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Adapting to the COVID-19 Pandemic: Reflections from Pennsylvanian Environmental Educators

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## ABSTRACT

The COVID-19 pandemic called for adaptations to environmental education (EE). To address the gap in research on environmental education adaptations that emerged during the COVID-19 pandemic, reflections from professionals in Pennsylvania were gathered through virtual semi-structured interviews to collect qualitative data from before, during, and after the COVID-19 pandemic. Through analyses and coding of interview transcriptions, several themes emerged regarding shifts in audience and programming. All professionals interviewed incorporated virtual programming or elements of technology into their operations during the COVID-19 pandemic. Other environmental education adaptations included adhering to CDC guidelines in programming to uphold public safety. Further, many educators reported increased visitation to their facility/organization upon reopening from COVID-19 lockdowns/closures. The trends and patterns from this research indicate that environmental education benefited from using technology to increase access to a broader audience throughout the COVID-19 pandemic. However, data from this study underlines the drawbacks that came with virtual programming during the COVID-19 pandemic. Although there has been a recent shift away from EE adaptations that emerged from the pandemic, some remain and provide continued success, such as community nature journaling, at-home learning kits, and hybrid virtual programs. Overall, environmental educators were challenged to evaluate their programs and create innovative strategies to meet the changing needs and interests of their audience during the pandemic. Moving forward, sustained use of technology may provide EE organizations with a channel to have stronger engagement with their audiences and continue making program improvements.

Further research may delve into the use of technology and media in environmental education while seeking an audience perspective.

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## **Chapter 1**

### **Introduction**

The arrival of the COVID-19 pandemic in the United States called for adaptations in work, education, socialization and more to prioritize public health and safety (*How the COVID-19 pandemic changed society*, 2022). Education and healthcare providers reevaluated their practices to meet patient and student needs as the pandemic endured (*How the COVID-19 pandemic changed society*, 2022). The role of virtual communication has provided breakthroughs in telemedicine and at home education, allowing people of all ages to grow more familiar with using technology (*How the COVID-19 pandemic changed society*, 2022). However, little research explored the intersection of adaptations during the COVID-19 pandemic and environmental education (EE). This thesis will explore how the field of environmental education in Pennsylvania adapted to the constraints of the pandemic, while also addressing the affordances and challenges of these adaptations for future practice.

In the spring of 2020, college students completed their academic year in an unexpected way. In March, the outbreak of coronavirus (COVID-19) sent students home from their universities, and through zoom, an online virtual communication platform, classes continued. Meanwhile, universities adapted to support students during their adjustment to at-home learning. For example, a statement from Northeastern University addressed students' emotions and mental health challenges, and provided virtual resources to support students, such as free unlimited university counseling services (Northeastern University Health and Counseling Services, 2020)



Beyond academia, the pandemic disrupted opportunities for social interaction, negatively impacting individuals' mental health and wellbeing (McClain et al., 2021, p. 14). Navigating a global pandemic was unprecedented and involved periods of quarantine and isolation. Although these measures were necessary to prevent disease transmission, they came with multiple challenges. Studies suggest that social isolation during the pandemic resulted in a range of negative mental health consequences (Robinson et al., 2021, p. 14-17). Symptoms of depression and anxiety increased globally among young adults (Torales, et. al, 2020). Largely, social interaction shifted to a virtual setting. In a survey among American adults, 90% reported that the internet was essential for their personal lives during the pandemic (McClain et al., 2021, p. 15). Yet, another study reported that 40% of respondents experienced feeling burned out or fatigued from virtual interactions (McClain et al., 2021, p. 12).

However, the outdoors may have offered a solution to COVID-19's negative effect on wellbeing. Time spent in natural spaces is associated with achieving health and happiness (Bratman et al., 2019, p. 2-3). Natural spaces boast physical, mental, and social benefits that may act as a catalyst in improving human health. Evidence shows that time spent outside provides short term benefits such as increased happiness levels and improved cognitive function, promoting memory and creativity, as well as long term benefits such as reduced risks of psychopathologies including anxiety, attention deficit hyperactive disorder (ADHD), and depression (Bratman et al., 2019, p. 3). In recent years, human-nature connection has declined with the rise of technology and multimedia (Dwyre, 2015, p. 9-16). However, amidst heightened stress and anxiety levels during the COVID-19 pandemic, solace was sought in the outdoors. In a study conducted among 1148 participants in Great Britain, 88% of respondents reported an increased amount of time spent in nature due to the pandemic (Robinson et. al., 2021, p. 5). For

some, the pandemic may have been an awakening to the benefits of spending more time outside. As such, environmental education was urged to adapt to an increased demand for services while providing participants with safety during the COVID-19 pandemic.

In-person recreation and leisure services suddenly became limited or unavailable due to the pandemic. However, virtual platforms provided both opportunities and setbacks for the continuation of environmental education. Research found that on one hand, the COVID-19 pandemic presented breakthroughs for adaptability in EE using multiple technological tools such as zoom and its supplemental features like breakout rooms and annotation (Nichols et. al., 2021, p. 12). Research exploring technology's use as a tool in environmental education and informal outdoor learning typically produces mixed results (Anderson et. al., 2015; Nichols et. al., 2021). However, when combined with appropriate EE techniques, technology can offer tools to interact with the environment and incentivize students to turn the outdoors into their classroom (Anderson et. al, 2015, p. 12-13). During the COVID-19 pandemic, technology has been a vital education tool from pre-K to higher academia. However, virtual learning comes with challenges, such as the deprivation of social connections between students and their peers and instructors, and experiencing distractions from notifications (Yan et. al., 2021, p. 13, 15). Another factor in virtual learning is access to technology. One study found that incompatible technology devices presented a barrier among 76% of students in higher education (Yan et. al., 2021, p. 3). Despite these challenges, the pandemic provided educators with an opportunity to rethink their practices and experiment with different learning techniques (Abramson, 2021). Few studies have examined adaptations, experiences, and practices of EE professionals over the COVID-19 pandemic. This study addressed the existing gap by examining what was learned from the challenges and affordances of the COVID-19 pandemic specific to EE in Pennsylvania.

