COMMUNICATION & SOCIETY

Bienvenido León
https://orcid.org/0000-0001-8556-9367
bleon@unav.es
Universidad de Navarra

Maxwell T. Boykoff
https://orcid.org/0000-0002-7474-2387
boykoff@colorado.edu
University of Colorado Boulder

Carmen Rodrigo Jordán
https://orcid.org/0000-0001-6122-2887
crodrigo.1@alumni.unav.es
Universidad de Navarra

Submitted
September 25th, 2019
Approved
July 22nd, 2020

Communication & Society
ISSN 0214-0039
E ISSN 2386-7876
doi: 10.15581/003.34.1.57-75
www.communication-society.com

2021 – Vol. 34(1)
pp. 57-75

How to cite this article:
León, B., Boykoff, M. T. & Rodrigo Jordán, C. (2021). Climate change perception among Spanish undergraduates. A reception study on the combination of the local, global, gain and loss frames. *Communication & Society, 34*(1), 57-75.

Climate change perception among Spanish undergraduates. A reception study on the combination of the local, global, gain and loss frames

Abstract

Climate change attitudes and perceptions vary significantly among countries and cultures through a host of factors. Within media content about climate change, framing is one of the most relevant elements. This research interrogated how framing combinations across local-global and gain-loss frames influence attitudes and perceptions about climate change. We examined varying framing approaches through case-study experimentation with university students in Spain (N = 120). Students viewed one of four videos, each one based on a different combination of frames before answering a set of survey questions, with the aim of testing (i) how do the combinations of the local-global and the gain-loss frames affect the perception of the seriousness of climate change and (ii) how do combinations of the four frames affect support for action to address climate change. Results indicate that the participants scored similar values, regarding the seriousness of climate change and the need to take action, regardless of the video they watched. This means that interaction effects and other contextual factors (e.g., previous environmental concerns) may limit efficacy of deliberately introduced frames more than previously considered. These findings help to further deepen and nuance possible explanations for wider discursive interactions that comprise our attitudes and perceptions of climate change.

Keywords

Climate change, Media representation, Media effects, Framing, perception of seriousness, need to take action.

1. Introduction

Clearly, there is no 'correct' framing that solves all climate communications challenges (Whitmarsh & Corner, 2017). Instead, climate change attitudes and perceptions vary significantly among countries and cultures through a host of factors. For instance, surveys show that Latin American and African citizens are more concerned than people in other regions (Pew Research, 2015). In contrast, then Administrator for the United States (US) Environmental Protection Agency –Scott Pruitt– persisted in the first years of the Trump Administration with a stated and influential belief that human behavior is not a 'primary contributor' to climate change (Thomsen, 2018). In the US, this influence has reverberated

over time in public arenas such as committee hearings in the US House, where Representatives Garret Graves and Gary Palmer questioned convergent scientific agreement from relevant expert communities that humans contribute to climate change (Sobczyk, 2019).

Nonetheless, social science research over the past few decades have pointed to a number of pathways where there are creative and hence effective ways to shape these issues in audience- and context-sensitive manners, then maximizing opportunities to influence perceptions on climate change (Boykoff, 2019).

The media play an important role in shaping public perception and attitudes towards climate change. Research indicates that media tend to focus on sensational elements, conflict and debates (e.g., Gans, 1979; Graber, 1997), uncertainty (Zehr, 2000), and the partisan dimensions of the issue (Boykoff & Boykoff, 2007; Lahsen, 2005; McCright & Dunlap, 2003), all of which are likely to give the public the perception that there is no clear scientific knowledge on this topic.

The role of the media in climate change perception has been analyzed from different perspectives. Within media content about climate change, framing is one of the most relevant elements. Framing has been a way to mobilize words, images, sounds and aesthetics to shape other's attitudes, intentions, beliefs and behaviors (Bolsen & Shapiro, 2017). Framing is a mechanism that both consciously and unconsciously privileges certain interpretations and 'ways of knowing' over others, within a larger current of dynamic activities.

This concept refers to the words, images and styles that are used to communicate information to an audience. A 'frame' is "a central organizing idea or story line that provides meaning to an unfolding strip of events, weaving a connection among them" (Gamson & Modigliani, 1989, p. 143). For instance, a frame can suggest what the controversy is about, and what the essence of an issue is. Framing is based upon the evidence that each medium and journalist "frames" the information from a particular perspective and includes his or her own point of view (Gamson, 1989; Entman, 1993; Johnson-Cartee, 2005; Reese *et al.*, 2001). A specific frame can lead to underlining some aspects of the information and expressing the ideas using a specific language.

The way in which a message is emphasized or constructed has an effect on how a receiver interprets the message (Rebich-Hespanha *et al.*, 2015; Shah *et al.*, 2009). Frames allow for the selection and presentation of a particular set of attributes to the audience (Hart, 2010). Framing theory, more broadly, provides an explanation of how media coverage influences public attitudes.

Robert Entman (1993) distinguished between two kinds of frames: media frames (construction and representation of content by the creator) and audience frames (mental maps or schemas of individuals that relate to audience exposure to the content). Framing, thus, enables one to develop a link between new information that an audience receives and the audience's prior knowledge on the issue. When it comes to environmental issues, framing can be an important tool to help gather attention, legitimize and provide a concrete understanding of abstract concepts (Doyle, 2007; Lakoff, 2010; Rebich-Hespanha *et al.*, 2015).

There is substantial existing literature on climate change frames. A number of researchers have developed typologies of frames that address several aspects of climate change representation, mainly in English speaking countries (e.g., Boykoff, 2011; Hulme, 2009; Nisbet, 2009; Olausson, 2009; Shanahan, 2007). Research has also explored the incidence of frames on behavioral intentions (Clawson & Waltenburg, 2009; Jones & Song, 2014), considering variables like open-mindedness (Nisbet *et al.*, 2013) or partisan predispositions (Wiest *et al.*, 2015), the role of emotion and framing in generating climate change advocacy (Naby *et al.*, 2018) and the impact of frames in fostering engagement with climate change action (Romsdahl, 2020).

From a public communication perspective, other researchers state that "climate change itself is a frame" (Rademaekers & Johnson-Sheehan, 2014, p. 12) and propose some guidelines

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

for scientists and communicators like speaking "positively within social frames of progress, science, ethics, truth, problem-solving and adaptation" and avoiding "frames that stress trade-offs, dominion, theory, catastrophe, and costs versus benefits" (Rademaekers & Johnson-Sheehan, 2014, p. 19).

Mike Schäfer and Saffron O'Neill (2017) classify frames on climate change into two different types: "formal-stylistic" and "content-oriented." The first group includes those frames that "focus on the structure or formal presentation of a communicative text instead of on its content" (e.g., "gain" and "loss"). The frames in the second group focus on the content itself (e.g., "consequences, "responsibility" or "conflict").

