

THESIS

EXPERIENTIAL COURSE'S IMPACT ON STUDENTS' BELIEFS AND BEHAVIORS OF NATURE AS A WELL-BEING
STRATEGY

Submitted by

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ABSTRACT

EXPERIENTIAL COURSE'S IMPACT ON STUDENTS' BELIEFS AND BEHAVIORS OF NATURE AS A WELL-BEING STRATEGY

The purpose of this thesis was to assess if an experiential field course influenced behaviors about nature immersion as a well-being strategy, investigate what behavior changes were affected by the course, and explore if components of behavior change theory emerged from the course. Additionally, this thesis explored the components of the experiential course that participants perceive as impactful on their beliefs and behaviors about nature as a well-being strategy. A mixed methods approach, including both nature-log surveys and interviews, was used to assess participant perceptions of their nature experiences, as well as impactful components of the experiential course, before and after the course. Participants underscored changes in behavior, including use of nature as a stress management strategy and finding new opportunities to experience nature close to home, work, and school. While frequency of nature experience did not increase for course participants throughout the following four months (from summer to early winter), it also did not decrease as it did for the control group during the same period. From participant self-assessments, components of behavior change that emerged include changes in beliefs and attitudes about the benefits and importance of nature experiences. Components of the experiential course that participants perceive as impactful include pairing of course content with experiential learning, learning alongside classmates with whom they could process, and the lack of technology and internet access. Implications include how education can promote beliefs and behaviors around nature as a well-being strategy, the importance of nature around people's homes, schools, and work, and designing experiential courses with the components that students perceived as impactful. We recommend future research that explores how to further promote

behavior change, including by emphasizing the COM-B system's essential conditions of opportunity and motivation.

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Chapter One: Introduction

Higher Education

Mental Health of University Students

Higher education has experienced significant changes in recent years, including regarding the mental health of students. Mental health is viewed as a serious crisis for college students (Flatt, 2013; Healthy Minds Network, 2020, Substance Abuse and Mental Health Services Administration, 2021), who have experienced consistent increases in poor mental health over previous years. In 2021, 73% of students reported moderate to severe psychological distress (American College Health Association, 2022) and approximately 60% of students met at least one criterion for mental health problems, a nearly 50% increase from 2013 (Lipson et al., 2022). Research suggests that this has been exacerbated by the COVID-19 pandemic, with college students reporting higher levels of perceived stress and alcohol use during the pandemic (Charles et al., 2021) which may have led to them being particularly vulnerable to worsened mental health (Stamatis et al., 2022). While higher education institutions have been adding resources to address the increases in poor mental health of their students (Gallagher 2014), these efforts are often reactionary and insufficient to address the extent of the crisis (Rakow & Eells, 2019; Xiao et al., 2017).

Format of Courses

The landscape has also experienced changes in recent years regarding the format of classes, especially because of the COVID-19 pandemic (Neuwirth et al., 2021). The pandemic led to increased online course formats, and some classes have continued to be offered virtually, even as concerns about COVID-19 have lessened. Hybrid courses, a mixture between online and in-person formats, have also become more prevalent, allowing for face-to-face interaction while also providing flexibility for students (Bashir et al., 2021; Ncanywa et al., 2022). Many practitioners and scholars view the future as higher education as having increased online and hybrid course offerings, although how these are integrated

with face-to-face strategies requires thoughtful planning (Guppy et al., 2022). Other classes have returned to an in-person format after taking place online during much of the pandemic, providing an opportunity for instructors to make changes from their pre-pandemic instructional strategies. As COVID-19 restrictions lift, higher education faces important questions about the format of courses, including how hybrid courses can be integrated effectively with face-to-face instruction, and how in-person courses can be improved from instructional strategies used pre-pandemic.

Experiential Education

Even with higher education courses having taken place in online formats during the COVID-19 pandemic, experiential education has largely grown rapidly over the last decade (Buzzelli & Asafo-Adjei, 2023; Gavillet, 2018) and it has shown to be effective in leading to learning outcomes (Burch et al., 2019). Experiential education, influenced by John Dewey's philosophy of education (Dewey, 1938) and Kolb (1984)'s experiential learning theory, involves the learner directly connecting with course content in some way (Keeton & Tate, 1978) and learning from those experiences (Kolk, 2014). Generally utilizing in-person formats, experiential education can have higher learning outcomes than traditional techniques (Burch et al., 2019) and is also often preferred by students (Blunsdon et al., 2010; Hawtrey, 2007; Sato & de Haan, 2016). Experiential education is widely accepted and has been used in a variety of contexts and course disciplines (Abdulwahed & Nagy, 2009; Baker et al., 2012; Cheung & Delavega, 2014; Houge Mackenzie et al., 2014; Kolb, 2014; Petkus, 2000; Williams & Sembiente, 2022). Even with conversations around the format of courses in higher education, the efficacy of experiential education continues to be accepted and valued.

Nature and Well-being

Another area of recent attention is around the link between nature and well-being. Research has continued to highlight nature's association with well-being benefits in a myriad of ways, including positive affect (Berman et al., 2012; Bratman et al., 2015), happiness (Stieger et al., 2022; White et al.,

2013), and other positive subjective well-being indicators (Mygind et al., 2019; O'Brien et al., 2011; Orban et al., 2017; Stieger et al., 2022). Nature experience has also been shown to be associated with reducing negative symptoms associated with anxiety (Beyer et al., 2014; de Vries et al., 2016), depression (Beyer et al., 2014; Cohen-Cline et al., 2015), aggression (Younan et al., 2016), and attention deficit and hyperactivity disorder (Carmine & Berto, 2020; Kuo & Taylor, 2004). Academic benefits of nature experience have also been highlighted, such as increased cognitive function (Norwood et al., 2019), academic achievement (Oswald et al., 2020), and improvements in communication (Prince, 2021). Benefits have been shown to vary depending on contextual factors such as socioeconomic status and individual differences such as preferences and traits (Astell-Burt et al., 2013; Bratman et al., 2019). Although research has highlighted the benefits of nature for several decades, recent research has continued to provide evidence for the benefits and identify new ones.

Growing Interest around Nature and Well-being

While research has highlighted the benefits of nature for decades, mainstream awareness and support for nature-based programs and interventions have developed more recently. For instance, the incorporation of nature experience into public education, especially for primary schools, has gained popularity. This can include a wide range of techniques, from nature play and outdoor classrooms to forest schools and outdoor education more generally (Shanahan et al., 2019). Recently, there's also been an increased push to engage medical providers in the prescription of 'nature exposure' (Kondo et al., 2020; Shanahan et al., 2019), and national programs such as Nature Rx and Park Rx are interventions that support physicians to do so (Crnic & Kondo, 2019; Rakow & Eels, 2019).

Another area of growing interest is around nature-based interventions (NBIs), which include some type of exposure to nature and can include activities such as hiking (e.g., Pichler et al., 2022), gardening and horticulture (Moeller et al., 2018, Vujcic et al., 2017), animal-assisted therapies (Moeller et al., 2018), and forest therapy techniques (e.g., Pichler et al., 2022). These have gained interest in

recent years in their capacity to promote positive well-being benefits and address mental health problems (Owens & Bunce, 2022). Along with other nature-based programs, NBIs have gained more mainstream interest as well.

Importance of this Research

Lack of Research Connecting Experiential Education and NBIs

Even with the growing acceptance of the efficacy of experiential education and nature-based programs and interventions, there is a lack of research surrounding how experiential education, especially within the context of nature, can help address the college mental health crisis. While there have been promising results from a few studies on the adoption of nature well-being strategies through educational courses, specifically in Sweden (Sahlin et al., 2014; Sahlin et al., 2019), there has been limited research conducted elsewhere. Even so, these studies have shown that nature-based stress management techniques can be adopted by participants of a course, specifically the techniques of mindfulness, taking walks in nature, and observing nature. Furthermore, participants were shown to experience well-being benefits after course (Sahlin et al., 2014; Sahlin et al., 2019). While both these courses had experiential components, they also had components of 'traditional' education. Further investigation can add to this preliminary research exploring the link between experiential education and well-being benefits.

Favorable Shifts around Benefits of Nature and Experiential Education

The favorable shift in public awareness and value around benefits of nature, as well as increasing experiential education in higher education, also presents opportunities for research exploring the link between experiential education and nature well-being strategies. With increasing nature-based programs and interventions, research may have the opportunity to inform real-world initiatives in education and elsewhere. This includes in higher education, where experiential education is growing,

and research may be able to inform new and existing courses. With growth and increased awareness in these areas, we hope that this research may be able to inform real-world programs and courses.

Course on Nature and Well-being at Colorado State University

Another opportunity for this research is a new course at Colorado State University (CSU) on nature and well-being. The course about nature experience and well-being consisted of a nine-day experience in the summer of 2022 at Colorado State University (CSU)'s mountain campus and provided an opportunity to study the link between experiential education and nature well-being strategies.

Overview of Thesis

This thesis explores participants' experiences with the course on nature and well-being. Manuscript 1 investigates if the experiential course influenced participants' behaviors surrounding nature as a well-being strategy and if common components of behavior change emerged from participants' experiences from the course. Manuscript 2 focuses on components of the experiential course that impacted participant beliefs and behaviors of nature as a well-being strategy. I conclude by making recommendations for higher education courses and personally reflect on my research journey.

Chapter Two: Manuscript 1

Introduction

Nature Experience and Well-being

Nature experience has been associated with well-being benefits in various ways. There is evidence that nature contact can increase positive affect (Berman et al., 2012; Bratman et al., 2015), happiness (Stieger et al., 2022; White et al., 2013), and other positive subjective well-being indicators (Mygind et al., 2019; O'Brien et al., 2011; Orban et al., 2017; Stieger et al., 2022). Exposure to nature can also reduce negative symptoms associated with anxiety (Beyer et al., 2014; de Vries et al., 2016), depression (Beyer et al., 2014; Cohen-Cline et al., 2015), aggression (Younan et al., 2016), and attention deficit and hyperactivity disorder (Carmine & Berto, 2020; Kuo & Taylor, 2004). Benefits have been shown to vary depending on contextual factors such as socioeconomic status and individual differences such as preferences and traits (Astell-Burt et al., 2013; Bratman et al., 2019). However, one of the most consistent findings in this area of research is nature's ability to decrease both acute and chronic stress (Beyer et al., 2014; Bratman et al., 2019; Frumkin et al., 2017; Hunter et al., 2019; Kondo et al., 2018; Meredith et al., 2020; Shuda et al., 2020). For example, a systematic review of adults found that nature exposure decreased stress in 11 out of 12 studies, with self-perceived stress decreasing in five out of six studies and physiological stress decreasing in all seven studies (Shuda et al., 2020). While stress is an important health risk itself, it is also a major risk factor for depression and other mental illnesses (Hammen, 2005). Thus, the ability of nature experience to decrease stress is a very important potential well-being benefit.