**Purpose**

The purpose of this study was to discover what was learned from the challenges of the COVID-19 pandemic to improve environmental education for future students and educators, whether the global pandemic remains or not. As COVID-19 is a recent phenomenon, there is limited research about its impact on environmental education. Therefore, the study aims to address the following questions:

- (1) What environmental education adaptations emerged from the pandemic?
- (2) Which environmental education adaptations that emerged from the COVID-19 pandemic persist and why or why not?

## Chapter 2

### Literature Review

#### Overview and Definitions of Environmental Education

Environmental education (EE) is defined below by the National Association for Environmental Education and taken from the 1977 Tblisi Declaration, an intergovernmental document organized by the United Nations Education, Scientific, and Cultural Organization (UNESCO) in cooperation with the U.N. Environment Programme (UNEP) with a unanimous urgency to advance the role of environmental education in for the preservation and improvement of the global climate, as well as the balanced development of global communities. The definition of environmental education is as follows:

a learning process that increases people's knowledge and awareness about the environment and its' associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (North American Association for Environmental Education, n.d., "About EE and Why It Matters; United Nations Environment Programme & United Nations Education, Scientific, and Cultural Organization, 1977, p. 1).

In addition, EE often occurs through experiential learning opportunities. According to the North American Association for Environmental Education's website:

Environmental education is based on learning through experiences, reflecting on those experiences, and applying the learning to help address real-world problems.

Learning by doing can help develop critical and creative thinking skills and help learners

develop a deeper understanding of environmental, social, and economic issues (n.d., “Experiential Learning”).

Taken together, these two definitions acknowledge that environmental education has existed within a vast range of people and places while being internationally recognized as an empowering educational resource in recent decades. Because individuals come from varying backgrounds of awareness and knowledge, EE does not follow a uniform blueprint, and one’s relationship with EE is an ongoing process. To effectively achieve its purpose, EE should be designed to meet the needs of individuals where they are.

### **A Growing Need for Environmental Education in the Post-Pandemic World**

The increasing need for accessible environmental education was emphasized by the COVID-19 pandemic. At a point in time where technology is central to the human lifestyle, research shows a growing disconnect between humans and nature (DJ Case & Associates, 2015-16). The average American spends over 10 hours behind a screen every day (Howard, 2016). In contrast, a study conducted in conjunction with federal wildlife and park agencies found that the average American adult reported spending five hours or less outside each week (YaleEnvironment360, 2017). While technology is used as a learning tool, the gap between humans and nature is associated with a variety of observed mental and physical health issues known as nature-deficit disorder (Dwyre, 2015, p. 4). Richard Louv explored this phenomenon in *Last Child in the Woods*, writing, “Nature-deficit disorder describes the human costs of alienation from nature, among them: diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses” (Louv, 2005, p. 34). These detriments to wellbeing in conjunction with negative implications of COVID-19 are enough to warrant nature-based solutions to nature deficit disorder and incentivize increased time spent outside.

## **Human-Nature Connection in Times of Adversity**

Throughout the COVID-19 pandemic, people turned to nature for its physical and emotional benefits (Robinson et. al., 2021, p. 9). Research shows that the COVID-19 pandemic may have brought forth new outdoor recreationists, but participation varied by geographic area. (Lawhon et. al., 2020). Another study found that time spent outdoors produced greater psychological well-being than time spent indoors during the pandemic (Lesser & Nienhuis, 2020, p. 9-10). As more people perceived the benefits of spending time outdoors, opportunities for environmental education followed, reinforcing its importance and growing demand.

## **COVID-19 Expands Environmental Education in New Ways**

During the COVID-19 pandemic, educators found creative ways to adapt their approach to the changing needs of students. Gena Zamarro, a professor in the Department of Education at the University of Arkansas wrote, “Teachers had to adapt to unexpected conditions, teaching in unprecedented ways, using synchronous and asynchronous instruction, while also being challenged to establish connections with students, families, and colleagues” (Zamarro et. al., 2021, p. 1). Despite challenges related to virtual learning, research showed that technology can be a useful tool in promoting engagement and participation in environmental education (Janz, 2021, p. 49). Technology adaptations to EE that emerged from the pandemic include webinars, social media campaigns, citizen science projects, virtual field trips, and guidance from mobile apps, all of which encourage meaningful outdoor learning experiences (Janz, 2021, p. 24-25, 43-44). Virtual learning presented opportunities to engage with the natural environment in backyards and throughout local communities, increasing the variety and accessibility of programming (Janz, 2021, p. 17). When analyzing adaptations that emerged from the pandemic,

technology is recognized as a helpful tool. However, research has yet to uncover which EE adaptations were the most successful and which will endure beyond the pandemic.

### **The Future of Environmental Education**

The COVID-19 pandemic presented numerous challenges. However, EE has the potential to leverage lessons learned from these challenges and improve as a field moving forward. In order to explore this process, data was gathered about adaptations that emerged from the pandemic . Adaptations may remain beyond the pandemic as methods to increase engagement and participation, reaching larger, more diverse audiences. This study will add to research in an ongoing pandemic, learning from the last two years as we look to the future of EE.

## **Chapter 3**

### **Methods**

#### **Study Design**

The literature review briefly introduced environmental education adaptations that emerged throughout the COVID-19 pandemic. This study seeks to explore adaptations in further depth, uncover innovative adaptations, and measure their effectiveness in EE practices across Pennsylvania. The study employed an inductive qualitative method through virtual in-depth interviews between the researcher and environmental education professionals across the state of Pennsylvania. Interviews were conducted and recorded via Zoom with an average duration of 26 minutes and 30 seconds. A semi-structured interview was designed to elicit contextual experiences and perspectives of environmental education professionals throughout the COVID-19 pandemic. Questions were developed by the researcher and academic committee to explore periods of time before, during, and after the COVID-19 pandemic. Semi-structured interview questions allowed the researcher to prompt additional context from environmental educators that could not be obtained through a virtual survey.

#### **Data Collection**

A purposive method was used to identify professionals who qualify for the study. Inclusion criteria included working for an organization that provided environmental education in the state of Pennsylvania during the COVID-19 pandemic. Together, the research committee decided that focusing on Pennsylvania would offer mutual advantages to the researcher and surrounding EE organizations. The researcher has an educational background from The Pennsylvania State University in Recreation, Park and Tourism Management with a focus in Outdoor Recreation, which lies within the college of Health and Human Development. The study



allowed the researcher to apply academic frameworks to explore EE in Pennsylvania while offering professionals an opportunity to reflect on the COVID-19 pandemic. Ultimately, the study is designed for environmental educators of all experiences to learn from each other by sharing the data.

