

## Localizing Discussions of Climate Change Effects May Not Increase Students' Willingness to Engage in Pro-Environmental Behavior

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**Citation:** Shackley, M. J. (2021). Localizing discussions of climate change effects may not increase students' willingness to engage in pro-environmental behavior. *Interdisciplinary Journal of Environmental and Science Education*, 17(4), e2257. <https://doi.org/10.21601/ijese/11149>

### ARTICLE INFO

### ABSTRACT

Received:

12 December 2020

Accepted:

16 July 2021

While acceptance of the reality of climate change is rising among the U.S. population, there still exists an inconsistent willingness of individuals to engage in pro-environmental behaviors (WPEB) to mitigate anthropogenic drivers of warming. Decreasing the temporal and spatial psychological distance between the adverse effects of climate change and students' home communities is one proposed approach that environmental science teachers can take to motivate students to take up attitudes to engage in pro-environmental action. This study used data from a large public survey of Americans' perceptions of climate change to better understand whether existing conceptions of the distance of the effects of climate change affects self-reported WPEB. Two ordinal logistic regression models were constructed to compare temporal distance of effects and spatial distance of effects respectively to the WPEB construct. Both models showed the inverse of the expected relationship, where participants who perceived the effects of climate change as more psychologically distant displayed a greater WPEB. These findings suggest that localizing discussions of climate change alone may not be sufficient to increase students' WPEB.

**Keywords:** science education, environmental science education, climate change, climate change education, psychological distance, environmental psychology

### INTRODUCTION

Recent political and social movements in the United States demonstrate a significant increase in ideological polarization (Pew Research Center, 2014). This polarization blurs the lines of the social and the political, the scientific and the ideological such that we increasingly struggle to find common ground on issues for which there would likely be a broad consensus were partisan allegiance removed from the equation (Talisse, 2019). One such instance of ideological polarization exists around American's attitudes towards the scientific consensus on the issue of climate change. Attitudes towards climate change have evolved significantly over the past decade, as acceptance of the reality of a change climate has increased. However, large sample survey data suggests a persistent ideological gap in beliefs regarding the causes of climate change and public

policy measures necessary for mitigation. While the percentage of Americans who report that they believe climate change is happening (69%) far outweighs those who think climate change is not happening (16%), there persists more stark disagreement whether this change is human caused (55%) as opposed to whether it represents an ongoing natural cycle (32%) (Leiserowitz et al., 2019). This is particularly troubling given the decreased willingness to engage in climate change mitigation by individuals who do not attribute the phenomenon to human activity (Brody, Grover, & Vedlitz, 2012).

Acceptance that climate change is happening and even an understanding to the science of the mechanism of the greenhouse effect have been shown to be inconsistent predictors of willingness to

engage in pro-environmental behavior (Bamberg & Möser, 2007). In fact, research suggests that greater knowledge alone can actually contribute to increased polarization of beliefs around appropriate climate change policy, as more knowledgeable individuals more reliably express beliefs that align with their ideological and political identities (Drummond & Fischhoff, 2017). Differential moral foundations between ideological identities, liberals placing higher value on compassion and fairness and conservatives placing more value on purity, authority, and in-group loyalty, explains this surprising lack of effect that increased knowledge of climate change has on beliefs and willingness to act across the political spectrum (Dickinson et al., 2016).

Given the challenges to promoting a willingness to engage in pro-environmental behaviors posed by political affiliations and differences in moral foundations between ideological groups, environmental science education that presents the facts of climate change in a sterile fashion not accounting for students' personal lives or beliefs cannot hope to greatly influence belief in anthropogenic climate change and willingness to engage in mitigation efforts. One approach to climate change education that has been suggested to combat ideological polarization in perception is portraying climate change effects as occurring as psychologically close to the student (Chu & Yang, 2018; Scannell & Gifford, 2011) and connected to a familiar place (Khadka, et al., 2021). This approach applies the construal level theory of psychological distance (Trope & Liberman, 2010), which suggests that individuals' willingness to act increases as spatial and/or temporal distance to an event decreases. Construal level theory suggest that this willingness to act is shaped by the level of abstraction used to think of an event. An event that is viewed as more distant is

conceptualized using more abstract higher-level features, decreasing an individual's understanding of specific actions that can be taken to mitigate the issue and the concrete effect these actions can reasonably be expected to have on the problem (Eyal et al., 2009). Figure 1 outlines the features of the construal of psychological near or distant phenomena and implications for action.

