularly for those who have not yet made up their minds about climate change.

A curious finding is that highly conservative viewers who liked the weathercaster were more likely to say

global warming is harmful after seeing the Weather-only video. It may be that for people who hold highly skeptical views of global warming—as is often the case for highly conservative individuals—the combination of likable weathercaster and the prospect of a continued heat wave may trigger more accepting than usual thoughts about global warming.

In summary, although our hypothesis was not confirmed, we conclude that weathercaster-delivered climate change education can have positive, albeit nuanced, effects on viewing audiences. Weathercasters who are liked appear to have the most potential as climate educators. Given that actual television-viewing audiences tend to watch the news team—including the meteorologist—they like the best, the meteorologist would therefore appear to hold considerable potential as a climate educator.

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