A non-random sampling method was used to find research participants. The researcher was directed to their starting point at the PAEE website by a member of the research committee. Environmental Education organizations were found from the Pennsylvania Association of Environmental Education (PAEE) website. PAEE is divided into six regions (Northcentral, Northeast, Northwest, Southcentral, Southeast, Southwest). Participants were selected from each of the regions to contact and set up interviews. Organizations were contacted via email or phone numbers found on their company websites, which are accessible through PAEE's website. To view the recruitment email sent to participants, see Appendix A. In addition to the non-random sampling method, the researcher employed snowball sampling by utilizing connections of the research committee. Participants were staff members of EE organizations who have been working at the organization prior to, during, and after the pandemic. In total, ten participants consented to conduct recorded interviews through Zoom. Of the 10 participating organizations, two came from the northcentral region, four came from the northeast region, one came from the northwest region, one came from the southcentral region, two came from the southeast region, and zero came from the southwest region.

### ***Instrument***

After a review of early effects of the COVID-19 pandemic and informal conversations with environmental educators, the research committee decided to explore emerging EE adaptations local to Pennsylvania. The semi-structured interview was designed as an instrument

to delve into different time periods of the pandemic, beginning in March 2020 and up to the window in which interviews were conducted between August and October 2022. Refer to Table 1 to see how questions were divided among different time periods of the pandemic. Interview questions addressed shifts in programming, audience, communication methods. Questions solicited a mixture of qualitative open-ended results and quantitative responses regarding visitation levels, with an intention to reveal fluctuations across the COVID-19 pandemic. The interview questions were created by the researcher under guidance of the research committee. Ultimately, the instrument was designed to gather the unique perspectives and experiences of environmental education professionals in Pennsylvania during the COVID-19 pandemic. Approval from the Institutional Review Board was obtained on August 1, 2022. The first virtual interview and the start of data collection occurred on August 17, 2022.

**Table 1.**

*Semi-Structured Interview Questions*

<b>Pre-COVID Questions</b>	<ol style="list-style-type: none"> <li>1. Describe the range of EE programming and opportunities at (organization) prior to 2020.</li> <li>2. On average, how many daily visitors were attending your EE programming pre-pandemic face-to-face? Virtually?</li> </ol>
<b>During COVID Questions</b>	<ol style="list-style-type: none"> <li>3. How was programming affected by stay-at-home / lockdown measures in early stages of the pandemic (closed, virtual opportunities, other)?</li> <li>4. How did your organization stay in touch with your audience during the stay at home / lockdown period of the pandemic?</li> </ol>

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5. What is something that the pandemic helped your organization realize you could do differently / you never thought of before?
  6. How did your staff continue to work together during the pandemic?

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**Post-COVID Questions**

7. On average, how many daily visitors did you see post-pandemic face-to-face? Virtually?
8. After lockdown when organizations began reopening, what were some of the differences in your programs? (New programs? Did you have to discontinue any existing programs? Modifications to old programs?)
9. In your experience as an environmental educator, how do you perceive the public's interest in nature-based activities now versus before the pandemic?
10. In what ways does your organization currently adjust and improve upon programming or service delivery?

**Data Analysis**

After the ten virtual interviews were conducted and recorded via Zoom and professionally transcribed using an online transcription service (Rev), they were downloaded and referenced for data analysis. The researcher organized responses by question and EE

organization in an Excel spreadsheet to assist thematic analysis. Refer to Appendix B to view a sample of the researcher's codebook. Open-ended questions were analyzed using descriptive hand coding to determine common codes and themes among data. This list of themes was then shared with the researcher's advisory team to offer suggestions to modify or refine themes. From these discussions, themes were finalized with their respective sub-themes and representative quotes/text that represented those themes. Data analysis explored relationships between themes, segmented into three windows of the pandemic: "Pre-COVID-19," "During COVID-19," and "Post-COVID-19." Themes are interpreted and explained in the results and discussion chapters.

## Chapter 4

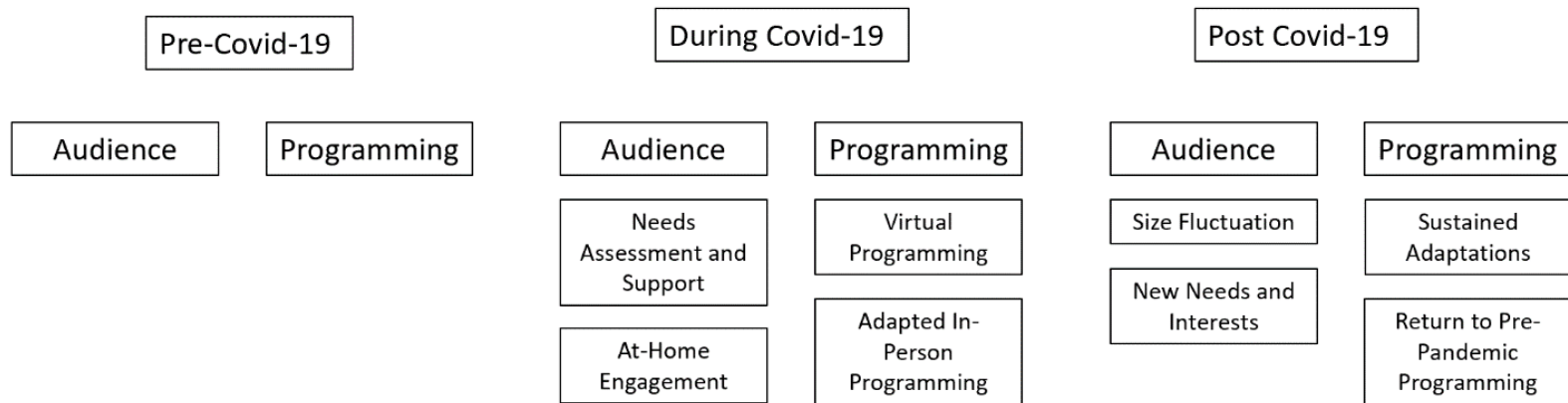
### Results

The analysis of interview transcripts was broken into themes of audience and programming from the “Pre-COVID-19,” “During COVID-19,” and “Post-COVID-19” eras. While exploring shifts and adaptations to EE, eight additional subthemes emerged under audience and programming in the “During-COVID-19” and “Post-COVID-19” eras. Themes and subthemes are outlined in Figure 1 and discussed in the Results and Discussion chapters.

