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Environmental education, age, race, and socioeconomic class: An exploration of differential impacts of field trips on adolescent youth in the United States

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ABSTRACT

Despite growing calls for greater inclusivity and cultural responsiveness, little is known about how environmental education (EE) may differentially affect diverse audiences. As part of a national study of 334 environmentally focused day field trips for adolescent youth in the United States in 2018, we examined how outcomes differed for students of different grade levels, racial backgrounds, and socioeconomic status. Participants who were younger, Hispanic, and from lower socioeconomic classes exhibited more positive outcomes than older, non-Hispanic, and wealthier participants. Differences in Hispanic populations are likely at least partially attributable to known survey response biases. We also found that programs with non-White instructors tended to yield higher levels of satisfaction in groups where the student majority was not White. We discuss potential explanations for these trends and call for further research on culturally responsive and age-appropriate approaches to EE.

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Field trips; diversity; age; socioeconomic status; evaluation

Introduction

Environmental education (EE), since its earliest formal definitions, has called for inclusive and holistic approaches to engage diverse audiences in solving problems related to both social well-being and environmental health (UNESCO 1977). As U.S. demographics continue to diversify rapidly and racial and socioeconomic disparities, injustices, and other issues remain broadly apparent, calls for more inclusive and culturally responsive approaches to EE continue to expand and intensify (Aguilar, McCann, and Liddicoat 2017; Djonko-Moore et al. 2018; Nxumalo and Ross, 2019; Stapleton 2020). To date, however, relatively little research has focused on systematically examining EE's effects on culturally diverse audiences. Rather, the literature tends to contain single case studies and essays about key principles for enhancing engagement with diverse audiences and improving program design. While the empirical case studies provide important insights, and the essays provide thoughtful guidance based on both theory and practical experience, large-scale studies that explore trends across cases are missing. Similarly,

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multiple authors suggest that the middle school ages represent an ideal time to engage students in EE (e.g. Ernst and Theimer 2011; Kahn and Kellert 2002; Stevenson et al. 2013); yet, few studies have focused on discerning different responses to EE within this age class. The exploratory effort we describe in this manuscript represents an early step toward identifying trends and important related questions for both practitioners and the research community to address to make EE programs more relevant, accessible and meaningful for diverse audiences.

As part of a larger study of single-day EE field trips for adolescent youth within the United States, this study explores trends in outcomes based on the racial make-up, grade levels, and socioeconomic contexts of student groups. It also explores patterns in outcomes for non-White majority student groups exposed to White vs. non-White EE instructors. The specific research questions are as follows:

1. Do single-day EE field trip programs yield similar outcomes for student groups of different grade levels (5th through 8th grade), different racial compositions, and different socioeconomic contexts?
2. Do White EE instructors achieve similar results as non-White EE instructors for non-White majority student groups?

EE across age groups

Literature suggests that early childhood nature experiences are particularly important for developing affective connections with the natural environment (Kahn and Kellert 2002; Ernst and Theimer 2011; Raudsepp 2005; Wells and Lekies 2006). Literature also suggests that values, which are deep-seated beliefs about right and wrong, and even attitudes, which reflect more specific evaluations of objects or actions, become harder to change as individuals age (Clayton 2003; Erikson 1968; Stern 2018; Vaske 2008; Vecchione et al. 2020). As a result, many stress the importance of high quality EE for all age ranges. Limited research suggests that appropriate approaches to EE and associated outcomes may differ across different age groups. For example, Braun and Dierkes (2017) found that younger participants, ages 7-9, showed greater gains in connectedness to nature after a five-day EE experience than 10-15 year-olds. However, they also found that older students, ages 16-18, showed greater gains than the youngest cohort, ages 7-9, after a one-day EE experience, with the middle age group, 10-15, showing middling effects. In another study, Braun and colleagues failed to identify significant differences in the effects of EE programs for different age groups (Braun, Cottrell, and Dierkes 2018).

EE commonly focuses on middle school students in the United States. A recent systematic review of two decades of EE research of programs for K-12 students, found that 57% focused on ages 11 through 14 (Ardoin et al. 2018); the authors suggest that these ages may represent the 'golden years' for EE in terms of moral development, citing Kahn and Kellert (2002) and Stevenson and colleagues (2013), who express similar sentiments (p. 13). Few studies, however, have examined the differential influences of environmental education *within* this age class.

Across the middle school years, findings have been inconclusive. Bergman (2016) found greater increases in environmental awareness in 5th grade students than 7th grade students following EE. However, the EE treatments were different for each age cohort in the study, so conclusions about the appropriateness of EE in general for different ages were difficult to discern. In a study of environmental curricula across 80 schools in North Carolina, Stevenson and colleagues (2013) found no significant differences in environmental literacy measures between 6th and 8th grade students. However, they found that improvement over the course of the school year in environmental literacy was slower among the 8th graders, suggesting that EE may be less effective for older students. Kahn and Lourenço (2002) found that 5th grade

students tended to use anthropogenic reasoning for environmental moral justifications more often than older students in 8th grade, who tended to exhibit a greater appreciation of biocentric values and concerns about adverse human impacts on the environment. Overall, there is little consensus about whether environmental orientations tend to decline or increase with age (Bergman 2016; Larson, Castleberry, and Green 2010), and at what ages specific shifts tend to occur. Thus, questions remain about the relative effectiveness of EE for students across the middle grades.

