

# Does environmental education work differently across sociopolitical contexts in the United States? Part II. Examining pedagogy in school field trip programs for early adolescent youth across political contexts

Emily G. Thorpe, Marc. J. Stern, Robert B. Powell & Tyler L. Hemby

**To cite this article:** Emily G. Thorpe, Marc. J. Stern, Robert B. Powell & Tyler L. Hemby (19 Dec 2023): Does environmental education work differently across sociopolitical contexts in the United States? Part II. Examining pedagogy in school field trip programs for early adolescent youth across political contexts, Environmental Education Research, DOI: [10.1080/13504622.2023.2295781](https://doi.org/10.1080/13504622.2023.2295781)

**To link to this article:** <https://doi.org/10.1080/13504622.2023.2295781>



View supplementary material [↗](#)



Published online: 19 Dec 2023.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)



# Does environmental education work differently across sociopolitical contexts in the United States? Part II. Examining pedagogy in school field trip programs for early adolescent youth across political contexts

Emily G. Thorpe<sup>a</sup>, Marc. J. Stern<sup>a</sup> , Robert B. Powell<sup>b</sup>  and Tyler L. Hemby<sup>b</sup> 

<sup>a</sup>Virginia Tech, Blacksburg, VA, USA; <sup>b</sup>Clemson University, Clemson, SC, USA

## ABSTRACT

Political polarization in the United States has made many environmental issues strongly partisan, with Democrats largely receptive to environmental messaging and Republicans commonly pitted against it. This phenomenon may have meaningful implications for how environmental education is conducted for people from different sociopolitical contexts. We explored whether certain pedagogical approaches to single-day environmental education field trip programs were linked to better or worse outcomes for early adolescent youth (ages 10–14) from different sociopolitical contexts: majority Republican, majority Democrat, or mixed (roughly even). All observed effect sizes were small with one exception. Play-based pedagogies tended to yield less positive outcomes for students from Republican majority contexts than others, with a medium effect size. The findings suggest that some traditional approaches to play, such as role-playing as animals or pretending to be water droplets, may feel incongruent with the social identities of students from largely Republican communities.

## ARTICLE HISTORY

Received 11 April 2023  
Accepted 30 November 2023

## KEYWORDS

Democrats;  
environmental education;  
environmental literacy;  
geographic sorting;  
politics; Republicans

## Introduction

Environmental issues have become increasingly partisan in the U.S. in recent decades, with Democrats most commonly proliferating pro-environmental messaging and Republicans most commonly countering those messages (Dunlap, McCright, and Yarosh 2016; McCright, Xiao, and Dunlap 2014). Moreover, Republicans and Democrats in the U.S. have become more and more geographically isolated from each other, sorting into more homogenous, like-minded communities over the past three decades (Bishop 2008; Johnston, Manley, and Jones 2016; Johnston et al. 2020). Therefore, the sociopolitical contexts of many of today's youth differ from prior generations. The messages and signals they receive from adults in their communities may be more partisan and more consistent, and their exposure to other ideas may be filtered through these geographically and politically distinct lenses. Thus, the communities in which they live have the potential to influence their receptiveness to environmental education (EE). Patterns of

social media consumption and partisan news coverage may further reinforce these trends (Benkler, Faris, and Roberts 2018).

Research suggests that adolescent youth typically develop a modest political awareness during their middle school years (generally, ages 10–14 in the U.S.), shaped by family, community, and major societal events (Jennings and Niemi 1974, 1981; Lewis-Beck et al. 2008). These years are also associated with the development of social identities, and the strengthening of social norms and connection to place (Kahn and Kellert 2002; Kohlberg 1971; Kroger 2006). Social identities develop through affiliation with a group or community of people. Through the process of social identification, people tend to adopt and endorse the norms, beliefs, and values of the people with whom they most identify (Kahan 2010). When we are confronted with ideas that conflict with these identity-based commitments, we may recoil or immediately seek ways to dismiss that new information (Haidt 2012). For example, we may immediately focus on the uncertainty in scientific arguments or seek contradicting evidence. In more extreme cases, information that conflicts with an individual's social identity may trigger an 'identity threat,' which can cause us to respond emotionally against the communicator or withdraw from the interaction altogether (Hurst et al. 2020; Sherman, Brookfield, and Ortosky 2017). Conversely, when newly received information conforms to our pre-existing perspectives and identity-based values, beliefs, and norms, we tend to readily accept it without considerable effort (Haidt 2012; Kahan, Donald, and Jenkins-Smith 2011). These common phenomena have been labeled in the literature as motivated reasoning, identity-protective reasoning, and confirmation bias (Kahan 2013; Stern 2018). In highly partisan contexts, political identities (social identities related to political dispositions) influence perceptions of what constitutes legitimate knowledge and thus inform how learning, particularly of social and scientific issues common to EE, takes place (Henderson and Zarger 2017; Merkley 2020; Walsh and Tsurusaki 2018). Anti-intellectualist and anti-environmentalist cues from Republican leaders and media sources, for example, have fomented substantial distrust in scientific messaging about environmental issues among Republican voters (Benkler, Faris, and Roberts 2018; Bugden 2022; Merkley 2020; Motta 2018; Walsh and Tsurusaki 2018).

Research on identity threats, motivated reasoning, and confirmation bias has largely involved studies with adults. In this study, we consider the possibility that such responses might also be present in adolescents whose social and political identities are still under development in highly politically partisan communities. When confronted with EE programs aiming to develop environmental literacy, are youth in certain communities more or less open to the experiences and their content?

EE aims to develop environmental literacy through enhancing individuals' knowledge, skills, attitudes, and dispositions needed to address environmental problems (UNESCO 1977). The political polarization of environmental problems in recent decades, coupled with the geographic sorting of the U.S. population, raises the question of whether students in certain communities may be more or less receptive to EE. Moreover, political identities (developed or developing) may make students more or less receptive to specific approaches to the delivery of EE. In a companion article in this issue (Thorpe et al., 2023), we address the first point about general receptiveness to EE. In this article, we examine how different approaches may influence environmental literacy outcomes for students in the context of single-day EE-focused field trip programs for public school groups. Specifically, we address the research question:

*Are certain EE program characteristics associated with different learning outcomes for middle school students from different sociopolitical contexts?*

## Literature review of program characteristics

Findings from prior studies and theory suggest that certain educator characteristics, forms of group interaction, and other specific approaches (Table 1) may be more or less effective in

Table 1. Theoretical justification and field measurement of programmatic characteristics related to sociopolitical context.

Observed program variable	Initial field scoring	Theoretical justification
Educator characteristics		
<i>Eloquence</i> —Extent to which the educator spoke clearly and articulately; the flow of the communication was smooth.	1 = Educator could not be clearly understood during most of the lesson. Pauses, confusion, or filler words like “like” or “um” over-ran the communication. 2 = Educator was only mildly eloquent and had repeated issues with mumbling, fumbling, or unclear speech. 3 = Educator communicated clearly. No major problems were noted. 4 = Educator was extremely eloquent, with an impressive command and clear flow of language. 1 = Educator displayed this identity 0 = Educator did not.	Anti-intellectual and anti-environmental cues from prominent Republican leaders may lead students from this context to negatively define educators as members of an out-group based on their degree of <i>eloquence</i> or their adoption of the <i>walking encyclopedia educator identity</i> , resulting in less positive outcomes. Given conservatives’ emphasis on deference to authority, educators who assume an <i>authority figure identity</i> may be positively defined as in-group members by students from conservative Republican contexts (positive outcomes) than by students from more liberal Democratic contexts (less positive outcomes).
<i>Educator identity: Walking encyclopedia</i> —Focused on conveying a large amount of facts, often using jargon.	1 = Educator displayed this identity 0 = Educator did not.	
<i>Educator identity: Authority figure</i> —Educator predominantly emphasized rules and/or authority to communicate.		
Group interaction		
<i>Verbal engagement</i> —Educator asked questions and facilitated dialogue.	1 = Not at all. 2 = Minimal efforts (asked a few simple questions here and there). 3 = Moderate efforts (frequent questioning). 4 = Major efforts (primary way in which the educator communicated). 1 = No group work. 2 = Minimal effort to incorporate group work (e.g. short discussion or activity among peers). 3 = Moderate efforts (some group activities, working together with others). 4 = Major component of the program (students worked in groups throughout much of the program). 1 = None. 2 = Minimal incorporation—at least one game included. 3 = Moderate—a game or games made up a meaningful portion of the program. 4 = Most of the program was play-based.	<i>Verbal engagement</i> and cooperative group work may lead to more positive outcomes for students from Democratic and Republican contexts but may feel more socially risky for students from politically mixed contexts and thus contribute to less positive outcomes for these students. Given that the subject matter of an EE program may be counter-attitudinal for students from Republican contexts, allowing students to learn from peer-to-peer dialogue and interaction may be particularly important for these groups. <i>Play-based learning</i> may be perceived as an identity conflict for students from Republican contexts due to the need to adopt potentially counter-attitudinal roles. It may also lead to discomfort within politically mixed groups.
<i>Group work</i> —Program required/explicitly asked students to work with others.		
<i>Play-based learning</i> —Actively engaging students in games or competition as an intentional teaching technique.		