Overall, the findings of this study imply that the leading adaptations to environmental education during the COVID-19 pandemic relied on virtual programming and technology. Virtual programming included webinars, interactive social media, and virtual telecommunication to conduct school outreach or virtual community programs. Although virtual programming is not employed as frequently or intensively as it was during the COVID-19 pandemic, adaptations were not entirely withdrawn. EE professionals report that the COVID-19 pandemic has increased the comfort and capacity to use technology as an educational and engagement tool with their audience. Aside from virtual programming, the COVID-19 pandemic brought unique challenges. Respondents reported the drawbacks of virtual programming as well as the logistical matters of implementing COVID-19 protocols as program challenges. It is hoped that both the successes and challenges of EE during the COVID-19 pandemic will serve as a reference for others to design future programs with a refined vision.

**Figure 1**

*EE Themes and Subthemes During the COVID-19 Pandemic*



## **Pre-COVID**

On March 11, 2020, the Centers for Disease Control and Prevention (CDC) declared COVID-19 a pandemic (CDC). By mid-March, states began to implement shutdowns among schools and businesses to prevent disease transmission (CDC). The “Pre-COVID” theme refers to the time before the turning point from what was considered “normal” to the start of the pandemic. Interviews explored the audience and programming of each organization before the pandemic. The two themes that emerged from the interview transcripts unpack the EE organizations’ programming prior to 2020 and the audiences they served in the pre-COVID era.

### ***Programming Prior to 2020***

Interview question 1 gathered data about programming opportunities offered by organizations before the pandemic. Table 1 reviews the themes formed from interview responses, including Youth Programming, Community Programming, and Independent Recreation and Leisure. Nine out of ten interview responses included combinations of multiple programming opportunities, while one interview was entirely concentrated on pre-kindergarten (pre-K) education. Program delivery assumed the form of in-person, informal outdoor environments, except for school programming, which involved a blend of traditional and non-traditional classroom learning. Furthermore, some EE organizations utilized indoor space as part of programming for educational events and if inclement weather arose during outdoor programs.

### **Table 2.**

#### *Review of Pre-Pandemic Programming Opportunities*

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<b>Youth Programming</b>	<ol style="list-style-type: none"> <li>1) Pre-K education</li> <li>2) Elementary and secondary education <ul style="list-style-type: none"> <li>• School outreach</li> </ul> </li> </ol>
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	<ul style="list-style-type: none"> <li>• Field trips</li> </ul>
	3) Summer camps
<b>Community Programming</b>	<ol style="list-style-type: none"> <li>1) Public events</li> <li>2) Adult programming</li> <li>3) Family programming</li> <li>4) Interpretation</li> <li>5) Group recreation</li> </ol>
<b>Independent Leisure &amp; Recreation</b>	1) Visits to EE organization site without participating in programming

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### ***Audience***

Interview question 2 aimed to obtain a daily average of visitors among the ten EE organizations. The daily average number of visitors pre-pandemic varied widely by organization and type of programming that was offered. Responses displayed a range between 20 and 30,000 participants, and anywhere in between. One respondent reported, “*We could have 1,000 people in one day, but during a typical education program, we could have anywhere from 12 to 100 students.*” This data portrays a wide range of visitors not only across all ten EE organizations, but even within the individual EE organizations themselves. Collectively measuring audience size was challenged by the variability of responses. Some respondents provided the number of daily visitors, while others provided the number of annual visitors, making it impractical to calculate an overall average number of visitors among organizations. Despite this lack of generalization, having an estimated audience size for each of the organizations interviewed allowed for a comparison before and after the pandemic.

### **During COVID**



“During COVID” refers to the period in which organizations underwent lockdowns and closures. During this time, pre-pandemic practices were halted, and the following months held uncertainty about reopening. The “During COVID” window ranges from March 2020 to various points of time in 2021 and 2022 when organizations returned to in-person and/or pre-pandemic programming. The 6 themes addressing changes in audience and programming include:

- Staying connected with the audience
- Needs assessment and supportive resources
- Environmental Education at Home
- Programming as the Pandemic Unfolds
- Growth of Technology and Virtual Programming
- Adapted In-Person Programming and COVID-19 Protocols

Each of these themes are discussed in the following sections.

### ***Staying Connected with the Audience***

Interview question 4 gathered a range of responses about the relationship between organizations and their audiences during lockdown and closures. During this point of the pandemic, engagement with the audience involved assessing their needs and implementing strategies to achieve virtual connectivity, which bore opportunities for EE at home. Strategies for virtual connectivity included interactive social media posts—primarily on Instagram, Facebook, and YouTube. One respondent reported seeing upwards of 20,000 views on their YouTube video. Additionally, another organization was happy to call a list of their participants via telephone to conduct a more personalized approach to connectivity during the COVID-19 pandemic.

### ***Needs Assessments and Supportive Resources***

5 out of 10 organizations reported taking measures to assess the needs of their audience or offer supportive resources during the COVID-19 pandemic. These measures included sharing mental health resources with the audience via email or social media, distributing virtual surveys, and calling audience members on the phone to evaluate their needs and provide a communication method. Moreover, needs assessments allowed EE organizations to reflect on the audiences that their programming was reaching and evaluate who needed the most support during the pandemic. 3 out of 10 respondents reported placing a stronger focus on audience segments that were lacking funding and resources during the pandemic. These organizations reallocated their resources to provide stronger support to people who needed it most. Additionally, one organization held a community food drive at their site during the lockdown.

### ***Environmental Education at Home***

During lockdowns and closures, many EE organizations did not offer in-person programming for varying amounts of time. During this period, organizations prioritized establishing virtual connections with their audience. Virtual connectivity was achieved with at-home learning activities and social media initiatives. Seven out of ten organizations reported using social media to connect with the audience during COVID-19. EE organizations reported using social media platforms such as Instagram, Facebook, and YouTube. Social media posts included photos and/or videos with educational content, interactive posts encouraging viewers to explore their environment, livestreams, and virtual “touchpoints” – an approach to simulate in-person visits by recording short video tours at different locations across an organization’s site. Two organizations reported encouraging their audience to engage in citizen science oriented scavenger hunts via applications iNaturalist and GooseChase. As in-person summer camps were frequently cancelled, two organizations developed at-home learning kits including youth

education activities to complete from the backyard, such as a seed dispersal kit. Overall, EE organizations collectively offered a mixture of virtual connectivity and hands-on learning opportunities for their audience to engage with from their homes.