College Students and Mental Health

The link between nature experience and well-being benefits, such as decreased stress, is of relevance to young adults, particularly college students, who are at a higher risk for mental health issues (Duffy et al., 2019; Rakow & Eells, 2019) and for whom mental health is viewed as a serious crisis (Flatt,

2013; Healthy Minds Network, 2020, Substance Abuse and Mental Health Services Administration, 2021). In the United States, research has shown consistent decreases in mental well-being among college students over previous years, with 73% of students reporting moderate to severe psychological distress in 2021 (American College Health Association, 2022) and approximately 60% of students meeting at least one criterion for mental health problems (e.g., anxiety disorder, symptoms of depression), a nearly 50% increase from 2013 (Lipson et al., 2022). Recent studies, focused on the impact of COVID-19, indicate that the mental health crisis in young adults was exacerbated by the pandemic. Specifically, research suggests that young adults and college students may have been particularly vulnerable to worsened mental health (Stamatis et al., 2022) and reported higher levels of perceived stress and alcohol use during the pandemic (Charles et al., 2021). The increases in mental health concerns both before and because of the pandemic have subsequently become a key concern for university administrators (Lipson et al., 2019). Although colleges and universities have generally been adding resources to address this crisis (Gallagher 2014), these efforts are often insufficient to address the extent of the crisis (Rakow & Eells, 2019; Xiao et al., 2017).

Nature-based Interventions

NBIs have gained interest in recent years in their ability to address mental health problems and promote positive well-being benefits (Owens & Bunce, 2022). These interventions include some type of exposure to nature such as hiking (e.g., Pichler et al., 2022), gardening and horticulture (Moeller et al., 2018, Vujcic et al., 2017), animal-assisted therapies (Moeller et al., 2018), and forest therapy techniques (e.g., Pichler et al., 2022). They have been shown to have efficacy in several contexts in the treatment of various mental health conditions (Moeller et al., 2018; Sahlin et al., 2019; Shanahan et al., 2019) as well as to decrease stress (Razani et al., 2018; Razani et al., 2019). Recently, there's been an increased push to engage medical providers in the prescription of 'nature exposure' (Kondo et al., 2020; Shanahan et al., 2019), and national programs such as Nature Rx and Park Rx are interventions that support

physicians to do so (Crnic & Kondo, 2019; Rakow & Eels, 2019). Another area of growing interest is the incorporation of nature experience into public education, especially for primary schools. This can include a wide range of techniques, from nature play and outdoor classrooms to forest schools and outdoor education more generally (Shanahan et al., 2019), and outcomes studied in these contexts include well-being benefits such as self-confidence (Ardoin & Bowers, 2020; O'Brien, 2009; Prince, 2021) and self-esteem (Ardoin & Bowers, 2020; Mygind et al., 2019).

Adoption of Nature Well-being Strategies

Even with growing interest around various types of NBIs and with research highlighting their well-being benefits, there is a lack of research around adoption of NBI strategies. Research within the fields of psychology and public health have addressed adoption of healthy behaviors through interventions focusing on exercise, healthy eating, alcohol reduction, and smoking (Carey et al., 2019, Cutler, 2004). These include interventions that target on the individual, community, and national levels (Cutler, 2004), and behavior change techniques often include mechanisms such as promoting “belief about capability” and “intention” (Carey et al., 2019). Other research, especially focusing on NBIs specifically and within educational contexts such as higher education, is limited.

Even with limited research about adoption of NBI strategies, there have been promising results from the few studies that have been conducted. Through an outdoor course for employees at risk for stress in Sweden, nature-based stress management techniques were adopted by many participants, especially the techniques of mindfulness, taking walks in nature, and observing nature (Sahlin et al., 2014). Researchers also found decreasing stress-related symptoms and burnout, as well as increasing work ability, at multiple follow-ups over the year after which the course was completed. Another study also found both behavior changes and well-being benefits in the unique context of a course at a Swedish

zoo for the caretakers of people with disabilities (Sahlin et al., 2019). Over two-thirds of caretakers reported choosing nature-based activities more often after the course and 40% continued to use increased nature-based activities to users at a twelve-month follow-up. The course also appeared to improve well-being of both caretakers and their dependents through stress benefits, improving the relationships between caretakers and users, and increasing the quality of nature visits (Sahlin et al., 2019). Even with these promising results, more research is needed around the adoption of nature well-being strategies from NBIs, especially within educational contexts.

Factors that Influence Adoption of NBIs

While behavior change theories have cited various factors thought to influence behavior change, there is also limited research around factors that are associated with behavior change in the adoption of NBIs. Common theories around behavior change include the Value-Belief-Norm theory (Stern et al., 1999), the Theory of Planned Behavior (Ajzen, 1991), and the Health Belief Model (Becker, 1974), and these theories cited several factors that influence behavior change, including self-efficacy, perceived benefits and barriers, attitudes, beliefs, and norms. More recently, the COM-B system highlighted the essential conditions for behavior change of motivation, capacity, and opportunity (Michie et al., 2011). Motivation, or “brain processes that energize and direct behavior” (p. 4), included both automatic conditions such as habits and emotional impulses, as well as reflective conditions such as conscious decision making and setting goals. Capacity, or “the individual's psychological and physical capacity to engage in the activity concerned” (p. 5), included both physical (e.g., skills) and psychological (e.g., knowledge) components. Opportunity, or “all the factors that lie outside the individual that make the behavior possible or prompt it” (p. 5), included social conditions such as cultural environment and social pressures, as well as what is afforded by the physical environment. These formed the center hub of the behavior change wheel, around which nine intervention functions (e.g., education, persuasion) are positioned, which aimed to address deficits in these conditions. The final, outermost layer of the

wheel were seven policy categories (e.g., regulation, fiscal measures) which aimed to enable the intervention functions to occur. The three essential conditions of motivation, capacity, and opportunity, as well as the nine intervention functions and seven policy categories, made up the behavior change wheel and COM-B system.

COM-B has been used in contexts such as physical activity (e.g., Stockwell et al., 2021), healthy eating (e.g., Graça et al., 2019), and disease reducing behaviors (e.g., West et al., 2020). To our knowledge, it has not been applied in the target behavior of adoption of nature well-being strategies within the context of higher education.

Research Questions

Based on this review of literature and the unique opportunity to apply prior research to a new context of student immersion in nature, this study addressed the following research questions:

- 1) Did common components of behavior change theory emerge from an experiential field course?
- 2a) Can an experiential field course influence behaviors surrounding nature as a well-being strategy?
- 2b) Can an experiential field course influence self-reported stress of participants?

Experiential Course on Nature and Well-being

Course Setting and Overview

The course about nature experience and well-being consisted of a nine-day experience in the summer of 2022 at Colorado State University (CSU)'s mountain campus, located approximately 90 miles west of Fort Collins. During the course, CSU's mountain campus offered the opportunity for participants to experience opportunities for nature immersion and well-being, and the benefits of such experiences they were learning about in the course. Nestled in a valley in the Rocky Mountains, the area included various hiking trails, many of which are accessible directly from the campus. Parts of the surrounding area had been burned by a recent wildfire and were in early stages of succession (the Cameron Peak fire in 2020), but also featured a rich upper montane habitat primarily of various coniferous trees and

aspens. The valley also had a large meadow through which meandered a mountain stream near which participants slept in rustic cabins. There was no cell reception on campus and Wi-Fi access was limited.

Course Content

Most of the course content was taught in-person at CSU's mountain campus, though the course consisted of some virtual components. The content was organized into five modules. The first module introduced the concept of well-being, which began virtually but was also explored in-person at the mountain campus. This was followed by the other four themes of the course: benefits of nature experience, barriers and solutions to nature experience, nature experience and sustainability, as well as social and environmental justice. Students practiced nature well-being strategies while in-person at the CSU mountain campus, including forest bathing and hiking. While the course had an academic focus, instructors were curious if nature well-being strategies would be adapted post-course. In the context of the COM-B system, this course heavily emphasized the essential condition of capacity, focusing on both physical (e.g., skills) and psychological (e.g., knowledge) components of nature well-being strategies.

Methods

Recruitment

CSU is a large public university in Fort Collins, Colorado, United States. Information about a 2022 summer course on nature and well-being was shared widely with the student body across the various colleges within the university. Nine students enrolled in the course, and prior to the beginning of the course a recruitment email was sent to students that explained the study, clarifying that involvement in the study has no influence on grades in the course, and invited them to participate. Students enrolled in the study by filling out a survey on Qualtrics which screened them according to inclusion criteria to be part of the intervention group. Inclusion criteria included being enrolled in the summer course on nature and well-being, being at least a half-time student during the following fall semester, and plans to live in the city of Fort Collins during upcoming Fall season.

Control group participants were recruited from the university's student population via email. Aiming for a wide sample, students in three different colleges at CSU (natural resources, liberal arts, and human sciences) were sent a recruitment email explaining the study and inviting them to participate. Similar to the intervention group, control group participants enrolled in the study by completing a survey via Qualtrics which screened them according to inclusion criteria. Control group participants needed to be at least a part-time students during the following semester and living in the city of Fort Collins during the upcoming Fall, but could not be enrolled in the summer course on nature and well-being. Additionally, control group participants were divided into two groups: Control Group 1 included those without an immersive nature experience of four or more days over the summer (such as an extended camping trip or nature retreat) and Control Group 2 included those with an immersive nature experience of four or more days. This distinction was made to explore the nuance of different impacts on the intervention group, including the impacts of extended nature experience (by comparing with Control Group 1 who had no extended nature experience) and the impacts of the course itself (by comparing with Control Group 2 who had extended nature experience but did not take the course).

Subjects and Withdrawals

After being filtered for inclusion criteria, eight students initially agreed to participate as part of the intervention group. One dropped out of the course, resulting in a total of seven individuals for the treatment group. These participants came from five different academic programs, reflecting different disciplinary backgrounds. One participant was a graduate student while the rest were undergraduates from sophomore to senior standing.

For the control group, 39 people enrolled and 29 of these were eligible for the study. Of these 29, 10 were classified into control group 1 (no nature experience of 4+ days that summer) and 19 were classified into control group 2 (nature experience of 4+ days that summer). Control group participants also reflected a wide range of academic programs.

Data Collection

After enrolling in the study, participants received a link to a first (pre-) survey to complete. For the intervention group, this occurred in the week prior to the course in mid-summer 2022, and for both control groups, this also occurred in mid-summer over a three-week period. In addition to the first survey, all participants received the same survey six weeks and ten weeks after the course. Additionally, participants in the intervention group participated in semi-structured interviews ten weeks after the course (Table 1).

Table 1. Number of participants in each study group who completed each of the three surveys and the interviews.

Study Group	Pre-Survey	Survey at Week 6	Survey at Week 10	Interviews
Control group 1	10	10	9	N/A
Control group 2	15	15	15	N/A
Participants	7	6	7	7

Quantitative Measures

As part of each survey, participants completed a 10-item Perceived Stress Scale (PSS; Cohen et al., 1983) during each of three data collection periods. The PSS is a widely used tool to measure self-reported stress and has shown to be reliable and valid (Shuda et al., 2020). It also has been used in the context of nature exposure's effect on stress (Shuda et al., 2020). In our research, participants were asked to respond how they felt over the past two weeks in response to ten statements, answering either "never" (rated as 0), "almost never" (1), "sometimes" (2), "fairly often" (3), or "very often" (4). Four of the items were reverse coded, and scores were summed to obtain an overall measure for participants.