EE, race, and socioeconomic status

EE has long suffered from a lack of diversity, both in terms of workforce and participants. Although EE has continuously called for inclusive approaches to engage broad and diverse audiences in problem-solving, it has traditionally emphasized the values and lifestyles of White middle class culture in the West (Lewis and James, 1995; Stapleton 2020) and has long been criticized for failing to adequately consider the perspectives and experiences of people of color (Nxumalo and Ross 2019; Taylor 1996). Traditional outdoor experiential activities, such as hiking, orienteering, bird watching, and EE, have been commonly understood by many to be the domains of White people with greater means to access leisure experiences (Rose and Paisley, 2012; Roberts 2009). The curricular focus (i.e. connection to school curricula) of many EE programs may also limit their relevance to some audiences. 'Issues associated with forests and lakes are most relevant to those who experience them frequently,' (Lewis and James, 1995, p.7), commonly those same, more privileged, audiences. Explicit efforts are often necessary to make content more relevant to audiences less familiar with wild and natural spaces. Other typical design elements of traditional EE may also translate poorly for some audiences. For example, Rose and Paisley (2012) describe how artificially constructed challenges common within EE programs may function well for more privileged audiences who live freer from the everyday structural challenges often faced by racial or ethnic minorities. Such contrived challenges, however, may inadvertently trivialize structural inequalities for less privileged participants. Each of these issues illuminates the challenges of developing relevant and meaningful experiences for diverse audiences.

Access to EE in its various forms is not uniform across racial and socioeconomic spectra. Common barriers to participating in such experiences may include limited access due to cost, transportation, or geographic factors; communication challenges between program providers and diverse communities; a lack of knowledge, experience, and awareness of programs on behalf of potential attendees; fear of discrimination in the places programs take place; cultural differences; and a lack of diversity reflected in the staff of program providers, making programs feel less welcoming for diverse communities (Bruyere and Salazar 2010; Floyd and Stodolska 2019; Hong and Anderson 2006; Roberts 2007; Pease 2015; Warren et al. 2014). As studies commonly find that youth from lower socioeconomic backgrounds have limited access to green spaces and EE experiences (Carlone et al. 2015; Marouli 2002; Rigolon 2017; Taylor 2016), the EE field recognizes the critical need to enhance equity and inclusion in EE programs across the United States (NAAEE 2017, 2020; Stern and Powell 2021). However, empirical evidence about how EE programs may differentially impact diverse audiences is lacking.

School field trips represent one particularly promising pathway for engaging more diverse audiences in EE. EE field trip programs are hosted by a wide array of organizations, including nature centers, museums, aquaria, gardens, and national, state, and local parks, in a wide array of locations around the US. While some research suggests that single-day field trips are less impactful than longer engagements, particularly for influencing behavior change (Chawla and Cushing 2007; Rickinson, 2001; Stern, Powell, and Hill 2014), we selected them due to their broad accessibility by a wide diversity of participants. Because the costs of attending such

programs are often subsidized and can be spread across entire schools or school districts, they enable a more diverse group of youth to actively engage in EE experiences that might otherwise not have the opportunity to attend (Powell, Jodice, and Stern 2013). Single-day field trips may also feel more accessible to families who, depending on their personal, cultural or socioeconomic circumstances, might feel less comfortable sending their children into overnight experiences (Bustamante 2008; Garst, Gagnon, and Bennett 2016). They thus provide a diverse sample of programs within which to examine how EE interacts with racial and socioeconomic characteristics of participants to influence outcomes.

To date, research has been inconsistent on the influences of race and income on environmental orientations and behaviors. For example, while income has previously been positively associated with pro-environmental behaviors (Clark, Kotchen, and Moore 2003; Straughan and Roberts 1999), more recent studies suggest that environmental concern may be more evenly distributed across income levels. Adeola (2004) and other studies (e.g. Pearson et al. 2018) suggest that environmental concern and responsiveness may actually be greater in communities of lower socioeconomic status and higher proportions of racial or ethnic minorities in the United States, as they are more commonly directly exposed to environmental risks. Recent studies of the spatial distribution of environmental risks lend further credence to this claim (e.g. Angermeier et al. 2021; Cushing et al. 2015).

Despite these trends, Pearson and colleagues (2018) documented that diverse segments of the US population regularly underestimate the actual environmental concerns of racial minority and low-income Americans. These misconceptions may have meaningful influences on the effects of EE programs on diverse populations. Recent studies have shown variable data regarding the environmental orientations of diverse youth (e.g. Taylor 2018). Stern and colleagues (2010), for example, found that urban, primarily African-American, adolescents displayed higher degrees of environmental responsibility than their primarily White rural counterparts in Maryland. Larson and colleagues (2010) found that African American and White students exhibited similar levels of personal interest in nature and intentions to engage in pro-environmental behavior, though environmental knowledge and awareness of environmental issues were greater among White children. In a study of middle school students from 80 schools across North Carolina, Stevenson and colleagues (2013) found that Black and Hispanic students exhibited lower levels of environmental literacy than White students. The authors found that these differences could be at least partially explained by socioeconomic status of the students, as students from Title I schools also exhibited lower scores on behavioral elements of environmental literacy.