(Continued)

Table 1. Continued.

Observed program variable	Initial field scoring	Theoretical justification
Facts, science, issues, and advocacy <i>Fact-focused</i> —Degree to which content that was conveyed was merely factual (devoid of deeper thought, consideration or emotions, values, or other non-factual considerations).	1 = Content clearly went far beyond the just the facts; 2 = Some portions were merely factual, but other strong efforts were made to go beyond just the facts; 3 = Most of the program was entirely factual, though a few efforts were made to go beyond just the facts; 4 = Virtually all content was entirely factual. No real efforts to trigger consideration or emotions, values, or other non-factual considerations.  0 = This did not happen 1 = This did happen.	Anti-intellectual and anti-environmental cues from political elites have contributed to science skepticism and anti-environmentalism largely amongst Republicans. Asking students to <i>role play as scientists</i> , using <i>advocacy</i> to favor a specific viewpoint, or <i>issue-based</i> programs that focus on real-world environmental problems may contribute to identity-threats for students from Republican contexts and therefore lead to less positive outcomes for these groups. <i>Issue-based</i> programs and <i>advocacy</i> also have the potential to be perceived as politically contentious and contribute to less positive outcomes for students from politically mixed contexts in which their peers may disagree with them.
<i>Scientist role play</i> —Educator specifically asked the students to consider themselves within the role of “scientists” during the program. <i>Issue-based</i> —Lesson focused on real-world environmental problems/issues, their consequences, and potential solutions.	1 = Not at all. 2 = An issue was mentioned and/or explained, but students were not engaged in discussing solutions or thinking through the problem. 3 = An issue was defined and students discussed it and potential solutions. 4 = The program was focused on (and structured around) an issue or issues. Students discussed and/or investigated potential solutions.  0 = Not at all 1 = Yes, to any extent.	<i>Fact-focused</i> programs may be insufficient at countering pre-existing beliefs or prior cultural commitments for students from Republican contexts. Students from any sociopolitical context may find purely <i>fact-focused</i> programs less engaging (Stern, Powell, and Hill 2014).
<i>Advocacy</i> —Instructor/program was clearly favoring a specific viewpoint, policy, or action as better than another.		

certain sociopolitical contexts. In this study, we systematically observed single-day EE field trip programs to track these characteristics and examine their relationships with environmental literacy learning outcomes, which were measured in student questionnaires at the conclusion of their on-site experiences. We discuss each of these program characteristics and their hypothesized relationships to outcomes associated with environmental literacy (Table 2) in more detail below.

### **Educator characteristics**

Social identity theory suggests that shared group identification, such as Democrat or Republican, encourages in-group bias in which group members positively define their in-group and negatively define members of out-groups (Cohen 2003; Esposo, Hornsey, and Spoor 2013; Kahan 2013; Tajfel and Turner 1979). In other words, people look to those in their own in-groups (e.g. friends, family members, coworkers, and media or political elites affiliated with other shared social groups)—particularly leaders—for help defining the social meaning of issues (Kahan 2013; Stern 2018).

Certain educator characteristics may negatively influence program outcomes if they cause students to perceive the educator as a member of their out-group. Considering contemporary trends of anti-intellectualism amongst conservatives (Motta 2018), educators who display high degrees of scientific expertise could be perceived as out-group messengers for students from Republican contexts, particularly given the subject matter of EE programs. Therefore, we expected that educators with a high level of *eloquence* and educators that we identified as '*walking encyclopedias*' may contribute to less positive outcomes for groups from Republican contexts. Research also suggests that compared to liberals and Democrats, conservatives and Republicans place a greater emphasis on hierarchy and deference to authority (Haidt 2012; Kahan, Donald, and Jenkins-Smith 2011; Wildavsky and Dake 1990). Therefore, we expected that educators we identified as '*authority figures*' may contribute to more positive outcomes for students from conservative Republican contexts than students from liberal Democratic contexts.

### **Group interaction**

Vygotsky's Sociocultural Theory of Cognitive Development suggests that social and cultural contexts shape how individuals learn and emphasizes the importance of social interactions in promoting cognitive growth (Jacobson, McDuff, and Monroe 2015; Rowe and Wertsch 2002). Identified as an important component of the EE learning process, *group interaction* is thought to foster cooperation and collaboration skills important to solving environmental problems (Jacobson, McDuff, and Monroe 2015; Klein and Merritt 1994). *Verbal engagement* techniques that seek to spur dialogue regarding core elements of EE programming are thought to develop higher levels of cognition, critical thinking, and problem solving (Stern, Powell, and Hill 2014). A systematic literature review of research studies that empirically evaluated the outcomes of EE programs found that many researchers credited program success to social engagement practices, such as verbal engagement and cooperative group work amongst students (Stern, Powell, and Hill 2014). Moreover, peer-to-peer interaction seems to be particularly effective for educating younger audiences about complex issues, such as climate change and sustainability (Corner et al. 2015; de Vreede, Warner, and Pitter 2014; Devine-Wright, Devine-Wright, and Fleming 2004). However, *verbal engagement* and *group work* can be dependent upon trust, acceptance, support, and effective conflict management. The development of these elements can be challenging on single-day field trips where educators have limited contact with students (Jacobson, McDuff, and Monroe 2015). Asking students to communicate publicly (*verbal engagement*) and/or work together with their classmates through *group work* requires a greater level

Table 2. Environmental education outcomes for the twenty-first century (EE21). all items measured on a 0-to-10 scale (Powell et al. 2019).

Environmental education outcomes for the twenty-first century (EE21)		
Outcome	Definition	Items
Place connection ( $M=7.85$ ; $SD=1.19$ )	The development of appreciation for and positive personal relationships with the physical location and its story.	How much do you agree with the following statements? (anchors: not at all, some, totally) <ul style="list-style-type: none"> <li>Knowing this place exists makes me feel good.</li> <li>I want to visit this place again.</li> <li>I care about this place.</li> </ul>
Learning ( $M=7.60$ ; $SD=1.00$ )	Knowledge regarding the interconnectedness and interdependence between human and environmental systems.	How much did you learn about each of the following things as a result of this field trip? (anchors: nothing at all, a fair amount, a huge amount) <ul style="list-style-type: none"> <li>How different parts of the environment interact with each other.</li> <li>How people can change the environment.</li> <li>How changes in the environment can impact my life.</li> <li>How my actions affect the environment.</li> </ul>
Interest in learning ( $M=6.61$ ; $SD=1.39$ )	Enhanced curiosity, increased interest in learning about science and the environment.	Did this field trip make you feel any <i>more interested</i> in any of the following things? (anchors: not at all, more interested much more interested) <ul style="list-style-type: none"> <li>Science.</li> <li>How to research things I am curious about.</li> <li>Learning about new subjects in school.</li> </ul>
Twenty-first century skills ( $M=6.51$ ; $SD=1.38$ )	Critical thinking and problem solving, communication, and collaboration	How much did this field trip help you <i>improve</i> any of these skills? (anchors: not at all, a fair amount, a huge amount) <ul style="list-style-type: none"> <li>Solving problems.</li> <li>Using science to answer a question.</li> <li>Listening to other people's points of view.</li> <li>Knowing how to do research.</li> </ul>
Meaning/self-identity ( $M=6.92$ ; $SD=1.31$ )	A heightened sense of self-awareness, critical reflection, and purpose.	Did this field trip do any of the following things for you? (anchors: not at all, a fair amount, a huge amount) <ul style="list-style-type: none"> <li>Taught me something <i>that will be useful to me</i> in my future.</li> <li>Really made me think.</li> <li>Made me realize something I never imagined before.</li> <li>Made me think differently about the choices I make in my life.</li> <li>Made me curious about something.</li> </ul>
Self-efficacy ( $M=1.00$ ; $SD=0.57$ )	Belief in one's own ability to achieve one's goals and influence their environment.	In a single post-experience survey, students were asked how much they agreed with each statement before and after the field trip. The scale is the mean difference between before and after evaluations. (anchors: not all, somewhat agree(d); strongly agree(d)) <ul style="list-style-type: none"> <li>I believe in myself.</li> <li>I feel confident I can achieve my goals.</li> <li>I can make a difference in my community.</li> </ul>

(Continued)

Table 2. Continued.

Environmental education outcomes for the twenty-first century (EE21)		
Environmental attitudes ( $M = 1.01$ ; $SD = 0.50$ )	Sensitivity, concern, and positive dispositions towards the environment	Same as above for self-efficacy: <ul style="list-style-type: none"><li>I feel it is important to take good care of the environment.</li><li>Humans are a part of nature, not separate from it.</li><li>I have the power to protect the environment.</li></ul>
Environmental stewardship ( $M = 7.49$ ; $SD = 1.08$ )	Motivations to perform stewardship-related behaviors.	Did this field trip make you any <i>more likely</i> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely) <ul style="list-style-type: none"><li>Help to protect the environment.</li><li>Spend more time outside.</li><li>Make a positive difference in my community.</li></ul>
Collaboration ( $M = 7.12$ ; $SD = 1.25$ )	Motivation to collaborate more with others	Did this field trip make you any <i>more likely</i> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely) <ul style="list-style-type: none"><li>Listen more to other people's points of view.</li><li>Cooperate more with my classmates.</li></ul>
School motivations ( $M = 7.45$ ; $SD = 1.42$ )	Motivation to work harder in school.	Did this field trip make you any <i>more likely</i> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely) <ul style="list-style-type: none"><li>Work harder in school.</li><li>Pay more attention in class.</li></ul>
EE21 scale ( $M = 5.96$ ; $SD = 0.96$ )	Unweighted index: Mean of the means of all outcomes measures above.	
M: mean; SD: standard deviation, prior to group-mean-centering for grade level and racial majority of the group.		



of vulnerability on the part of individual students. These approaches may feel more socially risky for students from politically mixed contexts where an individual's perspective might conflict with the identities of their classmates. Thus, *verbal engagement* and *group work* may be linked to less positive outcomes for students from politically mixed contexts and more positive outcomes for students from more homogeneous Democratic and Republican contexts.