Participants were also asked about their experiences in nature over the past two weeks, up to seven (7) experiences total. They answered questions regarding setting, motivation, and number of people in their group (if any). The survey also included other items not relevant to this manuscript.

Qualitative Measures

Participants in the intervention group were interviewed ten weeks after the conclusion of the course. The primary researcher and a secondary researcher conducted the semi-structured interviews, asking six main questions. Questions included themes surrounding changes in their lives since the course and impactful components of the course. Interviews were recorded by the primary researcher and audio files were saved in a secure folder.

Analysis

Quantitative Analysis

For each variable, the intervention group was compared at the three different data collection points: before the class (n=7), six weeks post-class (n=6), and ten weeks post-class (n=7). Additionally, the intervention group was compared to the control group 1 (n=9 for each survey) and control group 2 (n=15 for each survey) at each of the three data collection periods as well.

For the variables with continuous numerical data (frequency, stress, amount of time, and distance), Analysis of Variance tests (ANOVAs) were run for the comparisons described above. At times, t-tests or paired Wilcoxon Signed-Rank test (non-parametric alternative to t-tests) were run when comparing two samples. For the variables with categorical data (reason, setting, and social), data was coded into categories and Fisher's Exact Tests for Count Data were conducted for the comparisons described above, due to small sample sizes.

A correlational test between frequency of NI and stress was also conducted. This test was conducted with all the data across all three groups as well as within each group (intervention, control 1,

control 2). Additionally, this test was run within each group at each period (survey 1, survey 2, survey 3).

Qualitative Analysis

The semi-structured interviews audio files were transcribed by the primary researcher using the software Otter.ai (Liang & Fu, 2016). Thematic analysis was conducted following the six steps as described by Braun & Clark (2006): familiarizing oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. In our case, the primary researcher read twice through the interview transcripts and then generated initial codes systematically across the entire data set. Then, themes were searched for and proposed to secondary researchers, who reviewed these and aided in the development of a thematic map of the analysis, helping to define and name themes. This included a recoding process where the primary researcher and a secondary researcher recoded the data into the broad themes of beliefs and attitudes (due to their emergence from the data and presence in behavior change frameworks) as well as behaviors. Once the data was coded into these major themes, the primary researcher coded the data into subthemes. The entire data collection protocol of this study went through the human subjects' research IRB approval process (IRB: #3494).

Results

Quantitative Analysis

Frequency of Nature Experience

While frequency of nature experience for the intervention group did not change significantly from Survey 1 ($M = 7.3, SD = 5.1$) to Survey 3 ($M = 6.4, SD = 5.0$) using a paired Wilcoxon Signed-Rank test ($n = 14, V = 11, p = .67$) as a non-parametric alternative to a t-test, it did change for the combined control groups from Survey 1 ($M = 11.0, SD = 7.1$) to Survey 3 ($M = 4.5, SD = 4.7$) using a paired Wilcoxon Signed-Rank test ($n = 48, V = 262, p = 0.001$).

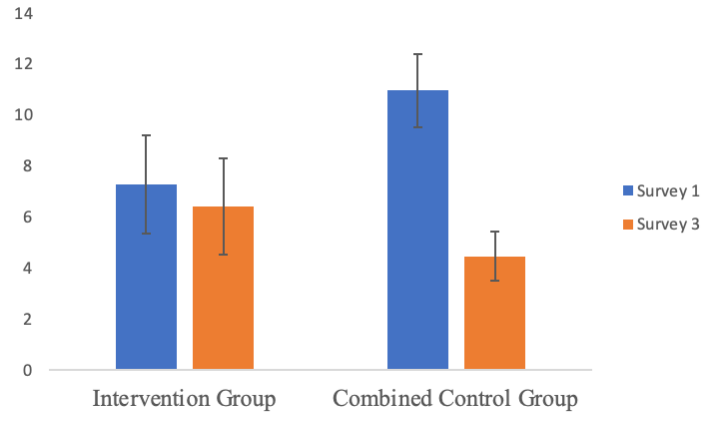


Figure 1: Frequency of nature experience over the prior two weeks of the intervention group and the combined control group at Survey 1 and Survey 3.

Stress of Participants

Stress decreased for the intervention group from Survey 1 ($M = 17.4$, $SD = 5.5$) to Survey 3 ($M = 14.4$, $SD = 6.3$), but not significantly ($p = .39$). This occurred, even though stress decreased just slightly for Control Group 1 from Survey 1 ($M = 16.3$, $SD = 5.3$) to Survey 3 ($M = 15.4$, $SD = 6.5$) and increased for Control Group 2 from Survey 1 ($M = 12.5$, $SD = 5.8$) to Survey 3 ($M = 14.9$, $SD = 6.9$), and these differences were not significant for either Control Group 1 ($p = .76$) or Control Group 2 ($p = .37$). The intervention group had higher stress at Survey 1 than Control group 1 ($M = 16.3$, $SD = 5.3$) and Control Group 2 ($M = 12.5$, $SD = 5.8$) and lower stress at Survey 3 than both Control Group 1 ($M = 15.4$, $SD = 6.5$) and Control Group 2 ($M = 14.9$, $SD = 6.9$), but these differences were also not significant for either Survey 1 ($p = .11$) or Survey 3 ($p = .95$).

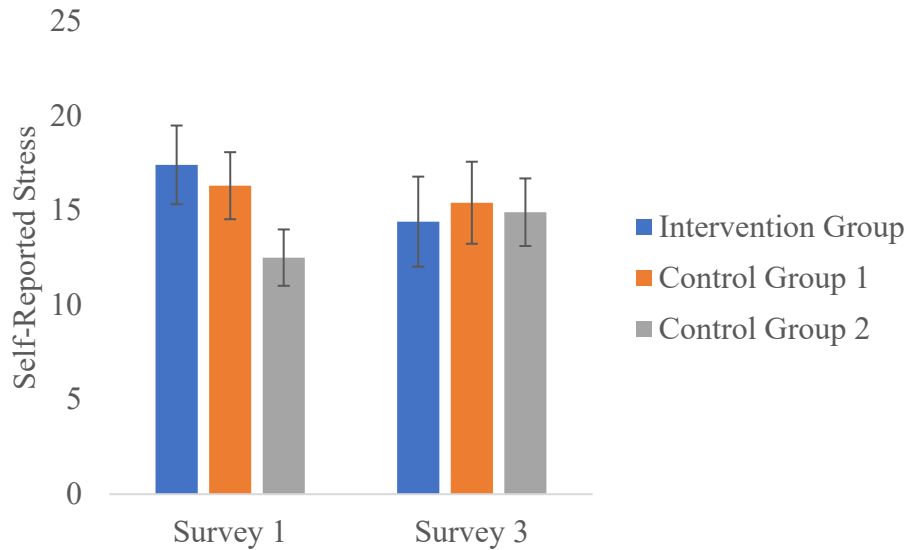


Figure 2: Self-reported stress over the prior two weeks of the three participant groups at Survey 1 and Survey 3, using the 10-item Perceived Stress Scale (Cohen et al., 1983).

Motivation for Experiencing Nature

Three categories emerged that were compared: *For nature* (e.g., I went outside to be close to trees), *because of the outcomes from being outside* (e.g., I went outside to calm down), and *doing other things while outside* (e.g., I exercised and it was outside). Participants in the intervention group increased their proportion of *doing other things while outside* from survey 1 [$r(31) = .31$] to surveys 2 [$r(20) = .43$] and 3 [$r(23) = .46$], such as hanging out with friends (especially initially) and drinking coffee. However, these differences were not significant ($p = .49$).

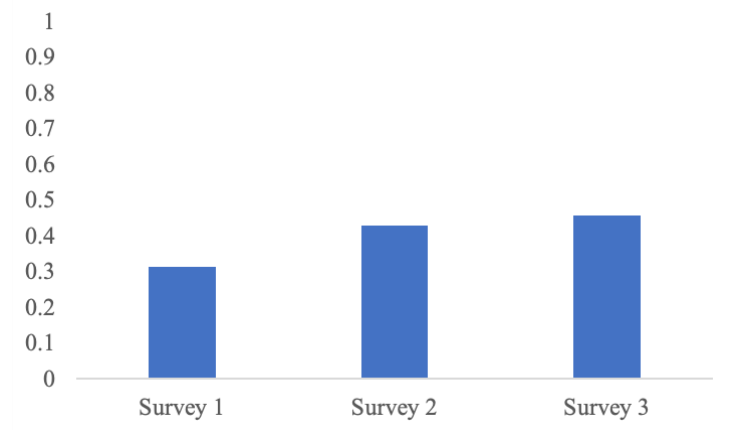


Figure 3: Frequencies of the motivation of *doing something else while outside* over the prior two weeks of the intervention group at Surveys 1, 2, and 3.

Setting of Nature Experiences

Three categories emerged that were compared: *Nearby nature* (around home, work, or school), *local nature* (generally less than 5 miles away but further than just outside the home/work), and *regional nature* (5 miles away or further, such as a state park). The proportion of NI experiences in *nearby nature* increased from Survey 1 [$r(15) = .19$] to Surveys 2 [$r(14) = .33$] and 3 [$r(19) = .25$] for the intervention group, although the differences were not significantly different ($p = .51$). There were some differences among the intervention and control groups at the different surveys. These differences were pronounced at Survey 3, when the proportion of *nearby nature* for the intervention group was $r(19) = .25$ and only $r(65) = .06$ for the combined control groups, although this was also not statistically significant ($p = .66$).

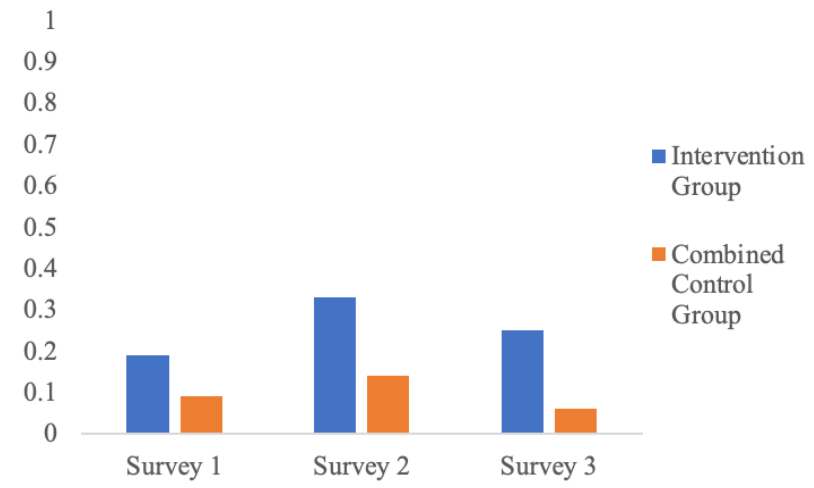


Figure 4: Frequencies of the setting of *nearby nature* over the prior two weeks of the intervention group and the combined control group at Surveys 1, 2, and 3.

