

Comparing effects of comedic and authoritative video presentations on student knowledge and attitudes about climate change

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Abstract: Given the diverse array of media sources available to students today, it stands to reason that some media outlets would be of greater quality than others when communicating particular subjects to students. But what constitutes effectiveness among the many choices in information sourcing might not be easily intuited. For example, previous findings have shown viewers of comedy “news” shows (the type of news show most frequently watched by younger viewers) to be better informed on some issues than viewers of other “news” outlets such as Fox News, CNN, or MSNBC. As students encounter them on their own, and as instructors often introduce topics using clips from current popular programs, we sought to compare the effects of two different sets of videos, one comedic and one authoritative scientific, on students' knowledge of and attitudes towards climate change as well as how the two sets of videos were received by students. Surprisingly, we found no difference in effects on students' knowledge of or attitudes towards climate change. We did find however, that students generally felt that the authoritative videos were more likely to influence the way someone might vote, and that liberal students felt both videos were slightly more likely to influence voting than conservative students. We also note a disjunction between self-reported understanding of climate science and actual knowledge thereof, and we make suggestions for future studies on media related to climate change and for climate change educators.

INTRODUCTION

Students in the digital age have access to a greater variety of media sources than ever before (Althaus & Tewksbury, 2000), and the rise of the smart phone and other mobile devices means news is available anytime and anywhere (Chan-Olmsted et al., 2013). Prior research has shown that different media sources align more strongly with the views of the scientific community than others. For example, a comparison of climate change news coverage across several countries found that in some countries, including the United States, a false pluralism emerges in the narrative surrounding climate change, implying that there is a debate about its factual nature; in other countries, though, coverage mirrors the views of the scientific community more closely (Dispensa & Brulle, 2003). Media literacy has also been suggested as a possible key factor in shifting attitudes towards global climate change (Cooper, 2011).

A 2012 Pew Research Center report showed that digital news media have surpassed newspapers and magazines, with television still the leading source nationwide. Among younger Americans, though,

many do not consume news at all, and the sources most likely to reach them are news comedy programs such as *The Daily Show* and *The Colbert Report* (Kohut et al., 2012). This fact may seem lamentable if it were not for the curious findings that viewers of such comedy shows have been shown to be better informed on certain issues than viewers of other news outlets. For example, a study of public knowledge of proposed Net-neutrality rules found that viewers of *The Daily Show*, *The Colbert Report*, and *Last Week Tonight* with John Oliver were better informed than any other viewership to which they were compared, including Fox News, CNN, and MSNBC (University of Delaware Center for Political Communication, 2014). It has also been found that *The Colbert Report*, a comedy news show in which the host satirically plays the role of a conservative newscaster lampooning actual conservative hosts such as Bill O'Reilly, did a better job of communicating about campaign finance than any other outlet, again including Fox News, CNN, and MSNBC (Hardy et al., 2014). It is important to note that viewers of *The Daily Show* and *The Colbert Report* are upwards of 80% moderates and liberals (Kohut et al., 2012), and

that conservative viewers of *The Colbert Report* are likely to view the satire as a sort of double-bluff, in which the host is only pretending to joke about the issues (LaMarre et al., 2009).

Global climate change (GCC) is a highly politicized scientific issue (McCright, 2010; McCright & Dunlap, 2011b), with conservative white males being the most likely demographic group to deny anthropogenic GCC (McCright & Dunlap, 2011a). This trend in politicization has been noted in national surveys in the United States for decades (Leiserowitz et al., 2012). Despite the purported desire of most Americans for unbiased news sources (Kohut et al., 2012), there is still large reliance on partisan media, which likely contributes to the widening gap in GCC opinions. The proposed mechanism by which this may occur is that consumption of conservative-leaning media tends to decrease trust in scientists while consumption of liberal media is associated with an increased confidence in scientific consensus (Hmielowski et al., 2014). However, whether this difference rests in the media coverage or the viewers themselves is unclear. What is clear is that representing climate science as controversial has measurable effects on media consumers' certainty about GCC (Corbett & Durfee, 2004). In terms of science communication, Kahan advises that climate communication should rely on evidence above all else (Kahan, 2013).