*Play-based learning*, or the use of games and competition to illustrate key environmental themes, also requires trust, cooperation, and vulnerability for students. Within politically mixed groups, play-based learning may lead to discomfort for those not predisposed to environmental messaging. Given that the subject matter of an EE program may already be counter-attitudinal for students from Republican contexts, these groups may perceive *play-based learning* as associated with their political out-group and feel that the extra vulnerability it requires is in further conflict with their identity. For example, many EE games ask learners to adopt animal personas as a way of building student empathy for nature. For students who have been regularly exposed to anti-environmentalist messages, this may feel like a silly game for tree-hugging environmentalists and not one that is congruent with their own identities.

### ***Facts, science, issues, and advocacy***

The knowledge deficit model suggests that providing people with factual information should result in greater support for scientific issues; however, empirical research in science education and communication has shown that this model is flawed and incomplete (see Simis et al. 2016 for discussion). Group attachments, such as political parties, are instrumental in explaining how individuals process new information or construct their attitudes and beliefs (Taber and Lodge 2006). Political orientation can also play a powerful role in what is accepted as legitimate knowledge or facts (Henderson and Zarger 2017). Although middle school students are still developing their political group attachments, individuals that are even modestly partisan engage in motivated and identity-protective reasoning, processing new information in a way that serves their existing beliefs and maintains their group identity (Kahan 2013; Kunda 1990; Stern 2018). As the cultural cognition thesis suggests, scientific facts are not enough to change people's minds when pre-existing beliefs or prior cultural commitments are involved (Kahan, Donald, and Jenkins-Smith 2011; Stern 2018). Moreover, an exclusive reliance on communicating facts may further exacerbate anti-intellectualist sentiments among students from conservative Republican contexts. Meanwhile, students from Democratic contexts are more likely to already agree with the messaging of EE programs and are therefore less likely to respond negatively to *fact-focused* content. However, evidence from prior research suggests that it is also possible that all students, irrespective of sociopolitical context will find purely *fact-focused* programs less engaging, thus leading to less positive outcomes overall (e.g. Powell, Stern, and Frensley 2022; Stern, Powell, and Hill 2014).

Increased anti-intellectualist cues and skepticism of scientists, particularly amongst conservatives, may also influence how students from more conservative Republican contexts respond to identity-based strategies in EE programs. For example, asking students to *role play as scientists* (i.e. educator says something along the lines of 'today, we're going to be scientists') may conflict with the valued in-group identities of these students.

*Issue-based* pedagogies have demonstrated considerable promise for developing elements of environmental literacy (Stern, Powell, and Hill 2014). However, focusing on a specific environmental issue carries with it the possibility of identity threat for students with Republican identities if the issue is seen as politically contentious. *Advocacy* is generally not promoted in typical guidelines for EE, which more commonly espouse providing students with knowledge, skills, and connections to make up their own minds (NAAEE 2020a). However, the appropriateness of advocacy within EE programs is debated (Gruenewald and Manteaw 2007; Jickling 2003;

Johnson and Mappin 2005; NAAEE 2020b; Warren and Breunig 2019). We hypothesized that both *issue-based* programs and those reflecting *advocacy* may be linked to less positive outcomes for students from Republican and politically mixed contexts. Meanwhile, these approaches may produce more positive outcomes for students from Democratic contexts, as pro-environmental messaging is likely already prevalent in their political milieu.

## Methods

### Study overview

This research is part of a larger study designed to explore the relationships between specific pedagogical approaches and student outcomes on EE-related field trips in the U.S. (see Powell, Stern, and Frensley 2022 and Thorpe et al., 2023). We use data collected from program observation, student participant questionnaires, and pre-existing databases at single-day EE field trip programs for students in grades 5–8 (ages 10–14) across the U.S. Program providers included national parks, state and local parks, nature centers, botanical gardens, wildlife reserves, farms, public forests, science museums, and other environmental and educational organizations. Programs were selected to maximize the diversity of geographic locations, programmatic approaches, and the socioeconomic contexts in which they took place. For more details on sampling, see Dale et al. (2020).

Following extensive training and calibration on the measurement of each indicator (see Powell et al. 2019; Powell, Stern, and Frensley 2022), four pairs of researchers collected observational data at 345 EE field trip programs for 5th to 8th graders between January and June of 2018. During each program, researchers observed and collected data on the quality and extent of 66 programmatic characteristics using quantitative scoring on a predesigned observation sheet (Powell, Stern, and Frensley 2022). The characteristics considered in the present study are described in Table 1. The research team most commonly followed subgroups on their field trips to ensure complete observation of their experiences (visiting school groups often sub-divide into smaller groups on-site). Immediately following each program, all attending students in grades 5–8 in the observed groups were invited to complete the EE21 survey (Powell et al. 2019) to assess their opinions of the program and its influence on them. Surveys were administered with a consistent script, offered in both English and Spanish, and took an average of 8 min to complete. Sociopolitical context measures were developed from pre-existing databases. The research protocol was approved by the Virginia Tech Institutional Review Board (IRB), protocol # 15-1031, and the Clemson University IRB, protocol # IRB2016-154, PPN 2016000567.

## Measurement

### Program outcomes

Paper surveys were administered to all student participants immediately after each observed program before they left the site of their field trip. The **EE21 scale**, which represents the composite mean of all subscales in Table 2, was developed through an extensive collaborative process between EE professionals and researchers and statistical validation to broadly represent key concepts associated with environmental literacy relevant to a wide array of EE programs (see Powell et al. 2019 for details). Prior analyses of national data using this scale revealed a significant upward response bias for Latinx respondents and significantly higher outcome scores for fifth grade students (Stern, Powell, and Frensley 2022). We thus controlled for grade level and race in this study by group-mean-centering the EE21 outcome measure for each grade level (grades 5, 6, 7, 8) and group racial majority (majority White, majority Black, majority Latinx, no racial majority). We removed programs with multigrade groups or groups of unknown

racial majority from our analyses (see *Data cleaning & aggregation*). Following group-mean-centering, the resulting overall mean for the group-mean-centered EE21 outcome score is zero. In effect, this process eliminates the influence of race and grade level in subsequent analyses. Original mean scores (on the 1-to-10 scales, before group-mean-centering) are provided in [Table 2](#).

### ***Program characteristics***

The quality and extent of the ten program characteristics described in [Table 1](#) were measured at each program in the sample through observations made by the research team. Observations of six constructs (*eloquence*, *group work*, *verbal engagement*, *play-based*, *issue-based*, and *fact-focused*) were initially field coded on a 1-to-4 scale. Following the logic of calibration, discussed by Ragin (2009), as well as extensive pilot testing with the full research team, these 1-to-4 scales allowed for easy categorization of observations by considering whether the observed program *more* or *less* reflected the programmatic characteristic in question (the difference between a 2 and 3 on the scale). It also maximized scale length, which helps detect meaningful differences between programs and their characteristics. Four constructs (two *educator identities*, *scientist role play*, and *advocacy*) were recorded as a binary measurement, indicating the presence or absence of the characteristic. Detailed descriptions and operationalization of all 12 variables can be found in the [Supplemental Material](#).

For the 4-point items, we collapsed any scoring categories with less than 2% of the total observations (or 5 observed programs within a sociopolitical subgroup), following Distefano et al. (2021). For four characteristics (*play-based*, *issue-based*, *verbal engagement*, and *group work*), this eliminated two points on the scale, resulting in binary constructs indicating either the presence or absence of the characteristic. For *issue-based*, *verbal engagement*, and *group work*, the cut-point for the new binary variable was between 2 and 3, indicating a difference between minor and moderate incorporation of the characteristic. For *play-based*, the cut-point was between a 1 and 2. As such, the new binary variable is interpreted as *no play* vs. *any play at all*. *Eloquence* and *fact-focused* were collapsed into 3-point scales (combining levels 1 and 2) in which the characteristic was minimally, moderately, or extremely represented on the program.