Social Context of Nature Experiences

Two categories emerged that were compared: *with one or more other humans* and *not with any other humans*. Participants in the intervention group had a higher proportion of *not with any other humans* at Survey 3 [$r(19) = .45$] than combined control groups, $r(65) = .24$, using Fisher's exact test ($p = 0.09$). This proportion of *not with any other humans* of the intervention group during Survey 3 [$r(19) = .45$] was also higher than during Survey 1 [$r(16) = .41$] and Survey 2 [$r(14) = .34$], although these differences were not statistically significant ($p = .52$).

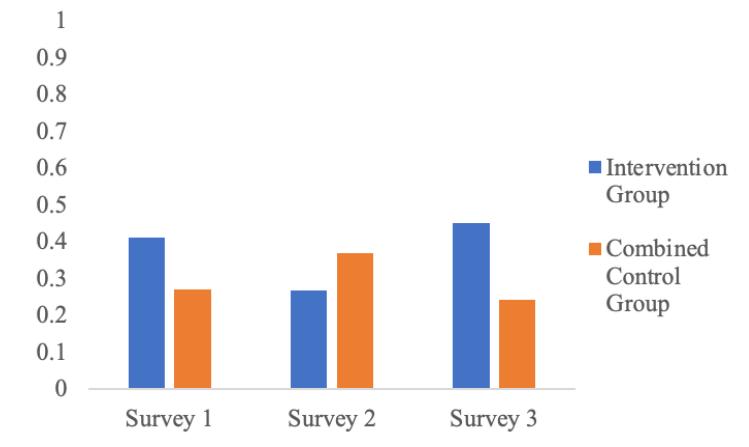


Figure 5: Frequencies of the social setting of *not with any other humans* over the prior two weeks of the intervention group and the combined control group at Surveys 1, 2, and 3.

Frequency & Stress Correlation

Across all groups, frequency of NI and stress are negatively correlated, $r(90) = -.31$, $p = .003$, which is shown in Figure 6. This correlation was statistically significant for the intervention group, $r(18) = -.67$, $p = .001$, and control group 1, $r(25) = -.46$, $p = .02$, but not for control group 2, $r(43) = -.08$, $p = .60$.

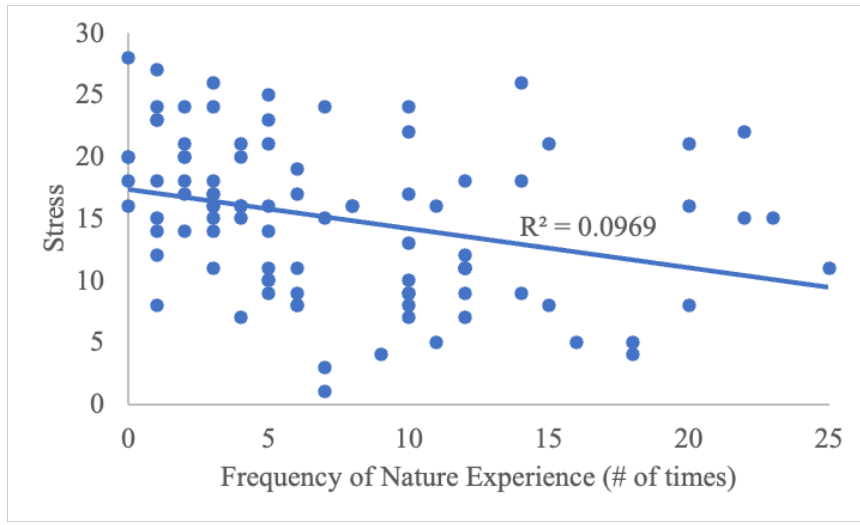


Figure 6: Correlation between frequency of nature experience and stress for all groups across all three surveys.

Qualitative Analysis

Themes around beliefs, attitudes, and behaviors emerged from the interviews, with subtheme(s) for each (Table 2).

Table 2. Three themes and eight subthemes around how participants experienced changes post-course emerging from the qualitative analysis.

Main Themes	Subthemes
Beliefs	<ul style="list-style-type: none"> • General importance of nature experience • Nature experience can affect stress and well-being • Nature experience can promote social relationships
Attitudes	<ul style="list-style-type: none"> • Appreciation of nature
Behaviors	<ul style="list-style-type: none"> • Experiencing of nature around home, work, and school • Active participation and intentionality during nature experiences • Use of nature as a stress management tool • Barriers of busyness and stress, as well as weather

Beliefs

Interviewees described beliefs around the importance of nature experiences when discussing their main takeaways from the course. Although participants choosing to take this course may have

already enjoyed nature before this experience, beliefs were described as strengthened by their participation in the course. For instance, one participant described “my overall belief that nature can help. Definitely, it's like a solid, yes now. Maybe before the course it was like, like, Yeah, I like spending time in nature. But I don't know what this actually does for me.” Other participants described expansion of existing belief. For example, one participant said:

So like reading the Nature Fix and seeing okay, it's not just for cardiovascular health, it's not just for our mental health, like it is our for - it benefits our entire lives. So just like the broad overarching, this is important for you.

Interviewees also reported beliefs around how nature experience can affect stress and well-being specifically, which was a major theme that emerged from the interviews. Often, participants described how these were new beliefs from the course. One participant, referencing nature experiences, said:

I used to think .. I'll do it when I can. But... if I don't have time, then it's not going to make a big difference for me or whatever. And now I'm like, no, it really like stops my brain from spinning or spiraling, and it like, you know, kind of centers me and it kind of gives me perspective.

Other participants described beliefs around the importance of utilizing nature in specific ways to help support their well-being as well. For example:

I didn't realize how heavy of an impact that nature can have on like, controlling your stress if you like use it properly. Like the, again, going back to the nature bathing that you guys taught us about, I never - like there's actual scientific proof behind that.

Some participants reported new beliefs around how nature experience can promote social relationships, which was a strong theme that emerged for some participants but not for all. For instance, one participant said, “I just look at like a lot of my relationships differently of like, maybe I can improve this relationship by taking this person on a hike or something.” The course concept of soft fascination was also mentioned in its connection to social relationships, and one participant mentioned: “I'm like, maybe outside might be like a better, better hangout session. Like because we're all feeling a little bit better, more elevated, like soft fascination is going on.” While beliefs about the ability of nature

experience to strengthen social relationships emerged for certain participants, general beliefs around the importance of nature experience and beliefs around stress and well-being were more widespread themes.

Attitudes

Participants described attitude changes that focused on increased appreciation of nature after the course than they had experienced before, which was sometimes linked with other changes as well. Participants described feeling more appreciative of nature generally. For example, one participant described: "I just didn't appreciate being outside as much before. And now it's like, every time I, every time I am outside, that's like, a highlight of my day." Participants also described appreciation for specific components of nature. One participant reported:

But like even the branches, you know, like, I always take a moment to look at the trees like, and that that's kind of what it looks like for me is like just taking those few moments to like, really appreciate it instead of just instead of just being out there and not like you know, taking it in at all or remembering any of it.

Another participant described how appreciation is linked with the pace in which they experience nature, saying:

Yeah, the course definitely helped a lot with like, learning to appreciate just everything in nature. If that makes sense. So yeah, definitely, like, appreciating, like being able to slow down when you're in nature. That was a big takeaway after the course.

In sum, participants described attitudinal change of increased appreciation of nature post-course, including both generally and specific components of nature, which was sometimes linked with other changes, such as the pace at which nature is experienced.

Behavior

Participants reported changes in the ways they experience nature after the course, including more experiencing of nature closer to home, work, or school, which was supported by trends in the quantitative data. For example, a participant described how they were applying what they learned from the summer course: "How I'm incorporating that now, this semester is like, literally just trying to spend

as much time outside as possible. Like if I have downtime between classes, try to be outside, not sit inside.” Often, this was described opportunistically with participants working to fit nature however possible into their lives. For example:

I think the other biggest takeaway was... doing what's best for you, what fits your schedule. So, like, we obviously talked a lot about nature bathing. But it was good to learn from that class that like, you don't have to go on like, a 12 mile hike every week, to like, nature bathe you know it was It can be whatever, like five minutes outside, you know, doing whatever, sitting on your balcony, going for a walk outside, sitting in forests, between classes, things like that. So that was definitely helpful to like, learn that. Yeah, you can do you can fit that in however you need to in your life.

Additionally, participants also highlighted how they worked to incorporate everyday activities into an outdoor setting, which were also often around home, work, or school. One participant described an example of how this might look in their life:

I like get home from school. And I'm like in my apartment. And I see that it's such a nice day outside, that I'm almost like, No, this feels wrong. I have to like go out and like I have to at least like maybe I have homework, but I can like go hammock and do homework, I can go sit like somewhere and do homework that isn't in here.

Another participant described how this focus on incorporation of everyday activities was especially strong right after the course:

So the course ended, and for the next month and a half, maybe two months, I consciously did everything outside that I could... I was like, out in my hammock, I was eating out there, I was doing my workout there. I was just like living in my backyard.

These behavior changes, with participants working to incorporate nearby nature and everyday activities into the outdoors, was sometimes linked with a redefining of what nature experience was for participants. For instance, a participant said:

You can just like walk outside, or just like lay in a field and that counts as doing outdoor activities. And I didn't really think of that as being like, outside even, you know, it's outside but it's not like being outside, you know, hiking is being outside. That's how I used to think of it.

Participants also reported changes in the way they actually experienced nature, describing how they were more of an active participant in the experiencing of nature and experiencing it more intentionally, often by changing the pace of which they experienced nature. “The biggest thing like being

intentional with like, being mindful in nature. So maybe before the course I just wasn't really slowing down as much when I was spending time in nature." This often involved feeling more a part of nature and connecting with it more. "Yeah, like, just, it's more, it's more immersive. It's more, it's more observant in various ways. It's not just like seeing things. It's like, trying to just make yourself as part of it that you can be." Sometimes, participants explicitly described how they actively utilized their senses to connect with nature. For example, one participant remarked:

I make an effort to activate all of my senses more in nature now, like, I, you know, could be on a hike, for example. And like before, on a hike, I would maybe just like be walking, have music in, kind of just do my thing, like, going up a hill. But now, it's like, so much less of just like visual observations. And it's like, okay, I'm gonna pick up this rock, and I'm gonna feel this rock as I walk, and I'm gonna take my headphones out for a little bit because I want to listen to the sound of that river or stuff like that, just like activating every possible way to like, be aware of it and be connected to it.

Lastly, participants described changes in how they use nature as a stress management tool. For example, one participant said:

And I've definitely used like what I know about nature to like, help me with like my stress, just just going outside, like even just to let my cats outside. I just kind of realized how important it is to like, be outside.