Given Kahan's suggestion that GCC communication should be evidence based (Kahan, 2013), the fact that most young Americans get their news from comedy shows (Kohut et al., 2012), and that viewers of comedy shows have been shown to be better informed about some issues such as net neutrality (University of Delaware Center for Political Communication, 2014) and campaign finance (Hardy et al., 2014), we wondered whether authoritative, nonpartisan, fact-laden educational documentaries on climate change are more effective or are perceived differently than comedic/satirical news stories on climate change in terms of how compelling students find the pieces, whether attitudes shift, and how knowledge of climate change science is influenced.

METHODS

We set out to compare how two different sets of videos concerning climate change might influence students' thinking about climate change after showing the videos in separate sections of a large, mixed-majors introductory biology class in a large, private university in the northeastern United States. The set of videos shown to one class section comprised authoritative, fact-laden, educational films from the Intergovernmental Panel on Climate Change (IPCC). The other class section was shown satirical, comedic videos instead of the IPCC films. These comedy videos featured humorous commentary on

science, news, and policy related to climate change by Jon Stewart, Stephen Colbert, and John Oliver (Comedy). This course is quite broad in its scope, and does not focus on climate change beyond a basic introduction to the greenhouse effect, global carbon cycling, and the correlation between global temperature rise and the rise in atmospheric concentrations of greenhouse gasses. The videos were shown to the students prior to any coverage of climate change in the curriculum, and all students received the same instruction in class aside from the different videos they were shown during one class session.

The IPCC-produced videos can be found at http://www.ipcc.ch/news_and_events/multimedia.shtml, and the specific videos shown were titled "Climate Change 2013: The Physical Science Basis" and "In Harm's Way." The videos were shown in the order listed above. The first is a video summary of the Working Group I section of the IPCC's Fifth Assessment Report (AR5, IPCC, 2013). The second is a video summary of the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX, IPCC, 2012). Both videos include narration by, and interviews with, actual contributors to the respective reports as well as imagery associated with climate change effects and also display text communicating facts about climate change.

The comedy videos consisted of three segments from popular satirical or parody news shows. The first was a clip from *The Daily Show* with Jon Stewart titled "Burn Noticed", which aired on September 22, 2014 and focused mainly on interactions between presidential science adviser Dr. John Holdren and various members of the US House of Representatives Committee on Science Space and Technology (<http://thedailyshow.cc.com/videos/8q3nmm/burn-noticed>). The second was a *Colbert Report* piece called "The Republicans' Inspiring Climate Change Message" which aired on November 6, 2014 mainly addressing the popular republican tactic of responding to questions or statements pertaining to climate change with some variant of "I am not a scientist" (<http://www.cc.com/video-clips/sc6mpp/the-colbert-report-the-republicans--inspiring-climate-change-message>). The third comedy video was from *Last Week Tonight* with John Oliver in which the host staged a "statistically representative climate change debate" pitting popular science author and former children's science show host Bill Nye along with 96 climate scientists as representatives of the scientific consensus on climate change against three climate change deniers in order to illustrate the extreme minority who hold this fringe position. (<https://www.youtube.com/watch?v=cjuGCJJUGsg>). The segments from *The Daily Show* and *The Colbert*

Report were shown as they appeared on TV, with the exception of skipping directly to the beginning of the segment in the lengthier *Daily Show* video clip. Volume on the multimedia system was briefly muted during the video from *Last Week Tonight* in order to censor an expletive.

All data were collected according to an IRB-approved protocol, and participation was voluntary. The videos were shown to two separate sections of a large introductory biology class, one viewing the IPCC videos and the other viewing the comedy clips. Students were then asked to respond to questions about their perceptions of the videos' effectiveness using individual response devices (commonly known as "clickers"). See Appendix 1 for the full list of questions asked in the lecture. Students who did not attend these lecture sections and did not see the videos served as a group for comparison, as long as they reported not having seen the videos at another time (we will refer to this group as "Control," though the only variable controlled for is whether or not the students had viewed the videos).