2. The local-global and the gain-loss frames in climate change perception

Climate change is often represented as a global issue, a geographically and temporally distant challenge (Gifford, 2008; Lorenzoni *et al.*, 2007; Ungar, 2007; Vlek, 2000). In addition, some researchers have investigated visual imagery in the media, in connection with the global-local frames. In general, results indicate that the images that are used to represent climate change tend to be linked to a global frame (DiFrancesco & Young, 2011; León & Erviti, 2015). This generates low perceptions of the severity of the problem, since it is thought that consequences will only be suffered in remote places of the planet and in many years from now (Lorenzoni & Pidgeon, 2006; Nisbet, 2009; Pidgeon, 2012), thus reducing individuals' willingness to act on a personal level or to support policy action for mitigation or adaptation measures (Spence *et al.*, 2012).

Some studies have concluded that the use of local frames can generate positive attitudes and support towards climate change action. Research conducted in the US showed that local frames increase perception of severity of climate change and support for local policy action, although it varies according to political position (Wiest *et al.*, 2015). Feitelson (1991) claimed that the study of place attachment had been neglected in research on human responses to climate change. He argued that fostering voluntary actions for climate change would be possible if we worked toward strengthening place attachments. One way of strengthening global attachment would be through the mass media (Devine-Wright, 2013). Research conducted in the UK demonstrated an increase in concern about climate change and willingness to engage in mitigation when links could be made between local extreme weather events and climate change (Spence *et al.*, 2011). In Canada, research found that local framing and a strong attachment influenced climate change engagement (Scannell & Gifford, 2013).

Recent research focuses on the four dimensions of psychological distance "social, spatial, temporal and certainty of outcome" and suggests that climate change is seen as impacting other people, in distant places, in the future (Devine-Wright, 2013, p. 66; Milfont, 2010). Studies also demonstrate that if people view climate change as happening in less psychologically distant areas, it could make it more tangible and easier to understand, and this would lead to more engagement (Leiserowitz, 2007; Maio & Haddock, 2007; Spence *et al.*, 2012).

However, other empirical assessments have concluded that the use of the local frame does not always favor positive attitudes. For instance, Spence and Pidgeon (2010) experimentally tested how framing climate change impacts as local vs. global would influence engagement in the UK. Results indicate that neither of the framings affected public attitudes toward mitigation. Other studies have also concluded that local frames do not always increase concern about climate change or support for policy action (e.g., Brulle *et al.*, 2012). This could be the result of "an optimism bias about local conditions" which reduces perceptions about the importance of climate change whereas distant frames depict problems far removed for action (Scannell & Gifford, 2013, p. 65).

On the other hand, climate change is often represented in the media in terms of potential damages or losses to ecosystems or human health (e.g., Hulme, 2009). But this may not be the

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

most effective way to communicate climate change. Particularly, within the field of health psychology, research has compared effectiveness of information frames that focus on positive (gain frame) and negative consequences (loss frame) that arise from specific behaviors. The concept of loss aversion is relevant wherein individuals are seen to dislike losses as compared to equivalent gains (Kahneman & Tversky, 1979). Negative information may influence decision-making more strongly than positive. There may be other factors that play a role when framing gain-loss outcomes such as the behavior being studied, or the relationship between the individual and the behavior. For example, loss frames may be more effective to change a behavior that is risky, while gain frames are more effective with behaviors that may be considered to be safe.

From a similar perspective, prospect theory proposes that "people are less inclined to take risks when considering gains, because the perceived subjective value of gains is fairly low whilst people will take risks to avoid losses, because the subjective value of losses is relatively high" (Spence & Pidgeon, 2010, p. 658). Research indicates that an emphasis on the gains from avoiding climate change leads to more positive attitudes towards climate change mitigation and increases perceived severity of impacts (Spence & Pidgeon, 2010). Furthermore, a positive frame increases intentions to reduce environmental impacts (Morton *et al.*, 2011), contrary to frames that emphasize personal sacrifices that are needed for reducing climate change effects (Gifford & Comeau, 2011). From a psychological research perspective, highlighting "the tangible gains associated with immediate action" is a suggested practice for policymakers, in order to improve public engagement with the issue (van der Linden *et al.*, 2015, p. 761). Feinberg and Willer (2011) conducted studies with undergraduate students in the US, in order to examine whether less dire messaging (negative frame) could be more effective in communicating climate change. They found that dire messages increased skepticism and the positive message decreased skepticism. Morton *et al.* (2011) focused on framing and uncertainty. They conducted two studies in the UK that showed that when higher uncertainty is combined with a negative frame highlighting possible losses, then individual intentions to undertake pro-environmental behavior tend to decrease. If higher uncertainty is combined with positive frames highlighting losses that may not occur, then intentions for pro-environmental behavior tend to become stronger.

These studies have given support to those who challenge the frequent use of sacrifice-oriented message frames for climate change communication (Nordhaus & Shellenberger, 2007). A shift of discourse toward a motivation-oriented approach involving "solutions, values, and visions" may be more effective (Gifford & Comeau, 2011, p. 1302). Gifford and Comeau (2011) examined the effect of motivational and sacrifice message framing on perceptions of climate change engagement and competence behavioral intentions for mitigation in a Canadian community and found that motivation-oriented frames were more valuable to promote climate engagement.

However, other researchers have obtained ambivalent results. O'Neill and Nicholson-Cole (2009) conducted two empirical studies in the UK to examine the role of visual and iconic representations in influencing public engagement with climate change. Their results indicate that negatively framed climate change representations that are "dramatic, sensational, fearful, shocking" can capture individual attention but disengage the individual through feelings of helplessness (p. 375). Their findings suggest that dramatic representations must be paired with positive framings establishing local relevance of impacts. In another study, Wiest *et al.* (2015) found that a discussion of potential benefits of climate change may make individuals less likely to perceive a threat from this process. In addition, it does not have a measurable effect on behavioral intention and weakens support for policy action in Democrats (p. 197).

In sum, research shows that the effects of the local-global and gain-loss frames in climate change perception can vary significantly, depending on the specific approach that is taken.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

We argue that the perceived effects of the four combinations of these two frames can provide evidence that may help to reach a better understanding of these complex perception processes.

3. Climate change perception and framing in Spain

Our research sought to provide empirical evidence on how different frames affect climate change perception in Spain, a country where no significant reception study on this specific topic has been conducted yet.

National surveys over time have indicated that over 90% of the Spanish citizens take up the perspective that climate change is happening (European Commission, 2017). Conversely, only about 8% have attributed climate change exclusively to natural causes. Over time, connected worries –especially economic issues– seem to have attenuated concern about climate change. The consideration of climate change as a top problem almost disappears when the question is circumscribed to the national or the local levels: only 0.2% mentions climate change as a top problem for Spain and 0.3% consider climate change to be a top problem for their own town.