Participants described using nature to benefit their own well-being as well as to benefit those around them. "When I'm upset, or, or just recently, like, my friend was kind of upset. And I was like, we should just go for a walk." Forest bathing, as well as other techniques from the course, were sometimes referenced as a specific tool for stress management. For instance, one participant described:

I'm trying to work on in my life is like being calm and centered and not panicky about things...trying to sort of embody the like, forest bathing principles type of thing. So I think that was one thing that was good for my personal growth.

While behavioral changes emerged from the interviews, participants also highlighted how barriers of busyness, stress, and weather sometimes conflicted with nature experiences. The busyness and stress of school was a major barrier. One participant mentioned:

I had like, a couple of weeks before school started where I had you know, no classes like nothing to do. So it was definitely much easier to like, focus on what I had just learned from the course

right after it ended versus like, now I'm like, you know, just thinking about the next like, exam.. I need to.. remember what I learned in the course but yeah, stress of school is hard.

Additionally, weather was described as a barrier. Another participant described:

I think, also this like, the discomfort factor has snuck back in a little bit. So I'm more likely to fall back into my old habits of 'Oh, but it's like kind of cold out' or 'Oh, I don't feel like sitting in the sun.'

The barriers described did not seem like they normally completely nullified the impacts of the course.

For example, one participant remarked: "But I think my efforts probably flack more when I'm like, stressed about the next exam or whatever I have coming up. So I think I'm still better than before, I could be better though." Overall, though, busyness, stress, and weather appeared to be barriers to behavioral change for participants, especially as the semester progressed.

Discussion

This study highlights the influence of an experiential field course on participants' beliefs and behaviors around nature as a well-being strategy. After the course, participants worked to find ways to incorporate nature experiences around home, work, and school. They experienced nature in more active and intentional ways, and used it as a stress management tool. The frequency of nature immersion did not decrease significantly during busy times of the semester (i.e., at Survey 3), even while it did for the control group. Participants experienced barriers of busyness, stress, and weather. Behavior change components that emerged include beliefs around the importance of nature experience generally as well as how it can affect stress and well-being and promote social relationships. Another behavior change component that emerged was the attitude around appreciation of nature.

Sustaining of Nature Experiences

Analysis of quantitative data, although with small sample sizes, showed that frequency of the intervention group's nature experiences was sustained post-course as their lives became more demanding (e.g., return to school and classes) even while they decreased for the control group. While research on courses like this one is limited, this is a similar finding to that of Sahlin et al. (2019), who

also found that, in the context of an experiential course for caretakers of people with disabilities, can influence the frequency of nature-based activities. While barriers limited this frequency, over 40% of caretakers reported increased frequency of nature activities at a 12 months after the course. Future studies about nature and wellbeing could evaluate frequency at longer-term follow-ups, as was done by Sahlin et al. (2019).

Participants in the intervention group sustained this frequency of nature experience by immersing in “nearby nature” close to home, work, and school. This is evidenced by shifts in the *setting* for their nature experiences, with participants finding ways to do it around home, work, and school, even as the semester progressed and got busier. This sustaining of nature experience could be related to strengthening beliefs on the importance of nature experience resulting from the course, leading to participants working to find ways to experience nature within their day-to-day lives. The interviews also suggested that for some participants, this may reflect a redefining of what is a nature experience, and realizations that benefits can be obtained through simple experiences such as walking or sitting in nature. Changing settings for nature experience and reasons for these shifts is an area of research that could be further explored.

Components of Behavior Change

There also emerged changes in participants’ beliefs and attitudes, which have been used in theory as components of behavior change (e.g., Ajzen, 1991; Becker, 1974; Stern et al., 1999). Participants described a strengthening of beliefs on the general importance of nature. Considering that participants in the intervention group chose to take this experiential course at a campus located in the mountains, it seems reasonable that these were not new beliefs but rather that the course strengthened pre-existing beliefs. On the other hand, beliefs around the ability of nature experience to address stress and well-being and to enhance social relationships tended to be described as new beliefs. To explore the

nuances between new beliefs and strengthening existing beliefs, follow-up studies could include pre- and post-questions surrounding belief and attitudes, in addition to behavior.

Barriers to Behavior Change and the COM-B System

Even though the frequency of nature experience did not decrease throughout the semester as it did with the control group, it also did not increase significantly post-course, especially later during the third survey data collection period. Participants discussed barriers of busyness and stress, as well as weather, which may have played a part. The COM-B system (Michie et al., 2011) may also help frame this pattern. While *capacity* was heavily emphasized in this course, including the knowledge and skills needed to engage in the target activity, *motivation* and *opportunity* are aspects of the COM-B system that could be further addressed. Specifically, automatic motivation (which includes habits & emotional impulses) could be further encouraged post-course through follow-up group activities in nature that provide opportunity for nature experience while continuing to promote good habits. Reflective motivation, such as through goal setting and follow-up on these goals, could also be emphasized. Additionally, the course did not impact *opportunity* for participants to engage in nature and well-being activities post-course. Providing social conditions that make it easy for participants to continue engaging in nature and well-being activities, such as planned group hikes and other activities, could be a way to impact the *opportunity* essential condition of the COM-B system.

Other Areas for Future Research

The findings from this study raise some other important questions for further research, including the relationship between nature experience and stress. The result from this study, that the greater number of nature experiences were correlated with decreased stress, aligns with extensive research in this area (Frumkin et al., 2017). The larger relationship shown for the intervention group raises the question if understanding the benefits can add to the benefits that nature experience often already provides. The lack of significance for a correlation between nature experience and stress for

control group 2 (extended summer nature experience) also raises questions. Do higher levels of nature experience decrease its benefits? Or were some of these participants working as part of their nature immersion, so nature experience has more negative associations and has more negative outcomes (e.g., Collado et al., 2015)?

Although not an explicit finding in this study, it could be inferred that this active participation and intentionality raised the *quality* of participants' nature experiences, which is another related theme explored in prior literature. Shanahan et al. (2015) suggests that, along with frequency and duration of exposure, the quality of nature is one aspect of the "nature dose," or the level of impact nature has on one's well-being. The level of dose is important because it has been linked with the amount of health benefits one receives from nature experience (Shanahan et al., 2016). Although quality of nature has been measured through GPS vegetation measures or "perceived greenness" (Shanahan et al., 2015), this leaves out the quality of the nature experience more holistically, including the techniques and strategies used by the participants themselves. We suggest exploring whether the concept of "nature dose" should include quality of nature experience, including the strategies used by the person experiencing nature, instead of just focusing on the quality of the nature setting.

Limitations

There were several limitations of this study. Because of a small sample size, especially for the intervention group, we struggle to draw meaningful conclusions from the quantitative data. A larger sample size could provide a more robust data set, although we were limited by the number of students who signed up for the course. Additionally, survey data from the control groups may have been influenced by selection bias. While we sent the survey to three different colleges within CSU to seek out a more representative sample of the student body, participants who chose to partake in the survey may have had interest in the topic and may not have represented the CSU student body as a whole.

There are also challenges in generalizing our findings to other contexts. This was a unique course that took place at a particular location, and with a group of participants with their own distinct backgrounds and unique relationships that formed within them. However, with a lack of research around NBIs in higher education contexts and around components of behavior change, the purpose of this study was simply to address whether behavior change could occur in this specific context and what behavior change components emerged from the course.

Conclusion

In the United States and elsewhere, the mental health of university participants is a serious crisis. Nature experience is associated with mental health benefits in various ways, including through stress reduction. While NBIs have been used successfully in different contexts, there is a lack of research around the adoption of strategies learned through NBIs, especially in the context of an educational, experiential course. Theory that guides this work includes more traditional behavior change theories as well as the more recent COM-B system (Michie et al., 2011).

This paper examines the influence of an experiential course on nature immersion and well-being on participants' beliefs, attitudes, and behaviors regarding nature as a stress management strategy. A mixed-methods approach was implemented, with quantitative data collected through surveys and compared with two control groups, and qualitative data collected through interviews.

Participants reported changes in their beliefs, attitudes, and behaviors regarding the importance of nature on well-being. Beliefs around the general importance of nature experience were strengthened, with new beliefs emerging around nature as a well-being strategy and in its ability to promote social relationships. Attitudes also emerged around an increased appreciation of nature. Finally, behavior changes were reported, with participants experiencing nature close to their home, work, and school, participants more active and intentional during nature experiences, and the utilization of nature as a stress management strategy. Stress decreased for the intervention group and proportion of reasons

given for nature experience increased for *doing other things while outside*, although these changes were not significant. Participants increased the proportion of their nature experiences in *nearby nature* and how much they were *not with any other humans*, although these also were not significant quantitatively. Participants did not increase their frequency of nature experience as the semester went on, but neither did it decrease significantly (as it did for the control group). Barriers to increased nature experience included busyness and stress, as well as weather.

Although more research is needed to support the results of this relatively novel study, the results of this study indicate that this experiential course influenced participants' beliefs, attitudes, and behaviors surrounding nature as a well-being strategy, and that behavior may be associated with decreased stress. Barriers such as opportunity and motivation may have limited the extent of behavior change, and further research could help elucidate if designing such an intervention around of the COM-B system may help promote participants' adoption of nature immersion as a strategy for stress management and well-being.

Chapter Three: Manuscript 2

Introduction

Experiential education has grown rapidly over the last decade, including in higher education (Buzzelli & Asafo-Adjei, 2023; Gavillet, 2018), and has been shown to produce better learning outcomes than traditional approaches (Burch et al., 2019). The landscape of higher education has also witnessed a recent decrease in the mental wellbeing of college students compared to previous years (American College Health Association, 2022; Lipson et al., 2022). Nature experience through experiential education has the potential to both enhance learning while simultaneously improving student mental health through the teaching of well-being strategies (Sahlin et al., 2014; Sahlin et al., 2019). Because little research has been done on the potential for outdoor experiential learning to promote mental health, this study explores the possible synergy between experiential education and using nature as a well-being strategy.

Experiential Education

Experiential education has been growing rapidly in STEM disciplines (Buzzelli & Asafo-Adjei, 2023) and other areas (Gavillet, 2018). Rooted in John Dewey's philosophy of education (Dewey, 1938) and developed further by Kolb (1984)'s experiential learning theory, experiential education connects the learner directly with course content in some way (Keeton & Tate, 1978) and involves active learning from experiences (Kolb, 2014). Put simply, experiential education is learning by doing (Lewis & Williams, 1994), with primary goals of increasing understanding and developing skills (Qualters, 2010). Kolb's (1984) experiential learning theory includes four stages: concrete learning, reflective observation, abstract conceptualization, and active experimentation. Concrete learning includes having a new experience or a new interpretation of an experience that has happened before. Reflective observation involves personal reflection on what the experience means. Abstract conceptualization refers to the formation of new ideas or adjustment in thinking based on the experience and reflection. Active

experimentation then, becomes the application of these new ideas by trying them out. Kolb's experiential learning theory has been studied in contexts such as education, management, information science, psychology, medicine, and more (Kolb, 2014). However, to our knowledge it has not been used as a framework to study the impactful components of a nature well-being course on students' beliefs and behaviors about nature as a well-being strategy.