### ***Determining sociopolitical context***

The measure of sociopolitical context incorporates voting from the 2016 Presidential, Senate, and House elections that could be attributed to a school attendance zone (SAZ).<sup>1</sup> We limited the sample to public schools with clearly defined SAZ's and drew upon publicly available election data and dasymetric mapping to determine the average Republican percentage of the total two-party vote in each SAZ. Based on different conventions in the political geography literature, we use two different sets of cutpoints in the data to create subgroups representing sociopolitical contexts (Abramowitz 2010; Bishop 2008). The first set used a ten average percentage point separation between Republican and Democratic candidates: *Democrat-leaning* (<45% Republican); *Republican-leaning* (>55% Republican); and *Mixed* (45–55% Republican). The second set created a more stringent separation, employing a 20 average percentage point between candidates of the two parties: *Strongly Democratic* (<40% Republican); *Strongly Republican* (>60% Republican); and *Mixed* (40–60% Republican). A more detailed description of the methods for determining sociopolitical context is described in the companion article in this issue (Thorpe et al., 2023).

### ***Data cleaning and aggregation***

Data cleaning procedures on the original data set of 345 programs included removing invalid responses and screening for multivariate outliers, as described in Powell, Stern, and Frenslley

**Table 3.** Sample frequencies by sociopolitical context.

	10-point Landslide			20-point Landslide		
	Democrat-leaning	Mixed	Republican-leaning	Strongly Democratic	Mixed	Strongly Republican
# Programs (235)	108	48	79	95	82	58
# Providers (65)	37	17	26	32	27	18
# Schools (114)	53	24	37	44	44	26
# States (22)	20	10	16	18	15	11

Note: (Total  $n$  in sample).

(2022). The data for this study were further limited to programs attended by public school groups of a single grade and known racial majority. The resulting final sample for this study included 235 programs provided by 65 organizations across 114 schools in 22 states (see Thorpe et al., 2023). Following data cleaning, individual student survey responses were aggregated to the program level to match all other data—grade level, racial majority, socioeconomic status, and sociopolitical context of the attending group, which all exist at the program level. The EE21 outcome score thus represents the mean across all students who attended a specific program. Intraclass correlation coefficients were calculated to ensure the appropriateness of aggregation (see Thorpe et al., 2023).

## Analyses

We performed a series of two-way ANOVAs to examine how relationships between program characteristics and EE21 outcomes differ across political contexts while controlling for grade and race. We examined both political thresholds—the 20-point landslide cutpoint as well and the 10-point landslide cutpoint. We report both statistically significant ( $p < 0.05$ ) and marginally significant ( $p < 0.10$ ) findings to explore the influence of political context on the relationships between program characteristics and student outcomes. We also examine the consistency with which certain predictors remain statistically significant across both cutpoints and calculate effect sizes.

## Results

Table 3 reports sample frequencies for programs, providers, schools, and states by sociopolitical context. Examining the distribution of programs across sociopolitical contexts using the 10-point landslide, 46% of programs served students from Democrat-leaning contexts, 34% from Republican-leaning contexts, and 20% from mixed contexts. Using the 20-point landslide, 40% of programs served students from strongly Democratic contexts, 25% from strongly Republican contexts, and 35% from mixed contexts. Across all 235 programs, the *average percent Republican* ranged from 9.3 to 78.2% with a mean of 46.1%, equal to the national Republican percentage of the two-party vote in the 2016 presidential election.

### ***Are certain EE program characteristics associated with different learning outcomes for middle school students from different sociopolitical contexts?***

Table 4 reports the frequencies of observed programmatic characteristics by sociopolitical context using the 10- and 20-point landslides following the variable collapsing procedures described.<sup>2</sup> Using the 10-point landslide, the *eloquence* variable had a limited sample size in the sociopolitically mixed subgroup; therefore, we excluded this subgroup from the analysis. Both the *eloquence* and *issue-based* variables had limited sample sizes in the strongly Republican subgroup;

Table 4. Frequencies of programmatic characteristics by sociopolitical context after collapsing variables.

	Frequencies %, (n)					20-point Landslide				
	10-point Landslide									
Fact-focused	Total	Low (1)	Moderate (2)	High (3)	Total	Low (1)	Moderate (2)	High (3)	Total	Low (1)
Dem.-leaning	235	20.4% (48)	59.6% (140)	20.0% (47)	235	20.4% (48)	59.6% (140)	20.0% (47)	235	20.4% (48)
Mixed	46.0% (108)	18.5% (20)	65.7% (71)	15.7% (17)	40.4% (95)	15.8% (15)	68.4% (65)	15.8% (15)	40.4% (95)	15.8% (15)
Rep.-leaning	20.4% (48)	33.3% (16)	50% (24)	16.7% (8)	34.9% (82)	34.1% (28)	45.1% (37)	20.7% (17)	34.9% (82)	34.1% (28)
Eloquence	33.6% (79)	15.2% (12)	57% (45)	27.8% (22)	24.7% (58)	8.6% (5)	65.5% (38)	25.9% (15)	24.7% (58)	8.6% (5)
	Total	Low (1)	Medium (2)	High (3)	Total	Low (1)	Medium to high (2)		Total	Low (1)
Dem.-leaning	235	6.8% (16)	87.2% (205)	6.0% (14)	235	6.8% (16)	93.2% (219)		235	6.8% (16)
Mixed	46.0% (108)	7.4% (8)	87.0% (94)	5.6% (6)	40.4% (95)	7.4% (7)	92.6% (88)		40.4% (95)	7.4% (7)
Rep.-leaning	20.4% (48)	2.1% (1)	91.7% (44)	6.3% (3)	34.9% (82)	6.1% (5)	93.9% (77)		34.9% (82)	6.1% (5)
Play-based	33.6% (79)	8.9% (7)	84.8% (67)	6.3% (5)	24.7% (58)	6.9% (4)	93.1% (54)		24.7% (58)	6.9% (4)
	Total	Not at all (0)	Any play (1)		Total	Not at all (0)	Any play (1)		Total	Not at all (0)
Dem.-leaning	235	72.3% (170)	27.7% (65)		235	72.3% (170)	27.7% (65)		235	72.3% (170)
Mixed	46.0% (108)	66.7% (72)	33.3% (36)		40.4% (95)	63.2% (60)	36.8% (35)		40.4% (95)	63.2% (60)
Rep.-leaning	20.4% (48)	89.6% (43)	10.4% (5)		34.9% (82)	87.8% (72)	12.2% (10)		34.9% (82)	87.8% (72)
Issue-based*	33.6% (79)	69.6% (55)	30.4% (24)		24.7% (58)	65.5% (38)	34.5% (20)		24.7% (58)	65.5% (38)
	Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)
Dem.-leaning	234	88.5% (207)	11.5% (27)		234	88.5% (207)	11.5% (27)		234	88.5% (207)
Mixed	46.2% (108)	86.1% (93)	13.9% (15)		40.4% (95)	88.4% (84)	11.6% (11)		40.4% (95)	88.4% (84)
Rep.-leaning	20.5% (48)	85.4% (41)	14.6% (7)		34.9% (82)	85.4% (70)	14.6% (12)		34.9% (82)	85.4% (70)
Verbal engagement	33.3% (78)	93.6% (73)	6.4% (5)		24.7% (57)	93.0% (53)	7.0% (4)		24.7% (57)	93.0% (53)
	Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)
Dem.-leaning	235	37.0% (87)	63.0% (148)		235	37.0% (87)	63% (148)		235	37.0% (87)
Mixed	46.0% (108)	34.3% (37)	65.7% (71)		40.4% (95)	34.7% (33)	65.3% (62)		40.4% (95)	34.7% (33)
Rep.-leaning	20.4% (48)	35.4% (17)	64.6% (31)		34.9% (82)	42.7% (35)	57.3% (47)		34.9% (82)	42.7% (35)
Group work	33.6% (79)	41.8% (33)	58.2% (46)		24.7% (58)	32.8% (19)	67.2% (39)		24.7% (58)	32.8% (19)
	Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)	Moderate to major (1)		Total	None to minimal (0)
Dem.-leaning	235	72.8% (171)	27.2% (64)		235	72.8% (171)	27.2% (64)		235	72.8% (171)
Mixed	46.0% (108)	84.3% (91)	15.7% (17)		40.4% (95)	85.3% (81)	14.7% (14)		40.4% (95)	85.3% (81)
Rep.-leaning	20.4% (48)	60.4% (29)	39.6% (19)		34.9% (82)	69.5% (57)	30.5% (25)		34.9% (82)	69.5% (57)
Advocacy	33.6% (79)	64.6% (51)	35.4% (28)		24.7% (58)	56.9% (33)	43.1% (25)		24.7% (58)	56.9% (33)
	Total	Not at all (0)	Any advocacy (1)		Total	Not at all (0)	Any advocacy (1)		Total	Not at all (0)
Dem.-leaning	235	72.3% (170)	27.7% (65)		235	72.3% (170)	27.7% (65)		235	72.3% (170)
Mixed	46.0% (108)	71.3% (77)	28.7% (31)		40.4% (95)	69.5% (66)	30.5% (29)		40.4% (95)	69.5% (66)
Rep.-leaning	20.4% (48)	75.0% (36)	25.0% (12)		34.9% (82)	76.8% (63)	23.2% (19)		34.9% (82)	76.8% (63)
	33.6% (79)	72.2% (57)	27.8% (22)		24.7% (58)	70.7% (41)	29.3% (17)		24.7% (58)	70.7% (41)

(Continued)

Table 4. Continued.