Research from formal education supports the hypothesis that the racial and ethnic identities of educators can also have meaningful influences on student outcomes. Numerous studies have found that elementary and middle school students tend to perform better on reading and math tests when their teachers are the same race or ethnicity as them (e.g. Dee, 2004; Egalite et al., 2015). Racial matching between teachers and students has also been linked to lesser absenteeism and fewer major disciplinary actions (Holt and Gershenson, 2015; Lindsay and Hart, 2017). Dee (2005) found that racial mismatches between teachers and their students were linked to more negative perceptions on behalf of teachers toward their students' behaviors and performance across a national sample of eighth grade classes in the United States. This effect intensified for students of lower socioeconomic status. To our knowledge, similar analyses are unavailable for large-sample EE studies.

Taken together, the findings of prior research raise important questions about the interactions between EE programs, race, and socioeconomic status. Do EE programs have more or less positive influences on different types of students from different contexts? And does racial/ethnic mismatch between students and their on-site instructors influence outcomes? This study details a systematic exploration of these questions across the United States.

Methods

This research was conducted as part of a larger study designed to explore the relationships between specific pedagogical approaches and student outcomes on EE-related field trips in the United States (see Dale et al. 2020; Lee, Stern, and Powell 2020; O'Hare et al. 2020). This research uses data collected from student participants, on-site educators, and pre-existing databases. Student questionnaires provided the outcomes measures; educator questionnaires provided educators' self-reported racial identities; and pre-existing databases were used to identify the racial make-up of student groups and the overall socioeconomic climate of their schools. Each measure is explained in more detail below, following a description of site selection and preceding a description of the analyses performed to address the research questions. 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.

Site selection

The larger study sought a diverse sample of single-day EE-focused school field trips for students in grades 5-8 across the United States. Program providers of these programs included nature centers, national, state and local parks, botanical gardens, museums, wildlife reserves, farms, science museums, public forests, and other environmental organizations. Programs were selected to maximize the diversity of the contexts in which programs were conducted. To do so, we relied on Ruggiero's (2016) evaluation of Environmental Literacy Plans (ELPs) in the US, which ranked states with regard to the status and quality of their ELPs. ELPs are 'state-specific comprehensive frameworks that support school systems in expanding and improving environmental education programs' (NAAEE 2014, p. 4) and thus serve as a general proxy for the status of EE in each state. We divided states into quartiles based on Ruggiero's evaluation and quota-sampled a minimum of ten program providers from within each quartile. Specific selection criteria were based primarily on the availability and frequency of single-day on-site EE school field trips for students in grades 5-8 with our sampling window (January-July 2018). We also sought to maximize diversity in terms of the socioeconomic context of the programs by sampling across the urban-to-rural spectrum in various locations. Ultimately, we observed 345 programs provided by 90 unique organizations across 24 states and Washington, DC, across the four quartiles (see Supplemental Table A1 for a more complete breakdown of the final sample after data cleaning). For more detail on sampling, see Dale et al. (2020).

The vast majority of programs (96%) were science-focused; 24% replicated typical lab experiments similar to those that might take place in a classroom, but did so in a field environment. Forty-three percent of the field trips involved the students in some form of active data collection. Eighty-four percent of the field trips spent most or all of the field trip outdoors; only 2% spent no time outdoors. The average group size was 15.8 students, and the average duration of time spent on site was 191 min. Roughly 38% of programs had only one on-site instructor; 36% had two; and 26% had more than two on-site instructors.

Measuring program outcomes

We administered in-person post-experience paper questionnaires to all student participants immediately after the program before they left the site of their field trip to measure self-reported changes in study outcomes, which included a broad measure of environmental literacy known as 'EE21' (Powell et al., 2019), satisfaction, and behavioral intentions. The **EE21 scale** consists of 10 subscales intended to measure self-reported changes resulting from programs in key components of environmental literacy, including learning, enhanced curiosity,

21st century skills, environmental attitudes, personal meaning, self-efficacy, school motivations, positive youth development, environmental stewardship, and place connection (Table 1). The scale was developed through an extensive collaborative process with EE professionals and researchers and then statistically validated (see Powell et al., 2019 for details). Each item used a 0-to-10 Likert-type scale to measure the degree of influence the program had on particular outcomes (see table X). **Satisfaction** was measured as a single item, 'How would you rate this field trip on a scale from 0 to 10?' with the ends of the spectrum labeled 'Terrible' (0) and 'Excellent' (10). **Behavioral intentions** were measured using a single two-part question. 'As a result of this field trip, do you intend to do anything differently in your life?' Respondents were instructed to circle yes or no, followed by an open-ended text box, labeled: 'If yes, what will you do? Write your answer in the space below.' These responses were reviewed by the research team to determine whether they reflected behaviors relevant to the programming. If they were entirely irrelevant (for example, 'I will become a professional wrestler.'), they were recoded as 'no.' The surveys took roughly 8 min, on average, for students to complete.