Outside of class, a measure of knowledge of the science of human-induced climate change (HICCK, Lombardi et al., 2013) was administered before and after the intervention, as were survey questions assessing students' opinions about GCC and recording demographic information (Carter & Wiles, 2014). For control purposes, additional questions in the post-intervention surveys were asked to ascertain whether students had previously viewed the videos in another context. Asking students whether they had previously viewed the videos also allows the exploration of whether these students align with particular demographic or attitudinal categories, and whether these factors may influence those students who had not seen the videos. All pre-post surveys were administered online using course management software (Blackboard) as described in Carter and Wiles (2014). Each of the two groups (IPCC and Comedy) were compared to the control (Control) in terms of various items generated through pre/post surveys: their gains in knowledge about GCC, changing opinions about GCC, and thoughts about how scientists view GCC. We also examined how various demographics—especially political leanings—correlate with these results. Pre- and post-viewing numeric responses were compared using paired t-tests, while differences among groups were analyzed using box plots and chi-squared tests for quantitative and categorical variables, respectively. Correlation tests and analysis of variance tests were used to assess relationships between quantitative variables from the same time points. The sample consists of a mixed majors introductory biology class at a medium-sized private university in the northeast. The demographic breakdown is similar to that described in Carter and Wiles (2014). For this study, respondents are grouped as follows: Total N = 649,

Comedy N = 288, IPCC N = 250, and Control N = 111. In this study, liberal-identifying students outnumber conservative-identifying students 2:1, with N=411 of the former, and N=199 of the later. Historically, this population is largely accepting that climate change is occurring, so we focus on the importance of the issue of climate change as our main indicator of attitudes towards climate change as in Carter and Wiles (2014).

RESULTS

Results were not appreciably different if students who had seen the videos before were excluded from analysis, so they were included in the appropriate experimental groups and the full dataset used for analyses. Despite our expectations about differential effects between IPCC and Comedy videos, little difference was observed. No group was significantly more or less likely to change their opinion about climate change. None of the three groups (IPCC, Comedy, Control) differed significantly pre- to post-treatment in terms of how well they claimed to understand climate change as a notched box plot showed no significant difference in group median values. For the full dataset with all groups together, a paired t-test shows $p = 0.0639$, mean of differences = -0.0574 , and though there was a significant difference pre- to post-intervention in personal importance of climate change ($p = 0.0166$), the average difference was very small between groups.

Confoundingly, we measured a slight but significant decrease in actual understanding of climate change science for each group. For the Control group $p = 0.00116$ and mean of differences = -3.539 ; the IPCC group had $p < 0.001$, and mean of difference = -3.667 , and the Comedy group $p < 0.001$ and mean of differences = -4.69 . Pre-post differences were nearly identical when comparing students who identified as liberal versus conservative. Climate science knowledge significantly decreased pre- to post-intervention for both liberals ($p < 0.001$, mean of differences = -3.978) and conservatives ($p < 0.001$, mean of differences = -4.372).

There was a significant difference between the Comedy and IPCC groups in how influential students thought the video could be on the way a person votes, with the authoritative videos from the IPCC perceived to be more influential. A Welch two sample t-test indicates a significant difference in the means ($t = 3.975$, $p < 0.0001$). This difference is shown in Figure 1. Since whether the video might influence how a person might vote was asked in class immediately following the video, there are no data to compare with the Control group. Students perceived both video sets to be equally influential in terms of how they may change people's attitudes or the way people might vote on issues related to GCC. However, liberal students on average thought both video sets would be more influential than their