Frequencies %, (n)									
10-point Landslide					20-point Landslide				
Scientist role play	Total 235	No (0)	Yes (1)		Total 235	No (0)	Yes (1)		
Dem.-leaning	46.0% (108)	66.0% (155)	34.0% (88)			66.0% (155)	34.0% (88)		
Mixed	20.4% (48)	65.7% (71)	34.3% (37)		Strongly Dem.	40.4% (95)	30.5% (29)		
Rep.-leaning	33.6% (79)	60.4% (29)	39.6% (19)		Mixed	34.9% (82)	40.2% (33)		
ID: Walking encyc.	Total	69.6% (55)	30.4% (24)		Strongly Rep.	24.7% (58)	31.0% (18)		
		No (0)	Yes (1)		Total	No (0)	Yes (1)		
Dem.-leaning	46.0% (108)	72.8% (171)	27.2% (64)			72.8% (171)	27.2% (64)		
Mixed	20.4% (48)	68.5% (74)	31.5% (34)		Strongly Dem.	40.4% (95)	31.6% (30)		
Rep.-leaning	33.6% (79)	75.0% (36)	25.0% (12)		Mixed	34.9% (82)	28.0% (23)		
ID: Authority figure	Total	77.2% (61)	22.8% (18)		Strongly Rep.	24.7% (58)	19.0% (11)		
		No (0)	Yes (1)		Total	No (0)	Yes (1)		
Dem.-leaning	46.0% (108)	73.6% (173)	26.4% (62)			73.6% (173)	26.4% (62)		
Mixed	20.4% (48)	77.8% (84)	22.2% (24)		Strongly Dem.	40.4% (95)	22.1% (21)		
Rep.-leaning	33.6% (79)	75.0% (36)	25.0% (12)		Mixed	34.9% (82)	23.2% (19)		
		67.1% (53)	32.9% (26)		Strongly Rep.	24.7% (58)	37.9% (22)		

\*Removed one outlier for normality assumption violation.

therefore, we were unable to perform analyses or draw any meaningful conclusions for these variables using the 20-point landslide.

As noted in Thorpe et al. (2023), most programs avoided politically-charged issues. Table 5 provides a summary of key issues covered by all programs that were coded positively for *advocacy* or for *issue-based* pedagogy. There were three additional field trips that mentioned climate change but were not coded as *advocacy* or *issue-based*. While these programs included basic content or questions about climate change, they did not fully employ issue-based pedagogy, nor did the educator advocate toward a specific solution. Each of these three programs took place with students from Republican-leaning contexts. Table 6 shares the EE21 outcome scores (group-mean-centered to control for grade level and race) of all programs that addressed climate change or renewable energy in any way. No statistical differences ( $p > 0.05$ ) were observed in outcomes for these programs across sociopolitical contexts nor when comparing these programs to the rest of the sample.

**Table 5.** Key issues of all programs coded as issue-based or advocacy.

Topics of environmental issues/advocacy observed	Number of programs
Protection of habitat or a specific place	40
Water protection (incl. pollution, development)	26
Invasive species	10
Species protection	8
Climate change	7
The value/importance of science in decision-making	5
Recycling	3
Site restoration	3
Food waste	2
Alternative energy	1
Sustainable agriculture practices	1

Some programs included more than one issue.

**Table 6.** EE21 outcome scores (controlling for grade and race) for programs that addressed climate change or the transition to renewable energy.

Sociopolitical context	<i>n</i>	EE21
Strong Democratic (<40% Republican)	6	−0.35
Lean Republican (55–60% Republican)	3	−0.36
Strong Republican (>60% Republican)	2	−0.06

Figure 1 shares all statistically significant ( $p \leq 0.05$ ) and marginally significant ( $p \leq 0.10$ ) findings of the two-way ANOVA examinations. Interaction effects were observed for six approaches, indicating that the sociopolitical context influenced the relationship between the approach and the EE21 outcome. We also share statistically significant within-group effects (t-statistics) to indicate within-group relationships.

### Educator characteristics

For *eloquence*, we were only able to examine Democrat-leaning and Republican-leaning groups within the 10-point landslide due to sample size limitations. Our findings suggest that groups from Republican-leaning contexts displayed less positive outcomes following participation in programs with the most eloquent educators. The two-way ANOVA effect size analysis suggests only a small influence of sociopolitical context on the relationship between *eloquence* and the EE21 outcome ( $\eta^2 = 0.04$ ). Analyses of the *walking encyclopedia identity* revealed no significant differences between sociopolitical contexts, and the statistical analyses for educators who adopted the *authority figure* identity yielded inconsistent findings.

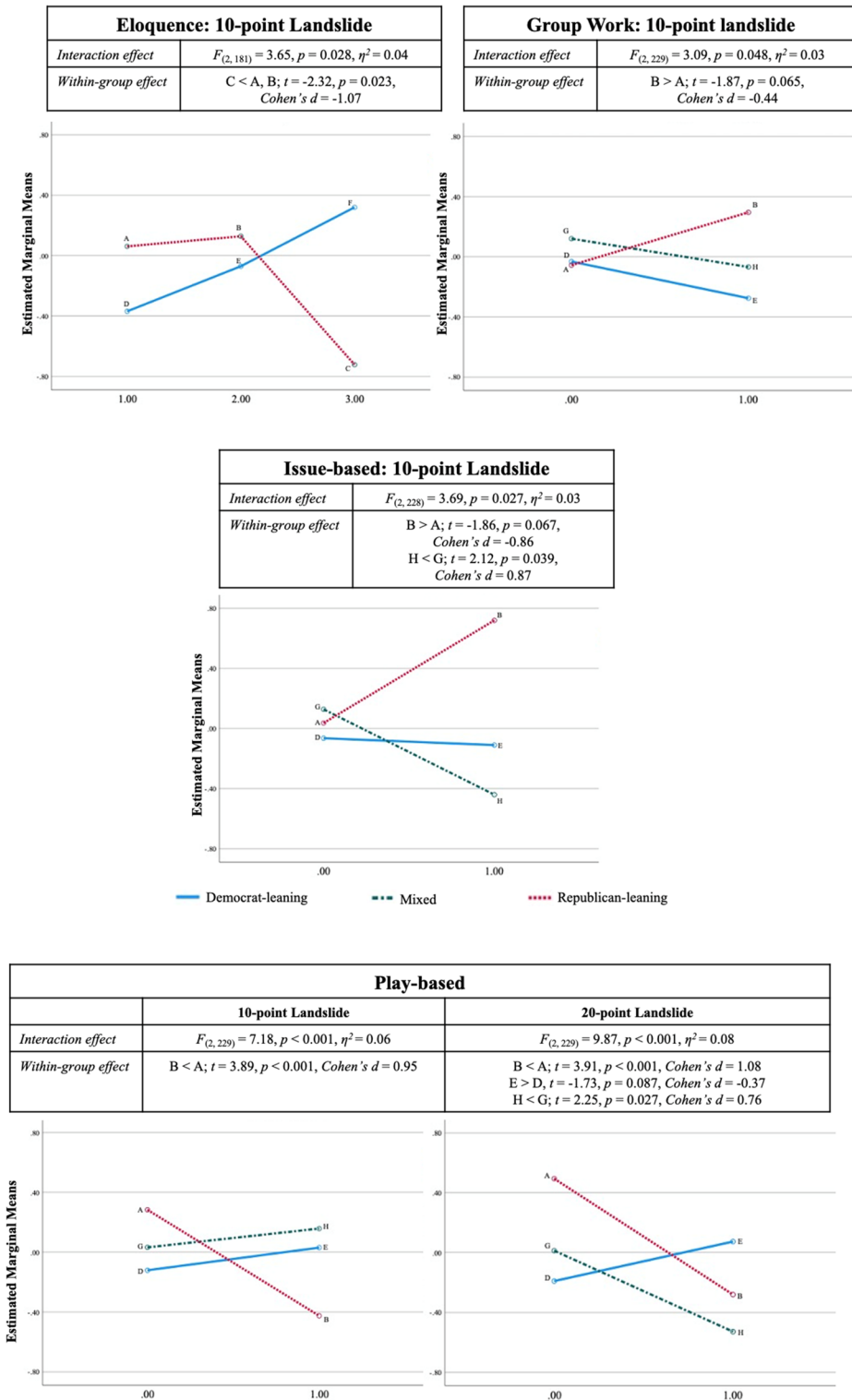


Figure 1. Student EE21 outcomes as a function of programmatic characteristics and sociopolitical context, controlling for grade and race.



