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Moving Beyond Scientific Fact-Only Environmental Education in the United States

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MOVING BEYOND SCIENTIFIC FACT-ONLY ENVIRONMENTAL EDUCATION
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ABSTRACT

Environmental education (EE) aims to develop the knowledge, skills, dispositions, and behaviors necessary to solve environmental problems (Stern, Powell & Hill, 2014; Tbilisi Declaration, 1977). However, there is debate regarding whether EE programs should focus exclusively on teaching environmental science or on teaching as well as encouraging pro-environmental behaviors (PEBs) through civic engagement, advocacy, and action/behavior change (CEAA) techniques. To assess the outcomes educators prioritize, which CEAA techniques EE providers feel are appropriate to utilize in EE programming for youth, as well as the extent to which they utilize them, we designed and distributed a survey to members of several large North American EE organizations. Based on the North American Association for Environmental Education's (NAAEE) Guidelines for Excellence (2019) and input from professionals and practitioners, the survey included a list of 32 CEAA techniques. Respondents ($N = 261$) to the survey were asked to prioritize programmatic outcomes and also rate each CEAA technique in two ways (1) the level of appropriateness of the technique and (2) how frequently they utilized the technique when teaching their program to students in either grades 4th-5th, 6th-8th, or 9th-12th. The results suggest EE providers prioritize knowledge and enjoyment outcomes for younger audiences and higher cognitive level outcomes (skills, attitudes, and behaviors) for older age groups. The results also suggest that explicit advocacy and behavior change techniques were rated less appropriate and were also utilized less for younger age groups. We also compared the appropriateness and use mean scores of each CEAA technique to determine the "gap" and identify techniques that were deemed highly appropriate but were underutilized. The largest gaps occurred in active civic engagement and advocacy techniques related to Justice, Equity, Diversity, and Inclusion (JEDI). Finally, we found EE providers rated most techniques as less appropriate for younger audiences than for older audiences. Practical and philosophical implications of these findings are further discussed.

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INTRODUCTION

Environmental education (EE) aims to develop environmental literacy, which is defined as the knowledge, skills, dispositions, and behaviors necessary to solve environmental problems (e.g., Hofstein & Rosenfeld, 1996; Tbilisi Declaration, 1977). EE, as defined by the Tbilisi Declaration (1977), is interdisciplinary and must help individuals and communities "understand the complex nature of natural and built environments resulting from the interaction of their biological, physical, social, economic, and cultural aspects" (p.14). Thus, a holistic approach to building environmental literacy addresses the economic, social, cultural, and political nature of environmental issues along with the biological and physical, an approach commonly referred to as socioenvironmental (Musters et al., 1998; Pulver et al., 2018). Further, the North American Association for Environmental Education (NAAEE, 2009) highlights the necessity for EE participants to learn "action skills" that will facilitate solving socioenvironmental problems and suggests successful EE programs should be "action-oriented." However, there is debate regarding whether EE programs in the United States, especially for youth, should focus exclusively on teaching environmental science or on teaching environmental science as well as helping participants develop the skills, dispositions, and pro-environmental behaviors (PEBs) necessary to solve challenging socioenvironmental problems (Jickling, 2003; NAAEE, 2021).

For US-based EE programs geared toward youth, there are both political pressures and educational expectations for programs to meet educational standards, most commonly science standards, and to not "indoctrinate" youth to a particular way of thinking (Jickling, 2003; Warren & Breunig, 2019). This focus on science standards has led some to claim US-based EE programs have simply become environmental science programs that emphasize the knowledge domain of environmental literacy and address only the biological and physical aspects of socioenvironmental issues (Gruenewald & Manteaw, 2007; Warren & Breunig, 2019). Currently, organizations such as the NAAEE promote a broad range of techniques for EE practitioners that focus not only on enhancing knowledge of environmental science, but also building the dispositions and skills to support civic engagement and future environmental action

(NAAEE, 2020; Johnson & Mappin, 2009; Krasny, 2020). However, it is unclear which civic

engagement, advocacy, and action/behavior change (CEAA) techniques US-based EE providers believe

are appropriate to use when teaching youth (grades 4th-12th) and how widely they use these techniques.

We focus this investigation on three different grade ranges: 4th-5th grade, 6th-8th grade, and 9th-12th grade

because these reflect different developmental stages and correspond with different educational standards

(Dewey, 1899; Kellert, 2002; Kohlberg, 1979; Krathwohl et al., 1956; Piaget, 1953; Wells, 2000; Wells

& Evans, 2003). We expect the extent of appropriateness and intensity of use of CEAA techniques to vary

depending on the grade range EE providers teach. Therefore, the purpose of this study is to answer the

following research questions:

1) Which outcomes does the EE field seek to achieve in programming for youth in different grade

ranges (4th-5th, 6-8th, and 9th-12th)?

2) What CEAA techniques does the EE field believe are appropriate to use in programming for

youth in different grade ranges (4th-5th, 6-8th, and 9th-12th)?

3) To what extent do educators use CEAA techniques in programming for youth in different

grade ranges (4th-5th, 6-8th, and 9th-12th)?

4) What opportunities exist to expand use of age appropriate CEAA techniques?

Chapter Two:

LITERATURE REVIEW

United States-Based Environmental Education Programs for Youth

According to the Tbilisi Declaration (1977), EE typically uses hands on and engaging educational

techniques to impart knowledge and awareness about the environment and its associated challenges;

develops skills and expertise to address these challenges; and fosters positive attitudes and motivations to

encourage participants to make informed decisions and take action to solve socioenvironmental

challenges (Ardoin et al.2015; Emmons, 1997; Hollweg et al., 2011; Stern et al., 2014; UNESCO, 1977).

EE programs designed for youth often also seek to meet educational standards (e.g., Powell et al., 2011),

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enhance place connection (Ardoin, 2006; Gruenewald, 2003; Vaske & Kobrin, 2001), and improve positive youth development (Garst et al., 2011; Lerner et al., 2005). However, EE programs can vary in their (1) programmatic content, (2) intended outcomes, and (3) techniques they use to achieve their intended outcomes. The primary focus of this study is to explore whether EE providers are open to setting the stage for PEBs using techniques that go beyond meeting environmental science standards.

Learning and Educational Standards in the US

While EE's stated purpose is to enhance participants' knowledge, skills, dispositions, and behaviors to solve environmental problems, EE for youth in the US tends to emphasize achieving educational standards. The No Child Left Behind Act of 2001 requires measuring student achievement in traditional content areas; aligning teacher preparation and curriculum with state academic standards; and holding teachers and schools accountable for results. These requirements have strongly influenced the fields of education and EE for twenty years (Gruenewald & Manteaw, 2007; Dimick, 2015). As a result, many EE programs for youth in the US now focus primarily on meeting curriculum standards and the knowledge domain of environmental literacy in an attempt to legitimize EE (See, for example, Lieberman & Hoody, 1998; Gruenewald & Manteaw, 2007).

EE providers have also long assumed that providing scientific information alone would lead to pro-environmental behavior change, but there is ample evidence that a sole focus on knowledge does not lead to informed action (Burgess et al., 1998; Ham, 2013; Heimlich & Ardoin, 2008; Hines et al., 1998; Stern, 2018). Environmental educators aiming for a holistic approach to environmental literacy that is relevant to participants' everyday lives may discuss complex issues that can sometimes be politically contentious (Brownlee et al. 2013; Monroe et al., 2019). The ability to lead a program related to these issues is at the heart of EE if it is to accomplish the goals of the Tbilisi Declaration and achieve outcomes beyond knowledge. However, the perceived obligation to meet formal educational standards has shifted many environmental educators away from programming that is focused on the bolder outcomes and aims of environmental literacy, including developing 21st century skills (critical thinking, creativity, collaboration, and communication), motivation, attitudes, dispositions, and ultimately pro-environmental

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behavior change (Bonta et al., 2015; Gruenewald & Manteaw, 2007; Warren & Breunig, 2019). To take a comprehensive approach to environmental literacy and address the complex issues of the 21st century, EE programs should strive not only to enhance knowledge, but also a range of additional EE outcomes.

EE Program Outcomes for 4th-12th Grade Participants

Despite pressures to achieve science standards, EE providers throughout the United States may aim for a range of outcomes in their programming, including knowledge, attitudes, social-emotional learning, enjoyment, skills development, 21st century skills (including civic engagement skills), and behavior change (Table 1; Ardoin et al., 2020; Powell et al., 2019).

Table 1. *Intended EE Program Outcomes.*

Knowledge	Participants' change in awareness of the subject matter, environmental issues, or concepts.
Attitudes	Participants' change in attitudes towards the subject matter of the program.
Enjoyment	Participants' overall satisfaction with the program.
Positive youth development (social-emotional learning)	Participants' development of identity, self-esteem, personal awareness, or other positive emotions.
Connection/Place attachment	The development of appreciation for and positive personal relationships with the physical location and its story.
21st Century Skills	Participants strengthen their abilities to perform specific actions, which could include science-related skills, civic engagement skills, or others relevant to the program content.
Environmental justice	Participants strengthen their understanding of the connection between equity, inclusion, and diversity and environmental issues.
Action orientation	Intentions to perform behaviors relevant to the program's content or goals.
Behavioral intentions/Behavior change	A change in participants' self-reported or actual behaviors or behavioral intentions relevant to the program.
Outcomes not pre-determined	They emerge from the participants.

Programmatic outcomes, including attitudes and skills, which theoretically set the stage for behavior change, are not mutually exclusive and may build upon each other (Heimlich & Ardoin, 2008; Kollmuss & Agyeman, 2002; Stern, 2019). Additionally, EE programs that aim to influence behavior change may focus on several types of PEBs (Table 2). PEBs may be categorized in several ways, including individual level behaviors or collective behaviors (Larson et al., 2015). Most studies focus on individual level behaviors (Larson et al., 2015; Kaiser et al., 2007; Steg & Vlek, 2009) that are socially

accepted (e.g., Powell, et. al., 2009), such as recycling (Schultz, Oskamp & Mainieri, 1995), waste

reduction (Ebreo & Vining, 2001), water conservation (Corral-Verdug et al., 2008), energy conservation

(Abrahamse et al., 2005), environmentally conscious transportation (Kaiser et al., 2005), green or eco-

friendly purchasing (Larson et al., 2015; Young et al., 2010), and donating to environmental organizations

(e.g., Powell & Ham, 2008; Powell et al., 2008).

At the other end of the spectrum are collective PEBs, which typically include some type of

community-oriented action or a focus on communication designed to inform others about the importance

of conservation or the value of pro-environmental actions (Larson et al., 2015). This includes activities

such as neighborhood cleanups, eco-walks, and public meetings about environmental policies. Each

behavior will vary in terms of difficulty, barriers, locus of control, social support, how "normal" they are

considered, their potential scale of impact, and more. Therefore, there is not a one-size-fits-all approach to

influencing PEBs. EE providers should consider the level of difficulty, social acceptability, and social

context of the behaviors they aim to influence. Finally, not all PEBs are explicitly related to nature or the

environment. The environmental justice movement recognizes that people of lower socioeconomic status,

people of color, and those who live in the Global South are disproportionally affected by

socioenvironmental issues (Martinez-Alier et al., 2016); therefore, EE programs may consider including

social advocacy, civic engagement, or justice, equity, diversity, and inclusion (JEDI) work to encourage

environmental justice behavior outcomes. Table 2 provides the types of PEBs we include in our study

with examples of each. EE providers who aim to influence these PEBs may use a variety of CEAA

techniques.

Table 2. *Types of PEBs.*

Home conservation behaviors	e.g., taking shorter showers, turning off the water when they brush their teeth
Transportation behaviors	e.g., walking or riding a bicycle instead of driving, carpooling, taking public transit
Reduce, reuse, recycle behaviors	e.g., bringing reusable bags or water bottles with you, composting organic waste, recycling, repairing old items before buying new ones
Consumer behaviors	e.g., purchasing items made from recycled materials, buying products from companies with environmentally responsible practices, purchasing

	locally produced items
Political conservation behaviors	e.g., urging people in positions of power to support pro-environmental practices, becoming a member of an environmental organization
Environmental conservation behaviors	e.g., improving the habitat for wildlife, planting native plants, working to improve parks in your neighborhood
Environmental justice behaviors	e.g., working to ensure all communities have equal access to clean water, air, and green spaces, addressing social injustices, working toward justice, equity, and inclusion related to environmental issues

Civic Engagement Techniques in EE

A significant portion of the EE community has begun to respond to feedback from EE scholars and practitioners related to its overemphasis on environmental knowledge by simultaneously aiming to help participants build the skills necessary to address socioenvironmental problems and focusing on civic engagement (NAAEE, 2017; NAAEE, 2020). Civic engagement is defined as "developing the knowledge, 21st century skills [e.g., communication, collaboration, critical thinking, and creativity], values, and motivation to make a difference in the civic life of communities" (Bobek et al., 2009, p. 617). At its highest form, civic engagement is active and addresses socioenvironmental issues systemically (NAAEE, 2020). The EE community typically associate civic engagement with developing 21st century skills and considering all stakeholder views in the decision-making process (NAAEE, 2020; Pielke, 2014).

NAAEE recently launched an initiative to examine the overlap between environmental literacy and civic literacy and how the two may work together to promote systems thinking and deeper engagement in socioenvironmental issues. They coined the term Civic Engagement for Environmental Issues (CEEI), which is a process that "enables learners to become more knowledgeable and skilled in the resolution of environmental issues through community governance" (NAAEE, 2020, p.1). Participants in CEEI programs are encouraged to use their understandings of environmental systems and civic institutions and structures (e.g., governance) in investigations and deliberations. These CEEI activities should challenge learners to use and improve their 21st century skills to justify and communicate their

own views on socioenvironmental issues and possible ways to address them. Participants even reflect on how their civic actions impact the environment and what changes they might implement within their own communities to resolve socioenvironmental issues, including changes in policies (NAAEE, 2020).

Additionally, NAAEE's *Community Engagement: Guidelines for Excellence* (2017) identifies capacity-building and civic action as key outcomes of an effective EE program. NAAEE (2017) recommends educators "integrate environmental education with complementary communication, education, and social change approaches to promote ongoing civic engagement in community life" (p.49). Civic engagement techniques (and specifically CEEI) aim to highlight social and political elements of environmental issues for a more sophisticated understanding that moves beyond the role physical sciences play in socioenvironmental issues.

When participants and educators collaborate to explore, assess, and evaluate recommended courses of action based on underlying evidence and ethics, this process empowers participants to choose what action or actions to take (Hansson, 2017; Jickling, 2003). This is an important distinction, as some EE scholars and practitioners believe advocating for a specific behavior is problematic and inappropriate (Hansson, 2017; Uzzell, 1995). Thus, those aiming for civic engagement generally do not advocate for a specific, clearly defined position, action, or policy. Instead, they focus on helping participants develop the skills, motivation, and values to make a difference in civic life and expand participant choice (Table 3; Figure 1).