Experiential learning has been shown to be effective in leading to learning outcomes. A recent meta-analysis of experiential learning that included studies with both an intervention and control group showed that experiential learning had significantly higher learning outcomes than traditional pedagogy, which authors generally defined as lecture-based approaches (Burch et al., 2019). In other studies, students have shown a preference towards experiential education (Blunsdon et al., 2010; Hawtrey, 2007; Sato & de Haan, 2016). The efficacy of and student preference for experiential education is well-documented across a variety of disciplines and contexts.

While the goals of experiential education are typically to increase understanding and develop skills, it has also been used to promote behavior change. For example, short simulation experiences have been used to reduce gambling behavior (Abel et al., 2021) and other experiential techniques have been used in financial literacy courses with aims of changing other financial behaviors (Fernandes et al., 2014; Miller et al., 2014). Experiential education has been shown to be successful in other areas as well, one example is an experiential leadership course which led to positive attitudinal and behavioral changes in the workplace, including improvements in how employees dealt with challenges (Rhodes & Martin, 2014). Other studies have explored how experiential education in the context of climate change education and diet-related behaviors, can change motivation, knowledge, and attitudes (Siegener, 2018; Taylor et al., 2014). These studies suggest that experiential education may have capacity not only to increase understanding and skill development, but also to change behavioral patterns.

College Students and Mental Health

Experiential education's capability of leading to higher learning outcomes, including behavior change, may be of relevance within the context of mental health in higher education. In addition to the opportunity many higher education institutions have for including experiential education in their courses, mental health has decreased significantly among college students in recent years (American College Health Association, 2022; Lipson et al., 2022). Experiential courses could provide a conduit through which wellbeing knowledge, skills, and behaviors are taught. This is especially relevant because other efforts by higher education institutions to address student mental health have not been sufficient to slow this trend (Rakow & Eells, 2019; Xiao et al., 2017).

Nature-based Interventions

Wellbeing interventions have been shown to positively impact mental health in non-academic contexts, including through nature-based interventions (NBIs; Arango et al., 2018; Bole Williams et al., 2010). NBIs have been shown to constructively address mental health problems and promote positive well-being benefits (Owens & Bunce, 2022). Examples of these programs include hiking (e.g., Pichler et al., 2022), gardening and horticulture (Moeller et al., 2018; Vujcic et al., 2017), animal-assisted therapies (Moeller et al., 2018), and forest therapy techniques (e.g., Pichler et al., 2022). Even though NBIs have been shown to lead to positive wellbeing outcomes, their utilization within experiential education has not been directly researched.

Promoting Mental Health through Education

Even though NBIs in the context of higher education are limited, certain educational strategies have been used more generally to improve mental health, especially when focused on developing personal competencies to increase resilience (Kobau et al., 2011). Learned optimism programs teach skills such as avoiding thinking traps, calming and focusing, and putting things in perspective, which have been shown to improve mental health (Kobau et al., 2011; Seligman, 2006; Seligman et al., 2009). One example, a school-based intervention called the Penn Resiliency Program, has decreased anxiety and

depression among students for up to two years and has increased positive behaviors for longer (Gillham et al., 1995; Brunwasser et al., 2009; Seligman et al., 2009). The US army has also offered soldiers Master Resilience Training to promote resilience and positive well-being, which has improved participants competency to deal with stress and soldiers have reported adoption of these competencies into their daily lives (Griffith & West, 2013). Programs that promote social interactions and group support, in addition to individual competencies, seem to be especially effective for motivating long-term positive change (Kobau et al., 2011). It has been argued that 21st century education needs to have stronger goals around happiness, resiliency, and well-being (Alam, 2022), and mental health promotion is a field in which researchers have specifically called for growth (e.g., Arango et al., 2018).

Adoption of Mental Health Strategies from Nature Well-being Courses

While education has been used to promote positive mental health and adoption of various well-being strategies, much less work has focused on the potential for nature well-being strategies to enhance these outcomes. However, there have been promising results from the few studies that have occurred. Through an outdoor course for employees at risk for stress in Sweden, nature-based stress management techniques were adopted by many participants, especially the techniques of mindfulness, taking walks in nature, and observing nature (Sahlin et al., 2014). Another study found both behavior changes (choosing of nature-based activities) and well-being benefits in a course at a Swedish zoo for the caretakers of people with disabilities (Sahlin et al., 2019). While both these courses included knowledge and skills components, the specific aspects of the course that were impactful on participants were not explored (Sahlin et al., 2014; Sahlin et al., 2019). More research is needed around the adoption of nature well-being strategies within educational contexts, including which components of experiential courses have the greatest impact of beliefs and behaviors for successful utilization of nature as a well-being strategy.

Components of Experiential Education for Behavior Change

While researchers have highlighted the beneficial outcomes of experiential education and NBIs (e.g., Burch et al., 2019; Moeller et al., 2018; Sahlin et al., 2019; Shanahan et al., 2019; Razani et al., 2018; Razani et al., 2019), more work is needed to identify what specific components of experiential education and NBIs are most impactful on students' beliefs and behaviors. Understanding which components of experiential education and NBIs are most influential could lead to better program design and increased positive outcomes. Although literature that explicitly studies this is limited, Morris (2020)'s systematic exploration of the concrete experience stage of Kolb (1984)'s experiential learning theory, provides insight. In this review, Morris (2020) proposed five components as constituting a concrete experience: "learners are involved, active, participants; knowledge is situated in place and time; learners are exposed to novel experiences, which involves risk; learning demands inquiry to specific real-world problems; and critical reflection acts as a mediator of meaningful learning" (p. 1). Based on these findings, Morris (2020) proposes a revision to Kolb's experiential learning theory: "experiential learning consists of contextually rich concrete experience, critical reflective observation, contextual-specific abstract conceptualization, and pragmatic active experimentation" (p. 1). Morris (2020)'s revision to Kolb's experiential learning theory suggests potentially impactful components of an experiential course on students' beliefs and behaviors about nature as a well-being strategy.

Research Question

While experiential education can lead to strong learning outcomes as well as behavior changes, experiential education through nature-based courses has not been explored for its potential to motivate the adoption of mental health strategies. Thus, our research addressed the following question: Which, if any, components of a nature well-being course influence participant beliefs and behaviors of nature as a well-being strategy?

Methods

Experiential Course on Nature and Well-being

Course Setting and Overview

The course about nature experience and well-being took place at Colorado State University (CSU)'s mountain campus, located approximately 90 miles west of Fort Collins. In the summer of 2022, participants spent nine days on this campus, which is in a secluded valley in the Rocky Mountains. Students could access various hiking trails directly from the campus which went through different types of forest ecosystems. Parts of the surrounding area were in early stages of succession after being burned by a recent wildfire (the Cameron Peak fire in 2020), but also featured a rich upper montane habitat primarily of various coniferous trees and aspens. The valley also had a large meadow through which meandered a mountain stream, and participants slept near this stream in rustic cabins. There was no cell reception on campus and Wi-Fi access was limited.

Course Content

The course content was organized into five modules, most of which was taught in-person at CSU's mountain campus but some of which was included in virtual components before and after the in-person portion of the course. The course began with the concept of well-being, which participants studied virtually and explored in-person at the mountain campus. This was followed by the next four modules: benefits of nature experience, barriers and solutions to nature experience, nature experience and sustainability, as well as social and environmental justice as they relate to well-being (Table 3).

These modules included structured class time for various stages of Kolb (1984)'s experiential learning theory (Table 3). For example, participants learned and practiced forest bathing as part of the concrete learning stage. Then, students participated in the reflective observation stage through individual journal entries. Finally, the abstract conceptualization may have occurred for certain participants during class discussion and further processing of the experience. Other topics followed similar stages as forest bathing.

Table 3: The five modules of the course, including their content focus and major experiential components.

Module Number	Content Focus	Major Experiential Component(s)	Stage(s) of Kolb (1984)'s Experiential Learning Theory
1	Well-being	N-A	Reflective observation
2	Benefits of nature experience	Forest bathing, walking meditations, low-ropes course	Concrete learning, reflective observation, abstract conceptualization
3	Barriers and solutions to nature experience	High ropes course, group hike	Concrete learning, reflective observation, abstract conceptualization
4	Nature experience and sustainability	Long group hike	Reflective observation, abstract conceptualization
5	Social and environmental justice	N-A	Abstract conceptualization, active experimentation

Major Course Components

As mentioned previously, participants engaged with course topics through lecture, group discussion, and learning activities, which included forest bathing activities, walking meditations, and short group hikes. Participants were also assigned journal reflections and several daily readings as well as two major assignments: a program design presentation and an op-ed writing assignment. Other components of the course included group activities such as low-ropes, high-ropes, and a longer day hike. Participants were invited to daily swims in the mountain creek and had their own free time as well.

Recruitment

CSU is a large public university in Fort Collins, Colorado, United States. Information about a 2022 summer course on nature and well-being was shared widely with the student body across the various colleges within the university. Nine students enrolled in the course, and prior to the beginning of the course a recruitment email was sent to students that explained the study, clarifying that involvement in the study has no influence on grades in the course, and invited them to participate. Students enrolled in the study by filling out a survey on Qualtrics which screened them according to inclusion criteria to be

part of the intervention group. Inclusion criteria included being enrolled in the summer course on nature and well-being, being at least a half-time student during the following fall semester, and plans to live in the city of Fort Collins during upcoming Fall season.

Subjects and Withdrawals

After being filtered for inclusion criteria, eight students initially agreed to participate as part of the intervention group. One dropped out of the course, resulting in a total of seven individuals for the treatment group. These participants represented five different academic programs, reflecting different disciplinary backgrounds. Most participants were undergraduates from sophomore to senior standing while one participant was in a graduate program.

Data Collection

All participants in the intervention group participated in semi-structured interviews 10 weeks after the conclusion of course. The primary researcher and a secondary researcher conducted the semi-structured interviews, which occurred in person and near a college building where many of them were taking classes. Students were given the option to do the interview indoors or outdoors, and every student chose to do it outdoors, and this outdoor setting consisted of a tree lawn with large rocks to sit on. The two researchers asked six main questions about impactful components of the course as well as changes in their lives since the course (Appendix C). For instance, participants were asked “When you reflect on the course, which of the experiences during the course influenced your learning about nature and well-being the most?” Participants were also asked about changes in their lives. For example, they were asked “When you reflect on before and after the course, has the course led to any changes in how you spend time in nature for your well-being?” Interviews tended to last between 30 and 45 minutes. The primary researcher recorded the interviews and saved the audio files in a secure folder.