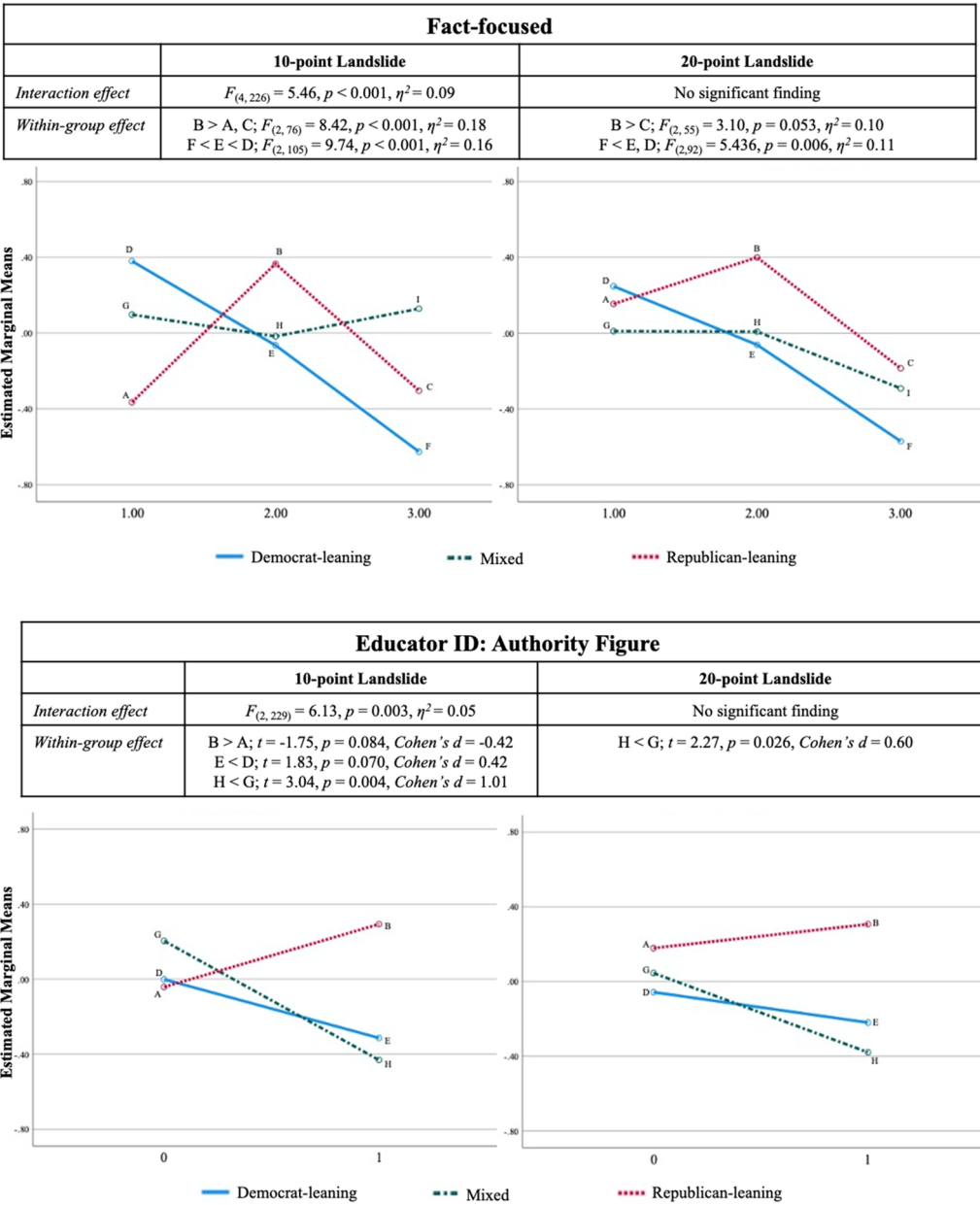


Figure 1. Continued.

### Group interactions

Examinations of *verbal engagement* yielded no statistically significant results. Due to sample size limitations, we were only able to examine *group work* using the 10-point landslide data. For students from Republican-leaning contexts, *group work* was associated with marginally more positive outcomes, with small effect size ( $\eta^2 = 0.03$ ). Programs containing *play-based* activities were associated with less positive outcomes for students from Republican contexts with a medium effect size of the interaction ( $\eta^2 = 0.06\text{--}0.08$ ). This medium effect size indicates a potentially meaningful difference between sociopolitical contexts.

### ***Facts, science, issues, and advocacy***

*Fact-focused* programs were negatively related to EE21 outcomes in Democratic contexts. However, *fact-focused* EE displayed less linear results for students from Republican contexts. For these students, outcomes were most positive at moderate levels of fact-sharing and least positive for the lowest and highest degrees of fact-sharing. The results of the two-way ANOVA were inconsistent, however, between the two cut-points of the study (10-point and 20-point landslides). Analyses of *scientist role play* yielded insignificant results. Due to sample size limitations, we were only able to examine *issue-based* learning using the 10-point landslide. For students from Republican-leaning contexts, *issue-based* learning was associated with marginally more positive outcomes. Meanwhile, students from mixed sociopolitical contexts exhibited less positive outcomes on programs with *issue-based* learning. Each interaction again demonstrated only small effect sizes ( $\eta^2 = 0.04$ ). Analyses of programs using *advocacy* and *scientist role play* yielded no statistically significant results. See [Supplemental Materials](#) for full results of two-way ANOVA analyses.

### **Discussion**

This exploratory study examined the relationship between different programmatic approaches and learning outcomes for students from different political contexts. The strongest and most consistent statistically significant finding was that programs with *play-based* activities, however minor, were linked to less positive outcomes for students from Republican contexts. Play-based learning requires trust, cooperation, and vulnerability for students to let their guard down and participate in games (Nieto and Bode 2008). The development of these elements can be challenging on single-day field trips where educators have limited contact with students (Jacobson, McDuff, and Monroe 2015). Given that the subject matter of an EE program may already be counter-attitudinal for students from Republican contexts, these groups may perceive EE-related play-based learning as associated with their political out-group and feel that the extra vulnerability it requires is in further conflict with their identity. Our observations of play-based programs included activities like role-playing, camouflage competitions, and games designed to teach about the water cycle and geology. Some games asked students to pretend to be water droplets or to adopt the animal personas of a snowshoe hare or a mouse as a way of building student empathy for nature. For students with more utilitarian relationships with nature (through hunting, fishing, or other consumptive uses), as well as those who may be more regularly exposed to anti-environmentalist messages, these games may have felt incongruent with their own social identities (Kellert 1997). This may have compounded pre-existing tendencies for conservatives to be less 'open to experiences' than their more liberal counterparts, as measured through predispositions about imagination and abstract ideas (Osborne and Sibley 2020), yielding less positive outcomes for these approaches overall.

Other program characteristics were only weakly (small effect sizes), inconsistently (different between the 10- and 20-point landslides), or not at all associated with differing outcomes for students from different sociopolitical contexts. Small effect sizes and inconsistencies suggest that some of these findings may have been spurious. Identity threats associated with expertise (eloquence), scientific identity, and other hypothesized elements were not consistent across the sample. The lack of any interaction regarding *advocacy* may be a particularly relevant null finding. We expected *advocacy* to be associated with less positive outcomes for groups from Republican contexts due to commonplace anti-environmental messaging amongst conservatives. However, because worldviews, group attachments, and political ideologies are still developing alongside students' knowledge of environmental issues at these ages (Klimstra et al. 2010; Stevenson et al. 2014), youth may be more open to the inclusion of action-based

appeals in EE programs. An alternative explanation would involve the specific subject matter and topics of the appeals themselves. The most common issues addressed by the programs we observed included habitat, species, and water protection. These may be less politically challenging issues than others we more rarely observed, including climate change or renewable energy.

Furthermore, issue-based pedagogy and calls to action can be employed in various ways, some that might signal outgroup membership or other threats to identity, and others that might help to contextualize important human-environment linkages. Prior studies have suggested that these linkages can help to make environmental issues more locally relevant to students and thus lead to more positive program outcomes (Powell, Stern, and Frensley 2022; Stern, Powell, and Hill 2014). For example, Long, Henderson, and Meuwissen (2022) promote problem-based learning as an effective approach to motivate student interest in conservative communities, which involves introducing learners to real world problems and promoting the exploration of potential solutions (Kirsop-Taylor et al. 2020). Our field teams did not observe problem-based approaches in action within our sample, possibly due to a strict adherence to school curricula in many cases<sup>3</sup> and possibly due to perceptions of insufficient time to progress fully through a problem-based experience on a single-day field trip. Thus, the potential for local problem-based pedagogy across sociopolitical contexts remains an open question ripe for future research.

Findings from our companion study (Thorpe et al., 2023) suggest that EE field trip programs may have stronger positive impacts on students from less wealthy and Republican areas. This study suggests that reaching these students should not require a drastic change in approach from EE providers. The approaches observed within our sample largely produced positive results in these contexts (Thorpe et al., 2023). However, the positive findings are only relative to other audiences within the study itself. To examine the actual efficacy of field trips and other EE programs, future research could examine approaches tailored for specific audiences. For example, Håkansson, Kronlid, and Östman (2019) and Slimani, Lange, and Håkansson (2021) each recommend strategies for incorporating the consideration of political aspects of environmental issues into EE. Long, Henderson, and Meuwissen (2022) suggest a focus on local problem-based approaches for conservative audiences. Many other studies posit ideas for addressing identity threats associated with political partisanship and motivated reasoning in adults (e.g. Cohen et al. 2007; Hurst et al. 2020). Might some of these approaches also apply to younger audiences? Each of these areas presents meaningful opportunities for experimental design and testing of approaches to EE with youth.