### ***Programming as the Pandemic Unfolds***

Questions 3 and 5 gathered data about the pandemic's impact on programming. The return to in-person programming occurred at different points of time for each organization, some returned to in-person programming as early as the summer of 2020, while some returned in 2022. During this time, various forms of virtual programming emerged. Virtual programming differs from virtual connectivity strategies mentioned above. Virtual programming involved adapting in-person programs to occur in an entirely virtual format. Whereas virtual connectivity often included innovative, experimental strategies to keep the audience engaged with EE. When in-person opportunities returned, several organizations highlighted minor differences from pre-pandemic programming. Therefore, two themes in programming during the pandemic are the rise of virtual programming and adapted in-person programming.

### ***Growth of Technology and Virtual Programming***

As expected, technology and virtual programs during the pandemic were repeatedly discussed in interviews. Not only was technology vital to remain connected with the audience, but it became a routine tool in the workplace of organizations that were not always technology dependent before the pandemic. All 10 respondents reported diffusing technology into their programming during the pandemic. In some cases, organizations shifted their already existing programs to a virtual format. Meanwhile, virtual programming initiated new programs altogether, such as online community nature journaling. Eventually, this program successfully transferred to an in-person format. Other examples of virtual programming included using zoom

to conduct webinars, guest speakers, and hold asynchronous classes with students ranging from pre-K to higher education. Additionally, 8 out of 10 respondents reported using technology to uphold staff cohesion during the pandemic. Although there was growth seen among technology usage, this was not true for all. 2 respondents reported challenges in obtaining access to new technologies to supplement or continue their programming during the pandemic.

### ***Adapted In-Person Programming / Covid-19 Protocols***

Occurring at different points in the pandemic, the return to in-person programming was impacted by continually changing information and guidelines from the CDC about COVID-19. COVID-19 protocols included masking, social distancing, limited capacity, strategic use of outdoor spaces, and minimized use of hands-on equipment. Table 3 includes quotes from respondents about how COVID-19 protocols impacted the audience, staff, and program delivery of EE organizations. Environmental education during the COVID-19 pandemic involved enforcing CDC guidelines such as masking, social distancing, and limiting group sizes. Upon the decline of COVID-19 cases at the national and local levels, EE organizations have begun to revert to pre-pandemic practices and lift COVID-19 protocols.

**Table 3.**

#### *COVID-19 Protocols and Adapted In-person Programming*

<b>Masking</b>	“We still had heavy mask protocols at that point in time, both indoors and out. A lot of constant communication with parents about what our protocols were, what they were going to be expected to do, what our staff would be expected to do.”
<b>Social Distancing</b>	“In our amphitheater, we had tape marks on the benches that were spaced out six feet apart

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	and of course just followed the CDC guidelines.”
<b>Limited Capacity</b>	“For some of our popular programs, if we don't limit them, we could have 80 people following us through the woods. It's not safe. It's not fair. It's not equitable. People can't hear you. We can't keep track if someone gets lost. So, I'd say that's something we've continued on is limiting registration a lot more.”
<b>Strategic Use of Outdoor Spaces</b>	“We did try a couple of Zoom based programs, but they didn't go over as well as in person. I think everyone got some Zoom fatigue, was a little tired of trying to do online interaction. But for the most part, our program lineup stayed pretty much the same. We had to make some procedural modifications, making sure that people were spaced out, trying to do as many of our programs outdoors as we could.”
<b>Minimal use of hands-on equipment</b>	“Pre-COVID, we used to pass around to the audience, raptor feet, wings, skulls, so that they're seeing it and touching it and feeling it. We stopped doing that, once we reopened post-COVID, because we still are trying to be as cautious and proactive as possible to be safe and healthy.”

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## Post-COVID

A limitation of this study is the inability to truly define an end to the COVID-19 pandemic. Indeed, the “Post-COVID” time frame varied by organization. Within the context of this study, all organizations had returned to in-person programming by the time interviews were conducted between August and October of 2022. However, the ramifications of the pandemic are likely to endure over an extended period. Therefore, the “Post-COVID” time frame of the data collected in this thesis fell anywhere between an EE organization’s return of in-person programming and the mark of the last interview in October 2022. “Post-COVID” questions

explore fluctuations and patterns among the audience's size and needs, and how these shifts impacted programming.

### ***Audience Fluctuations***

Interview Question 7 gathered data about the number of post pandemic visitors. Few EE professionals reported exact statistics on the average post pandemic number of daily visitors to their organization. A restriction of this question is that EE organizations measured their number of annual visitors, not daily, and because there is typically fluctuation in visitation by the season, it is difficult to obtain the average number of daily visitors. While four out ten EE organizations reported a dramatic increase in visitation post pandemic, other organizations reported different experiences. Another four out of ten respondents reported that they were gradually recovering from a decrease in visitors during the pandemic. One respondent described experiencing a spike in visitors during fall 2020. *“By fall of 2020, our visitor numbers had gone up for the fall foliage months by a factor of three.”* Meanwhile, another respondent recalled the gradual process of revitalizing visitors in the midst of reopening after lockdowns and closures. *“It's all an experiment, trying things out as we reopen here. Numbers will be down, but I think we're getting back to where we were.”* The remaining two organizations reported a dramatic decrease or inconclusive number of post pandemic visitors. One respondent reflected on working with a much smaller group of students upon reopening post-pandemic. *“We reopened in August, September-ish of 2021. Classroom enrollment had dropped severely. I think we reopened my room with maybe five kids out of 20.”* The vast fluctuation in audience size is due to several factors, including region/location, when the organization reopened, type of programming offered, and more. But the dramatic increase in visitation experienced by many EE organizations may be related to a growing interest in the outdoors among local communities.