Determining the racial majority of visiting groups

Although student surveys contained a question about racial identity using standard Census Bureau categories, we observed that students often experienced discomfort and/or misunderstanding concerning this question. Many left the question blank or wrote in invalid responses. Because of these problems, we took steps to verify the racial majority of each participating school group. We began by determining the overall racial make-up of the school of each attending group using various internet sources (https://nces.ed.gov; www.elementary schools.org; www.greatschools.org; www.schooldigger.com, and individual school websites). We recorded the racial majority of students (> 50%) as: majority White, majority Black, majority Hispanic, or no majority. We then compared self-reported racial demographics on the student surveys to these school-wide figures to determine mismatches. The school-wide data matched self-reported data in 88% of the cases. We examined each mismatched case where school-wide data did not match the attending group data. In most cases, the mismatch could be explained by low response rates on the surveys (it would still be possible that the majority of the group could match the majority of the school). In cases of mismatch with higher response rates, we recorded the group as 'missing data,' rather than assigning a specific racial make-up to the group. We did this to be as conservative as possible and avoid misclassification. This only happened in four cases. In some cases (35), school-wide data was not available. In these cases, we coded the majority of the student group using self-reported racial data only when a clear majority (>50% of all students in the group, regardless of the response rate) identified as a specific race. Other cases (4) were coded as missing data. This resulted in eight cases in which the racial majority was not clear enough to use in our analyses.

Socioeconomic context

We use the percentage of students with access to free and reduced lunch prices within a school (% FRPL) as a single indicator of socioeconomic context. While socioeconomic class reflects a far broader array of circumstances, % FRPL reflects the general context of a school's attendance zone in terms of the concentration of low income students (National Center for Education Statistics, 2020). Nationwide, approximately 58% of public school students participated in the National School Lunch program that provides free and reduced lunch prices in 2018 (Bauman and Cranney 2020; USDA Food and Nutrition Service, 2020).

Table 1. Outcomes measures. N = 326 (all programs for which race data were available).

Outcome	Definition	Items	Mean (SD)
Satisfaction	Overall evaluation of the experience	How would you rate this field trip on a scale from 0 to 10? (*anchors: terrible, excellent*)	7.58 (1.18)
Behavioral intention	Proportion of students indicating positive behavioral intention as a result of the program	As a result of this field trip, do you intend to do anything differently in your life? If yes, what will you do?	0.48 (0.22)
EE21[a]	Index	Mean of all subscales listed below.	5.80 (1.01)
EE21 subscales follow			
Learning	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)* • How different parts of the environment interact with each other. • How people can change the environment. • How changes in the environment can impact my life. • How my actions affect the environment.	7.46 (1.06)
Interest in learning	Enhanced curiosity, increased interest in learning about science, the environment.	*Did this field trip make you feel any more interested in any of the following things? (anchors: not at all, more interested much more interested)* • Science. • How to research things I am curious about. • Learning about new subjects in school.	6.42 (1.45)
Meaning/ identity	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)* • Taught me something that will be useful to me in my future. • Really made me think. • Made me think differently about the choices I make in my life. • Made me curious about something.	6.75 (1.37)
21st century skills	Critical thinking and problem solving; communication; and collaboration.	*How much did this field trip help you improve any of these skills? (anchors: not at all, a fair amount, a huge amount)* • Solving problems. • Using science to answer a question. • Listening to other people's points of view. • Knowing how to do research.	6.32 (1.44)
Environmental stewardship	Motivations to perform stewardship-related behaviors.	*Did this field trip make you any more likely to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)* • Help to protect the environment. • Spend more time outside. • Make a positive difference in my community.	7.32 (1.17)

(*Continued*)

Table 1. Continued.

Outcome	Definition	Items	Mean (SD)
Collaboration	Motivation to collaborate more with others.	*Did this field trip make you any more likely to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)* • Listen more to other people's points of view. • Cooperate more with my classmates.	6.95 (1.30)
School motivations	Motivation to work harder in school.	*Did this field trip make you any more likely to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)* • Work harder in school. • Pay more attention in class.	7.21 (1.48)
Place connection	Appreciation and development of personal relationships with the physical location.	*How much do you agree with the following statements? (anchors: not at all, some, totally)Knowing this place exists makes me feel good.* • I want to visit this place again. • I care about this place.	7.66 (1.25)
Change in self-efficacy	Belief in one's own ability to achieve one's goals and influence their environment.	*In a single post-experience survey, students were asked to indicate 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))* • I believe in myself. • I feel condiment I can achieve my goals. • I can make a difference in my community.	0.95 (0.56)
Environmental attitudes	Sensitivity, concern, and positive dispositions towards the environment.	*Same as above for self-efficacy:* • I feel it is important to take good care of the environment. • Humans are a part of nature, not separate from it. • I have the power to protect the environment.	1.00 (0.50)

[a]To account for potential unequal weighting of the items measured as change scores (which had lower means), we also calculated a standardized EE21 score using the z-scores of each subscale and re-ran all analyses. The results of all statistical tests did not change. The standardized EE21 index comprised of z-scores of the subscales was almost perfectly correlated with the original measure ($r = 0.99$). For simplicity's sake, and to enhance the ease of potential replicability of the study, we used the non-transformed EE21 index in the analyses reported herein

Grade levels

Grade levels were reported by the on-site educators, but were also collected on student questionnaires. Most groups were comprised of a single grade. Groups containing students from multiple grades were removed from the grade level analyses.