Analysis

The software Otter.ai (Liang & Fu, 2016) was used by the primary researcher to transcribe the audio files. Then, the researchers analyzed the interviews thematically by following generally the steps described by Braun & Clark (2006): familiarizing oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Specifically in our analysis, the interview transcripts were read through twice by the primary researcher who then generated initial codes systematically across the entire data set. Then, the primary researcher searched for themes and proposed these to secondary researchers. The secondary researchers reviewed these and helped develop a thematic map of the analysis, assisting in defining and naming of themes. After the data was coded into major themes, the primary researcher also coded the data into subthemes that emerged. The entire data collection protocol of this study went through the human subjects' research IRB approval process (IRB: #3494).

Results

Three main themes emerged from the interviewing: 1) pairing of course content with experiential learning, 2) forest bathing was one experience that emerged as especially impactful, 3) learning alongside classmates with whom they could process their learning, and 4) a lack of technology and internet access. Several subthemes emerged as well (Table 4).

Table 4. Three main themes and subthemes about impactful components of a nature and well-being course on participants' beliefs and behaviors of nature as a well-being strategy.

Main Themes	Subthemes
Pairing of course content with experiential learning	<ul style="list-style-type: none"> Scientific evidence was impactful and helped tie together content and experiences for participants
Forest bathing was one experience that emerged as especially impactful	<ul style="list-style-type: none"> No subthemes
Learning alongside classmates with whom they could process	<ul style="list-style-type: none"> Diverse perspectives and backgrounds increased learning Challenges such as high ropes and the long hike helped strengthen relationships
Lack of Technology and Internet Access	<ul style="list-style-type: none"> No subthemes

Key Finding 1: Pairing of Course Content with Experiential Learning

Participants often referenced the pairing of course content with experiential learning regarding impactful components of the course. Both learning the content and experiencing it, including in different settings and ways, was one of the strongest themes that emerged. One participant, in describing the course, said, “It was very immersive... I felt like we were learning about things that we were simultaneously experiencing in the moment. And that was super cool.” Sometimes participants directly linked this to an increased awareness of the course topics. “That was just so powerful to ... not only be learning but be so aware of what you're learning.” Other times, participants reflected on how this led to greater retainment of course content. For example, one participant described how the instructor(s) were “teaching us in different methods and in different locations. That increased our ...comprehension, because like seeing something in action was super cool... to help the course concepts like stick.”

Scientific Evidence

Scientific evidence, including assigned readings from peer-reviewed articles and chapters from the *The Nature Fix* (see Williams, 2017) emerged as an impactful component of the content learning. For example, one participant described how “There's like, multiple studies in multiple different places, multiple countries, from multiple people of different backgrounds and different lives. And they all came to this conclusion just like being in nature does help you. So that was cool.” Scientific evidence was cited as being helpful in tying together the content with the experiences that participants had. Another participant remarked:

When we learned in the classroom, I thought that that was really beneficial for me because it connected the dots of what I was experiencing... with what, you know, the science does, which was kind of cool... I had heard all these things, and then I was experiencing them and then I was like, wow, like, that's so cool.

Other times, scientific evidence was referenced as a reason for shifting beliefs around nature as a well-being strategy. For instance, one participant described:

I didn't realize how heavy of an impact that nature can have on controlling your stress if you use it properly. Like the, again, going back to the nature bathing that you guys taught us about... like there's actual scientific proof behind that, which is so amazing to me that like spending time in nature, just being near trees helps you just overall... Yeah so I think definitely spending the time on the campus helped me to open up my mind to more natural ways to help myself, I guess, if that makes sense.

In sum, scientific evidence was an important component of content learning, as well as for linking experiences with content. Scientific evidence was also sometimes linked with changing beliefs around nature as a well-being strategy.

Key Finding 2: Forest Bathing was One Experience that was Especially Impactful

Forest bathing was a course component that participants often referenced as impactful, especially in how it helped participants be more intentional with the way they interact with nature. One study participant mentioned:

The forest bathing activities that we did that forced us to be really intentional in nature. That first forest bathing activity when I was in my favorite forest biome with the pines and the Aspens. I realized... these are all the things that you love about this forest, and I was able just to sit and watch them and they made me really happy.

Sometimes, participants linked strategies learning through forest bathing with behaviors even after the course was over. For example, one participant described:

Learning about forest bathing, and the explanations of why nature is calming to people or benefits mental health, I think... looking for fractal images and nature, like I still do every day now. I'm walking, and I'm like, Oh, those leaves, they're a fractal image...yeah, forest bathing was a big one.

Forest bathing emerged as one of the most impactful experiential components of the course and one that was linked with behaviors post-course by some participants.

Key Finding 3: Learning Alongside Classmates with Whom They Could Process

Being able to experience and learn alongside classmates with whom they could process also emerged as a course component impactful for participants. One participant mentioned that “Having like

a set group of people that you're like, learning and going through the levels of every aspect of the course with was super cool.” Another participant described how learning was enhanced through this social aspect:

There's something that happens when people are in a group like that experiencing things together for a period of time. I don't know what it is. But there's something that that adds to the learning and makes it a completely different sort of level of learning.

The relationships that were built with other classmates seemed to be very important in the support of learning, and participants seemed surprised at how quickly relationships were built. Another participant said:

That group just really bonded and in such a short period of time, almost like an abnormal amount of time for people to get that close. I just, it felt like... all the social barriers are like knocked down. And you can just ... be yourself and not really care.

Diverse Perspectives and Backgrounds

Related to the ability to process with classmates, participants described how the different perspectives and backgrounds of their classmates was also impactful. For instance, one participant described how important it was “getting everybody's different opinions.” This participant went on to describe:

Because everyone in that class was so different from each other. So that was pretty cool. And just like, even, you know, like, just listening to what they thought about a concept that I'd also just learned about, and like them thinking something kind of different was pretty cool.

Sometimes participants had varying experiences when it came to experiential components of the course, and participants described how debriefing these experiences was helpful in the reflection process. For example, one participant described:

Some of the forest bathing moments, we've talked about... how, like different settings like appealed to us, more or less and learning about that and just how different people to have different (experiences) like relates to your basic childhood... (*a peer in the course*) was way more comfortable in the scenario where we were by the lake, and I was kind of like me, like, just not able to focus in that scenario. And so I think like different perspectives, different people backgrounds, ties it all together really well.

Challenges Strengthened Relationships and Personal Growth

Activities that presented mental and physical challenges, especially the high ropes course and the long hike, were experiences often referenced by participants. These appeared to strengthen relationships within the group and also supported personal growth for participants. One participant described:

Tying in the social component of nature with, like, the high ropes course, for example. I feel like that was a good example that showed like, not all of us wanted to do it. But we all did it together. And we were outside. And I feel like we all had a positive experience from that.

These challenges, including high ropes, were also described as having influence on participants' personal growth. For example, another participant mentioned:

The ropes course was a big one that was like, huge for me, because...I think just doing the beauty of doing things that you an hour before didn't think you could do is... a really cool, like self awareness moment of like, it's literally a mental block like you are your own like wall in that scenario. And the people were also supportive. I think just like, in the right environment, it's like you are seriously capable of so much more than you think you are.

The hike was also referenced as important for group bonding and personal growth. One participant described how much the hike helped the group grow, even before the hike happened:

The hike at the end of the week ... that was a fun build up. I feel like that also bonded the whole group too because it was like, we're gonna kill that hike, we're gonna do that hike, talking about it all week, and then finally doing it and achieving that together. Like building up so much momentum to something and then doing that accomplishment as a group was so cool.

Another participant linked the experience of the long hike with motivation to try other new things. This participant described:

The big hike that we did that Saturday... Some of us were, like, a little skeptical about going on a big hike. But we all did it. And we all did it together. And it was a good time. So yeah, that was another thing that I've definitely thought about, too, from this course is like, challenging yourself when you're outside like...Like, just the feeling you get when you accomplish something outside that you didn't think that you could do but you ended up doing. That's like, really good. Yeah, I'm just trying new things. Like I remember I started painting again, when we were up there. And that was really nice to do that. And I was like, journaling a lot more like I usually try and journal pretty regularly. But it was, for whatever reason, very easy to do it like, every day when we were up there. So I don't know if that's directly correlated to one another, but yeah.

In sum, learning alongside other classmates was a course component that was impactful in helping participants process learning and experiences, especially considering the diverse perspectives of

classmates and the mental and physical challenges that strengthened relationships between participants.

Key Finding 4: Lack of Technology and Internet Access

Finally, the lack of technology and internet access seemed to allow participants to focus on learning and the people around more fully them. One participant, while describing the changes in how they interact with nature, said:

Yeah, like being forced to be disconnected was super helpful... if we would have had signal, it would have been so much of a worse experience I feel like... People would have just been on their phones like all the time. And I probably would have been too, yeah. But it was so nice to be forced to be disconnected from our phones.

One participant described how phones can be a “safety net,” which they opined was beneficial to be away from:

Yeah, because I feel like a lot of people especially around my age are really reliant on phones and spend like, a lot, like, a couple hours a day on a phone. So... in a place where it takes away what I view as people's safety net, which is like the phone and kind of escaping through the phone, it does a great job of taking away the safety net while not making it uncomfortable.

Another participant linked the way they were able to really connect with nature through forest bathing with not having technology to be distracted by. After describing the first forest bathing experience, which was formative for them, they described how their learning “really started because we didn't have internet connection.” The lack of cellular service and strong internet was widely described to be an important course component.

Discussion

This study highlights components of a course on nature and well-being that participants perceived as having the greatest influence on their beliefs and behaviors about nature as a well-being strategy. The results of this research suggest that several components of this course should be emphasized when designing experiential courses, especially those that seek to promote well-being beliefs and behaviors. These components include the pairing of experiential learning with course

content, including scientific evidence that helped tie these together, and the experience of forest bathing as one particularly impactful experience. Additionally, learning alongside classmates with whom participants can process learning was influential on participants, especially by promoting space for diverse perspectives and backgrounds and through mental and physical challenges. Finally, a lack of technology and internet access can help participants learn and develop relationships more deeply.

Pairing of Course Content with Experiential Learning

One of the strongest themes that emerged was the link between course content and experiential learning. Course design was presumably essential in promoting this link between courses content and experiential learning, with experiences specifically designed to connect with course concepts, as well as space for reflection to process these experiences. For example, participants learned about the concept of fractal images, or repeating patterns that can be found in nature, and then searched for fractal images outdoors, and then had time to process this concept through class discussions and individual journal reflections. The setting of the CSU mountain campus may have also played a significant role, which relates to a systematic review and meta-analysis of nature-based mindfulness that suggests that mindfulness experiences in forest and wild nature settings have larger benefits than garden and park settings (Djernis et al., 2019). At the mountain campus, participants could walk out of the classroom door and be immersed in nature in a remote and beautiful setting, and having some classes outdoors meant that participants were sometimes simultaneously learning about and experiencing course concepts. However, participants when described applying course techniques post-course, they mostly seemed to occur in an urban setting. Would the course have been as impactful if it hadn't happened at the CSU mountain campus? Could a course in an urban setting also have similar outcomes?