### *New Needs and Interests*

In interview question 9, respondents shared their insight on the audience’s interest in nature-based opportunities post pandemic. Eight out of ten respondents reported that they perceived an increased interest among their audience in spending time outside. Respondents reported seeing increased first-time engagement among local community members. Furthermore, respondents recognized health and wellness as a factor in their audience’s changing needs and interests. Responses from environmental educators are illustrated in quotes organized by theme in Table 4.

**Table 4.**

#### *Post-Pandemic Interest in EE*

<b>Finding Health and Wellness in the Outdoors</b>	<ol style="list-style-type: none"> <li>1) “You could really see that people are valuing these outside opportunities because for a lot of people, I feel like initially it might have been because they were safe. They felt safe because it decreased transmission.”</li> <li>2) “I think people are more aware of their need to connect with nature for their own mental and physical health.”</li> </ol>
<b>Local Discoveries</b>	<ol style="list-style-type: none"> <li>3) “During and after the pandemic, we saw more of the public. They weren't necessarily those people who say, "Oh, it's a nice Saturday, I'm going to go for a hike." So I think it broadened some of the horizons of the general public, which was nice to see.”</li> <li>4) “More people discovered us and then became familiar with our story, familiar with what our property has to offer.”</li> </ol>

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- 5) “As people looked to go outdoors, they discovered resources that they didn't know were in their community. And we're finding now, even post pandemic, that people are continuing to want to use those resources.”
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### ***The Return to Pre-pandemic Programming***

Over the pandemic, programming and EE adaptations continued to vary by organization. While some organizations reached peak visitation amidst the COVID-19 pandemic, others were gradually recovering to pre-pandemic visitation levels. Although not clearly prompted by the interview questions, several organizations mentioned returning to pre-pandemic programming. Generally, this involved a discontinuation of virtual programs and lifting COVID-19 protocols.

### ***Enduring Adaptations Moving Forward***

Although the COVID-19 pandemic continues to become more distant, some adaptations employed by EE organizations during the COVID-19 pandemic were reported to find continued success. The quotes in Table 5 demonstrate adaptations induced by the COVID-19 pandemic that continue to benefit EE programs. Adaptations that have endured the pandemic range from improving programs with increased supplemental knowledge on ecological information and interpretive style to the evolution of a program that emerged during the COVID-19 pandemic.

### **Table 5.**

#### *COVID-19 Adaptations in Current Programming*

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<b>Supplemental Knowledge Post-Pandemic</b>	1) “So that (virtual programming) took us out of our comfort zone a little bit, because having done environmental ed since the 80s, when you do the same topic and when you take them on the same path in
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	<p>the woods, you say the same thing. I think the pandemic gave us a jolt into increasing our own background knowledge on some topics where maybe we were lacking a little bit. And that's one thing that we have really tried to do post-pandemic.”</p>
<p><b>Reallocation of Resources and Intentional Partnerships</b></p>	<p>2) “A local school district is very underfunded, and they cannot afford to offer environmental education experiences, so we try to direct our resources towards schools who really need the resources the most. That's something else we're trying to do as we reopen and we plan out our field trip and program schedules. We just want to be mindful of working with students and other audiences who would benefit the most from what we can provide.”</p>
<p><b>Using Zoom as a Multipurpose Tool</b></p>	<p>3) “We now have continued to have Zoom meetings with our stakeholders all throughout the world, and it's been great, and it's also helped us to do trainings, professional development. It's helped us reach a broader audience, and it also allows us to offer more programs for free because it's less intensive to do a virtual program than an onsite program, and it provides better support for people that physically might not be able to come here.”</p>
<p><b>Blending Virtual Tools into EE Programs</b></p>	<p>4) “Even though most of our workshops are back to being in person, we now have that capacity to be virtual. Now when we are in person, we use more of those (virtual) tools in our classroom presentations and our public programs than we ever did before.”</p>
<p><b>At-home Non-virtual Learning Tools</b></p>	<p>5) “One thing that we're still doing, and I'm proud of as a nature center, is discovery boxes. That is something that parents or teachers can rent out, and it follows phenology. We'll put it on the porch for them if they don't want to have interactions or contact. And then they can take home that box with all the materials,</p>

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	lesson plans, and activities around that topic.”
<b>Pandemic Program Evolves with Long-Term Success</b>	6) “We've continued the monthly community nature journaling sessions, which, whenever people ask, "How many more are you going to do?" I'm like, "Forever." I think it's a very sustainable program.”

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## Chapter 5

### Discussion

This study explored environmental education during the COVID-19 pandemic with a unique focus on a subset of participants from Pennsylvania. As demonstrated in numerous relevant studies, (Janz, 2021; Lawhon et. al., 2020; Nichols et. al., 2021; Robinson et. al., 2021; Yan et. al., 2021), the COVID-19 pandemic presented a pivotal opportunity to gather data on how practices were adjusted amidst an unprecedented challenge. It was important to act upon this opportunity in a timely manner. As the start of the COVID-19 pandemic gradually becomes more distant in time, individuals' responses may become less accurate (Ito, Walker and Kono, 2019), and the topic may become increasingly more challenging to research. By analyzing and reflecting now on EE practices, trends, and patterns throughout the COVID-19 pandemic, findings may point future educators and practitioners towards successful program outcomes.

While exploring adaptations to EE that emerged from the COVID-19 pandemic, this research sought the reflections and perspectives of environmental educators in Pennsylvania. Interview responses reflect on different points of time during the COVID-19 pandemic to provide a big picture of shifts in EE programming. From these reflections, data revealed a range of responses with common themes. In sum, the COVID-19 pandemic included both successes and challenges that point towards learnings that can be applied to future practice.

#### *Successes for Environmental Education*

As expected, the use of technology was vital to EE during the COVID-19 pandemic. Overall, the COVID-19 pandemic may have allowed EE providers and their audience to expand or strengthen their relationship with technological tools including social media, virtual communication platforms, and applications that guide individual users to explore the

environment. While existing research explores uses of technology in practice to promote instruction and investigation (Anderson et.al., 2015, p. 12-13), this study acknowledged novel uses of technology to conduct virtual EE programming. All ten interview respondents diffused technology into their programming or organizational operations during the COVID-19 pandemic. Specifically, zoom webinars, asynchronous classes, and interactive social media (i.e. Facebook Live, Instagram, and Youtube) were practiced widely among EE organizations during the COVID-19 pandemic. Adaptations to EE programming during the COVID-19 pandemic from this study are concurrent with those of a national survey on EE during the COVID-19 pandemic conducted by Margaret Janz of Hamline University, which included a 7.9% response rate of Pennsylvanian environmental educators (Janz, 2020, p.37, 46-58). From this study, synchronous virtual educational programming such as webinars were reported to be the most successful by 74% of participants (Janz, 2020, p.45). In Janz's study, 58% of survey respondents reported that virtual programming is the most likely EE adaptation to endure the pandemic, (2020, p.50). Although this statistic foreshadows a growth of technology in future EE, this continues to be a controversial standpoint. The nuances of technology's use in EE during the COVID-19 pandemic are discussed in the implications section.