Construal of climate change effects as local phenomena is more likely to incorporate concrete and complex detail. Presented an example of a local effect of climate change, a student can be expected to inductively construct an understanding of the mechanism that causes this outcome. This understanding, in turn, allows the student to evaluate the potentially efficacy of suggested mitigation plans. In contrast, construal of climate change effects as distant phenomena is more likely to be simple and abstract with a focus on the effect itself but not the causal mechanism. Prior research suggests this leads to a decreased understanding of the mechanism of climate change as causing social and/or biological harm when presented with distant effects, leading to a decreased willingness to engage. In addition, an abstract theory-based construal of the phenomenon is more open to the influence of individual values. An understanding of climate change constructed in relation to psychologically distant examples would therefore theoretically allow for a more subjective perception of causes and effects more significantly influenced by pre-existing ideological biases (Brügger et al., 2015; Legerwood, et al., 2010).

Construal level theory has shown some promise as a basis for climate change education that empowers pro-environmental behavior through connection of concrete human activities causing climate change to specific observable local effects (Van der Linden, et al., 2015). For example, in a large sample

<i>Near</i>	<i>Distant</i>
<i>Construal</i>	
Concrete	Abstract
Complex	Simple
Inductive, effortful	Deductive, theory-based
Focus on means (how)	Focus on ends (why)
<i>Implications</i>	
Evaluation of future plans based on feasibility of means	Evaluation of future plans based on desirability of ends
Little optimism bias	Substantial optimism bias
Greater fear of errors of commission	Greater fear of errors of omission

Note: Adapted from Krebs & Rapport (2012)

Figure 1. Construal level theory of psychological distance

experimental survey of American adults, Chu & Yang (2018) demonstrated reduced ideological polarization when presenting climate change as impacting a spatially close place. However, these findings on the power of place-based contextualization have failed to replicate consistently across different sociocultural contexts (Spence & Pidgeon, 2010) and show little power to overcome strongly held ideological beliefs. Chu & Yang (2018) concede, "Individuals with strong ideological beliefs on specific issues such as human's relationship with the environment or the structure of our society think and act based on their value, regardless of whether climate impacts were portrayed as distant or close" (p. 180). Despite such observed inconsistencies, environmental science education has seen a proliferation of recent policy recommendations, grounded in theories of psychological distance, to refocus climate change education on locally contextualized effects rather than global trends and mechanisms (*Connecting on Climate*, 2014; *The Psychology of Climate Change Communication*, 2009). In addition, this focus on local contextualization is central to the increasingly popular movement towards so-called place-based education in the environmental sciences (Armstrong & Krasney, 2020).

Criticisms of construal level theory and subsequent educational programs focus on the lack of emphasis placed on perceptions and experiences of risk and beliefs about self and collective-efficacy to affect climate outcomes (Roser-Renouf, et al., 2014). Awareness that one lives in an area at risk of immediate damage due to climate change without first-hand experience of such damage does not necessarily affect concern and willingness to engage (Lujala et al., 2015). Likewise, low belief in ability of one's own actions to prevent negative climate change outcomes, self-efficacy, or in the ability of society to coordinate and execute effective collective action, collective-efficacy, is correlated with avoidance, helplessness, denial, and overall lack of willingness to engage (Lorenzoni et al., 2007; Ockwell et al., 2009).

The present study seeks to add to the literature on climate change beliefs and willingness to engage in pro-environmental behaviors. The following quantitative analysis investigates whether perceiving climate change as a more immediate threat, spatially and temporally, influences willingness to act, specifically willingness to make a personal sacrifice in order to address the issue. This analysis uses a large publicly available dataset of U.S. residents' survey responses to questions about their perceptions and beliefs around climate change. Accordingly, the analysis focuses on existing perceptions of the psychological distance of climate

change unrelated to beliefs about risk or self- or collective-efficacy. A positive correlation between strong beliefs in temporally and/or spatially close effects of climate change and a willingness to engage in pro-environmental behaviors would provide support for the construal level theory model and basic local contextualization. A lack of such correlation would suggest that climate change curricula that seek to promote pro-environmental behaviors should place more emphasis on risk and ensuring students of their self-efficacy and the effectiveness of collective action to mitigate the problem.