Regarding the relevance that Spanish young people attribute to climate change, surveys show ambivalent results. According to Meira *et al.* (2013, p. 42), people from 18 to 24 attribute more relevance to climate change than people of 65 and over. In fact, more young people than citizens in other age groups consider that the threat of climate change is undervalued (Meira *et al.*, 2013, p. 42). However, a more recent survey indicates that the perception of seriousness that Spanish young people attribute to climate change is 5% lower than the average for all age groups (Negredo, 2020).

Another study conducted among Spanish undergraduate students indicate that most of them agree that climate change is caused by human activities, although they are not aware of the high level of existing scientific consensus (Meira *et al.*, 2014). In addition, they consider themselves to be insufficiently educated about environmental issues, although the majority (85.3%) follows basic environmentally-friendly actions, such as using low-consumption bulbs (Fundación Endesa, 2017).

In some fundamental ways, these are logical contradictions amid what has been called 'the ultimate collective action problem' (Smith, 2009). For most citizens, doing something about anthropogenic climate change usually just is not a great priority. Climate change is often perceived as a diffuse issue or distant and long-term threat (Boykoff, 2011). While we all are implicated to varying degrees as contributors of greenhouse gas emissions –through household activities, engagement in industrial activities through consumption, transport– those who perceive themselves as experiencing concentrated impacts from climate change are much fewer. So, despite concern expressed by relevant expert researchers of climate change, more immediate issues –such as job security, health and the economy– often take on greater importance in many people's everyday lives (Lorenzoni & Pidgeon, 2006). Sheldon Ungar has also appropriately cautioned, "the public could very well be concerned but relatively ill informed" (2000, p. 309).

As far as framing is concerned, research indicates that, in Spain, climate change is often framed as a political issue (Blanco *et al.*, 2013; Teso *et al.*, 2013). However, in Spain, political orientation plays merely a small part in climate change perception (Meira *et al.*, 2013). Climate change is also frequently framed as a scientific or social issue (Lozano Ascencio, 2013); a relatively remote phenomenon (León, 2014; Noguera, 2013); a controversial process (Teso *et al.*, 2013); or a mix of "disasters, dangers and fears" (Aguila Coghlan, 2013).

According to Heras (2008), climate change communication in Spain has traditionally had four biases: industrial (presenting industries as responsible of gases emissions); geophysical (focused on climate change consequences, such as ice melting or temperature raising); geographical (informing about consequences over a place, normally a distant one); and

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

technological (technology presented as a solution against climate change). Those four biases responded to their typical imagery, which were, respectively: smokestacks, polar bears, Polar Regions and renewable energies plants. Another Spanish study analyzing climate change coverage on TV news released in periods when a climate summit or a catastrophe were not in the agenda, identified four main frames: scientific, social, political or technical and administrative. The first two were prominent, pointing out scientific research or public engagement and social issues as principal interests in the news (Lozano Ascencio, 2013).

In Spain, climate change is often linked to remote places. Only 35% of climate change stories published by the main national newspapers, and 23.3% of the stories in the main national television news programmes are situated in Spain. The "global" undefined scenario is frequent (35.6% of TV stories, 26.0% of newspaper stories), and a significant share of the news is situated in America, Arctic, Antarctic and other regions that Spanish citizens can regard as "remote" (Noguera, 2013, p. 59). A research on the visual representation of climate change in Spanish TV news, indicates that images of remote places, like climate summits or ice melting in the Poles, are very frequent. Furthermore, when the causes of climate change are represented, smokestacks are the most frequent image (León & Erviti, 2015).

In summary, in the Spanish context, climate change is commonly represented through a varied set of frames. This provides an appropriate research field to explore the connection between the combination of several frames and climate change perception, since there is no clear dominant representation pattern. The ambivalent position of many young people in Spain –they agree climate change exists, but many are not aware of the relevance of the problem– provides a good opportunity to explore the effect of framing on a part of this demographic group.

4. Research aim and methodology

With this temporal and spatial context in mind, our research examined how combination of framing devices influenced attitudes and perceptions among a segment of the Spanish public citizenry. To do this, we deployed combinations of local-global and gain-loss frames influence stated climate change perception among Spanish undergraduate students.

4.1. *Research design*

Our research was designed building upon previous empirical research about climate change framing. In particular, we followed a similar approach to that of Wiest and colleagues (2015), although instead of testing the incidence of partisan predisposition in the effect of the different frames, we tested the incidence of the different frame combinations in climate change perception of seriousness. In addition, our research was conducted in a different geographical, cultural context and focused on a specific age group. Our research was designed as a quasi-experiment (Campbell & Stanley, 1995).

We investigated the following research questions:

Q1. How do combinations of the local-global and the gain-loss frames affect the perception of the seriousness of climate change?

Q2. How do combinations of the local-global and the gain-loss frames affect support for action to address climate change?

Based on the previous literature review, we formulated three hypotheses:

H1. Global frames will be associated with higher perception of the seriousness of climate change for the planet, while local frames would increase the perception of seriousness for Spain.

H2. Local frames will be associated with higher support for action to address climate change.

H3. Framing will have a higher impact among those viewers with a low environmental concern.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

4.2. *Methods*

Our research was conducted at the University of Navarra (Pamplona, Spain). Following a public announcement among undergraduate students, via email, we randomly selected a sample of 120 students (62.5% females, 37.5 males), from 18 to 23 years old, participated. No remuneration was given to the participants. There was no control group but a random assignment to the treatments of the four combinations of the two variables.

A preliminary test of 32 responses (8 for each video) was conducted, in order to find possible mistakes or difficulties in understanding the questions. However, this did not lead to any significant change in the study protocol or the questionnaire. Therefore, the pre-test coincides with the post-test.

The 120 students participated in this quasi-experiment in a controlled laboratory environment. They were asked to read an informed consent sheet and then asked to complete a questionnaire on "science online videos." Following their agreement, each participant completed a questionnaire of an online survey based on Google forms that included a pre-questionnaire, a video and a post-questionnaire (see Appendix 1)

The pre-questionnaire provided some information on the research ("an international study about science-related online videos"), without a detailed description of the research aim, in order to hide the agenda and avoid possible biases. Considering climate change perception may be influenced by the participant's previous environmental concern, before watching the video, participants were asked to assess the importance of reducing CO_2 emissions to the atmosphere, in a 1-7 scale. This pre-questionnaire included other questions, in order to hide the agenda.

Each respondent was randomly directed to one of four videos that were previously produced. All the videos had the same length (2 minutes) and contained the same images. Each video had a different narration, based on a specific combination of frames. The four videos allowed testing all the possible combinations of the variables: (1) global-gain; (2) global-loss; (3) local-gain; and (4) local-loss.