Advocacy Techniques in EE

A prominent, explicit goal of EE is to guide individuals, groups, and society toward behaviors that protect and sustain the environment (UNESCO, 1977). Aiming to influence PEB is part of environmental literacy, not separate from it. However, for over forty years the EE community has debated the appropriateness of advocacy, defined as actively promoting, supporting, or favoring a specific viewpoint or action (Jickling, 2003). Unlike civic engagement, advocacy is associated with providing a specific resolution or suggestion to address a socioenvironmental issue, which could reduce the ways participants may consider resolving a problem (Table 3; Figure 1). This is a contentious issue as some

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educators believe it is their responsibility to simply provide facts; some believe they should facilitate and help participants collaboratively decide on future actions (Hansson, 2017; Monroe et al., 2008; Naess et al., 2000; Simmons, 1996); and others feel they should guide students toward an appropriate and specific action (Jickling, 2003). Educators may feel uncomfortable taking a specific stance on an issue. But there are also risks to remaining neutral. Jickling (2003) writes:

> *In leaning away from advocacy, educators risk implying through their programs and actions that (a) participation in controversial issues and adoption of a position are unimportant, (b) work of environmentalists should not be valued, and (c) much 'radical' thinking and actions should be avoided (p.23).*

If EE providers expect to make an impact on socioenvironmental issues with their program participants, they must eventually come to an agreement about what action(s) to take. Pielke (2014) posits science plays a different role in situations in which there is high values consensus and low scientific uncertainty than in situations in which there is a lack of values consensus and high scientific uncertainty. Situations in which there is high values consensus and low scientific uncertainty may lead to quicker decision-making. For example, the Sixth Assessment by the IPCC (2021) provides high scientific certainty that human activity, specifically burning fossil fuels, causes climate change and that bold actions are necessary to address this crisis. Provided high scientific certainty about the causes and potential impacts of climate change, a group that shares similar social values may more easily decide on a course of action to address the issue and thus advocate for that specific solution.

NAAEE is committed to addressing issues such as climate change and cites advocacy as a potential component of civic engagement educators could use as part of a program to address specific issues that influence communities directly, such as a lack of infrastructure for walking and bicycling (NAAEE, 2020). Additionally, behavior change theories suggest educators must be specific if they aim to change people's actions (Stern, 2018). Still, there is tension in the field whenever advocacy is mentioned (Monroe et al., 2008; Naess et al., 2000; Simmons, 1996). Regardless, whether EE providers use civic engagement or advocacy techniques (or a combination of the two) to influence or reinforce participants'

future behaviors, these techniques should be informed by social-psychological theories related to

persuasion and behavior change if educators expect them to be effective (Table 3; Figure 1).

Table 3. *CEAA Techniques Defined.*

Civic Engagement Techniques	Techniques used to develop the knowledge, skills [e.g., communication, collaboration, critical thinking, and creativity], values, and motivation to make a difference in the civic life of communities. These techniques emphasize the social and political nature of socioenvironmental issues and aim to consider all stakeholder views and values in the process.
Advocacy Techniques	Techniques that actively promote, support, or favor a specific viewpoint or action. These techniques also emphasize the social and political nature of socioenvironmental issues but may not consider all views to expedite decision-making and action.
Action/Pro-environmental Behavior Techniques	A range of techniques (most often based in behavior change theories) that include developing specific skills, values, knowledge, and motivation to take action to address specific socioenvironmental issues.

Figure 1. *A Comparison of Civic Engagement and Advocacy Techniques.*
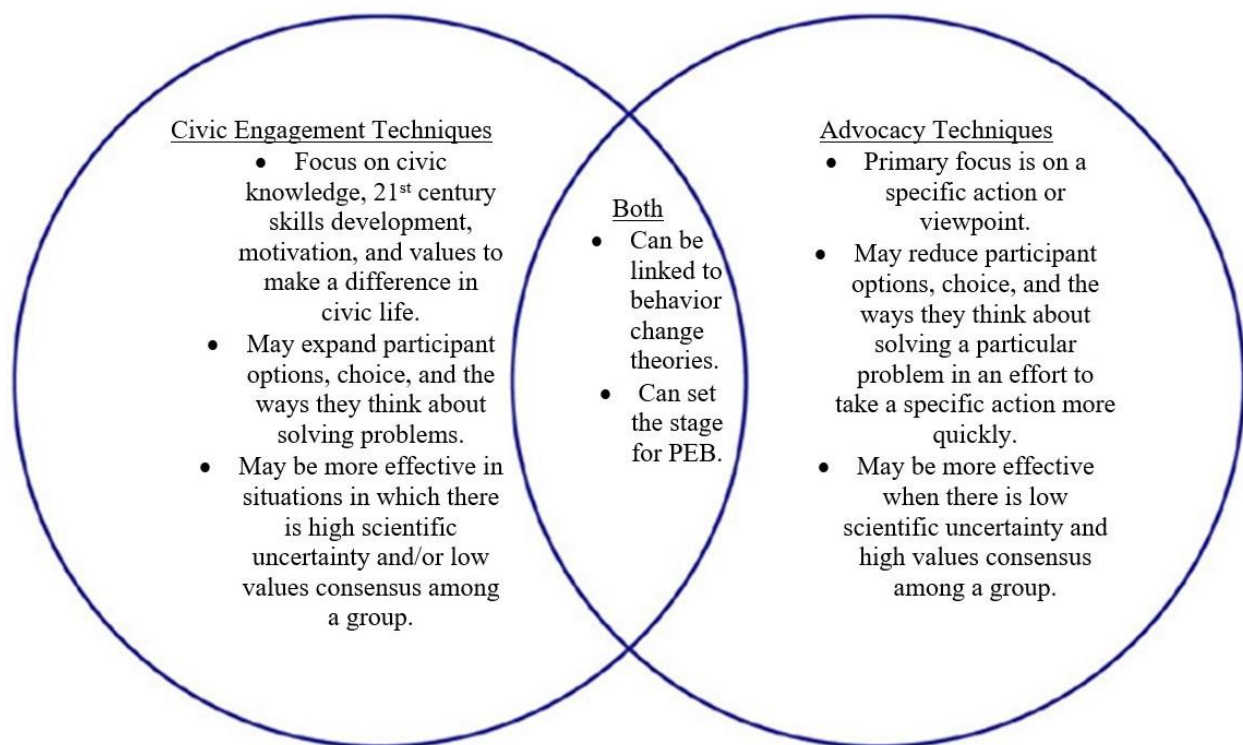
Behavior Change Theories in EE

Environmental educators who wish to change behaviors have a wealth of social-psychological

theories related to persuasion and behavior change to inform their program designs. For this study, we

will review three theories that are prevalent in EE research and have practical applications for EE

providers (Heimlich & Ardoin, 2008; Kollmus & Agyeman, 2002; Stern, 2018): the theory of planned behavior (TPB), norm activation theory (NAM), and value-belief-norm theory (VBN).

Theory of Planned Behavior

TPB (Ajzen, 1991) is one of the most studied theories for understanding and predicting the performance of future behaviors. TPB asserts that human behavior is the product of elaborative, rational thought (Manfredo, 2009) and that future performance of a behavior is contingent on three positive or negative evaluations an individual person makes pertaining to: (1) the result(s) of performing a particular behavior (Fishbein & Ajzen, 2011); (2) how they expect the people who are important to them feel about the potential behavior (social norms) (Hrubes et al., 2001; Stern, 2018); (3) a belief about whether or not they are able to engage in a particular behavior based on their perceived personal capabilities and the potential barriers to performing the behavior (perceived behavioral control) (Armitage & Conner, 2001; see Figure 2). There are some limitations to TPB: (1) it asserts that behavioral intentions lead to actual behaviors and (2) it ignores the role identity, emotions, and several other factors play in human behaviors (Miller, 2017). Despite these limitations, TPB has a variety of applications, including EE (Brown et al., 2010). TPB can be applied to CEAA techniques in EE programming in several ways, including: (1) addressing the benefits and disadvantages a potential action may have on individuals (attitudes toward the behavior); (2) highlighting pro-environmental social norms in individuals' communities (subjective norms); and (3) improving self-efficacy by practicing the target behavior and expressing confidence in people's abilities (perceived behavior control; Stern, 2018).

Figure 2. *Theory of Planned Behavior (Ajzen, 1991).*
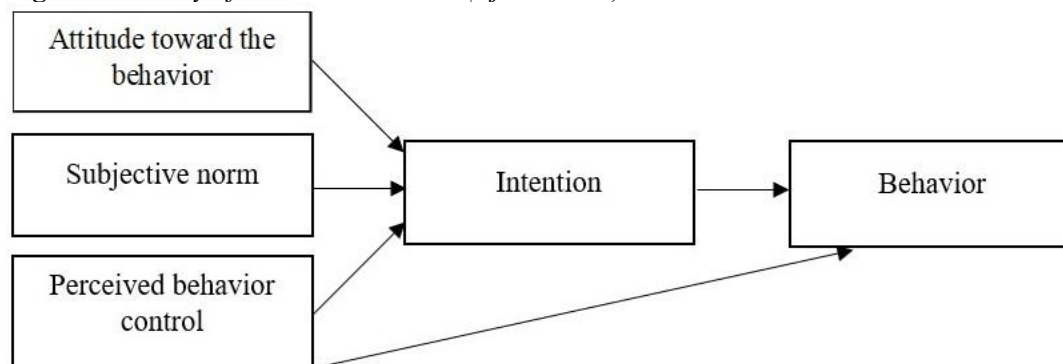
Norm Activation Model

NAM theory suggests that personal norms, awareness of the consequences of personal action/inaction, and ascription of responsibility are determinants of prosocial or pro-environmental intentions (Schwartz, 1977; Figure 3). Personal norms refer to the sense of moral obligation a person feels to behave in a certain way, based on their internal standards (Stern, 2018). NAM posits that for personal norms to become moral obligations that inspire action, individuals must (a) be aware of the consequences of potential action (or inaction) upon something they care about (problem awareness) and (b) accept personal responsibility for those consequences (ascription of responsibility; Stern, 2018). When individuals are aware of the consequences of their behaviors on the environment or other people, and they take responsibility for those consequences, normative activation may occur (Hwang et al., 2016).

Figure 3. *Norm Activation Model (Schwartz, 1977).*
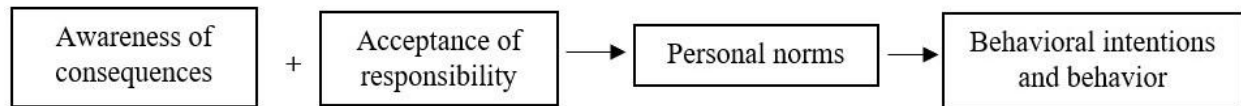
Value-Belief-Norm Theory

VBN theory builds upon NAM to include the environmental value orientations that are thought to influence environmental behavior. Values represent relatively stable beliefs individuals use to evaluate and guide situations and behaviors (Stern, 2018; Kellert, 1996). These environmental value orientations are categorized as biospheric, altruistic, and egoistic, and they shape general environmental beliefs (Stern, 2000; Figure 4). Those with biospheric values tend to value all living things without substantially favoring humans; those with altruistic values are most concerned with human welfare; and those with egoistic values prioritize self-interest (Riper & Kyle, 2014). Individuals with high "self-transcendent" (i.e., beyond the self, those with biospheric or altruistic values) orientation are more likely to report an interest in PEBs (Han et al., 2017). Egoistic values, on the other hand, are more commonly negatively correlated with PEBs (Han et al., 2017; Stern, 2018). General environmental beliefs refer to individuals' views about what constitutes an appropriate relationship between humans and the environment. These beliefs are often reflective of the perceived social norms of an individual's social network (Stern, 2018).

NAM and VBN can be applied to CEAA techniques in EE programming in several ways, including: (1) providing a very clear description of the problem and its consequences and relating the consequences to something the audience cares about; (2) providing a clear, actionable solution to the problem, and being clear that this action will influence an outcome the audience cares about; (3) eliciting active commitments such as written or verbal pledges, and (4) aligning messaging with the values and beliefs of the audience (Stern, 2018).

Figure 4. *VBN Theory (Stern, 2000).*

| Values Biospheric Altruistic Egoistic | → | General environmental beliefs | → | Awareness of consequences | + | Acceptance of responsibility | → | Personal norms | → | Behavioral intentions and behavior |
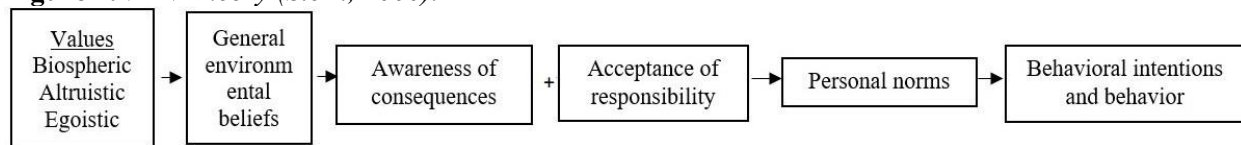
Summary of Behavior Change Theories in EE

The social-psychological theories reviewed above suggest that communications and teaching techniques that target perceived behavioral control, attitudes toward the performance of a specific behavior, subjective norms, personal norms, environmental worldview, values, awareness of consequences, ascription of responsibility, and self-efficacy may influence the performance of PEBs (Lakhan, 2017; Chao, 2012; Mosquera & Sánchez, 2012; Zhao et. al., 2018; Chen, 2015). Despite the many theories that apply to persuasion and predicting behavior change, EE best practices as outlined in the NAAEE Guidelines for Excellence are based on consensus in the EE field and may not include theoretical background. Further, it is unclear whether the EE community feels it is appropriate to seek to change or reinforce specific behaviors (e.g., supporting climate change adaptation initiatives) in 4th-5th, 6th -8th, and 9th -12th grade EE participants, even if that could improve the environment. A comprehensive study of what CEAA techniques the EE community believes are appropriate and which it uses would greatly benefit the field of EE and, potentially, the environment at large. In this study, we incorporate techniques that are informed by the theories mentioned above, as well as literature on civic engagement and advocacy, and identify how appropriate the EE providers believe these techniques are and how often they utilize them.

Chapter Three: METHODS

Although environmental literacy, including the skills and behaviors necessary to solve socioenvironmental issues, is often a desired outcome of EE programs, there is very little research on: (1) the extent to which EE practitioners actively aim to enhance skills, foster civic engagement, and change behaviors; (2) understanding which techniques the EE field believes are appropriate in programming for youth; (3) and identifying which techniques the field uses. To find answers to these questions, we designed an online survey and distributed the survey to members of NAAEE and their state affiliates, the Association of Nature Center Administrators (ANCA), and the National Association for Interpretation (NAI) to target EE practitioners in North America.

Data Collection Procedures and Sampling

NAAEE and ANCA sent invitations containing a description of the survey, voluntary consent information, and a link to an online survey instrument to their members in mid-April 2021 via e-newsletters with a weblink to the survey. Combined, NAAEE and ANCA have over 20,700 members. NAI sent a weblink via an e-newsletter to its members on April 30, 2021. We also contacted NAAEE State Affiliate Organizations and requested that they send the invitation to their membership. Twelve state affiliates distributed the invitation to their members via e-newsletters, Facebook posts, email invitations, or announcements on their websites: Connecticut, Utah, Illinois, Indiana, Kentucky, Minnesota, North Carolina, South Carolina, Pennsylvania, Rhode Island, Virginia, and Wisconsin. We used an adapted Dillman approach in that we asked NAAEE, ANCA, and NAI to post follow-up reminder invitations to take our survey to maximize survey responses (Dillman, 2011). NAAEE and ANCA each sent one follow-up reminder to their members one month after the initial invitation.

When the survey closed after two months of data collection, 400 individuals opened the link. Seventy-six respondents clicked on the link or read the directions but did not start the survey. Three hundred and twenty-four started the survey. Of those, 261 completed more than 50% of the survey, and

249 completed more than 90%. For our analysis, we removed the 63 respondents who completed less than 50% of the survey, leaving 261 valid responses.

Instrument Development

Demographics and Context: The survey included demographic and context questions, such as questions about respondents' current job position, type of organization, how many people the organization employs, how often the organization serves various age groups and underrepresented groups, the extent to which they prioritize various outcomes (on a 4-point Likert type scale) in EE programming for 4th-12th grade participants, which types of PEBs they aim for (if any), the number of years of experience they have in the EE field, and, finally, the racial and gender identity of the respondent (open-ended). Finally, we asked respondents who said they do not attempt to change behavior in their programming to answer an open-ended question explaining why (See Appendix).