### ***Limitations and opportunities for future research***

Limitations of our study are primarily attributable to small subsamples that were not statistically representative of the entire U.S. and a lack of variability in some key variables of interest. For example, we rarely observed fully issue-based programming (only three programs scored at the highest level for this approach), and few programs focused on highly politicized topics. Future research could aim to conduct larger and more representative samples of each sociopolitical context or focus on specific communities for more locally-specific explorations. Sample size limitations prevented us from subdividing the sample based on socioeconomic context or racial make-up of the groups. Future research could continue to examine which program characteristics lead to better outcomes in more fully-delineated contexts. Experimental research could also explicitly test different pedagogical approaches with differing targeted audiences.

## Conclusions

We set out to determine if EE field trip programs function differently for adolescent youth from different sociopolitical contexts in the United States. In the companion paper to this article (Thorpe et al., 2023), we found that existing programs tended to yield less positive environmental literacy outcomes for students from wealthier Democratic contexts. In this article, we examined whether certain pedagogical approaches might be more or less successful for students from different sociopolitical contexts. Despite examining ten potential hypotheses, we found only one consistent difference in this respect: play-based approaches tended to yield less positive outcomes for students from Republican contexts. Taken together, the results suggest that EE field trips for public school students can be highly effective across sociopolitical contexts and could be potentially more effective with some minor adjustments. With students from wealthier Democratic communities, enhancing program novelty may yield more positive outcomes (see Thorpe et al., 2023). With students from Republican communities, reconsidering the appropriateness of traditional play-based approaches may enhance program outcomes.

## Notes

1. We were unable to incorporate other socioeconomic factors in this analysis to maintain sufficient statistical power to examine interaction effects.
2. The original, uncondensed observations can be found in the [Supplemental Materials](#).
3. Some argue that the 'No Child Left Behind Act' and its emphasis on meeting educational standards has limited creativity in EE and its ability to enhance environmental literacy in the U.S. (Gruenewald and Manteaw 2007; Stevenson 2007). We witnessed many programs that felt roughly equivalent to classroom science lab assignments, rather than exhibiting best practices promoted by EE experts and practitioners (Krasny 2020; NAAEE 2020b; Stern, Powell, and Hill 2014).

## Acknowledgements

The authors thank Ryan Dale, Kaitlyn Hogarth, Tori Kleinbort, Hannah Lee, Eric Neff, Anna O'Hare, Daniel Pratson, and Neil Savage, who collected the field data for this project, and the 90 organizations around the United States who welcomed their presence. We'd also like to thank Dr. Shannon Bell and Dr. Karin Kitchens for their comments and input on the study.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

The study was funded by the National Science Foundation's Advancing Informal STEM Education Program (DRL 1612416 and DRL 1906610) and the Institute for Museum and Library Services National Leadership Grant (MG-10-16-0057-16) and analysis was supported in part by the USDA National Institute of Food and Agriculture, McIntire-Stennis project 7001451.

## ORCID

Marc. J. Stern  <http://orcid.org/0000-0002-0294-8941>  
 Robert B. Powell  <http://orcid.org/0000-0003-2775-2571>  
 Tyler L. Hemby  <http://orcid.org/0000-0002-0629-3292>

## References

- Abramowitz, A. I. 2010. "Transformation and Polarization: The 2008 Presidential Election and the New American Electorate." *Electoral Studies* 29 (4): 594–603. <https://doi.org/10.1016/j.electstud.2010.04.006>
- Benkler, Y., R. Faris, and H. Roberts. 2018. *Network Propaganda: Manipulation, Disinformation, and Radicalization in American Politics*. Oxford, UK: Oxford University Press.
- Bishop, B. 2008. *The Big Sort: Why the Clustering of like-Minded America is Tearing Us Apart*. Boston, MA: Mariner Books.
- Bugden, D. 2022. "Denial and Distrust: Explaining the Partisan Climate Gap." *Climatic Change* 170 (3–4): 34. <https://doi.org/10.1007/s10584-022-03321-2>
- Cohen, G. L. 2003. "Party over Policy: The Dominating Impact of Group Influence on Political Beliefs." *Journal of Personality and Social Psychology* 85 (5): 808–822. <https://doi.org/10.1037/0022-3514.85.5.808>
- Cohen, G. L., D. K. Sherman, A. Bastardi, L. Hsu, M. McGoey, and L. Ross. 2007. "Bridging the Partisan Divide: Self-Affirmation Reduces Ideological Closed-Mindedness and Inflexibility in Negotiation." *Journal of Personality and Social Psychology* 93 (3): 415–430. <https://doi.org/10.1037/0022-3514.93.3.415>
- Corner, A., O. Roberts, S. Chiari, S. Völler, E. S. Mayrhuber, S. Mandl, and K. Monson. 2015. "How Do Young People Engage with Climate Change? The Role of Knowledge, Values, Message Framing, and Trusted Communicators." *WIREs Climate Change* 6 (5): 523–534. <https://doi.org/10.1002/wcc.353>
- Dale, R. G., R. B. Powell, M. J. Stern, and B. A. Garst. 2020. "Influence of the Natural Setting on Environmental Education Outcomes." *Environmental Education Research*. 26 (5): 613–631. <https://doi.org/10.1080/13504622.2020.1738346>
- de Vreede, C., A. Warner, and R. Pitter. 2014. "Facilitating Youth to Take Sustainability Actions: The Potential of Peer Education." *The Journal of Environmental Education* 45 (1): 37–56. <https://doi.org/10.1080/00958964.2013.805710>
- Devine-Wright, P., H. Devine-Wright, and P. Fleming. 2004. "Situational Influences upon Children's Beliefs about Global Warming and Energy." *Environmental Education Research* 10 (4): 493–506. <https://doi.org/10.1080/1350462042000291029>
- DiStefano, C., D. Shi, and G. B. Morgan. 2021. "Collapsing Categories is Often More Advantageous than Modeling Sparse Data: Investigations in the CFA Framework." *Structural Equation Modeling: A Multidisciplinary Journal* 28 (2): 237–249.
- Dunlap, R. E., A. M. McCright, and J. H. Yarosh. 2016. "The Political Divide on Climate Change: Partisan Polarization Widens in the U.S." *Environment: Science and Policy for Sustainable Development* 58 (5): 4–23. <https://doi.org/10.1080/00139157.2016.1208995>
- Esposito, S. R., M. J. Hornsey, and J. R. Spoor. 2013. "Shooting the Messenger: Outsiders Critical of Your Group Are Rejected Regardless of Argument Quality." *The British Journal of Social Psychology* 52 (2): 386–395. <https://doi.org/10.1111/bjso.12024>
- Gruenewald, D. A., and B. O. Manteaw. 2007. "Oil and Water Still: How No Child Left behind Limits and Distorts Environmental Education in US Schools." *Environmental Education Research*, 13 (2): 171–188. <https://doi.org/10.1080/13504620701284944>
- Haidt, J. 2012. *The Righteous Mind: Why Good People Are Divided by Politics and Religion*. New York, NY: Vintage Books.
- Håkansson, M., D. O. O. Kronlid, and L. Östman. 2019. "Searching for the Political Dimension in Education for Sustainable Development: Socially Critical, Social Learning and Radical Democratic Approaches." *Environmental Education Research* 25 (1): 6–32. <https://doi.org/10.1080/13504622.2017.1408056>
- Henderson, J. A., and R. K. Zarger. 2017. "Toward Political Ecologies of Environmental Education." *The Journal of Environmental Education* 48 (4): 285–289. <https://doi.org/10.1080/00958964.2017.1336978>
- Hopkins, D. J. 2018. *The Increasingly United States: How and Why American Political Behavior Nationalized*. Chicago, IL: The University of Chicago Press.
- Hurst, K., M. J. Stern, R. B. Hull, and D. Axsom. 2020. "Addressing Identity-Related Barriers to Collaboration for Conservation through Self-Affirmation Theory and Moral Foundations Theory." *Conservation Biology: The Journal of the Society for Conservation Biology* 34 (3): 572–580. <https://doi.org/10.1111/cobi.13428>
- Jacobson, S. K., M. D. McDuff, and M. C. Monroe. 2015. *Conservation Education and Outreach Techniques*. Oxford, UK: Oxford University Press.
- Jennings, M. K., and R. G. Niemi. 1974. *The Political Character of Adolescence: The Influence of Families and Schools*. Princeton, NJ: Princeton University Press.
- Jennings, M. K., and R. G. Niemi. 1981. *Generations and Politics: A Panel Study of Young Adults and Their Parents*. Princeton, NJ: Princeton University Press.
- Jickling, B. 2003. "Environmental Education and Environmental Advocacy: Revisited." *The Journal of Environmental Education* 34 (2): 20–27. <https://doi.org/10.1080/00958960309603496>
- Johnson, E. A., and M. J. Mappin, eds. 2005. *Environmental Education and Advocacy: Changing Perspectives of Ecology and Education*. Cambridge, UK: Cambridge University Press.