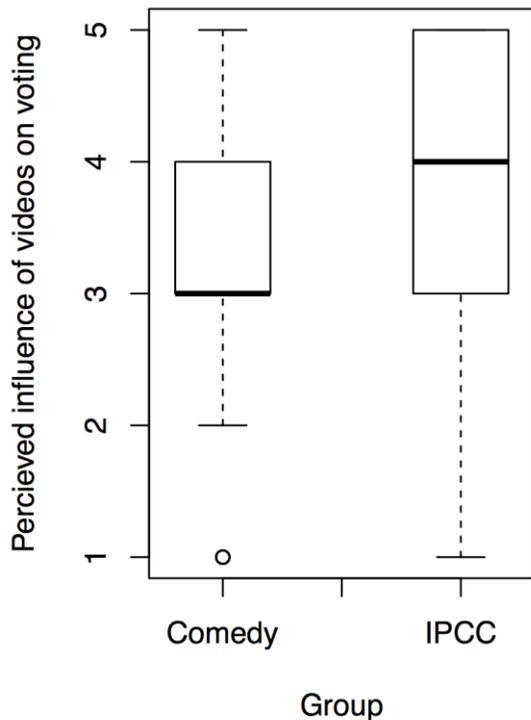


Figure 1: The relationship between which videos were viewed and response to the question “Do you feel these videos might influence the way someone might vote?” 3 corresponds to “Maybe,” and 4 corresponds to “Probably.” The bottom, middle, and top of the box represent the first, second, and third quartile, respectively, while the whiskers represent the minimum and maximum values within 1.5 times the interquartile range. Outliers are represented as individual points.

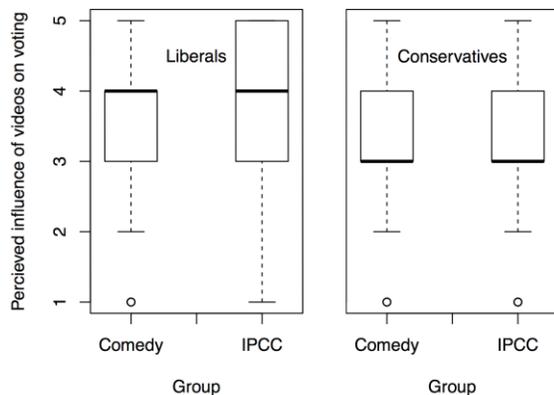


Figure 2: The relationship between which videos were viewed and response to the question “Do you feel these videos might influence the way someone might vote?” broken down by political views held by respondents. 3 corresponds to “Maybe,” and 4 corresponds to “Probably.” The top, middle, and bottom of the box represent the first, second, and third quartile, respectively, while the whiskers represent the minimum and maximum values within 1.5 times the interquartile range. Outliers are represented as individual points.

conservative counterparts did. This difference is demonstrated in Figure 2.

A separate interesting outcome of the analysis of these data is that the correlation between pre-intervention, self-reported understanding of climate change and actual measured understanding of climate change science, while positive and significant (r of 0.151, $p < 0.001$), is weaker than expected. This trend is shown in Figure 3. The post-intervention correlation increased ($r = 0.199$, $p < 0.001$), but was still not at all strong. Results differed somewhat for the IPCC group, which had a larger increase, but lower p -values (pre-intervention $r = 0.167$, $p = 0.0103$, post-intervention $r = 0.25$, $p < 0.001$). The correlation between self-reported and measured understandings of climate change were greater post-intervention for the IPCC group than either of the other groups, although only 6.25% of the variance in self-reported understanding is explained by measured understanding.

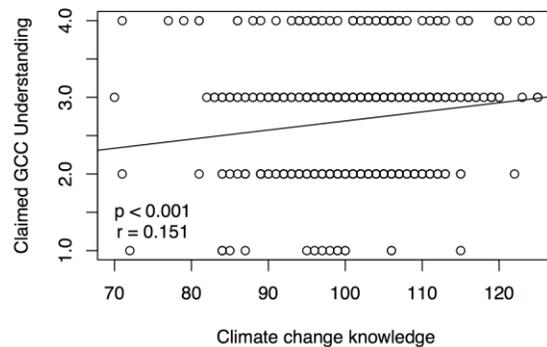


Figure 3: The pre-intervention relationship between climate change knowledge (as measured by individual scores on the HICCK instrument) and claimed climate change understanding (response to the question, “How well would you say you understand climate change?” 1 = Not at all, 2 = A little, 3 = Fairly well, 4 = Very well).