## METHOD

The following two research questions address the spatial and temporal dimensions of climate change perception respectively.

RQ1: How does perceived spatial distance of the effects of climate change on human life influence self-reported willingness to act to mitigate climate change?

RQ2: How does perceived temporal distance of the effects of climate change on human life influence self-reported willingness to act to mitigate climate change?

Publicly available survey data from the Yale Program for Climate Change Communication's "Climate Change in the American Mind" survey was used to address both of these research questions. This survey was administered online to a nationally representative sample of 20,024 U.S. adults aged 18 and older in 17 waves, once in 2008 and then twice a year between 2017 (Leiserowitz et al., 2019). Samples were drawn from the Ipsos KnowledgePanel® online panel, consisting of over 55,000 members. Leiserowitz et al. calculate that the margin for error resulting from sampling error for each wave is +/- 3% at the 95% confidence level, except the single 2008 wave where the margin of error is +/- 2%. Margins of error become smaller when combining multiple waves for analysis. In this study, all waves are combined into a single sample of 20,024 individuals, therefore significantly decreasing the margin of error.

Data for the following four survey items, asking about perceived degree of climate change effects, were cleaned and recoded on a four-point Likert scale with possible responses (1) "Not at all," (2) "Only a little," (3) "A moderate amount," and (4) "A great deal." Variables given in parentheses were assigned to each item for use in modelling.

- How much do you think global warming will harm you personally? ( $x_{personal}$ )
- How much do you think global warming will harm people in the United States? ( $x_{US}$ )
- How much do you think global warming will harm people in developing countries? ( $x_{distant}$ )
- How much do you think global warming will harm future generations of people? ( $x_{future}$ )

During the process of cleaning the data, respondents who refused to answer the question ("Refused") or who responded that they did not know whether climate change would harm people in that region ("Don't Know") were recoded as missing. As a result, the number of useable responses dropped from the 20,024 individuals who completed the survey to 16,525.

Data for the following survey item was cleaned and recoded, as a proxy for willingness to engage in pro-environmental behavior (WPEB) on a four-point Likert scale (1) "Strongly oppose," (2) "Somewhat oppose," (3) "Somewhat support," and (4) "Strongly support." This item became the outcome variable of the two ordinal logistic regression models below.

- How much do you support or oppose the following policies? Require electric utilities to produce at least 20% of their electricity from wind, solar, or other renewable energy sources, even if it costs the average household an extra \$100 a year.

Once again, cleaning the data resulted in the loss of respondents who refused to answer the question ("Refused"). This brought the total number of usable responses for all variables to 11,967. It is also important to note that for all items above, the term "global warming" is used, despite "climate change" being more common in modern discourse. Leiserowitz et al. give no explanation for why this term is used. It's use introduces an interesting source of error as, "global warming" has fallen out of political favor, and might serve to further polarize opinion on an already ideologically charged topic.

SPSS was used to construct and analyze the following two ordinal logistic regression models addressing RQ1 (spatial effect influence) and RQ2 (temporal effect influence) respectively.

$$\log[\text{Odds}(y_i = 4)] = \beta_1 + \beta_2 x_{personal} + \beta_3 x_{US} + \beta_4 x_{distant}$$

$$\log[\text{Odds}(y_i = 4)] = \beta_5 + \beta_6 x_{personal} + \beta_7 x_{future}$$

The first model demonstrates the effect that differences in perception of degree of climate change effects at the personal, national, and international

levels influence willingness to engage in pro-environmental behavior (WPEB). The second model demonstrates the effect that differences in perception of degree of climate change effects at immediate and future times influence WPEB. If perceiving effects as more immediate, both spatially and temporally, is a stronger predictor of WPEB, the difference between the estimated odds for the values (4) "A great deal" and (1) "Not at all" should be greater for the  $x_{personal}$  variable than the spatially and temporally distant variables in both models.