Each narration emphasized different elements, related to the specific combination of frames that was portrayed in each case. For example, the videos with a global frame mentioned the effects of climate change for the Planet, while the videos with a local frame focused on some of the effects of climate change in Spain. The loss-frame videos mentioned some of the negative effects of climate change, while the gain-frame videos mentioned the possible benefits of addressing climate change. The four videos can be viewed through the following links:

1. Global-gain:
   https://www.youtube.com/watch?time_continue=122&v=DAvq6MC9Dr4&feature=emb_logo
2. Global-loss:
   https://www.youtube.com/watch?time_continue=7&v=OjP6OySebNw&feature=emb_logo
3. Local-gain:
   https://www.youtube.com/watch?time_continue=3&v=rl2HY2E303A&feature=emb_logo
4. Local-loss:
   https://www.youtube.com/watch?time_continue=1&v=aJvsjk1Sngs&feature=emb_logo

After watching the videos, the participants were asked to complete a questionnaire of eight questions, in most cases, selecting one option in a 1-7 scale. The questions were grouped as follows:

- Two questions about online video viewing habits
- One question about the perceived importance of science

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

- Two questions about the perceived seriousness of climate change (on a global and a local context)
- Three questions about the perceived importance of taking action to address climate change

The instrument's quality (validity and reliability) was ensured by following a similar design to that of previous studies that has proved to be effective in this type of research (Kinder & Palfrey, 1993). In particular, we ensured that no relevant event related to climate change happened during the dates of application of the quasi-experiment, as this may have biased the participants' perception. In addition, the quasi-experiment was conducted in the same place, under the same circumstances and in three consecutive days, in order to avoid any significant change of the context.

The results of the responses to each question were coded and analyzed. The responses were grouped in two categories: high perception (scores 6 or 7 in the scale) and medium or low perception (scores 1 to 5 in the scale). This allowed for a clearer presentation of the effects of each frame combination in the respondents' perception.

Significance was tested with ANOVA tests or T-Tests, as indicated in the results section. Before the application of the ANOVA tests, normality (Kolmogorov-Smirnov) and homoscedasticity (Bartlett) tests were conducted. Although the results indicate there is no normality, we considered we have enough data so that the ANOVA tests are acceptable. The results of the Bartlett test indicate there is no homoscedasticity, but we considered this does not affect the ANOVA contrast, since we are working with equal groups. We also conducted non-parametric tests (Kruskal-Wallis) that confirm the results of the ANOVA (Appendix 2).

5. Results

In principle, it could be expected that global frames would lead to higher perception of the seriousness of climate change for the planet (H1), while local frames would increase the perception of seriousness for Spain (H2), since those are the geographical references that are emphasized in each case. However, regarding the seriousness of climate change, the participants scored similar values after watching the videos based on the different combinations of frames. In addition, the results about the perception of seriousness of climate change for Spain indicate that the frame of the videos did not have a relevant incidence in the participants' perceptions.

These results differ from those of previous studies, which concluded that the gain frame tends to diminish the perception of climate change as a serious issue (Wiest *et al.*, 2015), and may indicate that other factors, like previous knowledge and viewers' attitudes may play a more relevant role than the framing of the videos. It could also mean that the combination of frames can produce complex interactions that may influence perception in different ways.

Regarding the need to take action to address climate change, the participants also scored similar values, regardless of the video they watched. Therefore, responses related to action followed the same pattern as those related to perception of seriousness.

Participants were also asked to rank their level of agreement with the following statements: "Taking action to address climate change brings environmental, economic and social benefits" and "Not taking action to address climate change will have serious consequences for life on our planet." As Table 1 and Table 2 show, the responses to both questions indicate that three of the frames were associated to higher levels of agreement, while the local-loss frame was related to lower levels of agreement (df: 3; f=1.44; sig.=.23; df: 3; f=8.54; sig.=.00).

This result confirms previous research concluding that the use of the local frame does not always favor positive attitudes (Spence & Pidgeon, 2010), and can also be related to an optimism about local conditions (Scannell & Gifford, 2013, p. 65), which fits well into the social perception of climate change in Spain, where most citizens do not consider this process to be

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

a top problem, even less at a national or local level, as explained in the introductory section of this article.

In addition, the results shown in Tables 1 and 2, also indicate that the use of gain frames do not necessarily lead to a personal predisposition to take action to address climate change, thus confirming previous research, as explained in the introduction section.

Table 1: Level of agreement with "Taking action to address climate change brings environmental, economic and social benefits."

	Low-medium level of agreement	High level of agreement
Global-gain	3 (10%)	27 (90%)
Global-loss	6 (20%)	24 (80%)
Local-gain	5 (16.6%)	25 (83.3%)
Local-loss	8 (26.6%)	22 (73.3%)

Source: Own elaboration.

Table 2: Level of agreement with "Not taking action to address climate change will have serious consequences for life on our planet."

	Low-medium level of agreement	High level of agreement
Global-gain	1 (3.3%)	29 (96.66%)
Global-loss	1 (3.3%)	29 (96.66%)
Local-gain	2 (6.6%)	28 (93.33%)
Local-loss	11 (36.66%)	19 (63.33%)

Source: Own elaboration.

Our research also explored the relationship between climate change perception and the previous environmental concern of the participants. We hypothesized that framing would have a higher impact among those viewers with a low environmental concern (H3), since they should have more knowledge and maintain stronger beliefs that could make them less likely to be influenced by the framing of the videos.

In our sample, 95 respondents (79.17%) show a high level of environmental concern (scored 6 or 7 in the scale about the importance of reducing CO_2 emissions), whereas the remaining 25 (20.83%) show a medium or low environmental concern (scored 1 to 5 in the scale).

The results confirm our hypothesis: among respondents with a high environmental concern, frames have little incidence in their perception of seriousness of climate change for the planet, since percentages are similar across the different frames. On the contrary, among respondents with a medium or low environmental concern, framing has a higher impact. The participants who watched the videos based on the global-gain and global-loss frames scored a higher perception of seriousness of climate change for the planet, compared to those who watched the videos using the other two frames (t: 4.67, df=119; sig. (2-tailed)=.000). In other words: the combinations including the global frame seem to lead the participants with a low or medium previous environmental concern to a higher perception of seriousness of climate change for the planet (Table 3). This may indicate that global frames have a more powerful incidence than the gain and the loss frames when it comes to stressing the seriousness of climate change for the planet. This effect could be explained by considering that the combinations including the global frame can help the viewers to keep in mind the planetary dimension of this process.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

Table 3: Perception of seriousness of climate change for the planet (High perception of seriousness).

	Medium or low environmental concern	High environmental concern
Global-gain	3 (60.00%)	20 (80.00%)
Global-loss	6 (85.71%)	15 (65.22%)
Local-gain	1 (20.00%)	20 (80.00%)
Local-loss	1 (12.50%)	21 (95.46%)

Source: Own elaboration.