Data cleaning and aggregation

To match the program-level racial, socioeconomic, and grade level data, outcomes were aggregated to the program level as well. Prior to the aggregation, data from 5,317 student surveys from the 345 programs were screened for validity, using SPSS. We first dropped any programs where fewer than 50% of students completed the surveys. This eliminated three programs from the sample. We then removed surveys from which 25% or more of the questions were left unanswered. With these removals, one additional program dropped below the 50% response rate threshold. Data were then screened for obvious patterns indicating invalid responses, such as no variability in answers, strings of consecutive numbers, or using one circle to indicate responses for multiple items. This caused one more program to drop below the 50% required response rate. Finally, we screened the data for multivariate outliers using Mahalanobis Distance (MAH). This caused six more programs to drop below the 50% response rate threshold. Our resulting valid sample included 4,376 valid surveys from 334 programs provided by 90 organizations in 24 states and Washington, DC. For more details on data cleaning, see Dale et al. (2020).

Following data cleaning, individual survey responses were aggregated to the program level to match grade level, predominant race of attending group, socioeconomic context, and instructor race data, which all exist at the program level. EE21 represents the total scale mean across all students who attended a specific program. Similarly, satisfaction represents the mean score for the program. The program-level behavioral intention measure represents the percentage of students who indicated a valid positive behavior change response following the program. To test the validity of aggregating to the program level, we calculated the ICC (1) and ICC (2), which were 0.21 and 0.78, respectively. Each value suggests that most of the variance exists at the group level rather than the individual level and that aggregation is thus valid (Woehr et al. 2015).

Analyses

We first report the descriptive statistics of the sample with regard to grade levels, racial majorities and socioeconomic contexts. We then address the first research question by comparing the means (ANOVA) of each outcome measure across different grade levels and racial majorities. We then conduct Pearson correlation analyses to examine the relationship between % FRPL and each outcome measure. Finally, we examine the relative effects of each explanatory variable (grade level, racial majority, and % FRL) by first examining the relationships between each (ANOVA) and then conducting a linear regression for each outcome. The two categorical variables are entered into the regression as dummy variables. To enable the regression, one category must be designated the reference category and left out of the equation (Hardy 1993). For grade level, fifth grade served as the reference. For racial majority, White majority was the reference category.

To address the second research question, we first report the frequencies of different racial majorities of the student groups and the racial composition of the on-site educators. We then compare the mean scores in outcomes measures for programs with non-White majority students that had all White instructors, some non-White instructors, and all non-White instructors. Unfortunately, our small sample sizes within the non-White racial/ethnic categories limited our ability to further break down the analysis into finer distinctions along racial lines. To control for grade level, we group mean centered the outcome measures for each grade

level. While we hoped to be able to control for % FRPL as well, the data violated the assumptions of homoscedasticity and homogeneity of regression slopes, as the racial make-up of on-site educators had a significant relationship to the socioeconomic context of the students.

Results

We were able to identify the racial majority of 326 of the visiting school groups. Table 2 displays racial majorities as distributed across grade levels within the sample. Free and reduced lunch statistics were available for 275 of the 334 visiting school groups. The proportion of students eligible for free or reduced price lunches ranged from 2% to 100%, with a mean of 56.9%, similar to the national average for 2018 of 58%. Programs with unclear racial majorities ($n = 8$) or mixed grade levels ($n = 27$) were not included in subsequent analyses. These are shaded in gray in Table 2.

Comparing outcomes across grade levels

Table 3 displays the results of a one-way ANOVA comparing mean outcome scores across grade levels. Visiting groups containing mixed grades were omitted from the analysis. The influence of programs on outcomes measures were significantly more positive for fifth grade school groups than for groups from higher grades ($p < 0.001$). Cohen's d effect size analysis indicated a medium effect size (Cohen's $d = 0.62$) for the difference in EE21 outcomes between fifth graders and students in the higher grades. Effect sizes characterizing the difference between fifth graders and students in the higher grades for satisfaction and behavioral intention were small (Cohen's $d = 0.46$ and 0.39, respectively). Eighth grade students exhibited less positive EE21 and behavioral intention outcomes than younger students (Cohen's $d = 1.05$ and 0.73, respectively).

Comparing outcomes by racial majority

Hispanic majority student groups consistently exhibited the most positive outcomes scores (Table 4). White majority groups typically exhibited the lowest scores; though, the only other statistically significant difference was between EE21 scores for White and Black majority groups. Effect sizes were large for the differences between Hispanic majority groups White majority groups for EE21

Table 2. Grade levels and racial majorities of the participating school groups.

	Grade level					
Race majority	Fifth	Sixth	Seventh	Eighth	Mixed grades	Total
White majority	60	54	12	12	13	151
Hispanic majority	41	24	26	5	7	103
Black majority	5	7	14	0	0	26
No majority	21	12	6	0	7	46
Unclear	4	1	3	0	0	8
Total	131	98	61	17	27	334

Table 3 . One-way ANOVA by grade level of visiting groups with LSD posthoc tests.