## RESULTS

In the first model, variation in responses to the three spatial variables explains 25.2% of the variation in willingness to engage in pro-environmental behavior according to the Nagelkerke pseudo- $R^2$ . All values of the three ordinal predictor variables are significant at  $p < 0.001$  with the exception of (2) "Only a little" and (3) "A moderate amount" for personal harm, which are both not significant. Table 1 provides parameter estimates for this ordinal logistic regression model.

Each estimate represents the natural log of the odds of a respondent rating WPEB 1-point higher on the Likert scale for a given response to the predictor variable item. Odds at each response level are calculated by exponentiating that estimate. For example, an individual who responds "Not at all" to the item "How much do you think global warming will harm people in the United States?" is  $e^{(-1.083)} = 0.339$  times as likely to rate WPEB 1-point higher as an individual who responds "A great deal" to the same item. An individual who responds "Only a little" is  $e^{(-0.585)} = 0.557$  times as likely to rate WPEB 1-point higher as an individual who responds "A great deal," and so on. In this case the inverse odds, the odds that responding "A great deal" as opposed to "Not at all" affects WPEB response, can be found by dividing 1 by the odds. For example, using the example above, an individual who responds "A great deal" to the item "How much do you think global warming will harm people in the United States?" is  $\frac{1}{e^{(-1.083)}} = 2.954$  times as likely to rate WPEB 1-point higher as an individual who responds "Not at all" to the same item.

Comparing the inverse odds for the "A great deal" response to each of the less emphatic responses across all three spatial variable allows one to ascertain how the perception of climate change effects at different distances affects willingness to act. These values were calculated for each distance variable and plotted in Figure 2.

The trend demonstrated here is the inverse of what was expected given the literature and

Table 1. Model 1 parameter estimates

Location		Estimate	Std. Error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Harm personally	"Not at all"	-.392	.091	.000	-.571	-.214
	"Only a little"	.061	.077	.426	-.089	.211
	"A moderate amount"	.121	.070	.084	-.016	.258
	"A great deal"	0 <sup>a</sup>	.	.	.	.
Harm the U.S.	"Not at all"	-1.083	.123	.000	-1.325	-.841
	"Only a little"	-.585	.084	.000	-.749	-.421
	"A moderate amount"	-.348	.063	.000	-.471	-.226
	"A great deal"	0 <sup>a</sup>	.	.	.	.
Harm developing countries	"Not at all"	-1.516	.108	.000	-1.729	-1.304
	"Only a little"	-.889	.070	.000	-1.207	-.751
	"A moderate amount"	-.615	.052	.000	-.718	-.513
	"A great deal"	0 <sup>a</sup>	.	.	.	.