The results about the perception of seriousness for Spain, classified by environmental concern, show that the combinations including local frames did not result in a high perception of seriousness of climate change for Spain, among participants with medium or low environmental concern. Again, this may be related to the fact that climate change is often represented as a global phenomenon and therefore many citizens may be more familiar with global effects than with local effects, and this previous conception may act as a filter to reduce the effect of the videos using the local frame. The answers to the question "Please indicate your level of agreement with the following statement: Taking action to address climate change brings environmental, economic and social benefits" (Table 4) show that, again, the local-loss frame combination leads to a lower level of agreement among respondents with a medium or low environmental concern (t: .928, df=119; sig. (2-tailed)=.355).

Table 4: Level of agreement with "Taking action to address climate change brings environmental, economic and social benefits" (high level of agreement).

	Medium or low environmental concern	High environmental concern
Global-gain	4 (80%)	23 (92%)
Global-loss	6 (85.7%)	18 (78.2%)
Local-gain	3 (60.0%)	22 (88.0%)
Local-loss	0 (0.0%)	22 (100%)

Source: Own elaboration.

Furthermore, the responses to the question "Please indicate your level of agreement with the following statement: "Not taking action to address climate change will have serious consequences for life on our planet" (Table 5), confirm that the participants with a medium or low environmental concern scored lower levels of agreement after watching the video based on the local-loss frame (t: .-1.611, df=119; sig. (2-tailed)=.110).

Therefore, our research indicates that the combination of the local frame and the loss frame seems to have influenced the participants to express a lower level of agreement with the need to take action to address climate change, regardless of a positive or negative formulation.

Table 5: Level of agreement to "Not taking action to address climate change will have serious consequences for life on our planet" (high perception of agreement).

	Medium or low environmental concern	High environmental concern
Global-gain	5 (100%)	23 (92.0%)
Global-loss	7 (100%)	22 (95.6%)
Local-gain	3 (60%)	25 (100%)
Local-loss	2 (25%)	17 (77.2 %)

Source: Own elaboration.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

6. Discussion and conclusion

This study has informed efforts to advance understanding of framing effects regarding the subject of climate change perceptions. In the Spanish context, our findings here have demonstrated that many framing efforts can effectively be confounded by interactions among different frames, contextual influences and by the previous knowledge and attitudes of the audience.

Combinations of the local, global, gain and loss frames produce complex interactions that can provoke effects that are different to those that have been identified by previous research. In this regard, our results showed:

- the use of combinations including the gain frame do not necessarily lead to diminish the perception of the seriousness of climate change, as other studies had affirmed.
- the local and loss frames was associated with lower levels of perception of seriousness, as well as lower levels of agreement to the need of taking action to address climate change.
- among the circumstances that act as previous filter of the frames, the previous environmental concern can play a key role, to the extent that participants with a strong environmental concern are not influenced by the frames, while among the participants with a medium or low environmental concern the frames have a clear impact.
- among participants with a medium or low environmental concern, the seriousness of climate change for the planet is transmitted more efficiently by means of the combinations including the global frame. However, the combinations including the local frame do not result in a higher perception of seriousness in the local level.

Our research findings support the need for integration of context into ongoing interpretations of framing effects on climate change attitudes and perceptions. Through our study appraising combinations of local-global and gain-loss frames we have found context continues to shape social perception of climate change as much as does specific framing techniques that are used. We illustrated this through our findings in the contemporary Spanish context, focused on undergraduate students. Doing so helps provide explanations for wider discursive interactions that comprise our understandings of climate perception. As we have demonstrated, the combination of different frames can provoke a complex set of interactions that can minimize the effects that have previously been identified by previous research.

Robert Entman has commented that, "framing essentially involves selection and salience. To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition" (1993, p. 52). However, Robert Brulle has cautioned that mere assessments of framing, without accounting for contextual elements, provide just a partial glimpse into the dynamic of political, economic, cultural and political issues (2010). There is a clear danger of displacing and overlooking important considerations through over-emphases on analyses of how key actors choose to discuss and 'frame' climate change without taking into account contextual influences (2011).

Teun van Dijk and many others have therefore posited that discourses themselves must be carefully considered in context (1988). Similarly, Dietram Scheufele has successfully advanced understanding of frame building and frame setting as they relate to communicators, content, context and audiences (1999). John Dryzek and Alex Lo have pointed out that effective framing is context-specific (2015). In conclusion, through this research we further show how disembodied analyses of framing and rhetoric that do not take contextual features that give rise to those articulations into account then only provide a partial accounting of what works, how, when and why.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

This research is part of the Videonline project, sponsored by the Spanish Ministry of Economy (CSO2103-45301-P).

References

Aguila Coghlan, J. C. (2013). El *framing* en las noticias sobre las cumbres del cambio climático en la televisión española. *Anuario electrónico de estudios en Comunicación Social "Disertaciones"*, *6*(1), 141-171.

Blanco Castilla, E., Quesada Pérez, M. & Teruel Rodríguez, L. (2013). Entre Kioto y Durban. Posición editorial de los medios de referencia ante el cambio climático. *Revista Latina de Comunicación Social, 68*, 420-435.

Bolsen, T. & Shapiro, M. A. (2017). Strategic Framing and Persuasive Messaging to Influence Climate Change Perceptions and Decisions. *Oxford Research Encyclopedia of Climate Science, 3*, 491-508. https://www.doi.org/10.1093/acrefore/9780190228620.013.385

Boykoff, M. T. (2011). *Who speaks for the climate? Making sense of media reporting on climate change*. Cambridge, UK: Cambridge University Press. https://www.doi.org/10.1017/CBO9780511978586

Boykoff, M. T. (2019). *Creative (Climate) Communications: A Handbook for Productive Pathways for Science, Policy and Society*. Cambridge, UK: Cambridge University Press. https://www.doi.org/10.1177/0963662519886433

Boykoff, M. T. & Boykoff, J. (2007). Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum, 38*(6), 1190-1204.

Brulle, R. J. (2010). From environmental campaigns to advancing a public dialogue: environmental communication for civic engagement. *Environmental Communication – A Journal of Nature and Culture*, *4*(1), 82-98. https://www.doi.org/10.1080/17524030903522397

Brulle R. J., Carmichael, J. & Jenkins, J. C. (2012). Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the US, 2002–2010. *Climatic change*, *114*(2), 169-188. https://www.doi.org/10.1007/s10584-012-0403-y

Campbell, D. T. & Stanley, J. C. (1995). *Diseños experimentales y cuasiexperimentales en la investigación social.* Buenos Aires: Amorrortu. https://www.doi.org/10.13140/RG.2.1.1179.8803

Clawson, R. A. & Waltenburg, E. N. (2009). *Legacy and Legitimacy: Black Americans and the Supreme Court*. Philadelphia, PA: Temple University Press. https://www.doi.org/10.1002/j.1538-165X.2009.tb01969.x

Devine-Wright, P. (2013). Think global, act local? The relevance of place attachments and place identities in a climate changed world. *Global Environmental Change*, *23*(1), 61–69. https://www.doi.org/10.1016/j.gloenvcha.2012.08.003.