Discovering which EE adaptations continue beyond the COVID-19 pandemic was central to the purpose of this study. Enduring adaptations include improving supplemental knowledge of EE topics, using technological tools for multiple purposes such as virtual programming, professional development, employee training, and maintaining staff cohesion. Moreover, respondents reported using a combination of technology with in-person methods to improve post-pandemic programming. Additionally, opportunities for EE at home with applications such as iNaturalist and GooseChase or youth-focused educational kits were reported to have been

sustained. Furthermore, a virtual program that was created during the COVID-19 pandemic has since evolved to become an in-person program and achieve post-pandemic long-term success.

Technology was used for more than just programming during the COVID-19 pandemic. The use of needs assessment strategies such as virtual surveys and communication channels helped several EE organizations adapt to the COVID-19 pandemic by gaining an understanding of their audience's shifting needs and interests. Moreover, EE organizations used technology to maintain staff cohesion by completing telework, explored opportunities for professional development, and shared mental health resources among staff and audience members during the COVID-19 pandemic.

Virtual programming may have introduced new audience members. 40% of interview respondents reported a dramatic increase in their audience post-pandemic. Moreover, 80% of interview respondents reported a perceived increased interest in nature-based programming and activities from their audience members. Increased interest among audience members could be related to expanded multimedia marketing and promotion efforts reported by EE organizations during the pandemic. Altogether, this data may support existing research findings stating that technology is a growing resource in environmental education and outdoor learning (Anderson et. al., 2015, p. 15). Moreover, data from this study supports existing research findings indicating that the COVID-19 pandemic allowed more opportunities for human-nature connection (Robinson et. al., 2021).

### *Learning from Challenges*

Ultimately, data from this study represents previous researchers' recognition of COVID-19 induced shifts (Nichols, et. al., 2021; *How the COVID-19 pandemic changed society*, 2022; Janz, 2021). EE during the COVID-19 pandemic involved enforcing CDC guidelines such as

masking, social distancing, and limiting group sizes. Professionals interviewed in this study reported eye-opening effects of these COVID-19 protocols. For example, one organization continues to limit their program capacity post-pandemic to avoid inequities and mitigate program risks such as trail safety. Furthermore, the COVID-19 pandemic produced mental and physical health challenges cited in research by Torales (2020). Similarly in this study, EE professionals in Pennsylvania reported instances of mental health challenges among their staff and audience, and a growing recognition of the importance of the outdoors for human health. Accordingly, these findings align with other research on the role of nature-based experiences on human health (Bratman et. al., 2019), and how crucial time outside was to EE participants during the COVID-19 pandemic (Lawhon et. al, 2020; Lesser & Nienhuis, 2020; Robinson et. al., 2021). Furthermore, another challenge for some EE organizations included limited resources and funding during the COVID-19 pandemic. This challenge prompted EE organizations to continue their programming with a stronger intention of serving audience sectors who have a strong need for EE, such as underfunded public schools. Altogether, the findings of this study encompass an intersection of human health, environmental education, and sustainability in the post-pandemic world.

Research has shown that during the COVID-19 pandemic, meeting the needs of people and communities was imperative to overcome challenges (*How the COVID-19 pandemic changed society*, 2022). Through various means, EE organizations offered supportive resources to their communities during the COVID-19 pandemic. In retrospect, the challenges of the COVID-19 pandemic returned a number of learnings and realizations. When combined and sustained, these learnings could promote improved outcomes to the future of EE and its intersecting fields.

## Implications

Based on the respondents who participated in this study, there are several implications that can be put into practice for current and future environmental educators. When implementing technology into EE programming, EE providers should consider its purpose and context. This data represented advantages to virtual programming, including:

- increased program accessibility to both people outside of the organization's geographic region and/or people who experience mobility challenges
- increased program affordability for both EE providers and audience members
- opportunities to build online communities that transfer into in-person communities

In contrast, this data represented disadvantages to virtual programming, including:

- insufficient funding or outdated technology was a constraint for few EE organizations
- few EE organizations reported experiencing burnout and fatigue among their staff and audience members due to increased use of technology

Moving forward, increased dependability and comfort with technology among EE providers and their audience could expand environmental education (i.e. offering virtual programs during the off season or during inclement weather, using social media as an outlet for educational content). However, EE providers should be wary of the effects of overly relying on technology for programming. Several respondents reported facing challenges such as burnout and fatigue, and not every organization reported seeing success from virtual programs. These findings are aligned with existing research outlining both technology's place in EE as a learning tool (Anderson et. al, 2015), and the controversy around increasingly technology-dependent lifestyles which could lead to human-nature disconnect (Dwyre, 2015).

Overall, this data from the COVID-19 pandemic indicates that technology has the potential to be a useful EE tool, but virtual programming is not designed to replace in-person EE practices altogether. This data suggests that using technology to implement virtual programming or online connectivity could be used as a strategy to introduce EE to a growing audience and create connections between communities and EE organizations from global to local levels. However, whether technology can sustain the interest of audience members will require further research.

### **Recommendations for Future Research**

Based on findings from this study, several recommendations are made for future research. As this study was exclusive to Pennsylvania, research on EE during the COVID-19 pandemic may be replicated in other parts of the United States to expand data outcomes. Meanwhile, exploring EE during the COVID-19 pandemic with a specific focus on a singular EE organization may allow for more specific research measures and greater depth into transitional moments of the pandemic. Another recommendation for future research would be to collect data from an audience perspective, especially regarding fluctuations in size and interest that are shown by data in this study. Researchers may seek reflections from audience members who participated in EE programming during the COVID-19 pandemic. Additionally, there is a need for more research on post-pandemic EE programming. Researchers may work with EE organizations to evaluate lasting COVID-19 adaptations and discover what enables their continued success.