Note: The parameters labelled (a) are set to zero because they are redundant

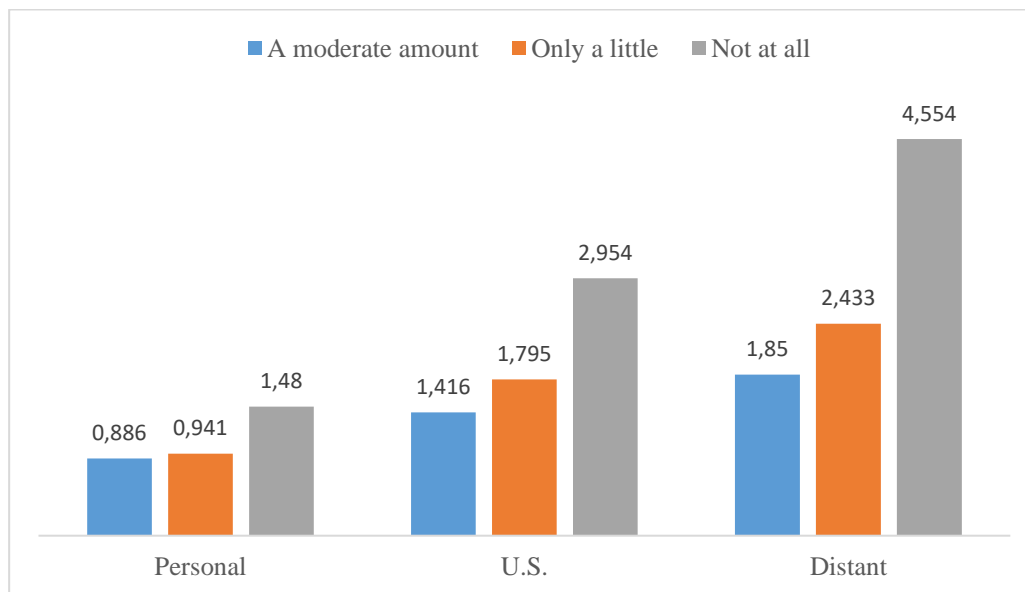


Figure 2. Comparative odds of 1-point higher WPEB for a response that climate change will harm "A great deal" across spatial distance

understanding of construal level theory of likelihood of harm to "people in developing psychological distance. An individual perceiving countries" as "A great deal" demonstrates



Table 2. Model 2 parameter estimates

			Estimate	Std. Error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Location	Harm personally	"Not at all"	-0.796	.072	.000	-0.937	-0.655
	Harm personally	"Only a little"	-0.345	.060	.000	-0.464	-0.227
	Harm personally	"A moderate amount"	-0.179	.060	.003	-0.296	-0.062
	Harm personally	"A great deal"	0 <sup>a</sup>	.	.	.	.
	Harm future generations	"Not at all"	-2.487	.072	.000	-2.628	-2.346
	Harm future generations	"Only a little"	-1.499	.061	.000	-1.618	-1.381
	Harm future generations	"A moderate amount"	-0.931	.046	.000	-1.020	-0.841
	Harm future generations	"A great deal"	0 <sup>a</sup>	.	.	.	.

Note: The parameters labelled (a) are set to zero because they are redundant

significantly greater odds of also reporting a higher willingness to engage in pro-environmental behavior than an individual perceiving likelihood of personal harm as "A great deal," controlling for the other distance category in each case. That is, a stronger belief that climate change is effecting distant locations is a stronger predictor of an increased willingness to engage in pro-environmental behaviors than a belief that climate change will affect the U.S. or the individual personally.

In the second model, variation in responses to the two temporal variables explains 27.5% of the

variation in willingness to engage in pro-environmental behavior according to the Nagelkerke pseudo- $R^2$ . All values of the two ordinal predictor variables are significant at  $p < 0.001$  with the exception of (3) "A moderate amount" for personal harm, which is significant and  $p < 0.01$ . Table 2 provides parameter estimates for this ordinal logistic regression model.

Once again, the inverse odds for the three less emphatic variables were calculated and plotted in Figure 3 below. The values in this figure represent the odds that an individual who believes climate change