DiFrancesco, D. A. & Young, N. (2011). Seeing climate change: The visual construction of global warming in Canadian national print media. *Cultural Geographies*, *18*(4), 517-536. https://www.doi.org/10.1177/1474474010382072.

Doyle, J. (2007). Picturing the clima(c)tic: Greenpeace and the representational politics of climate change communication. *Science as Culture*, *16*(2), 129–150. https://www.doi.org/10.1080/09505430701368938

Dryzek, J. S. & Lo, A. Y. (2015). Reason and rhetoric in climate communication. *Environmental Politics*, *24*(1), 1-16. https://www.doi.org/10.1080/09644016.2014.961273

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, *43*(4), 51-58. https://www.doi.org/10.1111/j.1460-2466.1993.tb01304.x

European Comission (2017). Special Eurobarometer. Climate change. Retrieved 10 June 2018 from https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2017_en.pdf

Feinberg, M. & Willer, R. (2011). Apocalypse soon? Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological Science, 22*, 34-38. https://www.doi.org/10.1177/0956797610391911

Feitelson, E. (1991). Sharing the globe: The role of attachment to place. *Global Environmental Change*, *1*(5), 396-406. https://www.doi.org/10.1016/0959-3780(91)90005-E

Fundación Endesa (2017). Ecobarómetro. Cultura ecológica y educación. Retrieved 20 June 2018 from http://www.comunidadism.es/actualidad/los-jovenes-de-18-a-35-anos-creen-que-su-educacion-escolar-en-medio-ambiente-y-energia-fue-insuficiente

Gamson, W. A. (1989). News as framing: Comments on Graber. *American Behavioral Scientist*, *33*(2), 157-161. https://www.doi.org/10.1177/0002764289033002006

Gamson, W. A. & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, *95*(1), 1-37.

Gans, H. J. (1979). *Deciding What's News: A Study of CBS News, NBC Nightly News, Newsweek, and Time*. Evanston, IL: Northwestern University Press.

Gifford, R. (2008), Psychology's essential role in alleviating the impacts of climate change. *Canadian Psychology*, *49*(4), 273–280. https://www.doi.org/10.1037/a0013234

Gifford, R. & Comeau, L. A. (2011). Message framing influences perceived climate change competence, engagement, and behavioral intentions. *Global Environmental Change*, *21*(4), 1301–1307. https://www.doi.org/10.1016/j.gloenvcha.2011.06.004

Graber, D. A. (1997). *Mass Media and American Politics*. Washington: CQ Press.

Hart, P. S. (2010). One or many? The influence of episodic and thematic climate change frames on policy preferences and individual behavior change. *Science Communication*, *33*(1), 28–51. https://www.doi.org/10.1177/1075547010366400

Heras Hernández, F. (2008). Comunicar el cambio climático. In J. Riechmann (Ed.), *¿En Qué Estamos Fallando?: Cambio Social para Ecologizar el Mundo* (pp. 201-238). Barcelona: Icaria.

Hulme, M. (2009). *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge, UK: Cambridge University Press. https://www.doi.org/10.1017/CBO9780511841200

Johnson-Cartee, K. S. (2005). *News Narrative and News Framing: Constructing Political Reality*. Lanham, MD: Rowman & Littlefield Publishers. https://www.doi.org/10.15581/003.18

Jones, M. D. & Song, G. (2014). Making sense of climate change: How story frames shape cognition. *Political Psycholo*gy, *35*(4), 447-476. https://www.doi.org/10.1111/pops.12057

Kahneman, D. & Tversky, A. (1979). Prospect Theory: An analysis of decision under risk. *Econométrica, 47*, 263–292. https://www.doi.org/10.1142/9789814417358_0006

Kinder, D. R. & Palfrey, T. R. (1993). On behalf of an experimental political science? In D. R. Kinder & T. R. Palfrey (Eds.), *Experimental Foundations of Political Science* (pp. 1-39). Ann Arbor: University of Michigan Press.

Lahsen, M. (2005). Seductive simulations? Uncertainty distribution around climate models. *Social Studies of Science*, *35*(6), 895-922. https://www.doi.org/10.1177/0306312705053049

Lakoff, G. (2010). Why it matters how we frame the environment. *Environmental Communication*, *4*(1), 70–81. https://www.doi.org/10.1080/17524030903529749

Leiserowitz, A. (2007). Communicating the risks of global warming: American risk perceptions, affective images, and interpretive communities. In S. C. Moser & L. Dilling (Eds.), *Creating a Climate for Change: Communicating Climate Change and Facilitating social change* (pp. 44-63). Cambridge, UK: Cambridge University Press. https://www.doi.org/10.1017/CBO9780511535871.005

León, B. (2014). El cambio climático en los medios. Una visión pluridimensional. In B. León (Ed.), *Periodismo, medios de comunicación y cambio climático* (pp. 11-27). Salamanca: Comunicación Social.

León, B. & Erviti, M. C. (2015). Science in pictures: Visual representation of climate change in Spain's television news. *Public Understanding of Science*, *24*(2), 183-199. https://www.doi.org/10.1177/0963662513500196

Lorenzoni, I. & Pidgeon, N. F. (2006). Public views on climate change: European and USA perspectives. *Climatic change*, *77*(1-2), 73-95. https://www.doi.org/10.1007/s10584-006-9072-z

Lorenzoni, I., Nicholson-Cole, S. & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global environmental change*, *17*(3-4), 445-459. https://www.doi.org/10.1016/j.gloenvcha.2007.01.004

Lozano Ascencio, C. (2013). El cambio climático en los telediarios: Alusiones a la catástrofe en tiempos de calma. *Disertaciones: Anuario Electrónico de Estudios en Comunicación Social*, *6*(1), 124-140.

Maio, G. R. & Haddock, G. (2007). Attitude change. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social Psychology: Handbook of Basic Principles* (pp. 565-586). New York, NY: Guilford Press.

McCright, A. M. & Dunlap, R. E. (2003). Defeating Kyoto: The conservative movement's impact on US climate change policy. *Social problems*, *50*(3), 348-373. https://www.doi.org/10.1525/sp.2003.50.3.348

Meira, P. A. & Arto-Blanco, M. (2014). Representaciones del cambio climático en estudiantes universitarios en España: aportes para la educación y la comunicación. *Educar em Revista, 3*, 15-33. https://www.doi.org/10.1590/0104-4060.38041

Meira, P. A., Arto, M., Heras, F., Iglesias, L., Lorenzo, J. & Montero, P. (2013). *La respuesta de la sociedad española ante el cambio climático.* Madrid: Fundación Mapfre.