Outcome measure	Grade (N)				Test statistic	p
	5th (131)	6th (98)	7th (61)	8th (17)		
EE21[L]	6.18[a]	5.68[b]	5.64[b]	4.80[c]	F: 14.2	< 0.001
Satisfaction[L]	7.92[a]	7.50[b]	7.30[b]	7.02[b]	F: 6.2	< 0.001
Behavioral intention[L]	0.53[a]	0.45[b]	0.48[a,b]	0.32[c]	F: 6.1	< 0.001

[a,b,c]Different superscripts indicate statistically significant mean differences ($p < 0.05$).

and satisfaction (Cohen's $d = 1.21$ and 0.88, respectively) and between Hispanic majority and Black majority groups for satisfaction (Cohen's $d = 0.85$). Medium effect sizes were observed for all other statistically significant differences in Table 3 (Cohen's d between 0.5 and 0.8).

Comparing outcomes across socioeconomic contexts

Students coming from schools with greater proportions of students eligible for free and reduced price lunches (% FRPL) exhibited more positive outcome scores (Table 5). In other words, students from poorer schools exhibited more positive outcomes on average.

Comparing the effects of grade level, race, and socioeconomic context

We first examined the data to determine the relationships between socioeconomic class, racial majorities, and grade levels. Our analyses revealed no statistical relationships between grade levels and the other two characteristics. However, racial majorities were statistically related to socioeconomic class (Table 6), with majority White groups exhibiting the lowest proportions of free and reduced price lunch eligibility in their schools and Black and Hispanic majorities groups exhibiting the highest.

Table 7 displays the results of linear regressions for each of the key student outcomes of the study. The proportion of students eligible for free and reduced price lunches was positively associated with each student outcome, indicating that students from schools with greater proportions of economically disadvantaged students exhibited more positive outcomes. Grade level variables indicate that non-fifth grade groups tended to exhibit less positive student outcomes. Hispanic majority groups exhibited more positive outcomes. Elements of each of the three key variables in question – grade level, race, and socioeconomic class—were statistically significant predictors within each model, indicating that they each explain different portions of the variance of each outcome. In other words, there were no strong mediating effects between the

Table 4. One-way ANOVA by majority race of visiting groups with Dunnett's C posthoc tests for EE21 and Satisfaction outcomes and LSD posthoc tests for Behavioral intention.

Outcome measure	Majority race (N)				Test statistic	p
	White (151)	Hispanic (103)	Black (26)	None (46)		
EE21	5.38[a]	6.41[b]	5.95[c]	5.74[a,c]	Welch: 32.8	< 0.001
Satisfaction	7.23[a]	8.17[b]	7.36[a]	7.55[a]	Welch: 17.8	< 0.001
Behavioral intention	0.44[a]	0.56[b]	0.48[a,b]	0.44[a]	F: 7.45	< 0.001

[a,b,c]Different superscripts indicate statistically significant mean differences ($p < 0.05$).

Table 5. Pearson correlations between program outcomes and the proportion of students eligible for free and reduced price lunches.

Outcome	Pearson *r* correlation with % FRPL	p
EE21	0.552	< 0.001
Satisfaction	0.371	< 0.001
Behavioral intention	0.254	< 0.001

Table 6. One-way ANOVA (with Dunnett's C posthoc tests for unequal variances) comparing the proportion of free and reduced price lunch eligibility (% FRPL) between schools of groups with different racial majorities.

Socioeconomic indicator	Majority race (N)				Test statistic	p
	White (151)	Hispanic (103)	Black (26)	None (46)		
% FRPL	0.42[a]	0.76[b]	0.65[b,c]	0.57[c]	Welch: 68.9	< 0.001

Table 7. Linear regressions predicting student outcomes.

	EE21 R^2= 0.442		Satisfaction R^2= 0.225		Behavioral intention R^2= 0.137	
Variables	Standardized β	p	Standardized β	p	Standardized β	p
% FRPL	0.425**	< 0.001	0.239**	0.001	0.157*	0.034
6th grade	−0.150**	0.004	−0.104	0.091	−0.135*	0.038
7th grade	−0.254**	< 0.001	−0.233**	< 0.001	−0.128	0.058
8th grade	−0.305**	< 0.001	−0.163**	0.005	−0.219**	< 0.001
Majority Hispanic	0.217**	0.001	0.243**	0.001	0.158*	0.048
Majority Black	0.087	0.105	0.023	0.716	0.026	0.702
Majority none	0.006	0.914	0.34	0.570	−0.045	0.486
F-statistic	28.90	< 0.001	10.59	< 0.001	5.77	< 0.001

independent variables; each serves as an independently important predictor of student outcomes. Overall, these variables explained roughly 44% of the variance in EE21 scores; 23% of the variance in satisfaction, and 14% of the variance in behavioral intentions.

Examining the influence of the race of instructors

Most programs we observed had at least one White instructor, and 78% had only White instructors. Meanwhile, the student groups attending the programs reflected considerably more diversity (Table 8). Our analyses revealed that non-White majority groups expressed higher degrees of satisfaction with their EE programs when there was at least one non-White instructor, controlling for the effects of grade level (Table 9). This effect was even stronger when there were no White instructors, with Cohen's d analyses indicating a small-to-medium effect size for the first comparison ($d = 0.41$) and a medium-to-large effect size for the second ($d = 0.79$). No statistically significant differences were noted for EE21 or behavioral intention outcomes. Small sample sizes for these analyses may have precluded other statistically significant patterns from emerging. Sub-sample sizes limited our ability to conduct additional analyses along racial lines.