Appropriateness and Use: We first asked each respondent to select the grade range with which they have the most experience and expertise: 4th-5th grades, 6th-8th grades, or 9th-12th grades. Their answer to this question determined the grade range for which they rated the relative appropriateness and use of CEAA techniques. These grade ranges reflect developmental theory and educational standards (Dewey, 1899; Kellert, 2002; Kohlberg, 1979; Krathwohl et al., 1956; Piaget, 1953; Wells, 2000; Wells & Evans, 2003) as well as school level (late elementary school, middle school, and high school) in the US.

We used NAAEE's *Community Engagement: Guidelines for Excellence* (2017) as a guide to develop items that reflect civic engagement techniques. We developed additional items focused on advocacy and behavior change based on behavior change theories, NAAEE Guidelines for Excellence (2019), practical knowledge of the field, current events, and current techniques within the EE field (Ajzen, 1991; Jickling, 2003; IPCC, 2021; NAAEE, 2020; Stern, 2018).

Survey respondents rated the list of CEAA techniques (Table 4) based on their relative appropriateness and intensity of use within EE programs for either 4th-5th, 6th-8th, or 9th-12th grade participants on Likert type scales scored from 1-4 (1= Not at all appropriate; 2= somewhat appropriate; 3=mostly appropriate; 4=totally appropriate) and (1= Never use; 2= rarely use; 3= sometimes use; 4=

often use). To encourage normal data distribution, we skewed the appropriateness scale positively (Miller, 2018).

Table 4. *Categorization of CEAA Techniques included on the survey and the corresponding theoretical construct(s) for each technique.*

Category 1: Knowledge and Skills Building for Civic Engagement	
Theoretical basis/Constructs	**Techniques**
Environmental knowledge	Teaching participants about ecology/environmental science.
Civic knowledge	Teaching participants about the public policymaking process.
NAM	Asking participants to identify individual and community assets that will help address a specific environmental issue.
TPB, self-efficacy, NAM	Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings).
VBN	Facilitating discussions that welcome multiple viewpoints.
VBN	Helping participants identify common ground between sides in controversial issues.
Civic engagement	Challenging participants to design novel solutions to a specific environmental issue.
Civic engagement	Asking participants to use evidence to support their proposed solutions to environmental issues.
Category 2: Values and Dispositions for Civic Engagement	
NAM, TPB, self-efficacy	Practicing skills to build participants' confidence in their abilities to address environmental issues.
VBN, values	Encouraging participants to consider that all living things have value in and of themselves.
VBN, values	Demonstrating that a healthy environment is vital to human health and well-being.
VBN, values	Using religious doctrine to support the case for environmental protection.
VBN, values	Communicating that it's our shared moral obligation to care for the environment.
VBN, values	Teaching that everyone has a right to clean air and water, regardless of where they live.
VBN, values, systems thinking	Discussing how systemic racism is intertwined with many environmental issues.
NAM, VBN, TPB, norms	Providing examples of diverse environmental role models.
Category 3: Motivation and Action Planning for Civic Engagement	
Norms, identity, VBN, TPB	Encouraging participants to be "conservationists" in their everyday lives.
TPB, VBN, self-efficacy	Empowering participants to see themselves as change agents.
TPB, self-efficacy	Having participants identify ways to overcome obstacles to performing a specific environmental behavior.
TPB, attitude toward the behavior, self-efficacy	Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue.
TPB, VBN, cost-benefit	Discussing the consequences of inaction on complex environmental issues, such as climate change.
TPB, self-efficacy	Helping participants write an action plan to address a specific environmental issue.
Reinforcement, TPB intervening factor	Following up with participants after a program to support continued behavior change.
TPB, NAM, VBN	Empowering participants to communicate with local decision makers about environmental issues.
Category 4: Advocacy (Unnamed on survey due to controversy)	

TPB, NAM	Asking participants to identify key decision makers related to the issue they are most interested in addressing.
TPB, NAM	Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).
TPB, NAM	Advocating that participants avoid purchasing certain products because of their environmental impacts.
TPB	Using persuasive arguments to influence participants' conservation behaviors.
TPB	Asking participants to sign a petition or pledge to support a specific environmental cause.
TPB	Encouraging participants to join a pro-environmental organization.
TPB	Encouraging participants to peacefully protest for a specific environmental issue.
TPB	Advocating for a specific policy to address an environmental injustice.

Pilot Testing

A team of eleven EE practitioners and researchers iteratively reviewed the survey, and an additional twenty practitioners and leaders from the NAAEE pilot tested the survey. We edited the content based on their suggestions to enhance survey clarity, validity, and inclusiveness.

Data Analysis

We used descriptive statistics to describe the sample of EE professionals who completed our survey, as well as the outcomes they aim for in their EE programming. We report the mean appropriateness and mean intensity of use scores for each CEAA technique and for each of the three grade ranges. We also used the gap between mean appropriateness and mean use (gap = mean appropriateness − mean use) for each technique and for each grade range to determine the greatest differences between extent of appropriateness and intensity of use. We then used one-way ANOVA tests with post hoc Bonferroni mean comparisons to examine whether the appropriateness and use of different techniques significantly varied based on age group. For techniques that had significant post hoc ANOVA results, we computed a Cohen's *d* value to assess the effect size. Cohen's *d* indicates how meaningful the difference in mean scores is between groups (Cohen, 1992; Powell et al., 2017; Tabachnick & Fidell, 2007). A Cohen's *d* value of 0.2 represents a small meaningful difference, a value of 0.5 represents a medium difference, and a value of 0.8 or greater represents a large meaningful difference (Cohen, 1992). Effect sizes larger than 1 indicate the difference between the two means is greater than one standard deviation (Cohen, 1992).

Importance-Performance Analysis → Appropriateness-Use Analysis

Martilla and James (1997) created the Importance-Performance Analysis (IPA) as a quantitative method for analyzing data in marketing. Since then, it has been used widely across many fields including education, leisure, recreation, and tourism (Oh, 2001). The IPA analysis is typically utilized to assess how important people feel certain tasks are for a particular career and how prepared they feel to perform these tasks. IPAs then provide graphical representations of data along two axes to illustrate which job measures or programmatic techniques need improvement (e.g., the tasks that people identify as important but are underprepared to perform) (Warner et al., 2016). In this study, we use a similar model to compare the extent of appropriateness and intensity of use of several CEAA techniques. Figure 5 (below) is an adaptation of the four possible results of an IPA, in this case used to compare the extent of appropriateness and intensity of use of CEAA techniques in North American EE programs geared toward 4th-12th grade participants. Following recommendations by Martilla & James (1997), we created an appropriateness-use graph for each grade range by calculating the grand mean for extent of appropriateness for each grade range (X-axis) and the grand mean for intensity of use for each grade range (Y-axis). We then plotted each individual CEAA technique by grade range based on mean appropriateness and mean use of that individual technique. The results are visual representations of the relative appropriateness and use of CEAA techniques by grade range.

Figure 5. *Possible Appropriateness-Use Analysis Results*.

1. Lower Appropriateness/ Higher Use	2. Higher Appropriateness/Higher Use
3. Lower Appropriateness/Lower Use	4. Higher Appropriateness/Lower Use

Chapter Four:

RESULTS

Demographics of Survey Respondents

Of the 261 survey respondents, most indicated they teach EE programs (81%). Over half also indicated that they develop EE programs (66.8%), are involved with training EE (62.2%), and/or manage EE programs/EE employees (57.6%). Almost half (45.4%) were very experienced with 15 or more years in the EE field. All respondents (100%) provided EE programming in United States, and some also provided programming in Canada or Mexico (Table 5). Respondents largely self-identified as white/Caucasian (92.3%) and female (70.3%) (Table 5). The next highest reported racial identity was mixed race at 3.6% (Table 5).

Roughly half of respondents (46.3%) indicated they worked at a nature center, non-profit, research center, or science center (Table 5). The next most common organization category was protected area, park, or government agency (24.9%) followed by schools, camps, and residential centers (18.7%) (Table 5). Finally, 7.9% indicated they worked at a zoo, farm, museum, aquarium, or garden.

Forty-three percent of respondents indicated they work at a small (<10 paid staff) organization (Table 5). The majority of respondents worked at organizations that serve a diverse public that varies in age, race, ethnicity, and economic status (Tables 6-7). Finally, most respondents indicated that they had the most experience working with 4th-5th grade participants (55.5%), followed by 6th-8th (25.6%), and 9th-12th (18.9%; Table 8).

Table 5. *Summary of Demographics (N = 261).*

Demographic	*Percentage*						
EE Positions *(non-exclusive)*	**Teach**	**Develop**	**Train**	**Ma nag e**	**Hiring**	**Director**	**Fund**
	81%	66.8%	62.2%	57.6 %	42%	28.6%	10.3%
Experience in Years	**15+**	**3-5.5**	**6-8**	**9-11**	**0-2**	**12-14**	
	45.4%	13.4%	13.3%	13%	9.2%	5.7%	
Gender Identity	**Female**	**Male**			**Non-binary**		
	70.3%	18.1%			2.4%		

Racial Identity	White	Mixed Racial/Ethnic Identity	Hispanic/Latinx	Black/African American	Native American	Asian	No answer/Missing
	92.3%	3.6%	2%	1%	0.5%	0.5%	10.8%
Countries for which they provide programming	**United States**	**Canada**		**Mexico**			
	100%	3.8%		1.5%			
Organization Type	**Nature Center/ Non-Profit/Research Center/Science Center**	**Protected Area/Park/ Gov. Agency**		**School/Camp/ College/Residential Center**		**Museum/Zoo/ Farm/Garden/ Aquarium**	
	46.3%	24.9%		18.7%		7.9%	
Organization Size *(# of employees)*	**<10**	**10-49**		**50-249**		**>250**	
	43.1%	32.8%		15.1%		9.1%	

Table 6. *How often do your EE programs serve the following age groups?*

	Never	Rarely	Sometimes	Often
Pre-K	18.7%	26.0%	26.0%	29.4%
Grades K-3	7.2%	13.9%	20.7%	58.2%
Grades 4-5	2.1%	7.5%	22.5%	67.9%
Grades 6-8	2.9%	9.1%	40.7%	47.3%
Grades 9-12	5.4%	27.7%	32.6%	34.3%
Adults	7.9%	10.0%	38.1%	43.9%

Table 7. *How often do your EE programs serve the following participants?*

	Never	Rarely	Sometimes	Often
African American or Black participants	1.7%	15.0%	45.1%	38.2%
Hispanic or Latino/Latina/Latinx participants	1.3%	9.4%	44.0%	45.3%
People for whom English is not their primary language	1.3%	28.6%	49.6%	20.5%
Participants from a lower socioeconomic background (i.e., those who qualify for free or reduced lunches)	0.0%	3.0%	37.2%	59.8%

Table 8. *Percent Frequency of Selected Grade Ranges.*

Grade Range Selected	Percentage of EE practitioners who selected this grade range
4th-5th	55.5%
6th-8th	25.6%
9th-12th	18.9%

Prioritization of EE Outcomes and Specific PEBs

We asked respondents to rate the extent to which they prioritize various EE outcomes in programing for the grade range they selected on a 4-point Likert type scale (1 = Not at all, 2 = Minor priority, 3 = Moderate priority, 4 = High priority; Table 9). The majority (86.3%, M = 3.83, SD =.47) of respondents who selected 4th-5th grade participants rated enjoyment as a high-priority outcome, followed by 66.7% (M = 3.64, SD = .54) who rated knowledge as a high-priority outcome and 56.8% (M = 3.50, SD = .64) who rated attitudes as a high-priority outcome. By contrast, 40.9% rated 21st century skills (M = 3.27, SD = .70) as a high-priority outcome for 4th-5th grade programming, and 31.8% (M = 3.05, SD = .80) rated behavior change as a high-priority outcome for 4th-5th grade programming (Table 9).

Over half (60%, M = 3.53, SD = .62) of respondents who selected 6th-8th grade programming rated attitudes as a high-priority outcome, and 57.6% (M = 3.51, SD = .65) rated 21st century skills development as a high-priority outcome. Those who selected 6th-8th grade also frequently rated enjoyment as a high-priority outcome (55.9%, M = 3.42, SD = .77), and 52.5% (M = 3.31, SD = .84) rated personal growth as a high-priority outcome. Finally, 41.7% (M = 3.20, SD = .78) rated behavior change as a high-priority outcome for 6th-8th grade programming (Table 9).

Well over half (64.4%, M = 3.60, SD = .58) of respondents who selected 9th-12th grade programming rated enjoyment and attitudes as the highest-priority outcomes (Table 9). A large majority (62.2%, M = 3.53, SD = .69) rated 21st century skills as a high-priority outcome, and 61.4% (M = 3.50, SD = .70) rated knowledge as a high-priority outcome. Finally, 46.7% (M = 3.22, SD = .82) of respondents rated behavior change as a high-priority outcome for 9th-12th grade programming**.**

Environmental justice was the outcome that varied most based on grade range. A slight majority of respondents (51.1%) who selected 9th-12th grade programming selected environmental justice as a high-priority outcome ($M = 3.18$, SD = 1.01), whereas it was more likely to be rated as a moderate priority ($M = 2.81$, SD = .96) for 6th-8th grade programming and a minor priority ($M = 2.32$, SD = .88) for those who selected 4th-5th grade programming (Table 9).

We then asked respondents who indicated behavior change was at least a minor priority in their programming to select whether they aimed for the following types of PEBs (yes/no; Table 10). Of those who indicated behavior change was at least a minor priority in their programming, environmental conservation behaviors was the type of behavior most frequently reported as a target in programming across all grade ranges (Table 10). Home conservation behaviors and reduce, reuse, recycle behaviors were also highly targeted across all grade ranges (Table 10). Environmental justice behaviors was the type of behavior least frequently reported as a target in programming, and it varied by grade range, with those who taught 6th-8th or 9th-12th grade participants being more likely to aim for it (Table 10). Transportation behaviors and political conservation behaviors also varied by grade range, and respondents who worked with older audiences were more likely to prioritize them (Table 10).

Table 9. *Prioritization of outcomes in EE programming.*

Outcome	4-5th (n=132) Mean (SD)	6-8th (n=60) Mean (SD)	9-12th (n=45) Mean (SD)	Overall (n=246) Mean (SD)	ANOVA			Post Hoc (Cohen's d) 1 = 4th-5th 2 = 6th-8th 3 = 9th-12th
					F	(df)	p	
Enjoyment	3.83 (.47)	3.42 (.77)	3.60 (.58)	3.86 (.62)	3.59	(2)	<.001	1 > 2*** (0.64)
Knowledge	3.64 (.54)	3.37 (.66)	3.50 (.70)	3.54 (.61)	4.22	(2)	.016	1 > 2* (0.45)
Attitudes	3.50 (.64)	3.53 (.62)	3.60 (.58)	3.52 (.62)	.44	(2)	.647	
Skills development	3.27 (.70)	3.51 (.65)	3.53 (.69)	3.36 (.70)	4.01	(2)	.019	Not sig.
Behavior change	3.05 (.80)	3.20 (.78)	3.22 (.82)	3.11 (.79)	1.25	(2)	.290	

Personal growth	2.94 (.86)	3.31 (.84)	3.38 (.81)	3.10 (.86)	6.55	(2)	.002	1 < 2*(0.44) 1 < 3** (0.53)
Outcomes are not pre-determined. They emerge from the participants' interests	2.76 (.88)	2.87 (.93)	2.89 (1.02)	2.81 (.92)	.39	(2)	.632	
Environmental justice	2.32 (.88)	2.81 (.96)	3.18 (1.01)	2.63 (.98)	16.35	(2)	<.001	1 < 2** (0.53) 1 < 3*** (0.33)

*p<.05 **p<.01 ***p<.001

Table 10. *Types of targeted behaviors.*

Type of behavior	Frequency (Percentage)			
	4th-5th	**6th-8th**	**9th-12th**	**Overall**
Environmental conservation behaviors	112 (84.8%)	49 (80.3%)	40 (88.9%)	208 (79.4%)
Reduce, reuse, recycle behaviors	106 (80.3%)	45 (73.8%)	28 (62.2%)	186 (71.0%)
Home conservation behaviors	99 (75%)	43 (70.5%)	30 (66.7%)	176 (67.2%)
Consumer behaviors	61 (46.2%)	36 (59%)	29 (64.4%)	132 (50.4%)
Transportation behaviors	35 (26.5%)	31 (50.8%)	24 (53.3%)	91 (34.7%)
Political conservation behaviors	18 (13.6%)	30 (49.2%)	29 (64.4%)	82 (31.3%)
Environmental justice behaviors	17 (12.9%)	13 (21.3%)	9 (20%)	40 (15.3%)

CEAA Techniques: Extent of Appropriateness

Respondents were asked to rate the appropriateness of a range of CEAA techniques for the grade range they selected on a 1-4 Likert type scale (1= Not at all appropriate; 2= somewhat appropriate; 3=mostly appropriate; 4=totally appropriate; Table 11). The technique rated as most appropriate across all grade ranges was *Teaching participants about ecology/environmental science* (*M* ranged from 3.89 – 3.93 depending upon grade range; Table 11). The technique rated as least appropriate across all grade ranges was *Using religious doctrine to support the case for environmental protection* (*M* ranged from 1.37 –

1.79 depending upon grade range). Overall, the results indicated that EE practitioners thought most civic engagement techniques were mostly or totally appropriate. Two techniques were deemed somewhat appropriate for 4th-5th graders*: Teaching participants about the public policymaking process* (*M*= 2.64) and *Discussing how systemic racism is intertwined with environmental issues* (*M*= 2.70).