DISCUSSION

Although viewers of comedy news shows have been shown to be more knowledgeable about other issues than those who obtain their news from traditional outlets (Hardy et al., 2014; University of Delaware Center for Political Communication, 2014), our results did not support the notion that such comedic news stories are any more informative or more likely to sway opinion than authoritative educational videos focusing on serious communication of facts. Encouragingly, this study also found little evidence for politicization of climate change in that there was no statistical difference between liberal- and conservative-identifying students in terms of how important they felt the issue of climate change was for them. This finding differs

from previous findings related to a more general population in the United States (McCright, 2010; McCright & Dunlap, 2011a; McCright & Dunlap, 2011b, Leiserowitz et al., 2012) as well as findings of a study with a very similar population of students (Carter and Wiles, 2014). This intriguing result may be indicative of a growing disconnect between younger and older conservatives on the issue of climate change.

We did find some support for the effectiveness of scientifically authoritative videos, at least in terms of how influential the content is perceived to be on how someone might vote, lending some evidential support to Kahan et al. (2011), who have claimed that cultural cognition heavily influences opinion. In this case, the authoritative videos presented the work of real scientists and presented climate change as an environmental crisis while the comedic videos were largely dismissive of those who oppose the climate consensus. There was no such evidence for Leiserowitz's assertion that focus on the scientific consensus on climate change is an effective strategy (van der Linden et al., 2015), although our study was not designed to test this assertion and only a portion of the comedic videos, John Oliver's "statistically representative climate change debate", directly concerned the climate consensus. No data were collected which might support or refute the hypothesis that cultural cognition shapes how people receive information on the climate change consensus such that information about the consensus may not be helpful in swaying opinion (Kahan et al., 2011).

Future studies should incorporate an overall measure of media literacy in order to explore the role it may play in student knowledge and attitudes, per Cooper (2011), and whether interventions might differentially affect media literacy for students of different worldviews given issues with the "backfire effect" as described by Cook and Lewandowsky (2011), discussed below. Moreover, a study in which students receive more explicit climate change instruction in addition to the video interventions, might have different results both in terms of treatment groups, since adding more background material could lead to increased effectiveness for the more popular comedic videos whereas the authoritative videos may be less effective since students may already have learned much of the presented material. Further, there could be differential effects in terms of political leanings of students, since interaction effects between (self-reported) knowledge of climate change and political leanings have been observed in a previous study (Hamilton, 2011). Additional study is also warranted in order to focus more precisely on the effectiveness of instruction about the scientific consensus on climate change specifically. First, it should be determined whether instruction is more effective when it focuses on the consensus, and in the case that

it isn't, it should be determined whether the lack of effectiveness might be due to barriers that result from cultural cognition. Additional studies could also pursue the question of whether liberal and conservative climate change media coverage does indeed affect viewers' trust in the science differently as has been suggested (Hmielowski et al., 2014).

In terms of their opinions about media on GCC that affirm its veracity and anthropogenic causation, and how such media might change people's minds, it is of interest that liberal students viewed both the comedic and the authoritative videos to be potentially more influential than their conservative-leaning cohorts. It may be that pro-GCC media of any stripe amounts to "preaching to the choir" among liberal students while conservative students experience what Cook and Lewandowsky (2011) describe as the backfire effect, whereby "for those who are strongly fixed in their views, being confronted with counter-arguments can cause their views to be strengthened." (p. 4) Perhaps conservative students perceived that both the comedic and the educational films to be unfairly biased against their viewpoint, and in the case of the comedy, even making fun of their ideas. Or, in the case of the clip from *The Colbert Report*, the conservative students took the host's satirical deadpan at face value. This is the sort of scenario described by LaMarre, Landreville, & Beam (2009) whereby conservatives viewing Colbert's mock-conservative comedy later forget that it was a joke and use what was intended as jest to support their prior thinking. This propensity to "see what you want to see in *The Colbert Report*" (LaMarre et al., 2009, p. 212) makes the use of such complex satire in educational settings particularly difficult.