Discussion

Fifth grade groups, groups of Hispanic majority, and groups from poorer socioeconomic contexts exhibited significantly more positive outcomes resulting from EE school field trips than other student groups. Majority White student groups exhibited smaller reported changes in outcomes overall. Non-White majority student groups reported higher satisfaction on programs with non-White instructors. We discuss each of these findings in turn.

Potential explanations for more positive outcomes among fifth graders stem from both theoretical and practical sources. Prior research and theory suggests that both cognitive and moral transitions may commonly occur around the age of 11, which equates to fifth grade for most students in the United States. For example, Piaget's work on cognitive development suggests shifts in students' abilities to think abstractly, test hypotheses, and draw valid conclusions from

Table 8. Racial breakdown of instructors and student groups.

Instructors	% of programs	Student groups	% of programs
At least one White instructor	91%	White majority	47%
Only White instructors	78%	Hispanic/Latinx majority	33%
At least on Hispanic/Latinx instructor	12%	Black majority	6%
At least one Black instructor	5%	No majority	14%
At least one mixed race instructor	12%		

Table 9. Means comparisons (independent samples t-tests) for outcomes of field trips with non-White majority students, controlling for grade level. *Dependent variables have been group-mean-centered (around zero) to control for grade level.*

	EE21			Satisfaction			Behavioral intention		
Group characteristics	Mean (sd)	t	p	Mean (sd)	t	p	Mean (sd)	t	p
Only White instructors (n = 97)	0.31 (0.79)	1.30	0.19	0.18 (1.06)	**2.32***	0.022	0.35 (0.22)	0.42	0.68
At least one non-White instructor (n = 51)	0.48 (0.70)			0.59 (0.93)			0.05 (0.23)		
At least one White instructor (n = 119)	0.35 (0.79)	0.68	0.50	0.18 (1.06)	**4.46****	< 0.001	0.03 (0.23)	1.44	0.15
No White instructors (n = 29)	0.46 (0.66)			0.88 (0.66)			0.09 (0.19)		

observations, around this age (Piaget 1972). Kohlberg's work on moral development suggests that shifts in moral reasoning often begin around this age as well, including stronger considerations of social norms and the value of maintaining broader societal well-being (Kohlberg 1976). Research on identity development similarly notes early adolescence as a time in which self-definition, in terms of membership in social groups, begins to become related to elements of self-esteem and cultural commitments (French et al. 2006; Klimstra et al. 2010). Each of these trends suggests that fifth grade might be an optimal time to expose students to content commonly included in EE. As new cognitive abilities are emerging, EE can provide new and exciting venues in which to put them to use. As students begin to more fully consider the importance of the well-being of society beyond their immediate concerns, they may be more receptive learning about environmental issues. Exploring environmental themes as identity development is just beginning to accelerate also presents opportunities for students to explore their own relationships with the broader world around them. Effectively conveying these themes in an impactful way later in life, when identities are commonly less malleable, might require stronger efforts than a single field trip experience can typically provide. For example, Hungerford and Volk (1990) suggest that students in 6th grade and above are better suited to higher degrees of autonomy and active investigation of multiple issues than children in earlier grades. Our study adds some more evidence to this idea, as students in 8th grade self-reported the least positive outcomes of any grade level, indicating the need for perhaps an entirely different programmatic approach for older students.

From a practical standpoint, we also noted throughout the planning and implementation of our research that most EE providers within our sample delivered far more programs to younger children, grades K-5, than to older children. The providers we spoke with commonly explained that it was easier to access these age groups, because they had fewer specific academic requirements and their daily schedules (e.g. the same teacher for all or most of the day) simplified the logistics of taking field trips. Although we did not systematically examine trends in offerings and program design across age groups, one potential explanation for the better performance of 5th grade programs is that EE providers may be designing their programs with these age groups specifically in mind. Our conversations revealed that programs for older groups were sometimes delivered on an *ad hoc* basis, in which instructors would use materials developed for younger audiences and (only sometimes) modify them for older participants. This may explain why 8th grade students exhibited the least positive outcomes. We have no consistent, systematic data on this trend, however – only conversations with program providers about their offerings. We urge further research on this phenomenon to examine its potential prevalence and influences on the effectiveness of EE for older age groups.

It is possible that Hispanic students tend to respond more positively to EE programs or that the programs for Hispanic students included in this study happened to be of higher quality on average than the other programs. However, the more positive outcomes observed in these

groups are likely at least partially attributable to a response style prevalent among Latinx respondents in the United States known as *acquiescence*. Acquiescence, which is related to social desirability bias, refers to a pattern of reflexively agreeing with survey items, thus creating a positive bias in responses. Latinx respondents in the United States more commonly exhibit this response style than other groups (Davis, Resnicow, and Couper 2011; Davis et al. 2019). They also tend to select more extreme ends of measurement scales (Dogan, Sitnick, and Onati 2012). Prior studies revealing these effects have primarily focus on teenagers and adults. It is thus unclear how much survey acquiescence and a bias toward the positive extreme might account for the differences observed between Hispanic respondents and others. In a study of the effect of field trips on informal science learning, Whitesell (2016) observed the most positive effects on test scores for Hispanic and lower-income students, suggesting there might be more to the observed trend than solely survey response bias.