Most techniques in the advocacy section have mean appropriateness scores that indicate they are at least somewhat appropriate. Only two techniques in this category have mean appropriateness scores less than 2.00 for at least one of the age groups: *Asking participants to sign a petition or pledge to support a specific environmental cause* (mean appropriateness score less than 2.00 for 4th-5th and 6th-8th, with an overall range of *M* = 1.91 – 2.26 across grade ranges) and *Encouraging participants to peacefully protest for a specific environmental issue* (mean appropriateness score less than 2.00 for 4th-5th grade only, with an overall range of *M* = 1.79 – 2.50 across grade ranges). Excluding these items, the mean appropriateness scores for advocacy techniques range from 2.02 to 3.76 out of four across all grade ranges (Table 14).

Are there significant differences in appropriateness based on grade range?

We utilized ANOVA with Bonferroni post hoc mean comparisons to determine if there were significant differences in how respondents rated the appropriateness of the CEAA techniques based on grade level (Tables 11-14). The results suggest that survey respondents consider many CEAA techniques to be less appropriate for 4th-5th grader audiences than for older grade ranges, and several of these differences have extremely large effect sizes (Cohen's *d* values greater than 1; Tables 11-14). Six techniques in which grade range had a significant effect on appropriateness were in the "Knowledge and Skills Building" section, four were in the "Values and Dispositions" section, five were in the "Motivation and Action Planning" section, and five were in the "Advocacy" section.

Table 11. *Knowledge and Skills Building for Civic Engagement: Mean Appropriateness.*

Definition presented in survey: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building knowledge and skills related to civic engagement.**			
Items	**Mean (SD) Appropriateness**	**ANOVA**	**Post Hoc (Cohen's *d*)**

Grade Range Selected	4th-5th	6th-8th	9th-12th	Overall	F	(df)	p	1 = 4th-5th 2 = 6th-8th 3 = 9th-12th
Teaching participants about ecology/environmental science.	3.93 (.28)	3.97 (.18)	3.89 (.42)	3.91 (.33)	1.72	(2)	.182	
Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings).	3.82 (.45)	3.75 (.65)	3.83 (.38)	3.79 (.49)	.51	(2)	.600	
Facilitating discussions that welcome multiple viewpoints.	3.66 (.67)	3.91 (.29)	3.93 (.26)	3.76 (.56)	6.36	(2)	.002	1 < 2* (0.48) 1 < 3* (0.53)
Asking participants to use evidence to support their proposed solutions to environmental issues.	3.54 (.71)	3.96 (.19)	3.90 (.37)	3.70 (.63)	13.64	(2)	<.001	1 < 2*** (0.81) 1 < 3** (0.63)
Challenging participants to design novel solutions to a specific environmental issue.	3.50 (.75)	3.80 (.49)	3.86 (.42)	3.63 (.67)	7.20	(2)	.001	1 < 2* (0.48) 1 < 3** (0.60)
Helping participants identify common ground between sides in controversial issues.	3.32 (.86)	3.76 (.51)	3.83 (.44)	3.52 (.76)	12.00	(2)	<.001	1 < 2** (0.62) 1 < 3*** (0.74)
Asking participants to identify individual and community assets that will help address a specific environmental issue.	3.06 (.84)	3.75 (.58)	3.83 (.44)	3.36 (.81)	26.93	(2)	<.001	1 < 2*** (0.95) 1 < 3*** (1.15)
Teaching participants about the public policymaking process.	2.64 (.88)	3.29 (.79)	3.66 (.62)	2.97 (.91)	29.55	(2)	<.001	1 < 2*** (0.78) 1 < 3*** (1.34)

*p<.05 **p<.01 ***p<.001

Table 12. *Values and Dispositions for Civic Engagement: Mean Appropriateness.*

Definition presented in survey: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building values and dispositions related to civic engagement.**								
Items	**Mean (SD) Appropriateness**				**ANOVA**			**Post Hoc (Cohen's d)**
Grade Range Selected	4th-5th	6th-8th	9th-12th	Overall	F	(df)	p	1 = 4th-5th 2 = 6th-8th 3 = 9th-12th
Demonstrating that a healthy environment is vital	3.92 (.27)	3.96 (.19)	3.95 (.31)	3.94 (.25)	.56	(2)	.574	

	4th-5th	6th-8th	9th-12th	Overall	F	(df)	p	Post Hoc
to human health and well-being.								
Encouraging participants to consider that all living things have value in and of themselves.	3.88 (.35)	3.88 (.33)	3.86 (.41)	3.87 (.36)	.04	(2)	.962	
Providing examples of diverse environmental role models.	3.72 (.66)	3.93 (.26)	3.88 (.45)	3.79 (.56)	3.50	(2)	.032	
Teaching that everyone has a right to clean air and water, regardless of where they live.	3.70 (.66)	3.96 (.19)	3.84 (.53)	3.79 (.56)	4.47	(2)	.012	1 < 2* (0.53)
Practicing skills to build participants' confidence in their abilities to address environmental issues.	3.56 (.68)	3.91 (.29)	3.91 (.29)	3.70 (.58)	11.57	(2)	<.001	1 < 2*** (0.67) 1 < 3** (0.67)
Communicating that it's our shared moral obligation to care for the environment.	3.15 (.90)	3.30 (.87)	3.43 (.80)	3.24 (.87)	1.78	(2)	.172	
Discussing how systemic racism is intertwined with many environmental issues.	2.70 (1.01)	3.46 (.79)	3.62 (.76)	3.06 (1.00)	23.31	(2)	<.001	1 < 2*** (0.84) 1 < 3*** (1.03)
Using religious doctrine to support the case for environmental protection.	1.37 (.60)	1.65 (.80)	1.79 (.93)	1.52 (.74)	6.54	(2)	.002	1 < 2* (0.40) 1 < 3** (0.54)

*p<.05 **p<.01 ***p<.001

Table 13. *Motivation and Action Planning for Civic Engagement: Mean Appropriateness.*

Definition presented in survey: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building motivation and action plans related to civic engagement.**

Items	Mean (SD) Appropriateness				ANOVA			Post Hoc (Cohen's *d*)
Grade Range Selected	4th-5th	6th-8th	9th-12th	**Overall**	**F**	**(df)**	***p***	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Empowering participants to see themselves as change agents.	3.83 (.48)	3.91 (.29)	3.93 (.26)	3.87 (.41)	1.24	(2)	.290	
Encouraging participants to be "conservationists" in their everyday lives.	3.80 (.47)	3.77 (.47)	3.63 (.69)	3.76 (.52)	1.83	(2)	.163	
Having participants identify ways to overcome obstacles to performing a	3.61 (.63)	3.85 (.36)	3.81 (.51)	3.70 (.57)	4.70	(2)	.010	1 < 2* (0.47)

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	4th-5th	6th-8th	9th-12th	Overall	F	(df)	p	Post Hoc
specific environmental behavior.								
Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue.	3.47 (.71)	3.76 (.47)	3.81 (.45)	3.60 (.63)	7.35	(2)	.001	1 < 2* (0.48) 1 < 3** (0.57)
Following up with participants after a program to support continued behavior change.	3.38 (.80)	3.51 (.79)	3.79 (.52)	3.48 (.78)	4.51	(2)	0.12	
Discussing the consequences of inaction on complex environmental issues, such as climate change.	3.17 (.84)	3.62 (.62)	3.79 (.47)	3.40 (.77)	14.62	(2)	<.001	1 < 2** (0.61) 1 < 3*** (0.91)
Empowering participants to communicate with local decision makers about environmental issues.	3.09 (.94)	3.55 (.81)	3.90 (.30)	3.36 (.90)	17.19	(2)	<.001	1 < 2** (0.52) 1 < 3*** (1.16)
Helping participants write an action plan to address a specific environmental issue.	3.06 (.89)	3.62 (.71)	3.74 (.59)	3.31 (.86)	16.35	(2)	<.001	1 < 2*** (0.70) 1 < 3*** (0.90)

*$p<.05$ **$p<.01$ ***$p<.001$

Table 14. *Advocacy: Mean Appropriateness*.

Definition presented in survey: There are many approaches to conducting a successful EE program. Some of these approaches may promote, support, or favor a specific viewpoint or action.								
Items	**Mean (SD) Appropriateness**				**ANOVA**			**Post Hoc (Cohen's d)**
Grade Range Selected	**4th-5th**	**6th-8th**	**9th-12th**	**Overall**	**F**	**(df)**	**p**	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).	3.74 (.52)	3.76 (.54)	3.55 (.65)	3.72 (.55)	2.03	(2)	.134	
Asking participants to identify key decision makers related to the issue they are most interested in addressing.	2.77 (.90)	3.38 (.83)	3.74 (.45)	3.09 (.91)	25.01	(2)	<.001	1 < 2*** (0.71) 1 < 3*** (1.37)

Using persuasive arguments to influence participants' conservation behaviors.	2.63 (.88)	2.71 (1.05)	3.03 (1.08)	2.74 (.97)	2.48	(2)	.086	
Advocating that participants avoid purchasing certain products because of their environmental impacts.	2.52 (.94)	2.89 (1.03)	2.76 (.91)	2.68 (.98)	3.26	(2)	.040	1 < 2* (0.38)
Advocating for a specific policy to address an environmental injustice.	2.02 (.97)	2.60 (1.13)	2.92 (1.10)	2.34 (1.10)	13.71	(2)	<.001	1 < 2** (0.55) 1 < 3*** (0.87)
Encouraging participants to join a pro-environmental organization.	2.02 (.86)	2.31 (.92)	2.71 (1.06)	2.23 (.95)	8.77	(2)	<.001	1 < 3*** (0.72)
Encouraging participants to peacefully protest for a specific environmental issue.	1.79 (.85)	2.22 (.96)	2.50 (1.06)	2.04 (.97)	10.61	(2)	<.001	1 < 2* (0.48) 1 < 3*** (0.74)
Asking participants to sign a petition or pledge to support a specific environmental cause.	1.94 (.92)	1.91 (.94)	2.26 (1.13)	2.01 (.98)	1.91	(2)	.150	

*$p<.05$ **$p<.01$ ***$p<.001$

CEAA Techniques: Intensity of Use

Respondents were asked to indicate how frequently they used various CEAA techniques for the grade range they selected on a 1-4 Likert type scale (1= Never use; 2= rarely use; 3= sometimes use; 4= often use; Table 15). Mean intensity of use scores ranged from 1.15 to 3.91. The following were heavily utilized (with mean scores above 3.00 on the 4-point scale) across grade ranges: (1) *Teaching participants about ecology/environmental science,* (2) *Facilitating discussions that welcome multiple viewpoints,* (3) *Encouraging participants to consider that all living things have value in and of themselves,* (4) *Demonstrating that a healthy environment is vital to human health and well-being,* (5) *Encouraging participants to be "conservationists" in their everyday lives,* (6) *Empowering participants to see themselves as change agents,* (7) *Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings),* and (8) *Encouraging participants to change their individual*

behaviors to improve the environment (e.g., using reusable water bottles). Overall, three of the eight most

heavily utilized CEAA techniques were from the "Knowledge and Skills Building" section, two were

from "Values and Disposition," two were from "Motivation and Action Planning," and one was from

"Advocacy." *Using religious doctrine to support the case for environmental protection* was perhaps the

most contentious technique in the survey and had the lowest intensity of use scores across all grade ranges

(with an overall range of $M = 1.15 – 1.29$ across grade ranges).

Are there significant differences in intensity of use based on grade range?

We utilized ANOVA with Bonferroni post hoc mean comparisons to determine if there were

significant differences in the level of use of the CEAA techniques based on grade level (Tables 15-18).

The results suggest that many CEAA techniques are used less frequently for 4th- 5th graders than for older

grade ranges, and many differences have extremely large effect sizes (Cohen's *d* values greater than 1;

Tables 15-18). Only two techniques were utilized significantly more frequently in 4th-5th grade

programming than they were in 9th-12th grade programming: (1) *Teaching participants about*

ecology/environmental science and (2) *Encouraging participants to be "conservationists" in their*

everyday lives. Seven techniques in which grade range had a significant effect on intensity of use were in

the "Knowledge and Skills Building" section, three were in the "Values and Dispositions" section, eight

were in the "Motivation and Action Planning" section, and five were in the "Advocacy" section.