Instructors may be tempted to use clips from popular comedy shows due to their impressions that students may find them engaging. However, our findings lead us to suggest that educators should not devalue authoritative scientific media as too boring or inaccessible to students. Nothing in our experience, including survey questions asked about how interesting the videos perceived to be and personal communication with individual students, indicates that the students felt that the authoritative videos were any less interesting or accessible, and unlike the comedic videos, very few had seen the IPCC-produced videos before. Nature of science conceptions have been shown to have positive effects on acceptance of scientific ideas (Carter and Wiles, 2014), and explicit instruction on the nature of science, specifically the role of evidence in supporting ideas, may be a helpful approach for maximizing the effectiveness of evidence-based instruction by helping students to think like scientists. The fact that the correlation between self-reported and measured climate change knowledge increased over time is heartening, and that correlation could perhaps be further strengthened by assessments. If

students are afforded more opportunities to disentangle what they actually know from what they think they know about climate change, this correlation is bound to increase.

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APPENDIX 1: QUESTIONS ASKED DURING LECTURE.

Asked before the videos were viewed:

1. How well would you say you understand climate change science?
 - A. Extremely well
 - B. Very well
 - C. Moderately well
 - D. Not very well
 - E. Not at all
2. How important is it to you for policy makers (senators, congress, the president, etc.) to know about climate change science?
 - A. Extremely important
 - B. Very important
 - C. Moderately important
 - D. Not very important
 - E. Not important at all
3. If a politician did not agree that climate change was happening or thought that we don't need to do anything about it...
 - A. I would not vote for that person.
 - B. I would not agree on this issue, but might vote for them depending on how they felt about other issues.
 - C. This issue would not make a difference in how I would vote.
 - D. I would agree with them on this issue, but I might not vote for them depending on how they felt about other issues.
 - E. I would vote for that person.
4. If a politician claimed no opinion on climate change saying "I am not a scientist."...
 - A. I would not vote for that person.
 - B. I would not agree on this issue, but might vote for them depending on how they felt about other issues.
 - C. This issue would not make a difference in how I would vote.
 - D. I would agree with them on this issue, but I might not vote for them depending on how they felt about other issues.
 - E. I would vote for that person.

Asked after videos were viewed:

1. Do you think these videos helped you understand climate change better?
 - A. Yes. A lot.
 - B. Yes. But I already knew some of that.
 - C. Not much. I already knew most of that.
 - D. No.
2. How well would you say you understand climate change science?
 - A. Extremely well
 - B. Very well
 - C. Moderately well
 - D. Not very well
 - E. Not at all
3. How important is it to you for policy makers (senators, congress, the president, etc.) to know about climate change science?
 - A. Extremely important
 - B. Very important
 - C. Moderately important
 - D. Not very important
 - E. Not important at all
4. If a politician did not agree that climate change was happening or thought that we don't need to do anything about it...
 - A. I would not vote for that person.
 - B. I would not agree on this issue, but might vote for them depending on how they felt about other issues.
 - C. This issue would not make a difference in how I would vote.
 - D. I would agree with them on this issue, but I might not vote for them depending on how they felt about other issues.
 - E. I would vote for that person.

5. If a politician claimed no opinion on climate change saying “I am not a scientist.”...
 - A. I would not vote for that person.
 - B. I would not agree on this issue, but might vote for them depending on how they felt about other issues.
 - C. This issue would not make a difference in how I would vote.
 - D. I would agree with them on this issue, but I might not vote for them depending on how they felt about other issues.
 - E. I would vote for that person.
6. Do you think these videos would change the way someone might vote?
 - A. Yes. Definitely.
 - B. Probably.
 - C. Maybe.
 - D. Probably not.
 - E. No.