White majority groups consistently exhibited the lowest outcome scores of all groups, lower than Hispanic majority groups and lower than Black majority groups on the EE21 outcome measure. While our study did not directly explore the reasons for these differences, some potential explanations might be related to observed trends in outcomes across socioeconomic context.Socioeconomic context, as measured by the proportion of students eligible for free or reduced price lunches in their schools, was correlated with each of the measured outcomes of EE programs. Students from wealthier school districts tended to exhibit less positive outcomes than those from poorer school districts. We posit that the degree of novelty of the experience for each group might be quite different. Novelty reflects the extent to which a new experience represents a contrast with prior experiences (Bevins et al., 1997; Garst, Williams, and Roggenbuck 2009). School and family field trips and unique EE experiences may be less common for students from poorer economic contexts (Greene, Kisida, and Bowen 2014). As such, EE field trips likely represent a more novel experience for these groups. In prior studies in youth outdoor education, novelty has been identified as a primary driver of more positive outcomes for participants (Dale et al. 2020; DeWitt and Storksdieck 2008; de Waal 2008; Garst, Scheider, and Baker 2001; Keltner et al. 2014), as long as the novelty is managed through appropriate preparation for students (Lee at al., 2020) and instructors help students to make sense of their new experiences (Boeve-de Pauw, Van Hoof, and Van Petegem 2019; Dale et al. 2020). Within our sample, White majority groups tended to come from wealthier school districts, while Hispanic and Black majority groups tended to come from the poorest. Given these relationships, a similar explanation might also apply to why Hispanic and Black majority groups, from the poorest school districts, exhibited more positive outcomes on average.

Our explorations of mismatches between instructor racial identities and student group racial majorities yielded mixed results. While non-White majority groups reported higher levels of satisfaction when non-White instructors taught programs, racial identities of instructors were not related to other outcomes. Prior research suggests the potential importance of racial diversity within program-providing organizations for creating welcoming environments for visiting audiences (Pease 2015; Roberts 2007; Taylor 2018). Pinckney et al. (2018) and Wakefield and Hudley (2007) suggest that young people might even gain a clearer understanding of their own racial or ethnic identities through interacting with adult mentors in programs like those we studied here. Our results suggest that interacting with instructors of similar racial backgrounds may have enhanced students' enjoyment of the experience. However, our findings also reveal that outcomes associated with environmental literacy, 21st Century skills, and positive youth development were not consistently influenced by the racial identity of the instructors or the degree of match or mismatch with the racial majority of the student group. While the EE21 outcome measure contains some elements of identity and self-efficacy, we did not directly assess the development of racial or ethnic identity.

Taken together, the study suggests that broader racial representation, especially mirroring the racial identities of visiting groups, can indeed enhance positive feelings about field trip programs. However, key learning outcomes may be achievable regardless of this specific match.

Thus, cultural appropriateness of programs is not solely (or even primarily in our case) based on racial similarity between instructors and students. Rather, cultural responsiveness may be cultivated through a broader array of approaches. Key elements of these approaches might include partnering with community members to co-create culturally relevant programs (Blanchet-Cohen and Reilly 2013; Pease 2015; Simon 2016); acknowledging and exploring diverse ways of knowing (Miller 2018; Nesterova 2020); centering programs on local issues of concern to local communities (Aguilar, McCann, and Liddicoat 2017; Blanchet-Cohen and Reilly 2017; Gay 2018); reconsidering how 'environment' is defined to align with locally relevant conceptions and lived experiences (Stapleton 2020; Stern, Powell, and Ardoin 2010; Taylor 1996); addressing social, cultural, political, and economic aspects of environmental issues (Lewis and James 1995; NAAEE 2021); incorporating authentic local and culturally relevant voices, characters, and examples into EE content and delivery (Blanchet-Cohen and Reilly 2017; NAEEE, 2021); emphasizing connections between personal, social, and ecological well-being (Fien 2003; Schindel and Tolbert 2017); examining programs for inadvertent insensitivities (Pease 2015); intertwining EE with other culturally relevant topics, such as health, food, or art (Del Campo, Purcell, and Marcos-Iga 2016; Stapleton 2015; Sowerwine et al. 2019); exploring environmental justice issues (Marouli 2002); and training educators in cultural competencies (Tso and Hill 2006; Gay 2018).

Limitations and future research

The coarse-grained analyses we conducted examine broad trends, rather than detailed explorations of the nuances and cultures of specific geographic locations. Each population described in the study exhibits tremendous diversity within itself. This research thus only demonstrates general trends across broad classes of student populations. Larger samples would be needed to examine subpopulations in a similar analysis. Moreover, the populations studied were not selected to be statistically representative of any larger populations. Instead, the sample represents only the audiences that attended the programs selected in the larger study.

This study also did not account for differences in program design and delivery across the diverse organizations providing EE programs. Larger and more representative sample sizes would be necessary to provide the statistical power needed to systematically examine whether different approaches to the development and delivery of EE programs yield differential outcomes for different subpopulations of students. However, even large-scale systematic investigations such as these can only identify broad trends. Continued case study research, both qualitative and quantitative, would be necessary to enhance understandings of why these trends exist and how to best address them in specific contexts around the US and abroad.

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