Table 15. *Knowledge and Skills Building for Civic Engagement: Mean Intensity of Use.*

Definition: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building knowledge and skills related to civic engagement.**							
Items	**Mean (SD) Intensity of Use**				**ANOVA**		**Post Hoc (Cohen's *d*)**
Grade Range Selected	**4th- 5th**	**6th - 8th**	**9th- 12th**	**Over all**	**F**	**(df)**	***p***	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Teaching participants about ecology/environmental science.	3.91 (.34)	3.82 (.43)	3.70(.67)	3.83 (.46)	3.82	(2)	.023	1 > 3* (0.39)
Facilitating discussions that welcome multiple viewpoints.	3.19 (.79)	3.59 (.60)	3.53 (.67)	3.34 (.74)	7.50	(2)	.001	1 < 2** (0.57) 1 < 3* (0.47)

Items	4th-5th	6th-8th	9th-12th	Overall	F	(df)	P	Post Hoc (Cohen's d)
Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings).	3.16 (.75)	3.02 (.88)	3.23 (.92)	3.14 (.81)	.902	(2)	.407	
Asking participants to use evidence to support their proposed solutions to environmental issues.	2.75 (.93)	3.43 (.72)	3.21 (1.01)	3.00 (.95)	12.23	(2)	<.001	1 < 2*** (0.82) 1 < 3* (0.47)
Challenging participants to design novel solutions to a specific environmental issue.	2.71 (.87)	3.24 (.85)	3.07 (.83)	2.91 (.88)	8.12	(2)	<.001	1 < 2** (0.62)
Asking participants to identify individual and community assets that will help address a specific environmental issue.	2.42 (.88)	3.08 (.83)	3.44 (.67)	2.78 (.94)	28.02	(2)	<.001	1 < 2 *** (0.77) 1 < 3*** (1.30)
Helping participants identify common ground between sides in controversial issues.	2.51 (.89)	3.20 (.83)	3.00 (.95)	2.77 (.94)	13.31	(2)	<.001	1 < 2*** (0.80) 1 < 3** (0.53)
Teaching participants about the public policymaking process.	1.98 (.79)	2.48 (.97)	2.90 (.88)	2.28 (.93)	21.07	(2)	<.001	1 < 2** (0.56) 1 < 3*** (1.10) 2 < 3*(0.45)

*p<.05 **p<.01 ***p<.001

Table 16. *Values and Dispositions for Civic Engagement: Mean Intensity of Use.*

Definition: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building values and dispositions related to civic engagement.**

Items	Mean (SD) Intensity of Use				ANOVA			Post Hoc (Cohen's d)
Grade Range Selected	4th-5th	6th-8th	9th-12th	Overall	F	(df)	P	1 = 4th-5th 2 = 6th-8th 3 = 9th-12th
Demonstrating that a healthy environment is vital to human health and well-being.	3.59 (.64)	3.71 (.46)	3.56 (.70)	3.61 (.62)	.91	(2)	.403	
Encouraging participants to consider that all living things have value in and of themselves.	3.64 (.67)	3.40 (.78)	3.30 (.86)	3.50 (.76)	4.28	(2)	.015	
Practicing skills to build participants' confidence in their abilities to address environmental issues.	2.86 (.88)	3.44 (.69)	3.51 (.67)	3.14 (.85)	16.35	(2)	<.001	1 < 2*** (0.73) 1 < 3** (0.83)

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Teaching that everyone has a right to clean air and water, regardless of where they live.	2.95 (1.00)	3.27 (.85)	3.30 (.91)	3.10 (.95)	3.59	(2)	.029	
Providing examples of diverse environmental role models.	2.60 (.90)	2.95 (.95)	3.40 (.82)	2.83 (.95)	13.18	(2)	<.001	1 < 3*** (0.93) 2 < 3* (0.51)
Communicating that it's our shared moral obligation to care for the environment.	2.83 (1.00)	2.75 (.89)	2.79 (1.05)	2.80 (.98)	.15	(2)	.858	
Discussing how systemic racism is intertwined with many environmental issues.	1.62 (.73)	2.44 (1.01)	2.90 (1.08)	2.06 (1.02)	41.39	(2)	<.001	1 < 2*** (0.93) 1 < 3*** (1.39) 2 < 3* (0.44)
Using religious doctrine to support the case for environmental protection.	1.15 (.41)	1.27 (.56)	1.29 (.55)	1.21 (.48)	2.16	(2)	.117	

*p<.05 **p<.01 ***p<.001

Table 17. *Motivation and Action Planning for Civic Engagement: Mean Intensity of Use.*

Definition: There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to <u>make a difference in the civic life of communities</u>. **The following items pertain to approaches related to building motivation and action plans related to civic engagement.**								
Items	**Mean (SD) Intensity of Use**				**ANOVA**			**Post Hoc (Cohen's *d*)**
Grade Range Selected	**4th-5th**	**6th-8th**	**9th-12th**	**Overall**	**F**	**(df)**	**p**	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Empowering participants to see themselves as change agents.	3.39 (.74)	3.70 (.50)	3.62 (.66)	3.51 (.69)	4.85	(2)	.009	1 > 2* (0.49)
Encouraging participants to be "conservationists" in their everyday lives.	3.52 (.63)	3.48 (.72)	3.19 (.73)	3.43 (.69)	4.10	(2)	.018	1 > 3* (0.48)
Having participants identify ways to overcome obstacles to performing a specific environmental behavior.	2.85 (.85)	3.24 (.67)	2.93 (.92)	2.96 (.84)	4.40	(2)	.013	1 < 2* (0.51)
Asking participants to identify the benefits and trade-offs of performing different actions to	2.63 (.86)	3.13 (.80)	3.12 (.93)	2.85 (.89)	9.30	(2)	<.001	1 < 2** (0.60) 1 < 3** (0.55)

Items	4th-5th	6th-8th	9th-12th	Overall	F	(df)	p	Post Hoc (Cohen's d)
address an environmental issue.								
Discussing the consequences of inaction on complex environmental issues, such as climate change.	2.47 (.90)	2.94 (.92)	3.02 (.96)	2.68 (.95)	8.77	(2)	<.001	1 < 2** (0.52) 1 < 3** (0.59)
Empowering participants to communicate with local decision makers about environmental issues.	1.75 (.83)	2.58 (1.05)	3.05 (1.06)	2.21 (1.08)	37.65	(2)	<.001	1 < 2*** (0.88) 1 < 3*** (1.37) 2 < 3* (0.45)
Helping participants write an action plan to address a specific environmental issue.	1.85 (.86)	2.45 (1.20)	2.83 (1.06)	2.15 (1.06)	18.78	(2)	<.001	1 < 2** (0.58) 1 < 3*** (1.02)
Following up with participants after a program to support continued behavior change.	1.95 (.86)	2.11 (.95)	2.67 (1.00)	2.12 (.95)	10.03	(2)	<.001	1 < 3*** (0.77) 2 < 3* (0.57)

*p<.05 **p<.01 ***p<.001

Table 18. *Advocacy: Mean Intensity of Use.*

Definition: There are many approaches to conducting a successful EE program. Some of these approaches may promote, support, or favor a specific viewpoint or action.								
Items	**Mean (SD) Intensity of Use**				**ANOVA**			**Post Hoc (Cohen's d)**
Grade Range Selected	**4th-5th**	**6th-8th**	**9th-12th**	**Overall**	**F**	**(df)**	**p**	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).	3.52 (.69)	3.44 (.86)	3.32 (.84)	3.47 (.75)	1.13	(2)	.326	
Using persuasive arguments to influence participants' conservation behaviors.	2.23 (.89)	2.31 (.99)	2.58 (1.20)	2.31 (.97)	1.81	(2)	.166	
Advocating that participants avoid purchasing certain products because of their environmental impacts.	2.03 (.94)	2.43 (.94)	2.35 (.98)	2.23 (.98)	3.97	(2)	.020	1 < 2* (0.42)
Asking participants to identify key decision	1.68 (.80)	2.26 (1.03)	2.68 (1.02)	2.02 (.99)	21.47	(2)	<.001	1 < 2*** (0.63) 1 <

makers related to the issue they are most interested in addressing.								3*** (1.10)
Encouraging participants to join a pro-environmental organization.	1.38 (.65)	1.70 (.84)	2.24 (1.13)	1.62 (.87)	17.26	(2)	<.001	1 < 2* (0.43) 1 < 3*** (0.93) 2 < 3** (0.54)
Advocating for a specific policy to address an environmental injustice.	1.23 (.52)	1.94 (1.12)	2.24 (1.10)	1.61 (.95)	29.37	(2)	<.001	1 < 2*** (0.81) 1 < 3*** (1.17)
Asking participants to sign a petition or pledge to support a specific environmental cause.	1.39 (.72)	1.31 (.64)	1.58 (.89)	1.42 (.74)	1.49	(2)	.227	
Encouraging participants to peacefully protest for a specific environmental issue.	1.13 (.40)	1.48 (.72)	1.74 (1.01)	1.34 (.67)	16.10	(2)	<.001	1 < 2** (0.60) 1 < 3*** (0.80)

*p<.05 **p<.01 ***p<.001

Gaps Between Means

We calculated the gap between the appropriateness mean and the intensity of use mean (gap = mean appropriateness – mean use; Tables 19-22) for each technique for every grade range. Positive scores for the gap between means indicate the technique received higher appropriateness than intensity of use scores, and negative scores indicate higher level of use for techniques that are deemed less appropriate. None of the gap scores were negative, suggesting all the CEAA techniques we included are considered more appropriate than their intensity of use might suggest. *Teaching participants about ecology/environmental science* had the smallest gap in mean scores between appropriateness and use across all grade ranges (Table 19). And *Following up with participants after a program to support continued behavior change* had the highest gap in mean scores between appropriateness and use across all grade ranges (gaps = 1.12 – 1.43 across grade ranges; Table 22). Table 23 highlights the top five largest positive gaps (where use is lower than the appropriateness).

Table 19. *Knowledge and Skills Building for Civic Engagement: Gap Between Means.*

Items	Gap Between Means (SD)			ANOVA			Post Hoc
Grade Range Selected	**4th-5th**	**6th - 8th**	**9th- 12th**	**F**	**(df)**	***p***	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*

	4th-5th	6th-8th	9th-12th	F	(df)	p	Post Hoc
Teaching participants about ecology/environmental science.	0.02 (.29)	0.15 (.45)	0.19 (.54)	3.59	(2)	.029	Not sig.
Teaching participants about the public policymaking process.	0.66 (.98)	0.78 (.81)	0.76 (.86)	.38	(2)	.684	
Asking participants to identify individual and community assets that will help address a specific environmental issue.	0.64 (.76)	0.67 (.75)	0.39 (.67)	1.86	(2)	.158	
Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings).	0.66 (.72)	0.73 (.98)	0.60 (.91)	.20	(2)	.820	
Facilitating discussions that welcome multiple viewpoints.	0.47 (.69)	0.32 (.51)	0.40 (.66)	.84	(2)	.431	
Helping participants identify common ground between sides in controversial issues.	0.81 (.86)	0.56 (.79)	0.83 (.96)	1.60	(2)	.205	
Challenging participants to design novel solutions to a specific environmental issue.	0.79 (.80)	0.56 (.86)	0.79 (.78)	1.40	(2)	.250	
Asking participants to use evidence to support their proposed solutions to environmental issues.	0.79 (.84)	0.53 (.69)	0.69 (.95)	1.58	(2)	.208	

*$p<.05$ **$p<.01$ ***$p<.001$

Table 20. *Values and Dispositions for Civic Engagement: Gap Between Means.*

Items	Gap Between Means (SD)			ANOVA			Post Hoc (Cohen's *d*)
Grade Range Selected	**4th-5th**	**6th - 8th**	**9th- 12th**	**F**	**(df)**	***p***	*1 = 4th-5th 2 = 6th-8th 3 = 9th-12th*
Practicing skills to build participants' confidence in their abilities to address environmental issues.	0.70 (.80)	0.47 (.69)	0.40 (.66)	3.01	(2)	.051	
Encouraging participants to consider that all living things have value in and of themselves.	0.24 (.52)	0.44 (.76)	0.56 (.82)	5.34	(2)	.005	1 < 3* (0.46)
Demonstrating that a healthy environment is vital to human health and well-being.	0.33 (.58)	0.25 (.45)	0.39 (.62)	.32	(2)	.730	

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	4th-5th	6th - 8th	9th- 12th	F	(df)	p	Post Hoc
Using religious doctrine to support the case for environmental protection.	0.22 (.56)	0.38 (.76)	0.50 (.89)	2.76	(2)	.065	
Communicating that it's our shared moral obligation to care for the environment.	0.32 (.71)	0.55 (.71)	0.64 (.79)	3.91	(2)	.021	1 < 3* (0.43)
Teaching that everyone has a right to clean air and water, regardless of where they live.	0.75 (.84)	0.69 (.83)	0.54 (.77)	1.15	(2)	.319	
Discussing how systemic racism is intertwined with many environmental issues.	1.08 (.96)	1.02 (.88)	0.72 (.97)	2.59	(2)	.078	
Providing examples of diverse environmental role models.	1.12 (.93)	0.98 (.90)	0.48 (.70)	8.16	(2)	<.001	1 > 3*** (0.78) 2 > 3* (0.62)

*p<.05 **p<.01 ***p<.001

Table 21. *Motivation and Action Planning for Civic Engagement: Gap Between Means..*

Items	Gap Between Means (SD)			ANOVA			Post Hoc (Cohen's *d*)
Grade Range Selected	**4th-5th**	**6th - 8th**	**9th- 12th**	**F**	**(df)**	**p**	*1 = 4th-5th* *2 = 6th-8th* *3 = 9th-12th*
Encouraging participants to be "conservationists" in their everyday lives.	0.28 (.51)	0.29 (.61)	0.44 (.63)	1.31	(2)	.272	
Empowering participants to see themselves as change agents.	0.44 (.69)	0.21 (.42)	0.31 (.60)	2.61	(2)	.075	
Having participants identify ways to overcome obstacles to performing a specific environmental behavior.	0.76 (.84)	0.61 (.68)	0.88 (.89)	1.19	(2)	.307	
Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue.	0.84 (.85)	0.63 (.75)	0.69 (.89)	1.29	(2)	.279	
Discussing the consequences of inaction	0.70 (.85)	0.68 (.72)	0.77 (.85)	.18	(2)	.835	

on complex environmental issues, such as climate change.							
Helping participants write an action plan to address a specific environmental issue.	1.12 (.98)	1.17 (1.12)	0.91 (.98)	1.50	(2)	.226	
Following up with participants after a program to support continued behavior change.	1.43 (1.01)	1.40 (1.02)	1.12 (.89)	1.71	(2)	.183	
Empowering participants to communicate with local decision makers about environmental issues.	1.34 (1.00)	0.97 (.94)	0.85 (1.03)	5.71	(2)	.004	1 > 3* (0.48) 1 > 2* (0.38)

*p<.05 **p<.01 ***p<.001

Table 22. *Advocacy: Gap Between Means.*

Items	Gap Between Means (SD)			ANOVA			Post Hoc
Grade Range Selected	**4th-5th**	**6th - 8th**	**9th- 12th**	**F**	**(df)**	***p***	*1 = 4th-5th* *2 = 6th-8th* *3 = 9th-12th*
Asking participants to identify key decision makers related to the issue they are most interested in addressing.	1.09 (.95)	1.12 (1.13)	1.06 (.98)	.07	(2)	.936	
Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).	0.22 (.57)	0.32 (.82)	0.23 (.71)	.57	(2)	.567	
Advocating that participants avoid purchasing certain products because of their environmental impacts.	0.49 (.73)	0.46 (.72)	0.41 (.68)	.25	(2)	.780	
Using persuasive arguments to influence participants' conservation behaviors.	0.40 (.72)	0.40 (.66)	0.45 (.77)	.07	(2)	.929	
Asking participants to sign a petition or pledge to support a specific environmental cause.	0.55 (.75)	0.60 (.90)	0.68 (.87)	.43	(2)	.654	

Encouraging participants to join a pro-environmental organization.	0.64 (.82)	0.61 (.79)	0.47 (.69)	.64	(2)	.526
Encouraging participants to peacefully protest for a specific environmental issue.	0.66 (.74)	0.74 (.79)	0.76 (.91)	.37	(2)	.693
Advocating for a specific policy to address an environmental injustice.	0.79 (.86)	0.66 (.83)	0.68 (.90)	.66	(2)	.516

*$p<.05$ **$p<.01$ ***$p<.001$

We determined the top five gaps by grade range (Table 23). Three of the top five gaps for 4th-5th grade programming are in the "Motivation and Action Planning" section, one is in the "Advocacy" section, and one is in "Values and Dispositions" section. *Discussing how systemic racism is intertwined with many environmental issues* (gap = 1.08) was a close sixth highest gap for 4th-5th grade programming. Two of the top five gaps for 6th-8th grade programming are in the "Values and Dispositions" section, two are in "Motivation and Action Planning", and one is in "Advocacy." *Empowering participants to communicate with local decision makers about environmental issues* (gap = 0.97) was a close sixth for 6th-8th grade programming. Four of the five highest gaps for 9th-12th grade programming are in the "Motivation and Action Planning" section, and one is in the "Advocacy" section.