- Johnston, R., D. Manley, and K. Jones. 2016. "Spatial Polarization of Presidential Voting in the United States, 1992–2012: The "Big Sort" Revisited." *Annals of the American Association of Geographers* 106 (5): 1047–1062. <https://doi.org/10.1080/24694452.2016.1191991>
- Johnston, R., D. Manley, K. Jones, and R. Rohla. 2020. "The Geographical Polarization of the American Electorate: A Country of Increasing Electoral Landslides?" *GeoJournal* 85 (1): 187–204. <https://doi.org/10.1007/s10708-018-9955-3>
- Kahan, D. 2010. "Fixing the Communications Failure." *Nature* 463 (7279): 296–297. <https://doi.org/10.1038/463296a>
- Kahan, D. M. 2013. "Ideology, Motivated Reasoning, and Cognitive Reflection." *Judgment and Decision Making* 8 (4): 407–424. <https://doi.org/10.1017/S1930297500005271>
- Kahan, D. M., B. Donald, and H. Jenkins-Smith. 2011. "Cultural Cognition of Scientific Consensus." *Journal of Risk Research* 14 (2): 147–174. <https://doi.org/10.1080/13669877.2010.511246>
- Kahn, P. H., and S. R. Kellert. 2002. *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*, 117–151. Cambridge, MA: MIT Press.
- Kellert, S. R. 1997. *The Value of Life: Biological Diversity and Human Society*. Washington, DC: Island Press.
- Kirsop-Taylor, N., D. Appiah, A. Steadman, and M. Huggett. 2020. "Reflections on Integrating the Political into Environmental Education through Problem-Based Learning and Political Ecology." *The Journal of Environmental Education* 52 (1): 1–13. <https://doi.org/10.1080/00958964.2020.1825919>
- Klein, E. S., and E. Merritt. 1994. "Environmental Education as a Model for Constructivist Teaching." *The Journal of Environmental Education* 25 (3): 14–21. <https://doi.org/10.1080/00958964.1994.9941953>
- Klimstra, T. A., W. W. Hale III, Q. A. Raaijmakers, S. J. Branje, and W. H. Meeus. 2010. "Identity Formation in Adolescence: Change or Stability?" *Journal of Youth and Adolescence* 39 (2): 150–162.
- Kohlberg, L. 1971. "Stages of Moral Development." *Moral Education* 1 (51): 23–92.
- Krasny, M. E. 2020. *Advancing Environmental Education Practice*. Ithaca, NY: Cornell University Press.
- Kroger, J. 2006. *Identity Development: Adolescence through Adulthood*. Thousand Oaks, CA: Sage Publications.
- Kunda, Z. 1990. "The Case for Motivated Reasoning." *Psychological Bulletin* 108 (3): 480–498. <https://doi.org/10.1037/0033-2909.108.3.480>
- Lewis-Beck, M., W. G. Jacoby, H. Norpoth, and H. F. Weisberg. 2008. *The American Voter Revisited*. Ann Arbor, MI: The University of Michigan Press.
- Long, D., J. Henderson, and K. Meuwissen. 2022. "What Is Climate Change Education in Trump Country?" *Educational and Developmental Psychologist* 39 (1): 132–145. <https://doi.org/10.1080/20590776.2021.2013713>
- McCright, A. M., C. Xiao, and R. E. Dunlap. 2014. "Political Polarization on Support for Government Spending on Environmental Protection in the USA, 1974–2012." *Social Science Research* 48 (2014): 251–260. <https://doi.org/10.1016/j.ssresearch.2014.06.008>
- Merkley, E. 2020. "Anti-Intellectualism, Populism, and Motivated Resistance to Expert Consensus." *Public Opinion Quarterly* 84 (1): 24–48. <https://doi.org/10.1093/poq/nfz053>
- Motta, M. 2018. "The Dynamics and Political Implications of Anti-Intellectualism in the United States." *American Politics Research* 46 (3): 465–498. <https://doi.org/10.1177/1532673X17719507>
- NAAEE (North American Association for Environmental Education). 2020a. *Guidelines for Excellence Series*. Washington, DC: North American Association for Environmental Education.
- NAAEE (North American Association for Environmental Education). 2020b. *The Promise of Civic Engagement in Environmental Issues: Synergy of Environmental Education and Civic Education*. Washington, DC: North American Association for Environmental Education.
- Nieto, S., and P. Bode. 2008. *Affirming Diversity: The Sociopolitical Context of Multicultural Education*. Boston, MA: Allyn & Bacon.
- Osborne, D., and C. G. Sibley. 2020. "Does Openness to Experience Predict Changes in Conservatism? A Nine-Wave Longitudinal Investigation into the Personality Roots to Ideology." *Journal of Research in Personality* 87: 103979. <https://doi.org/10.1016/j.jrp.2020.103979>
- Powell, R. B., M. J. Stern, B. T. Frensley, and D. Moore. 2019. "Identifying and Developing Crosscutting Environmental Education Outcomes for Adolescents in the Twenty-First Century (EE21)." *Environmental Education Research*. 25 (9): 1281–1299. <https://doi.org/10.1080/13504622.2019.1607259>
- Powell, Robert B., Marc J. Stern, and Brandon Troy Frensley. 2022. "Which Approaches Are Associated with Better Outcomes? Evidence from a National Study of Environmental Education Field Trip Programs for Adolescent Youth in the United States." *Environmental Education Research* 29 (3): 331–356. <https://doi.org/10.1080/13504622.2022.2145270>
- Ragin, C. C. 2009. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Chicago, IL: University of Chicago Press.
- Rowe, S. M., and J. V. Wertsch. 2002. "Vygotsky's Model of Cognitive Development." In *Blackwell Handbook of Childhood Cognitive Development*, edited by U. Goswami, 538–554. Oxford, UK: Blackwell Publishers.
- Sherman, D. K., J. Brookfield, and L. Ortosky. 2017. "Intergroup Conflict and Barriers to Common Ground: A Self-Affirmation Perspective." *Social and Personality Psychology Compass* 11 (12): e12364. <https://doi.org/10.1111/spc3.12364>



- Simis, M. J., H. Madden, M. A. Cacciatore, and S. K. Yeo. 2016. "The Lure of Rationality: Why Does the Deficit Model Persist in Science Communication?" *Public Understanding of Science* 25 (4): 400–414. <https://doi.org/10.1177/0963662516629749>
- Slimani, Melki, Jean-Marc Lange, and Michael Håkansson. 2021. "The Political Dimension in Environmental Education Curricula: Towards an Integrative Conceptual and Analytical Framework." *Environmental Education Research* 27 (3): 354–365. <https://doi.org/10.1080/13504622.2021.1879023>
- Stern, M. J. 2018. *Social Science Theory for Environmental Sustainability*. Oxford, UK: Oxford University Press.
- Stern, M. J., R. B. Powell, and B. T. Frensley. 2022. "Environmental Education, Age, Race, and Socioeconomic Class: An Exploration of Differential Impacts of Field Trips on Adolescent Youth in the United States." *Environmental Education Research* 28 (2): 197–215. <https://doi.org/10.1080/13504622.2021.1990865>
- Stern, M. J., R. B. Powell, and D. Hill. 2014. "Environmental Education Program Evaluation in the New Millennium: What Do We Measure and What Have We Learned?" *Environmental Education Research* 20 (5): 581–611. <https://doi.org/10.1080/13504622.2013.838749>
- Stevenson, K. T., M. N. Peterson, H. D. Bondell, S. E. Moore, and S. J. Carrier. 2014. "Overcoming Skepticism with Education: Interacting Influences of Worldview and Climate Change Knowledge on Perceived Climate Change Risk among Adolescents." *Climatic Change* 126 (3–4): 293–304. <https://doi.org/10.1007/s10584-014-1228-7>
- Stevenson, R. B. 2007. "Schooling and Environmental Education: Contradictions in Purpose and Practice." *Environmental Education Research* 13 (2): 139–153. <https://doi.org/10.1080/13504620701295726>
- Taber, C. S., and M. Lodge. 2006. "Motivated Skepticism in the Evaluation of Political Beliefs." *American Journal of Political Science* 50 (3): 755–769. <https://doi.org/10.1111/j.1540-5907.2006.00214.x>
- Tajfel, H., and J. Turner. 1979. "An Integrative Theory of Intergroup Conflict." In *The Social Psychology of Intergroup Relations*, edited by W.G. Austin and S. Worchel, 33–37. Monterey, CA: Brooks/Cole.
- Thorpe, E. G., M. J. Stern, R. B. Powell, and T. L. Hemby. 2023. "Does Environmental Education Work Differently Across Sociopolitical Contexts in the United States? PART I. Exploration of Outcomes for Adolescent Youth" *Environmental Education Research*. <https://doi.org/10.1080/13504622.2023.2273795>
- UNESCO. 1977. "The Tbilisi Declaration." Intergovernmental Conference on Environmental Education, 14–26.
- Walsh, E. M., and B. K. Tsurusaki. 2018. "'Thank You for Being Republican': Negotiating Science and Political Identities in Climate Change Learning." *Journal of the Learning Sciences* 27 (1): 8–48. <https://doi.org/10.1080/10508406.2017.1362563>
- Warren, K., and M. Breunig. 2019. "Inclusion and Social Justice in Outdoor Education." In *Encyclopedia of Teacher Education*, edited by M. Peters. Singapore: Springer. [https://doi.org/10.1007/978-981-13-1179-6\\_366-1](https://doi.org/10.1007/978-981-13-1179-6_366-1)
- Wildavsky, A., and K. Dake. 1990. "Theories of Risk Perception: Who Fears What and Why?" *Daedalus* 119 (4): 41–60.