### **Limitations**

The limitations of this study should be acknowledged. Firstly, non-random sampling presents a bias. The researcher chose participants after obtaining information about the EE



organizations prior to recruiting staff. Pertaining to the research instrument, self-reported methods introduce further bias as participants may respond according to their predictions of what the interview attempts to confirm. Another limitation lies in the study's retrospective nature. Retrospective responses are not proven to have the same accuracy as immediate responses (Ito, Walker and Kono, 2019). At the time when interviews were conducted, over two years had passed since the start of the COVID-19 pandemic. It may have been difficult for research participants to reflect on and describe attitudes, behaviors, or details from distant times with accuracy. Finally, it is important to note that the timeline of the COVID-19 pandemic is ongoing, as there are no definitive metrics to mark its ending. This challenges the ability to truly obtain responses from a post-pandemic perspective. Interview responses provided reflections and opinions during snapshots of the COVID-19 pandemic, where attitudes and behaviors are continually shifting.

## **Conclusion**

Overall, the purpose of this study was to create a resource for environmental educators to learn from challenges and successes throughout the COVID-19 pandemic. Through challenging times, environmental educators were held to new governmental standards while navigating the fluctuating needs, interests, and size of their audience. With dedication to a greater mission of EE, environmental educators applied creative innovation to not only continue but expand their organization's work during the COVID-19 pandemic.

The COVID-19 pandemic brought with it an urgency to reevaluate current practices and redesign them with a greater awareness for needed change (McClain et. al., 2021). In today's current climate, calls to expand EE are at the forefront of solutions to achieve climate, social, and environmental justice. Researchers at Stanford University discuss how increased support for

environmental and science education is of utmost importance to respond to the climate crisis at hand. Nicole Ardoin, an associate professor at the Stanford Graduate School of Education, describes environmental education as, “a necessary cornerstone for future social and environmental changes” (Dillon et. al., 2021, p. 1,5). When juxtaposed with the larger climate crisis, the COVID-19 pandemic should serve as an indicator that long-term structural changes, including an investment in environmental education from local, national, and international governments, are in our best interest. May the recent learnings in environmental education discovered during the COVID-19 pandemic be brought forth to pave the way for a more sustainable future.

## Appendix A

### Recruitment Email

Hello, (Recipient's Name):  
I hope this email finds you well.

My name is Emily Romberger and I am a fourth-year Recreation, Park and Tourism Management student at Penn State University Park. As a Schreyer Honors College student, I am conducting research on environmental education during the COVID-19 pandemic across the state of Pennsylvania. By recording interviews with 12-15 environmental education professionals via zoom, I will look for patterns among responses before synthesizing my findings in writing.

The purpose of this study is to reflect on shifts in environmental education brought on by the pandemic, how new challenges were met, and to recognize what was learned from the pandemic. A virtual interview will delve into questions about visitation levels at your organization during different points of the pandemic, ideas or adaptations that originated during the pandemic, and takeaways that may influence how EE organizations operate currently and into the future.

I am contacting you to ask for your participation in an interview about your experience working in environmental education during the pandemic. The virtual interview will last less than one hour, and a pseudonym will be used if your responses are referenced in my writing. With your consent, the interview will be recorded for data analysis. If you are interested in participating, please contact me by email ([efr5180@psu.edu](mailto:efr5180@psu.edu)) at your earliest convenience to coordinate a time and date for the interview or ask any questions.

**\*\*By scheduling an interview, you are consenting to your participation in the research study and the recording of your responses; you may withdraw consent at any time.\*\***

Thank you for your time in reading this.

With gratitude,

**Emily Romberger**  
Recreation, Park and Tourism Management Student  
Penn State University

## Appendix B

### Sample of Research Codebook

Question 1. Describe the range of EE programming and opportunities at your organization prior to 2020

	Response	Code	Theme
EE Organization 1	<p>Okay, the organization before the pandemic was providing environmental education through drop in activities, which, a drop in activity is the kind of activity where you set up a program, or a table program, or something less structured than that, even doesn't have to take place at a table. It could be like roving education as well, where the educator is not staying put in a single location but is present throughout the garden. Folks would come and drop into those programs. Those programs definitely took place throughout the summer months when children are not in school, and then they also took place in a more structured way for a preschool class. I was teaching preschool at the time, so I would be able to arrange for a visit with an environmental educator for my class to come and we might come on the solstice and learn about the sun dial and explore the garden, play in the garden, sing a song, and go back to preschool. That kind of program was not a drop in format, but more of a private education session.</p>	<p>1) drop-in activities 2) roving education, 3) pre-K classes</p>	<p>1)pre-K education</p>

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## ACADEMIC VITA

# Emily Mae Romberger (she/her)

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## Experience

JANUARY 2023–

**Americorps Member** • *student farm at Penn State*

Facilitate and lead collaborative projects in Penn State's [Sustainable Food Systems Program](#) (SFSP)

OCTOBER 2022

**Learning Group Leader** • *Shaver's Creek Outdoor School, Petersburg, PA*

Led elementary and college students exploring environmental education topics at a residential outdoor camp

JUNE 2022 – AUGUST 2022

**Assistant Naturalist** • *Shaver's Creek Environmental Center, Petersburg, PA*

Created positive outdoor experiences for staff and youth in nature-based summer camp

OCTOBER 2021 – MAY 2022

**Research Assistant** • *Penn State Department of Recreation, Park and Tourism Management*

Assisted data collection by leading participants through Qualtrics-based survey in Penn State Arboretum

MAY 2021 – AUGUST 2021

**Dining Room Supervisor** • *The Chocolatier, Hershey Entertainment & Resorts, Hershey, PA*

Circulated a restaurant serving over 1000 daily covers, assisted front of house staff, interacted with guests

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## Education

PENN STATE

UNIVERSITY PARK, PA

ANTICIPATED GRADUATION: MAY 2023

**B.S. Recreation, Park and Tourism Management**

Minor: Sustainability Leadership

Schreyer Honors College

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## Skills and Interests

### Environmental Education

Completed SEED semester (Students Engaging in Experiential Discovery) at Shaver's Creek Environmental Center; courses explored outdoor leadership and environmental interpretation.

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## Certifications

### CPR / First Aid

Valid through June 2023