Table 23. *Top five gaps between means by grade range.*

4th-5th	6th-8th	9th-12th
Following up with participants after a program to support continued behavior change (gap = 1.43)	*Following up with participants after a program to support continued behavior change* (gap = 1.40)	*Following up with participants after a program to support continued behavior change* (gap = 1.43)
Empowering participants to communicate with local decision makers about environmental issues (gap = 1.34)	*Helping participants write an action plan to address a specific environmental issue* (gap = 1.17)	*Asking participants to identify key decision makers related to the issue they are most interested in addressing* (gap = 1.06)
Providing examples of diverse environmental role models (gap = 1.12)	*Asking participants to identify key decision makers related to the issue they are most interested in addressing* (gap = 1.12)	*Helping participants write an action plan to address a specific environmental issue* (gap = 0.91)
Helping participants write an action plan to address a specific environmental issue (gap =	*Discussing how systemic racism is intertwined with many environmental issues* (gap =	*Having participants identify ways to overcome obstacles to performing a specific*

1.12)	1.02)	*environmental behavior* (gap = 0.88)
Asking participants to identify key decision makers related to the issue they are most interested in addressing (gap = 1.09)	*Providing examples of diverse environmental role models* (gap = 0.98)	*Empowering participants to communicate with local decision makers about environmental issues* (gap = 0.85)

Appropriateness-Use Analyses

We created an appropriateness-use graph for each grade range by calculating the grand mean for extent of appropriateness of all CEAA techniques combined for each grade range (X-axis) and the overall grand mean for intensity of use of all CEAA techniques combined for each grade range (Y-axis). This produced 4 quadrants: "Higher appropriateness/higher use," "Lower appropriateness/lower use," "higher appropriateness/lower use," and "lower appropriateness/higher use." From a practical perspective, we are interested in the latter two categories where there is a discrepancy between appropriateness and use.

We then plotted each individual CEAA technique by grade range based on mean appropriateness and mean use of each individual technique. Our appropriateness-use analyses reveal that most items were in the "Higher appropriateness/higher use" and "Lower appropriateness/lower use" quadrants. No items from any grade range were in the "Lower appropriateness/higher use" quadrant.

The quadrant that varied most by grade range was "Higher appropriateness/lower use," with 4th-5th grade programming having the lowest number (1) of techniques in this quadrant and 9th-12th grade programming having the highest number (6) of techniques in this quadrant. W = *Following up with participants after a program to support continued behavior change,* fell into the "Higher appropriateness/lower use" category across all grade ranges (Figures 6-8, Table 24). O = *Discussing how systemic racism is intertwined with many environmental issues* and V = *Helping participants write an action plan to address a specific environmental issue* fell into the "Higher appropriateness/lower use" category for 6th-8th and 9th-12th grade programming (Figures 6-8, Table 24). X = *Empowering participants to communicate with local decision makers about environmental issues* fell into the "Higher appropriateness/lower use" category for 6th-8th grade programming (Figure 7, Table 24). Finally, (1) B =

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Teaching participants about the public policymaking process, (2) S = *Having participants identify ways to overcome obstacles to performing a specific environmental behavior,* and (3) Y = *Asking participants to identify key decision makers related to the issue they are most interested in addressing* all fell into the "Higher appropriateness/lower use" category for 9th-12th grade programming. Techniques within this category all have potential for further consideration from EE practitioners who are interested in CEAA techniques and a comprehensive approach to environmental literacy.

Most of the techniques in the "Lower appropriateness/lower use" category across grade ranges reflect advocacy techniques (Figures 6-8, Table 24) with the exception of Z = *Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).*

Figure 6. *Appropriateness-Use Analysis of Civic Engagement and Advocacy Items for Grades 4-5.*
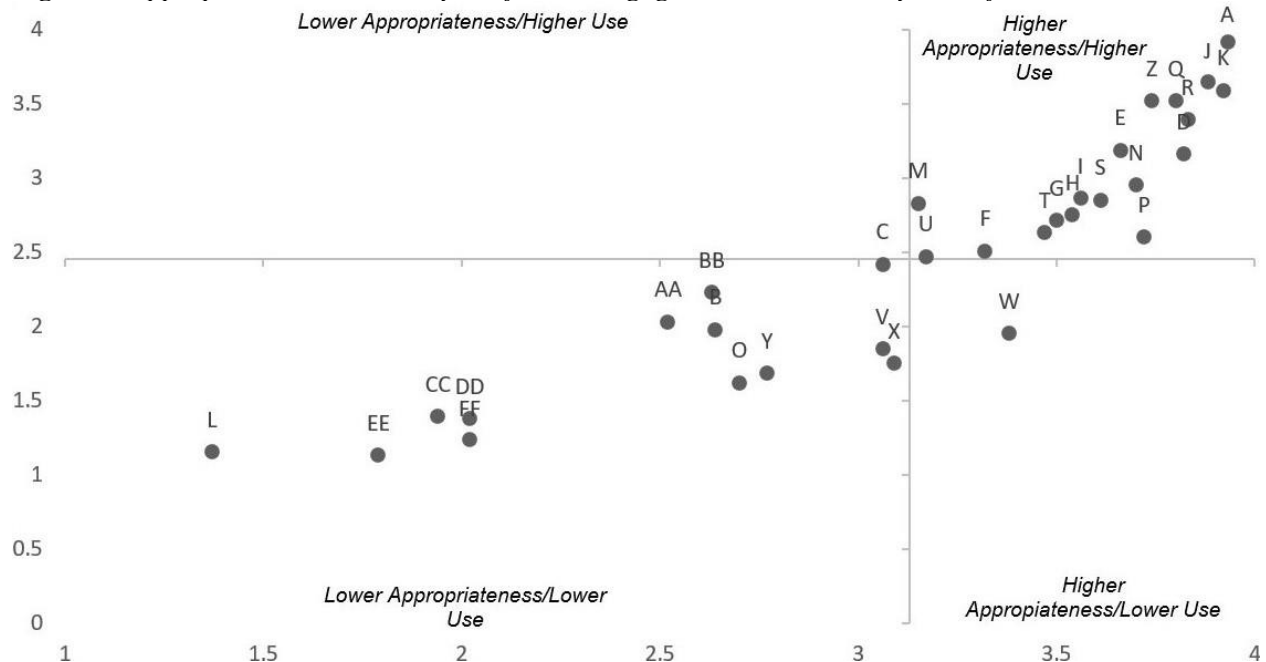
Figure 7. *Appropriateness-Use Analysis of Civic Engagement and Advocacy Items for Grades 6-8.*
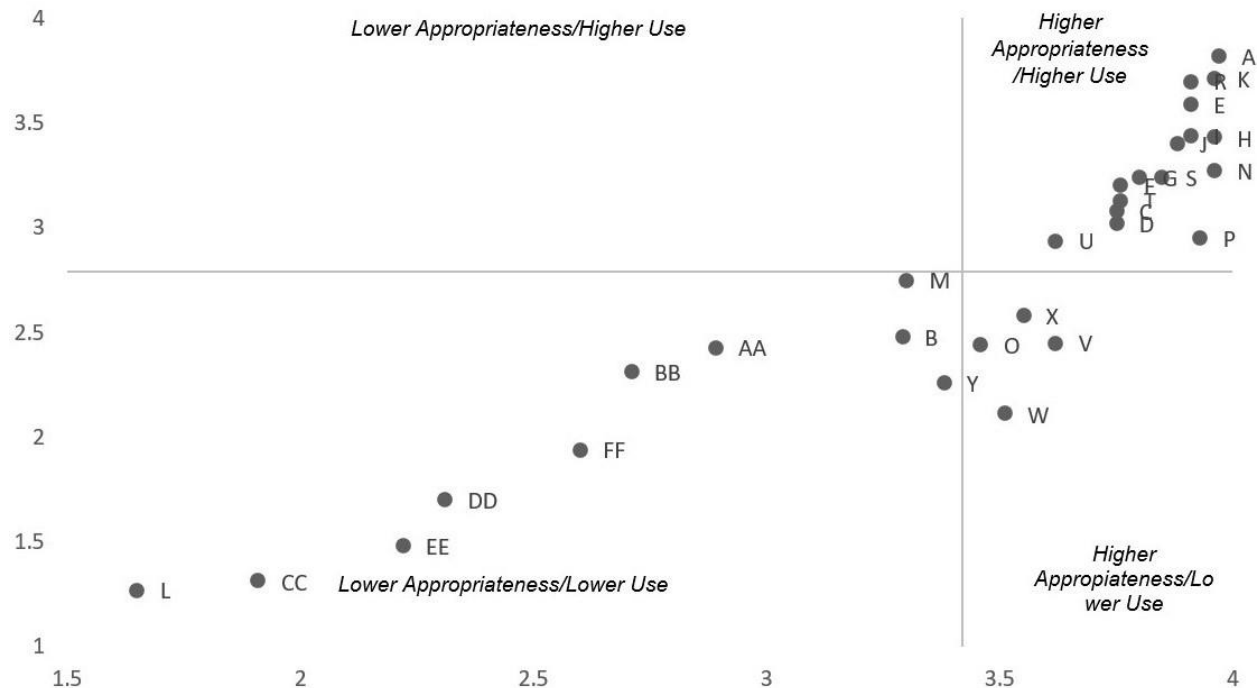
Figure 8. *Appropriateness-Use Analysis of Civic Engagement and Advocacy Items for Grades 9-12.*
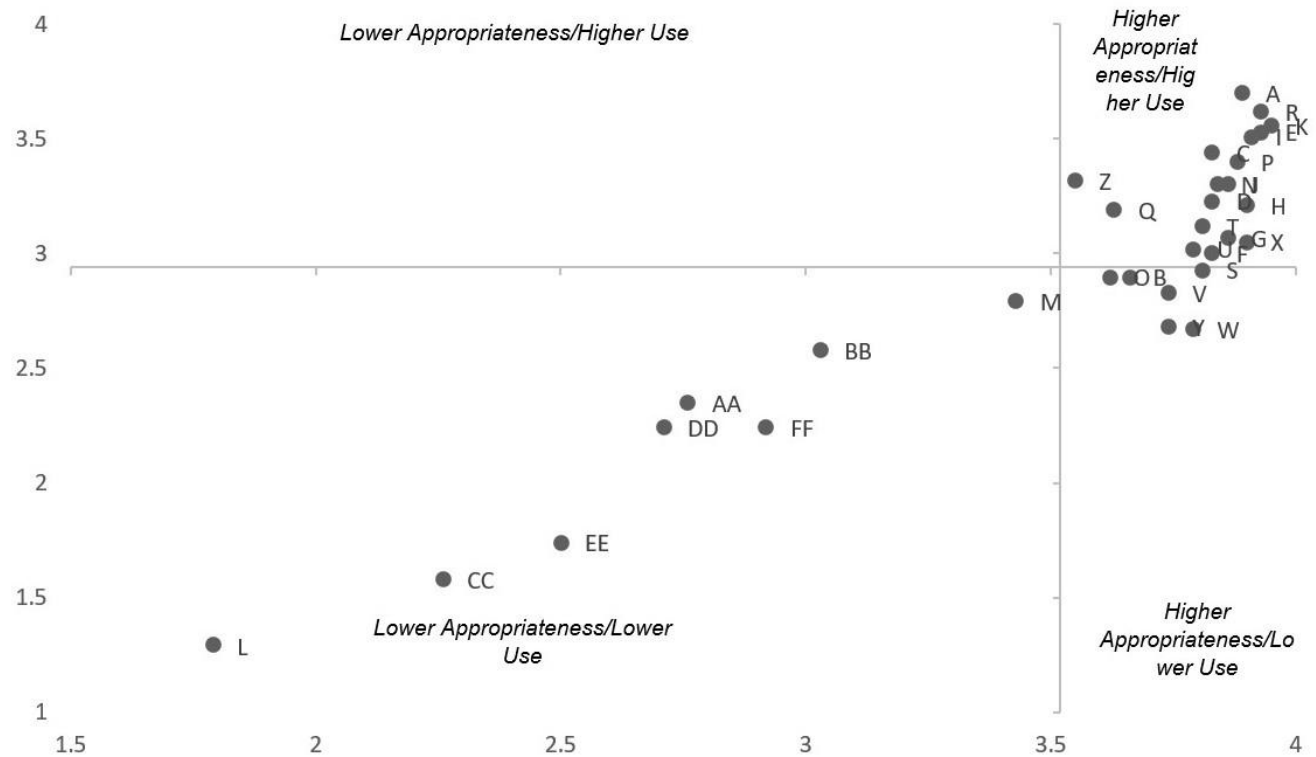
Table 24. *Civic Engagement and Advocacy Item Key for Appropriateness-Use Analysis.*

A	Teaching participants about ecology/environmental science.
B	Teaching participants about the public policymaking process.
C	Asking participants to identify individual and community assets that will help address a

	specific environmental issue.
D	*Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings).*
E	*Facilitating discussions that welcome multiple viewpoints.*
F	*Helping participants identify common ground between sides in controversial issues.*
G	*Challenging participants to design novel solutions to a specific environmental issue.*
H	*Asking participants to use evidence to support their proposed solutions to environmental issues.*
I	*Practicing skills to build participants' confidence in their abilities to address environmental issues.*
J	*Encouraging participants to consider that all living things have value in and of themselves.*
K	*Demonstrating that a healthy environment is vital to human health and well-being.*
L	*Using religious doctrine to support the case for environmental protection.*
M	*Communicating that it's our shared moral obligation to care for the environment.*
N	*Teaching that everyone has a right to clean air and water, regardless of where they live.*
O	*Discussing how systemic racism is intertwined with many environmental issues.*
P	*Providing examples of diverse environmental role models.*
Q	*Encouraging participants to be "conservationists" in their everyday lives.*
R	*Empowering participants to see themselves as change agents.*
S	*Having participants identify ways to overcome obstacles to performing a specific environmental behavior.*
T	*Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue.*
U	*Discussing the consequences of inaction on complex environmental issues, such as climate change.*
V	*Helping participants write an action plan to address a specific environmental issue.*
W	*Following up with participants after a program to support continued behavior change.*
X	*Empowering participants to communicate with local decision makers about environmental issues.*
Y	*Asking participants to identify key decision makers related to the issue they are most interested in addressing.*
Z	*Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles).*
AA	*Advocating that participants avoid purchasing certain products because of their environmental impacts.*
BB	*Using persuasive arguments to influence participants' conservation behaviors.*
CC	*Asking participants to sign a petition or pledge to support a specific environmental cause.*
DD	*Encouraging participants to join a pro-environmental organization.*
EE	*Encouraging participants to peacefully protest for a specific environmental issue.*
FF	*Advocating for a specific policy to address an environmental injustice.*

Discussion

Our results identify (1) the programmatic outcomes providers most heavily prioritize, (2) how

providers rate the appropriateness and use of a range of CEAA techniques, and (3) the gaps between

appropriateness and use of these CEAA techniques (i.e., where opportunities exist to increase use of age appropriate CEAA techniques).

The results of this study suggest the extent to which EE providers prioritize various EE outcomes depends upon the grade range of the target audience. Enjoyment and knowledge were the most highly prioritized outcomes for 4th-5th grade programming; attitudes and skills were the most highly prioritized outcomes for 6th-8th grade programming; and enjoyment, attitudes, and skills were the most highly prioritized outcomes for 9th-12th grade programming (Table 9). Respondents also reported prioritizing behavior change less for younger audiences, especially 4th-5th graders (Table 9). Developmental research and theory suggest we may see these differences because (1) younger audiences may not have as much awareness of their own values or the values of others; (2) educational experiences tend to be more successful when they build upon what students already know, and 4th-5th graders are just beginning to develop socioenvironmental knowledge and awareness; and (3) once students reach adolescence and young adulthood (6th-12th grade), they develop both a stronger sense of their own personal values as well as an awareness of how others perceive their actions (e.g., social values) (Dewey, 1899; Kellert, 2002; Kohlberg, 1979; Krathwohl, Bloom & Masia, 1956; Piaget, 1953; Wells, 2000; Wells & Evans, 2003). In addition, most of our respondents did not teach at schools, camps, colleges, or residential centers (Table 5) and likely had students for a limited amount of time. These time constraints may make it difficult to prioritize more cognitively challenging outcomes such as building skills and influencing behaviors. However, EE providers may provide developmentally appropriate programming that improves multiple outcomes even in a short period if they focus on student empowerment and student-centered learning through techniques such as issue-based and project-based approaches (Stern et al., 2013; Ardoin et al., 2015; Ardoin et al. 2018).