Milfont, T. L. (2010). Global warming, climate change and human psychology. In V. Corral Verdugo, C. H. García-Cadena & M. Frías-Arment (Eds.), *Psychological Approaches to Sustainability: Current Trends in Theory, Practice and Research* (pp. 19-42). New York, NY: Nova Science.

Morton, T. A., Rabinovich, A., Marshall, D. & Bretschneider, P. (2011). The future that may (or may not) come: How framing changes responses to uncertainty in climate change communications. *Global Environmental Change*, *21*(1), 103–109. https://www.doi.org/10.1016/j.gloenvcha.2010.09.013

Nabi, R. L., Gustafson, A. & Jensen, R. (2018). Framing climate change: Exploring the role of emotion in generating advocacy behavior. *Science Communication*, *40*(4), 442-468. https://www.doi.org/10.1177/1075547018776019

Negredo, S. (2020, June 3). La mayoría considera que los medios informan con precisión sobre el cambio climático y cómo afrontarlo. Retrieved from https://www.digitalnewsreport.es/2020/la-mayoria-considera-que-los-medios-informan-con-precision-sobre-el-cambio-climatico-y-como-afrontarlo/.

Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment*, *51*(2), 12-13. https://www.doi.org/10.3200/ENVT.51.2.12-23

Nisbet, E. C., Hart, P. S., Myers, T. & Ellithorpe, M. (2013). Attitude change in competitive framing environments? Open-/closed-mindedness, framing effects, and climate change. *Journal of Communication*, *63*(4), 766–785. https://www.doi.org/10.1111/jcom.12040

Noguera, G. (2013). La representación del cambio climático en los medios. In B. León (Ed.), *El periodismo ante el cambio climático. Nuevas perspectivas y retos* (pp. 46-69). Barcelona: UOC.

Nordhaus, T. & Shellenberger, M. (2007). Break Through: From the Death of Environmentalism to the Politics of Possibility. New York, NY: Houghton Mifflin Harcourt. https://www.doi.org/10.1089/env.2008.1109

Olausson, U. (2009). Global warming—global responsibility? Media frames of collective action and scientific certainty. *Public understanding of science*, *18*(4), 421-436. https://www.doi.org/10.1177/0963662507081242

O'Neill, S. & Nicholson-Cole, S. (2009). Fear won't do it. Promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, *3*(30), 355-379. https://www.doi.org/10.1177/1075547008329201

Pew Research (2015). Spring 2015 Global Attitudes Survey. Retrieved 3 June 2018, from http://www.pewglobal.org/2015/11/05/global-concern-about-climate-change-broad-support-for-limiting-emissions/.

Pidgeon, N. (2012). Public understanding of, and attitudes to climate change: UK and international perspectives and policy. *Climate Policy*, *12* (Suppl. 01), S85–S106. https://www.doi.org/10.1080/14693062.2012.702982

Rademaekers, J. & Johnson-Sheehan, R. (2014). Framing and re-framing in environmental science: Explaining climate change to the public. *Journal of Technical Writing and Communication*, *44*(1), 3–21. https://www.doi.org/10.2190/TW.44.1.b

Rebich-Hespanha, S., Rice, R. E., Montello, D. R., Retzloff, S., Tien, S. & Hespanha, J. P. (2015). Image themes and frames in US print news stories about climate change. *Environmental Communication*, *9*(4), 491–519. https://www.doi.org/10.1080/17524032.2014.983534

Reese, S. D., Gandy, O. H. & Grant, A. E. (2001). *Framing Public Life. Perspectives on Media and Our Understanding of the Social World*. New Jersey: Lawrence Erlbaum Associates. https://www.doi.org/10.1093/joc/53.4.739

Romsdahl, R. J. (2020). Deliberative framing: opening up discussions for local-level public engagement on climate change. *Climatic Change*, 1-19. https://www.doi.org/10.1007/s10584-020-02754-x

Scannell, L. & Gifford, R. (2013). Personally relevant climate change: The role of place attachment and local versus global message framing in engagement. *Environmental Behavior*, *45*(1), 60–85. https://www.doi.org/10.1177/0013916511421196

Schäfer, M. & O'Neill, S. (2017). Frame Analysis in Climate Change Communication. Oxford Research Encyclopedia of Climate Science. Retrieved 11 Jan. 2018, from http://climatescience.oxfordre.com/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-487. https://www.doi.org/10.1093/acrefore/9780190228620.013.48

Scheufele, D. A. (1999). Framing as a theory of media effects. *Journal of communication*, *49*(1), 103-122. https://www.doi.org/10.1111/j.1460-2466.1999.tb02784.x

Shah, D. V., McLeod, D. M., Gotlieb, M. R. & Lee, N. (2009). Framing and agenda-setting. In R. L. Nabi & M. B. Oliver (Eds.), *The Sage Handbook of Media Processes and Effects* (pp. 83–98). Thousand Oaks, CA: Sage.

Shanahan, M. (2007). *Talking about a revolution: Climate change and the media. COP13 Briefing and Opinion Papers*. London: International Institute for Environment and Development.

Smith, K. (2009). The wisdom of crowds. *Nature Reports Climate Change*, 30 July. Retrieved 10 June 2018, from http:// www.nature.com/climate/2009/0908/full/climate.2009.73.html

Sobczyk, N. (2019). Committee can't quite get past 'partisan ridiculousness' *Energy & Environment Daily*. Retrieved April 5 2018, from https://www.eenews.net/eedaily/2019/04/05/stories/1060143811

Spence, A., Poortinga, W. & Pidgeon, N. (2012). The psychological distance of climate Change. *Risk Analysis*, *32*(6), 957–972. https://www.doi.org/10.1111/j.1539-6924.2011.01695.x

Spence, A, Poortinga, W., Butler, C. & Pidgeon, N. F. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*, *1*(1), 46–49. https://www.doi.org/10.1038/nclimate1059

Spence, A. & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change, 20*, 656–667. https://www.doi.org/10.1016/j.gloenvcha.2010.07.002

Teso Alonso, G., Piñuel Raigada, J. L. & Pacheco Rueda, M. (2013). Aplicación de un phillips 66 para desvelar la red de apelaciones recíprocas entre agentes sociales expertos en torno al riesgo del cambio climático y su contraste con las representaciones de aludidos en el

discurso informativo de la TV sobre el mismo tópico. In M. Vicente Mariño, T. González Hortigüela & M. Pacheco Rueda (Eds.), *Investigar la comunicación hoy. Revisión de políticas científicas y aportaciones metodológicas. Simposio internacional sobre política científica en comunicación* (pp. 885-902). Segovia: Universidad de Valladolid, Facultad de Ciencias Sociales, Jurídicas y de la Comunicación.