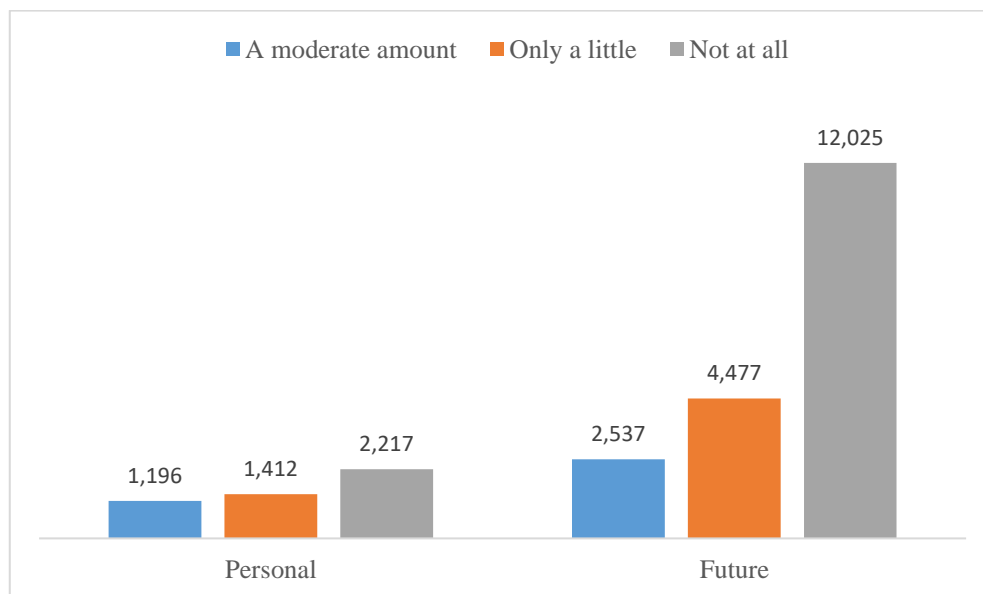


Figure 3. Comparative odds of 1-point higher WPEB for a response that climate change will harm "A great deal" across temporal distance

will cause “A great deal” of harm to the temporal situation will rate 1-point higher WPEB compared to each of the three less emphatic beliefs.

Again, the trend demonstrated here is contrary to what was expected given the literature and understanding of construal level theory of psychological distance. The effect for perception of effects at different times is much more powerful than that seen at varying distances. An individual perceiving likelihood of harm to future generations as “A great deal” demonstrates significantly greater odds of also reporting a higher willingness to engage in pro-environmental behavior than an individual perceiving likelihood of personal harm as “A great deal,” controlling for the other time category in each case.

## DISCUSSION

In both the spatial and temporal models, the trend of the odds of changing perception of harm at varying psychological distances was the opposite of what was expected based on the understanding of construal level theory discussed above. Respondents demonstrated greater odds of increased willingness to engage in pro-environmental behavior when they also perceived the effects of climate change affecting more distant locations and future generations. This is heartening in the sense that egotism, alone does not seem to be an important factor in determining WPEB.

It is important to note this study differed significantly from those of Chu & Yang (2018) and Scannell & Gifford (2011) above. In both of those cases, participants were presented with either a lesson on climate change or articles outlining its specific effects at various distances. Participants therefore formed a construal through the course of the study. The respondents to the “Climate Change in the American Mind” survey were not provided any such information, and were therefore working from a preformed construal. These results do not necessarily discount application of construal level theory to the study of climate change education and communication. Results in this case may have been different were it possible to control for participants’ prior climate change communication and whether it was locally or globally contextualized.

Another explanation for the surprising results may be a disconnect between acceptance of climate change and first-person experience of its effects. According to Leiserowitz et al. (2019), over half and as many as 62% of those surveyed in a given year believed climate change was happening and attributed its cause, at least in part, to human activity. An individual who accepts human-caused climate change may themselves not be experience any of its adverse effects. Presumably, such individuals would

still expect climate change-related harm to distant locations or future generations. This may account, in part, for perception of personal harm having a weaker effect on WPEB than perception of harm at a greater psychological distance.

The mechanism of relating vulnerable local places or even observable local climate change effects to individual pro-environmental behaviors is clearly more complex than construal level theory alone can explain. Brügger et al. (2015, p. 1035) warn as much in their analysis of prior research on the psychology of climate change proximity:

[P]roximizing climate change is complex. Focusing on proximal climate change is likely to trigger various psychological processes that are expected to interact with people’s existing thoughts, beliefs and preferences. At best, proximizing will be successful in encouraging people to take steps to mitigate or adapt to climate change. At worst, this strategy will lead to defensive reactions such as increased scepticism about the reality and relevance of climate change. In between these options, it is also possible that proximizing will change the frame of reference through which people think about climate change, but with no consequence for their level of action — thus rendering this strategy inert.

Given the possibility that local contextualization has the potential to work against the goals of promoting pro-environmental behaviors, it is clear that place-based climate change lessons are not in and of themselves a silver bullet for addressing polarization around the issue and necessary mitigation policies.

## CONCLUSION

The purpose of this study was to investigate the role of perceptions of the psychological distance of the effects of climate change on willingness to engage in pro-environmental behaviors. The motivation was to inform environment science education, namely the design of curriculum that go beyond simple acceptance of the science to foster WPEB. While these findings challenge the conventional understanding of the role of spatial and temporal distance in shaping individual WPEB, they demonstrate that the interaction between acceptance and action is more complex than previously thought.

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