Of those who indicated behavior change was at least a minor priority in their programming (all but two respondents), environmental conservation behaviors, home conservation behaviors, and reduce, reuse, recycle behaviors were highly targeted across all grade ranges (Table 10). Prioritization of environmental justice behaviors, transportation behaviors, and political conservation behaviors varied by

grade range and were less likely to be prioritized, especially for younger audiences (Table 10). These results are consistent with research that suggests EE providers primarily focus on the environmental components of socio-environmental issues and may struggle to provide social and cultural content and content that is culturally relevant for diverse audiences (Bonta et al., 2015; Hudson, 2001; Ladson-Billings, 1995; Simon, 2016; Warren & Breunig, 2019). Additionally, environmental conservation behaviors, home conservation behaviors, and reduce, reuse, recycle behaviors have the highest locus of control for younger individuals and are widely performed and socially acceptable, thus the content may be reinforcing the performance of existing behaviors. Older participants (starting in adolescence) are also more likely to have the ability to engage in critical thinking and more involved civic engagement and advocacy without involving adults, and thus may be more able to engage in political conservation behaviors. They may also have more independent access to the Internet and various information sources that provide exposure to social movements such as Black Lives Matter, #LANDBACK, and #FridaysForFuture. Finally, transportation behaviors, political conservation behaviors, and environmental justice behaviors may be more collective in nature, and once participants reach adolescence, they are developmentally more able to consider the views and values of others while simultaneously developing a deeper sense of their own values (Kohlberg, 1979; Krathwohl, Bloom & Masia, 1956; Piaget, 1953), allowing them to engage more deeply in civic discussions and complex socioenvironmental issues.

The technique most consistently identified as appropriate across all grade ranges was *Teaching participants about ecology/environmental science* (Table 11). This is in line with what both researchers and practitioners report as one of the most common practices in EE programming in North America and, again, highlights the strong emphasis in EE on scientific knowledge and meeting core curriculum and Next Generation Science Standards (NGSS; Gruenewald & Manteaw, 2007). Respondents reported the least appropriate technique across all grade ranges as *Using religious doctrine to support the case for environmental protection* (Table 12). It is possible respondents would have felt differently about this technique if they knew they were teaching a religious audience. As VBN theory suggests, it is important to tailor your messaging to your audience's values and beliefs so you deliver a message that resonates

with them (Stern, 2000). Additionally, "doctrine" has a potentially negative connotation, and we may have seen different results if we used a different word, such as "messages." Providers also may have been more open to an interfaith approach that highlights how different traditions value and perceive stewardship and socioenvironmental issues (e.g., Bahr, 2015; Biscotti & Biggart, 2014). Interfaith discussions surrounding socioenvironmental issues in EE programming are a potential topic for future research, as many believe religious organizations are morally obligated to address in socioenvironmental issues (Bahr, 2015).

The results also demonstrate respondents thought most techniques in the three civic engagement sections were mostly or totally appropriate. However, *Teaching participants about the public policymaking process* was rated less than "mostly appropriate" for 4th-5th grade participants (Table 11), as was *Discussing how systemic racism is intertwined with environmental issues* (Table 12). This may be because civics education is more likely to be emphasized for older participants and is a part of the core curriculum by the time most participants reach high school (Common Core, 2010; NGSS, 2021). By contrast, 4th-5th grade curriculum typically includes very little discussion of civics, and younger participants are much less likely to be exposed to contentious socio-environmental issues (Common Core, 2010; NGSS, 2021). It may be more appropriate for younger audiences to instead focus on their classroom or school policies, rather than branching out to the larger community that is more outside of their locus of control or their level of knowledge and awareness at the time.

Advocacy techniques were, overall, deemed less appropriate than civic engagement techniques, especially as the target audience age dropped. *Asking participants to sign a petition or pledge to support a specific environmental cause* and *Encouraging participants to peacefully protest for a specific environmental issue* appeared especially contentious for younger audiences (Table 14). The advocacy techniques deemed the most appropriate generally focused on encouraging smaller, individual actions such as recycling or conserving water (Table 14). These results highlight that EE practitioners may feel it is inappropriate to recommend specific resolutions or actions for issues that are more complex and potentially contentious such as climate change. However, behavior change theories suggest it is important

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to target a specific behavior and to provide positive framing that performing the behavior has the potential to have a positive impact (Lakhan, 2017; Chao, 2012; Mosquera & Sánchez, 2012; Zhao et. al., 2018; Chen, 2015). In cases where there is high values-consensus and low scientific uncertainty, it may make sense to offer fewer behavioral options or resolutions and in cases in which values consensus is low and/or there is high scientific uncertainty, advocacy may be less appropriate, and it may make sense to spend more time discussing alternatives or working through civic engagement techniques (Pielke, 2014). Additionally, the field may be more comfortable advocating for individual behaviors that are not as politically contentious than it is advocating for more collective and/or politically contentious behaviors.

We found that intensity of use scores varied more than mean appropriateness scores, ranging from never use (a score of 1.00) to often use (a score of 4.00; Tables 15-18). The techniques that were least utilized were related to JEDI work, advocacy, and motivation and action planning for civic engagement. This again suggests EE providers may be uncomfortable addressing the social and political components of socioenvironmental issues and working with students on specific actions they can take to address these issues, especially with younger audiences (Bonta et al., 2015; Hudson, 2001; Ladson-Billings, 1995; Simon, 2016; Warren & Breunig, 2019). These results also suggest that the field may need more training on JEDI, advocacy, and motivation and action planning techniques that are grounded in behavior change theories.

Overall, CEAA techniques related to JEDI and motivation and action planning had the largest gaps between mean appropriateness and mean intensity of use. Our appropriateness-use analyses also illustrate that far more CEAA techniques fall into the "Higher appropriateness/lower use," category for 9th-12th grade programming (6 techniques) than for 4th-5th grade programming (1 technique). *Following up with participants after a program to support continued behavior change,* falls into the "Higher appropriateness/lower use" category across all grade ranges (Figures 6-8, Table 24). This suggests most EE providers feel they could use more time with students after a program to reinforce learning. However, these follow-up activities may require additional funding and staff. Additional techniques related to action planning and JEDI work also fell into the "highly appropriate/underutilized" category for 6th-8th and 9th-12th

grade audiences (Figures 6-8, Table 24), which reiterates the opportunity for more intentional action planning and engagement in complex socioenvironmental issues, especially for older audiences.

Finally, while all CEAA techniques vary in terms of relative appropriateness and intensity of use, most of the techniques in the "Lower appropriateness/lower use" category were also rated as at least somewhat appropriate (a score of 2.00 out of 4.00). The results of the appropriateness-use analyses suggest that the EE field is least likely to use advocacy techniques and least likely to believe these techniques are appropriate across all grade ranges. They also suggest that some of what is considered appropriate and what is used varies by the grade range of the audience. However, no technique was deemed "totally inappropriate" across the board, which suggests there is potential to use all techniques with age-appropriate, content, and context adaptations.

Limitations and Conclusions

This study has several limitations including limited sample sizes, especially for educators focused on the older grade ranges, limited diversity of respondents, and the potential for social desirability bias. Our sample had the most experience providing programs focused on younger audiences, which may reflect how academic testing and logistical constraints limit participation by older student groups (e.g., Stern et al., 2012). Our sample overwhelmingly identified as white, female, and experienced, which was similar to other recent studies of the field (e.g., Anderson et al., in review; Woods et al., in review). This lack of diversity could be attributed to the fact that our survey was distributed by professional organizations that require a membership fee. By only targeting these professional organizations, we may have created a response bias towards more experienced and possibly less socioeconomically diverse educators. For future studies, this issue could be addressed by distributing the surveys through EE providers and community organizations to enhance diversity. Our results may reflect a social desirability bias (Babbie, 2021). If we had been able to observe these educators in the field, we may have drawn different conclusions about how frequently they use CEAA techniques. Finally, our study was not able to include every possible CEAA technique, and the way we worded techniques in our survey may have biased responses. Despite these limitations, our results have important implications for the field.

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With a rapidly impending climate crisis (IPCC, 2021), it is imperative that EE providers have the tools to take a more comprehensive approach to advancing environmental literacy, one that includes CEAA techniques and sets the stage for the performance of meaningful and socially just behaviors. EE providers could impact not only how program participants behave, but ultimately also how adults in their students' lives behave. There is strong evidence that intergenerational learning can be effective in influencing behaviors (e.g., Ballantyne, Connell & Fine, 2006; Duvall & Zint, 2010). A comprehensive approach to environmental literacy requires practitioners to move beyond fact-only science education and to address the political and social components of socioenvironmental issues while also focusing on what is relevant to their students' lived experiences and social realities (Bonta et al., 2015; Brownlee et al. 2013; Hudson, 2001; Simon, 2016; Ladson-Billings, 1995; Monroe et al., 2019; Warren & Breunig, 2019). However, our results suggest that what is considered appropriate varies by the age of the audience. In addition, EE providers also feel the need to meet educational standards and to not do anything that could be perceived as politically contentious (Gruenewald & Manteaw, 2007; Jickling, 2003; NAAEE, 2017; NAAEE, 2020). However, programs may meet both educational standards and include both civic engagement and advocacy techniques that are grounded in behavior change theories to advance environmental literacy.

The results of this survey will aid EE providers and organizations such as NAAEE, ANCA, NAI, and more, by providing a sense of which civic engagement and advocacy techniques EE providers believe are appropriate for different grade ranges, the extent to which they utilize these techniques, and how much of a gap exists between appropriateness and use. This assessment is especially important in 2021's political and social landscape, as it emphasized issues related to social and political engagement, complex socioenvironmental issues, and JEDI work. Our results are part of an effort to continuously revise and update best practices for EE providers so they will be well-equipped to promote comprehensive environmental literacy for current and future generations.

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APPENDICES

<u>Appendix A</u>
<u>Additional Tables</u>

Table 25. *Please share any additional techniques you may use to support civic engagement and/or behavior change in EE programming.*

Category	Number of Respondents	Themes
Systems thinking	2	Systems thinking for social change, corporate powers & lawmakers more impactful than individual habits
Action Planning	5	Action ideas developed by students, student agency, no "You should do this"
Teach behavior change theories	1	Values-based communication
Civic engagement	8	Providing a handful of possible action item ideas to students and/or schools, signing nonspecific pledges, doing citizen science projects/programs, attending civic association meetings, writing letters to elected officials, finding common ground instead of protesting, educate others about policies
Attitudes	3	Improve appreciation for nature, connect to nature
Knowledge/Awareness	10	Reflect on science, identify things in nature, become informed about issues, identify inappropriate behaviors for natural environments, showing examples of people taking action/protesting
Miscellaneous	6	Avoiding anything overly political, importance of appropriate techniques that align with school goals, not getting to specific, providing potential action items only if participants ask directly, telling students the decision to act is up to them

Table 26. *Earlier in the survey you indicated that behavior change is not a main focus of your programming. Can you share a bit about why it's not a focus?*

Reponses:

"We have these kids for a very short time, and there are expected learning results tied to NGSS."

"2 reasons. First, I've really only been teaching since the pandemic, and all of our programs have a focus on meeting state science standards. Management has asked us to focus on conveying facts/the scientific method rather than using interpretive skills/focusing on behavioral change. Second, the facility I am a part of is run by local government, and the kinds of civic behavior changes discussed here (such as signing petitions, protesting, advocating legislation, etc.) would be viewed as 'pushing a political agenda' and get us in trouble."

Appendix B
Survey Instrument

Civic Engagement in EE

Survey Flow

Block: Default Question Block (15 Questions)
Standard: Block 1 (11 Questions)

Page Break

Q1 Welcome! Thank you for your interest in understanding **civic engagement in environmental education (EE).** We are looking for a broad range of perspectives, and we invite all who teach, manage, write curriculum for, or fund EE programs to participate in this study.   This research study is being conducted by researchers at Clemson University and Virginia Tech in partnership with the North American Association for Environmental Education (NAAEE) and the Association of Nature Center Administrators. This research is funded by the National Science Foundation (NSF), Advancing Informal STEM Learning Grant #1906610.   Our goal is to better understand the current practices in EE and where opportunities might exist to develop helpful resources, training, and other support focused on civic engagement. We will also produce a research publication to share the results. Your input is essential to this work!   We expect the survey to take **approximately 10 to 15 minutes** to complete. For the best experience, we recommend that you not take this survey on a mobile device. Although participation is voluntary and you may quit at any time, we value your thoughts and input on this important topic and hope you will take the time to complete this survey. Your responses are **anonymous,** and we will report the results in broad statistical terms.   If you have questions about this survey (IRB #2021-0156), or how the results will be used, you may contact Ms. Erica Meier: eemeier@g.clemson.edu. If you have any questions about your rights as a research participant, contact the Clemson University Human Research Protection Program at irb@clemson.edu or (864) 656-1525.

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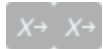
Q2 What are your roles within your organization that are relevant to EE (environmental education) programming? Check all that apply.

☐   I teach EE programs. (1)

☐   I am involved in hiring staff to teach EE programs. (2)

☐   I am involved in training staff to teach EE programs. (3)

☐   I fund EE programs. (4)

☐   I manage EE programming. (5)

☐   I am an executive decision maker within my organization. (6)

☐   I develop EE programs/write curriculum. (7)

☐   Additional role: (8) _____

Q3 How many total years of EE experience do you have?

_____
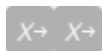
Q4 How often do your EE programs (and/or the EE programs you fund) serve the following age groups?

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)
Pre-K (younger than 5 years old) (pre_K)	○	○	○	○
Grades K-3 (ages 5-9) (K_3)	○	○	○	○
Grades 4-5 (ages 9-11) (4_5)	○	○	○	○
Grades 6-8 (ages 11-14) (6_8)	○	○	○	○
Grades 9-12 (ages 14-18) (9_12)	○	○	○	○
Adults (18+) (adult)	○	○	○	○

X→ X→
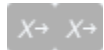
Q5 In the next section of this survey, we will ask for your opinion regarding various programmatic techniques used in EE. We will also ask you how often you use each of these techniques in programming for the grade range you select below. Please select the grade range that you have the most experience and expertise with, so we can ensure the survey is best suited to your knowledge and interests.

○ 4th-5th grade participants (1)

○ 6th-8th grade participants (2)

○ 9th-12th grade participants (3)

Page Break

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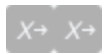
Q6 To what extent do you **prioritize** the following outcomes in EE programming for
${Q5/ChoiceGroup/SelectedChoices}?