Thomsen, J. (2018). Judge rules EPA must provide evidence used for Pruitt's climate change claims. *The Hill* June 7. Retrieved 10 June 2018, from http://thehill.com/policy/energy-environment/391130-judge-rules-pruitt-must-provide-evidence-used-for-climate-change?amp

Ungar, S. (2007). Public scares: Changing the issue culture. In S. C. Moser & L. Dilling (Eds.), *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change* (pp. 82–89). New York: Cambridge University Press.

Ungar, S. (2000). Knowledge, ignorance and the popular culture: climate change versus the ozone hole. *Public Understanding of Science*, 9, 297-312. https://www.doi.org/10.1088/0963-6625/9/3/306

Van der Linden, S., Maibach, E. & Leiserowitz, A. (2015). Improving public engagement with climate change: Five "best practice" insights from psychological science. *Perspectives on Psychological Science*, *10*(6), 758-763. https://www.doi.org/10.1177/1745691615598516.

Van Dijk, T. A. (1988). *News as discourse*. Hillsdale, NJ: Laurence Erlbaum.

Vlek, C. (2000). Essential psychology for environmental policy making. *International Journal of Psychology*, *35*(2), 153–167.

Whitmarsh, L. & Corner, A. (2017). Tools for a new climate conversation: A mixed-methods study of language for public engagement across the political spectrum. *Global environmental change*, 42, 122–135. https://www.doi.org/10.1016/j.gloenvcha.2016.12.008

Wiest, S. L., Raymond, L. & Clawson, R. A. (2015). Framing, partisan predispositions, and public opinion on climate change. *Global Environmental Change, 31*, 187-198. https://www.doi.org/10.1016/J.GLOENVCHA.2014.12.006

Zehr, S. (2000). Public representations of scientific uncertainty about global climate change. *Public Understanding of Science*, 9, 85–103. https://www.doi.org/10.1088/0963-6625/9/2/301

Appendix 1. Questionnaire

VIDEONLINE PROJECT. RECEPTION STUDY
Questionnaire
PAGE 1
Informed consent
This questionnaire is part of an international study on science online video, coordinated by the University of Navarra.
Title: Online video study
Please read this consent document carefully before you decide to participate in this study.
Purpose of the research study:
The purpose of this study is to examine people's perception of science online video.
What you will be asked to do in the study:
You will be asked to watch a two-minute video and answer a questionnaire.
Time required:
5-7 minutes
Risks and Benefits:
There are no risks associated with your participation in this study beyond what you may experience in every-day life. There are also no foreseeable benefits to you as the participant in regard to the outcome of this research.
Confidentiality:
No identifying information will be collected or connected with your responses, which will be anonymous.
Voluntary participation:
Your participation in this study is completely voluntary.
Right to withdraw from the study:
You have the right to withdraw from the study at any time without consequence.

Whom to contact if you have questions about the study:
Bienvenido León Ph.D., Professor
Facultad de Comunicación
University of Navarra
31080 Pamplona
Email: bleon@unav.es
Phone: 948-425600, ext. 802855

Agreement:
By clicking next, you agree that you have read the procedure described above and voluntarily agree to participate in the study

PAGE 2
1. Pre-questionnaire
Science Video Study
Please watch the film below then complete the survey, which will take you about 3 minutes to complete.
Before watching the video, please answer these questions
1. Are you male or female?
Male
Female
2. What is your age?
(open space to answer)

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

3. How important do you think the following scientific topics are? Please select one option from 1 to 7 (1=not important; 7=extremely important):
-Developing new techniques for human cloning: 1 2 3 4 5 6 7
-Reducing Co2 emissions to the atmosphere: 1 2 3 4 5 6 7
-Finding a vaccine against malaria: 1 2 3 4 5 6 7
4. True or false
- According to scientists, Pluto is not a planet of the solar system anymore.
- The poles' ice cover has melted a lot in the last few decades.
- In 2004, the Korean scientist Hwang Woo-Suk succeeded in cloning a human embryo in a lab.
5. What is the highest level of education you have completed?
-Did not attend school
-Primary school
-Secondary school
-University Bachelor's degree
-University Master's degree
-PhD or equivalent

PAGE 3. Participants watch one of the videos
Please, watch this two-minute video and answer the questions below

PAGE 4. Post-questionnaire
6. How many minutes do you normally spend each week watching online videos of any kind? (open space for answer)
7. How many minutes do you normally spend each week watching online videos about science?
8. How important do you think science is?
Please select one option from 1 to 7 (1=not important; 7=extremely important):
1 2 3 4 5 6 7
9. Does the video leave you feeling that climate change is a serious issue for the planet?
Please select one option from 1 to 7 (1=not at all; 7=very much):
1 2 3 4 5 6 7
10. Does the video leave you feeling that climate change is a serious issue for Spain?
Please select one option from 1 to 7 (1=not at all; 7=very much):
1 2 3 4 5 6 7
11. Does the video leave you feeling that it is important to take action to address climate change?
Please select one option from 1 to 7 (1=not at all ; 7=very much):
1 2 3 4 5 6 7
12. Please indicate your level of agreement with the following statements (1=I don't agree at all; 7: I totally agree).
-Taking action to address climate change brings environmental, economic and social benefits
1 2 3 4 5 6 7
13. Please indicate your level of agreement with the following statements (1=I don't agree at all; 7: I totally agree).
-Not taking action to address climate change will have serious consequences for life on our planet.
Thank you for your participation.

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75

Appendix 2. Statistical analysis

1. Level of agreement with "Taking action to address climate change brings environmental, economic and social benefits":
Kolmogorov-Smirnov test p-value = 2.858e-05
Bartlett test p-value = 1.177e-05
Kruskal-Wallis test p-value = 0.6927

2. Level of agreement with "Not taking action to address climate change will have serious consequences for life on our planet"
Kolmogorov-Smirnov test p-value = 2.079e-09
Bartlett test p-value = 8.54e-05
Kruskal-Wallis chi-squared = p-value = 0.0001626

3. Perception of seriousness of climate change for the planet
Kolmogorov-Smirnov test. p-value = 0.003062
Environmental concern, Bartlett test p-value = 0.9615
Frame, Bartlett test, p-value = 0.08023

4. Level of agreement with "Taking action to address climate change brings environmental, economic and social benefits"
Kolmogorov-Smirnov test: p-value = 0.0001155
Environmental concern, Bartlett test p-value < 2.2e-16
Frame, Bartlett test p-value = 0.01146

5. Level of agreement with "Not taking action to address climate change will have serious consequences for life on our planet"
Kolmogorov-Smirnov test: p-value = 0.0002468
Environmental concern, Bartlett p-value = 4.29e-05
Frame, Bartlett test p-value = 0.04005

ISSN 2386-7876 – © 2021 Communication & Society, 34(1), 57-75