	Not at all (1)	Minor priority (2)	Moderate priority (3)	High priority (4)
Knowledge - Participants' change in knowledge or awareness of the subject matter, environmental issues, or concepts. (knowled)	○	○	○	○
Attitudes - Participants' change in attitudes towards the subject matter of the program. (attit)	○	○	○	○
Skills development - Participants strengthen their abilities to perform particular actions, which could include science-related skills, critical thinking, civic engagement skills, or others relevant to the program content. (skills)	○	○	○	○
Personal growth (social-emotional learning) - Participants' development of identity, self-esteem, personal awareness, or other positive emotions. (social_emo)	○	○	○	○
Behavior change - A change in participants' self-reported or actual behaviors or behavioral intentions relevant	○	○	○	○

to the program. (behavior)				
Environmental Justice - Participants strengthen their understanding of the connection between equity, inclusion, and diversity and environmental issues. (envi_jus)	○	○	○	○
Enjoyment - Participants' overall satisfaction with the program. (enjoy)	○	○	○	○
Outcomes are not pre-determined. They emerge from the participants' interests. - Outcomes may change depending on participants' wants, needs, and interests. (not_pre_det)	○	○	○	○
Additional Outcome(s): (add)	○	○	○	○

X→ X→
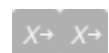
Q7 What behaviors do you hope **${Q5/ChoiceGroup/SelectedChoices}** will change as a result of your EE programs? *Check all that apply.*

☐ **Home conservation behaviors** (e.g., taking shorter showers, turning off the water when they brush their teeth, etc.) (1)

☐ **Transportation behaviors** (e.g., walking or riding a bicycle instead of driving, carpooling, taking public transit, etc.) (2)

☐ **Reduce, reuse, recycle behaviors** (e.g., bringing reusable bags or water bottles with you, composting organic waste, recycling, repairing old items before buying new ones, etc.) (3)

☐ **Consumer behaviors** (e.g., purchasing items made from recycled materials, buying products from companies with environmentally responsible practices, purchasing locally produced items, etc.) (4)

☐ **Political conservation behaviors** (e.g., urging people in positions of power to support pro-environmental practices, becoming a member of an environmental organization, etc.) (5)

☐ **Environmental conservation behaviors** (e.g., improving the habitat for wildlife, planting native plants, working to improve parks in your neighborhood, etc.) (6)

☐ **Environmental justice behaviors** (e.g., working to ensure all communities have equal access to clean water, air, and green spaces, addressing social injustices, working toward justice, equity, and inclusion related to environmental issues, etc.) (8)

☐ Other(s), please briefly describe: (7)

_____

Page Break

X→ X→

Q8 Knowledge and Skills Building for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building knowledge and skills related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**? And **how often do you use** each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**?

	Appropriateness				**Use**			
	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)	Never use (1)	Rarely use (2)	Sometimes use (3)	Often use (4)

Teaching participants about ecology/environmental science. (envi_know)

○ ○ ○ ○ ○ ○ ○ ○

Teaching participants about the public policymaking process. (civic_know)

○ ○ ○ ○ ○ ○ ○ ○

Asking participants to identify individual and community assets that will help address a specific environmental issue. (Q8_55)

○ ○ ○ ○ ○ ○ ○ ○

Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings). (Q8_56)

○ ○ ○ ○ ○ ○ ○ ○

Facilitating discussions that welcome multiple viewpoints. (Q8_57)

○ ○ ○ ○ ○ ○ ○ ○

Helping participants identify common ground between sides in controversial issues. (Q8_58)

○ ○ ○ ○ ○ ○ ○ ○

Challenging participants to design novel solutions to a specific environmental issue. (Q8_59)

○ ○ ○ ○ ○ ○ ○ ○

Asking participants to use evidence to support their proposed solutions to environmental issues. (Q8_60)

○ ○ ○ ○ ○ ○ ○ ○

70

Display This Question:

    If Q2 = I fund EE programs.

    And Q2 != I teach EE programs.

    And Q2 != I am involved in hiring staff to teach EE programs.
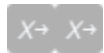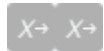
    And Q2 != I am involved in training staff to teach EE programs.

    And Q2 != I manage EE programming.

    And Q2 != I am an executive decision maker within my organization.

    And Q2 != I develop EE programs/write curriculum.

X→ X→

Q36 Knowledge and Skills Building for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building knowledge and skills related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**?

	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)
Teaching participants about ecology/environmental science. (envi_know)	○	○	○	○
Teaching participants about the public policymaking process. (civic_know)	○	○	○	○
Asking participants to identify individual and community assets that will help address a specific environmental issue. (assets)	○	○	○	○
Taking environmental actions with participants during an EE program (e.g., clean-ups or native plantings). (envi_active)	○	○	○	○
Facilitating discussions that welcome multiple viewpoints. (multi_view)	○	○	○	○
Helping participants identify common ground between sides in controversial issues. (common_ground)	○	○	○	○
Challenging participants to design novel solutions to a specific environmental issue. (novel_sol)	○	○	○	○

Asking participants to use evidence to support their proposed solutions to environmental issues. (evidence)

○   ○   ○   ○

X→ X→

Q8 Values and Dispositions for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building values and dispositions related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**? And **how often do you use** each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**?

	Appropriateness				Use			
	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)	Never use (1)	Rarely use (2)	Sometimes use (3)	Often use (4)

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Practicing skills to build participants' confidence in their abilities to address environmental issues. (confidence)	○	○	○	○	○	○	○	○
Encouraging participants to consider that all living things have value in and of themselves. (biophil)	○	○	○	○	○	○	○	○
Demonstrating that a healthy environment is vital to human health and well-being. (altru)	○	○	○	○	○	○	○	○
Using religious doctrine to support the case for environmental protection. (reli)	○	○	○	○	○	○	○	○
Communicating that it's our shared moral obligation to care for the environment. (moral_ob)	○	○	○	○	○	○	○	○
Teaching that everyone has a right to clean air and water, regardless of where they live. (clean_air)	○	○	○	○	○	○	○	○
Discussing how systemic	○	○	○	○	○	○	○	○

racism is intertwined with many environmental issues. (racism_emb)

Providing examples of diverse environmental role models. (div_role)

○   ○   ○   ○   ○   ○   ○   ○

X→ X→

Q37 Values and Dispositions for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building values and dispositions related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for **${Q5/ChoiceGroup/SelectedChoices}**?

	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)
Practicing skills to build participants' confidence in their abilities to address environmental issues. (confidence)	○	○	○	○
Encouraging participants to consider that all living things have value in and of themselves. (biophil)	○	○	○	○
Demonstrating that a healthy environment is vital to human health and well-being. (altru)	○	○	○	○
Using religious doctrine to support the case for environmental protection. (reli)	○	○	○	○
Communicating that it's our shared moral obligation to care for the environment. (moral_ob)	○	○	○	○
Teaching that everyone has a right to clean air and water, regardless of where they live. (clean_air)	○	○	○	○

Discussing how systemic racism is intertwined with many environmental issues. (racism_emb)	○	○	○	○
Providing examples of diverse environmental role models. (div_role)	○	○	○	○

Page Break

X→ X→

Q8 Motivation and Action Planning for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building motivation and action plans related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}? And **how often do you use** each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}?

	Appropriateness				Use			
	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)	Never use (1)	Rarely use (2)	Sometimes use (3)	Often use (4)

Encouraging participants to be "conservationists" in their everyday lives. (conserva)

○　　○　　○　　○　　○　　○　　○　　○

Empowering participants to see themselves as change agents. (change_age)

○　　○　　○　　○　　○　　○　　○　　○

Having participants identify ways to overcome obstacles to performing a specific environmental behavior. (obstacles)

○　　○　　○　　○　　○　　○　　○　　○

Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue. (pro_con)

○　　○　　○　　○　　○　　○　　○　　○

Discussing the consequences of inaction on complex environmental issues, such as climate change. (con_inaction)

○　　○　　○　　○　　○　　○　　○　　○

Helping participants write an action plan to address a specific environmental issue. (action_plan)

○　　○　　○　　○　　○　　○　　○　　○

Following up with participants after

○　　○　　○　　○　　○　　○　　○　　○

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a program to support continued behavior change. (follow_up)

Empowering participants to communicate with local decision makers about environmental issues. (decision_ma)

○   ○   ○   ○   ○   ○   ○   ○

Display This Question:

> *If Q2 != I teach EE programs.*
>
> *And Q2 != I am involved in hiring staff to teach EE programs.*
>
> *And Q2 != I am involved in training staff to teach EE programs.*
>
> *And Q2 != I manage EE programming.*
>
> *And Q2 != I am an executive decision maker within my organization.*
>
> *And Q2 != I develop EE programs/write curriculum.*
>
> *And Q2 = I fund EE programs.*

X→ X→

Q38 Motivation and Action Planning for Civic Engagement   There are many approaches to conducting a successful EE program. Some of these approaches relate to civic engagement, which is defined as developing the knowledge, skills, values, and motivation to make a difference in the civic life of communities. The following items pertain to approaches related to building motivation and action plans related to civic engagement.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}?

	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)
Encouraging participants to be "conservationists" in their everyday lives. (conserva)	○	○	○	○
Empowering participants to see themselves as change agents. (change_age)	○	○	○	○
Having participants identify ways to overcome obstacles to performing a specific environmental behavior. (obstacles)	○	○	○	○
Asking participants to identify the benefits and trade-offs of performing different actions to address an environmental issue. (pro_con)	○	○	○	○
Discussing the consequences of inaction on complex environmental issues, such as climate change. (con_inaction)	○	○	○	○
Helping participants write an action plan to address a specific environmental issue. (action_plan)	○	○	○	○

| Following up with participants after a program to support continued behavior change. (follow_up) | ○ | ○ | ○ | ○ |
| Empowering participants to communicate with local decision makers about environmental issues. (decision_ma) | ○ | ○ | ○ | ○ |

Page Break ─────────────────────────

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X→ X→

Q35 There are many approaches to conducting a successful EE program. Some of these approaches may promote, support, or favor a specific viewpoint or action.   In your personal opinion, **how appropriate** is it to use each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}? And **how often do you use** each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}?

	Appropriateness				Use			
	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)	Never use (1)	Rarely use (2)	Sometimes use (3)	Often use (4)

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Asking participants to identify key decision makers related to the issue they are most interested in addressing. (iden_dec_ma)

○ ○ ○ ○ ○ ○ ○ ○

Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles). (indi_beh)

○ ○ ○ ○ ○ ○ ○ ○

Advocating that participants avoid purchasing certain products because of their environmental impacts. (boycott)

○ ○ ○ ○ ○ ○ ○ ○

Using persuasive arguments to influence participants' conservation behaviors. (pers_arg)

○ ○ ○ ○ ○ ○ ○ ○

Asking participants to sign a petition or pledge to support a specific environmental

○ ○ ○ ○ ○ ○ ○ ○

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cause. (petition)								
Encouraging participants to join a pro-environmental organization. (envi_org)	○	○	○	○	○	○	○	○
Encouraging participants to peacefully protest for a specific environmental issue. (protest)	○	○	○	○	○	○	○	○
Advocating for a specific policy to address an environmental injustice. (policy)	○	○	○	○	○	○	○	○

Page Break

Display This Question:

If Q2 != I teach EE programs.

And Q2 != I am involved in hiring staff to teach EE programs.

And Q2 != I am involved in training staff to teach EE programs.

And Q2 != I manage EE programming.

And Q2 != I am an executive decision maker within my organization.

And Q2 != I develop EE programs/write curriculum.

And Q2 = I fund EE programs.

X→ X→

Q39 There are many approaches to conducting a successful EE program. Some of these approaches may promote, support, or favor a specific viewpoint or action.   In your personal opinion, how appropriate is it to use each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}? And how often do you use each of the following techniques in EE programming for ${Q5/ChoiceGroup/SelectedChoices}?

	Not at all appropriate (1)	Somewhat appropriate (2)	Mostly appropriate (3)	Totally appropriate (4)
Asking participants to identify key decision makers related to the issue they are most interested in addressing. (iden_dec_ma)	○	○	○	○
Encouraging participants to change their individual behaviors to improve the environment (e.g., using reusable water bottles). (indi_beh)	○	○	○	○
Advocating that participants avoid purchasing certain products because of their environmental impacts. (boycott)	○	○	○	○
Using persuasive arguments to influence participants' conservation behaviors. (pers_arg)	○	○	○	○
Asking participants to sign a petition or pledge to support a specific environmental cause. (petition)	○	○	○	○
Encouraging participants to join a pro-environmental	○	○	○	○

organization. (envi_org)

Encouraging participants to peacefully protest for a specific environmental issue. (protest)

      ◯   ◯   ◯   ◯

Advocating for a specific policy to address an environmental injustice. (policy)

   ◯   ◯   ◯   ◯

Page Break

*Display This Question:*

> *If Q6 != Behavior change - A change in participants' self-reported or actual behaviors or behavioral intentions relevant to the program. [Not at all]*

Q9 Please share any additional techniques you may use to support civic engagement and/or behavior change in programming for ${Q5/ChoiceGroup/SelectedChoices}; *I*f none, write "N/A":

_____

Display This Question:

> *If Q6 = Behavior change - A change in participants' self-reported or actual behaviors or behavioral intentions relevant to the program. [Not at all]*

Q10 Earlier in the survey you indicated that behavior change is not a main focus of your programming for ${Q5/ChoiceGroup/SelectedChoices}. Can you share a bit about why it's not a focus?

_____

X→ X→
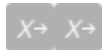
Q11 How often does your organization conduct the following types of EE programs?

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)
After school programs (after_sch)	○	○	○	○
Exhibit-focused visits (exhibit)	○	○	○	○
Multi-day experiences (multi_day)	○	○	○	○
Informal programs with walk-in visitors (informal_wa)	○	○	○	○
Other (non-overnight) planned programs with non-school groups (other_non_sch)	○	○	○	○
School field trips (sch_field)	○	○	○	○
Summer camps (camp)	○	○	○	○
Visits to a school (visit_to_sch)	○	○	○	○
Virtual programs (distance learning) (virtual_pro)	○	○	○	○
Events (festivals or booths at large public events) (events)	○	○	○	○
Professional development for educators (pro_dev)	○	○	○	○
Additional type of EE program: (additional)	○	○	○	○
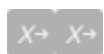
Q12 Which of the following best describes your organization?

○ Aquarium (1)

○ Botanical garden (2)

○ Camp (3)

○ College or university (4)

○ Community center (5)

○ Farm (6)

○ K-12 school (7)

○ Museum (8)

○ National park (9)

○ State park (10)

○ Other protected area (11)

○ Nature center (12)

○ Other non-profit organization (13)

○ Research organization (14)

○ Residential environmental education center (15)

○ Science center (16)

○ Zoo (17)

○ Local government (18)

○ State government (19)

○ Religiously affiliated organization (20)

○ Federal government (21)

○ Additional organization type: (22) _____

`X→` `X→`

Q13 In what country (or countries) does your organization provide EE programming? *Check all that apply.*

☐ United States (1)

☐ Canada (2)

☐ Mexico (3)

☐ Additional Country: (4) _____

Q14 In what state(s), province(s), or territories does your organization provide EE programming?
If you are a part of a larger state, regional, national, or international organization, please answer this question pertaining to where you work (i.e., your local site/unit).

_____

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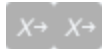
Q15 How often do your EE programs serve the following participants? If you are unsure, share your best guess.

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)
African American or Black participants (black)	○	○	○	○
Hispanic or Latino/Latina/Latinx participants (latino)	○	○	○	○
Participants for whom English is not their primary language (non_eng)	○	○	○	○
Participants from a lower socioeconomic background (i.e., those who qualify for free or reduced lunches) (lower_soc)	○	○	○	○
Additional specific identity: (additional)	○	○	○	○
Additional specific identity: (add2)	○	○	○	○
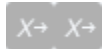
Q16 About how many people are employed by your organization?

If you are a part of a larger state, regional, national, or international organization, please answer this question pertaining to where you work (i.e., your local site/unit).

○ Fewer than 10 employees. (1)

○ 10-49 employees. (2)

○ 50-249 employees. (3)

○ 250 or more employees. (4)

Q17 *If you choose not to answer the following questions, please write "N/A."*

○ What is your racial identity? (4) _____

○ What is your gender identity? (5) _____

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Q18 If you are interested in sharing your opinions and experiences on behavior change, advocacy, and/or civic engagement in EE in a short interview (via phone or Zoom), please provide your name and email address below. Someone from our research team may then contact you via email to set up a time that is convenient for you. Thank you in advance!

Please click the arrow at the bottom of the screen to submit your completed survey!

○ Name: (1) _____

○ Email address: (2) _____

Q19 Thank you for your participation in this valuable research project!

If you have questions or comments contact Erica Meier at eemeier@g.clemson.edu or Bob Powell at rbp@clemson.edu. You may also contact Clemson University of Research Compliance by email at irb@clemson.edu or toll free at 866-297-3071 if you have questions regarding your rights as a research participant.

End of Block: Block 1