Forest Bathing

The strong theme that emerged around the importance of course content paired with experiential learning may also reflect a strong course emphasis on concrete learning, and experiences that participants referenced relate to Morris (2020)'s proposed five components of concrete experiences. For instance, participants cited that forest bathing as an experience that was impactful, and this experience relates to several of Morris (2020)'s components, such as that learners are active participants in learning and that learners are exposed to novel experiences which involve risk. Even though forest bathing was a sedentary activity, participants referenced how actively and intentionally they were experiencing nature. Some participants also referenced the psychological challenge and risk associated with forest bathing, especially being away from technology that they may rely on. One participant described how scary of an experience it was to be alone with their thoughts. Another participant's description of technology as a "safety net" also highlights this level of risk with forest bathing and also taking part in the course more generally. Participants also referenced other activities associated with risk including the high ropes course and the long hike. The importance of risk, including psychological risk being away from technology, could be interesting to explore further as well.

Learning Alongside Classmates

Participants' descriptions of how important learning alongside classmates was also a theme that relates with Kolb (1984)'s experiential learning theory. Participants' descriptions of how close they became with their classmates in such a short amount of time relate to suggestions that programs which promote social interaction and support, in addition to individual well-being competencies, may be especially effective (Kobau et al., 2011). This may have been aided by a small class size (nine students) as well as through intentional course design. Including group activities throughout the course, such as high ropes and group hikes, appeared to strengthen relationships between students. These strong relationships were referenced as being important in helping participants process course content and experiences, relating to Kolb (1984)'s abstract conceptualization stage of the experiential learning

theory. This suggests that Kolb (1984)'s abstract conceptualization stage may occur especially effectively if it is happening socially as well as individually. This finding also raises further questions. While it seems apparent that the social component of the course affected participants' *beliefs* about nature as a well-being strategy, whether it also affected participants' *behaviors* is unclear. Exploring if, when, and how this social component affected behavior could also be an interesting area for further research, especially because participants were not provided any organized structure for the social component after the course. Even with these questions, it is evident that providing opportunity for group relationship building and learning is important for experiential courses such as this.

Lack of Technology and Internet Access

Students' highlighted the importance of lack of technology and internet access, which was limited by the setting of the course. The CSU mountain campus had no cell reception and while WiFi was present in some areas, it was slow and failed to work certain times over the nine days of the course. This way that technology was limited – by the setting rather than by rules – could be interesting to explore further. Is limiting technology through course policies and rules, including through penalties, be as impactful on students than as through limited by the physical setting?

Other Areas for Future Research

While participants referenced aspects of the course that relate to the first three stages of Kolb (1984)'s experiential learning theory, participants did not directly reference aspects that related to the fourth stage: active experimentation. Intentionally creating space to actively experiment with the course ideas in new contexts, whether at the mountain campus or back in town, would be interesting to explore further. This could be as simple as time set aside for participants to choose a well-being strategy and practice it on their own at the mountain campus, or as a more formal assignment to practice a well-being strategy once participants return home. Would having this 'structured' time specifically for active experimentation lead to increased beliefs and behaviors about nature as a well-being strategy?

Additionally, even with increased variety of university course formats (i.e., in-person, virtual, hybrid), participants referenced aspects of the course that were specific to in-person learning such as experiential learning, learning alongside classmates, and lack of technology. However, all these components could be emphasized in an online or hybrid setting, although in different ways, and it raises the question of if these components would be as effective in other settings. Other research has suggested that mindfulness habits can be adopted even through online training (Bossi et al., 2022), and exploring how important the course's in-person format is for participants' beliefs and behaviors around nature as a well-being strategy would be another interesting area to explore.

Limitations

There were several limitations of this study. A small sample size led to a more limited data set, although we were limited by the number of students who signed up for the course. The interview questions asked about components of the course that impacted participants' beliefs and behaviors and did not differentiate between these two. Thus, we are limited in knowing if the course components described influenced participants' beliefs, behaviors, or both. There are also challenges in generalizing our findings to other contexts. This was a unique course that took place at a particular location, and with a group of participants with their own distinct backgrounds and unique relationships that formed within them. However, with a lack of research around impactful course components that may influence nature well-being strategies, the purpose of this study was simply to explore this in one context and to be used as a starting place for future research.

Conclusion

Experiential education can have higher learning outcomes than traditional techniques (Burch et al., 2019), and its use has been increasing in higher education and elsewhere (Buzzelli & Asafo-Adjei, 2023; Gavillet, 2018). Colleges and universities have also experienced other changes, especially regarding mental health of college students, who have had significant increases in poor mental health

over previous years (American College Health Association, 2022; Lipson et al., 2022). Experiential education has the potential to improve mental health through the teaching of well-being strategies (Sahlin et al., 2014; Sahlin et al., 2019), although there has been limited work in this area.

This paper examines what components of a nature and well-being course most impacted students' beliefs and behaviors of nature as a well-being strategy. A qualitative approach was implemented with data collected through interviews ten weeks after the conclusion of the course. This data was then transcribed and analyzed thematically.

One of the strongest themes that emerged was that the pairing of course content with experiential learning was impactful for students. This included the inclusion of scientific evidence into the course, which helped tie together the experiences with the content. Forest bathing was an especially influential experience for participants, as was learning alongside classmates with whom they could process. The diverse backgrounds and perspectives of their classmates was also referenced, as were the physical and mental challenges that they experienced, such as high ropes and the long hike, which helped strengthen relationships with classmates. Finally, a lack of phone service and limited internet connection was also a major theme that emerged as another impactful course component on participants' beliefs and behaviors about nature as a well-being strategy.

Experiential courses in higher education, especially those that aim to change students' beliefs and behaviors about nature as a well-being strategy, should emphasize the components that students cited as impactful in this study. Course content and experiences should be strongly linked, and scientific evidence can be used to help tie these together. Forest bathing is an experience that should be included, and other experiences that include mental and physical challenges, such as high ropes and long hikes, can be utilized to promote group relationship building. Strong group relationships, as well as classmates with diverse perspectives, can support learning. Finally, technological aspects of the course experience, including phone service and Wi-Fi access, should be intentionally limited and structured to promote

student learning and relationship building. Further research should explore how important the course format and setting (i.e., in-person at a mountain campus) is for these components to be impactful, and if an added emphasis on active experimentation, Kolb (1984)'s fourth stage of experiential learning theory, changes the course components that participants find as most impactful.

Chapter Four: Conclusion

To conclude, I include recommendations for higher education courses as well as a personal reflection on my research journey.

Recommendations for Higher Education Courses

Nature and Well-being

I recommend considering how well-being strategies can be taught within higher education courses. Considering the severity of the college mental health crisis, I believe it crucial to consider how to creatively support the well-being of students. This study highlights how a course not only taught students specific scientific concepts but also about how to use nature as a well-being strategy. Based on the results of this study, students were able to gain another ‘tool in the toolbox’ for how to promote positive mental health for themselves and for others. Considering how well-being strategies can be taught, including as the focus of courses, is important in supporting the mental health of college students.

Group Learning and Relationship Building

I also recommend that higher education courses strongly focus on incorporating opportunities for group learning and relationship building into coursework. It was fascinating to hear how much participants referenced how their classmates influenced their beliefs and behaviors about nature as a well-being strategy, especially in helping in the processing of experiences and content. Having strong, trusting relationships with classmates seemed like an important first step for this processing to occur, and going through mental and physical challenges helped these relationships to develop. The CSU mountain campus was a setting that afforded challenges such as hikes, high ropes, and more, although real-life challenges can be presented in other settings too. Additionally, spending time with each other, in and out of class, seemed to be influential in the development of these relationships. In the case of this

course, living together for nine days and having free time were beneficial, although activities like group discussion, group activities, and group projects can also promote time together in a classroom setting.

Use of Technology

Finally, I recommend serious intentionality around how technology is used in higher education courses. It was interesting to hear how the lack of technology emerged as a strong course component on participants' beliefs and behaviors as a well-being strategy. At times, it seemed like participants were describing the lack of technology during this experiential course as a relief; they didn't need to be posting photos, contacting people, etc., because they simply couldn't. One participant's description of how technology can be a 'safety net' to university students also supports this. The use of technology, including phones and internet, should be utilized intentionally. This is especially the case in experiential education formats, where intentionally used technology (or lack-there-of) can contribute to students more fully learning from experiences.

Personal Reflection of Research Journey

I decided I wanted to attend graduate school after I became curious on what leads people to adopt pro-environmental behaviors during my time teaching in Grand Rapids, MI, Tegucigalpa, Honduras, and Detroit, MI. I came to realize that while many of my students were interested in environmental topics and issues, simply learning about them rarely resulted in any behavior changes in their lives. For example, students enjoyed studying air quality in Detroit, but when given the opportunity to write a letter to their congressperson about air pollution near the school, I had only one student who did. Coming to graduate school provided me the opportunity to study behavior change more in-depth and develop an understanding of how complex it can be. I have learned how education can be an important aspect of behavior change, although there are many other factors and techniques to consider. Studying this course allowed me to learn about the impacts of experiential education and consider how different types of education can have different types of impact on students' beliefs and behaviors.

In addition to significant learning about behavior change and experiential education, I am also grateful to gain knowledge and experience in qualitative research. While I had done a research project as an undergraduate student in Michigan using a quantitative approach, I began graduate school with no experience using qualitative research methods. This research project, along with other graduate school coursework, helped me learn thematic analysis and learn about other qualitative methods as well. I also have gained an appreciation of qualitative research that I did not have before graduate school. I have realized how valuable qualitative approaches can be, especially through this research project as I gained a deeper understanding of participants' experience from the qualitative interviews than I did from the quantitative surveys. While I have much to learn in both qualitative and quantitative approaches, I appreciate the understanding and growth I have experienced in both, especially with qualitative methods.

Finally, I have realized the value of having supportive and collaborative people around me throughout this project. This project has reaffirmed for me that research does not need to always be completed in solitude, but benefits from multiple perspectives and teamwork. Some of my favorite parts of graduate school have been brainstorming with others about the topics, methods, and strategies for this research project, and doing this with others proved to be extremely beneficial. I could not have completed this project without my adviser, committee members, research associates, and others, and I am very grateful for their collaboration and support.

References

- Abel, M. Cole, S., & Zia, B. (2021). Changing gambling behavior through experiential learning. *The World Bank Economic Review*, 35(3), 745–763. <https://doi.org/10.1093/wber/lhaa016>
- Abdulwahed, M., & Nagy, Z. K. (2009). Applying Kolb's experiential learning for laboratory education. *Journal of Engineering Education*, 98(3), 283–294. <https://doi.org/10.1002/j.2168-9830.2009.tb01025.x>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Alam, A. (2022). Investigating sustainable education and positive psychology interventions in schools towards achievement of sustainable happiness and wellbeing for 21st century pedagogy and curriculum. *ECS Transactions*, 107(1), 19481–19494. <https://doi.org/10.1149/10701.19481ecst>
- Arango, C., Díaz-Caneja, C. M., McGorry, P. D., Rapoport, J., Sommer, I. E., Vorstman, J. A., McDaid, D., Marín, O., Serrano-Drozdowskyj, E., Freedman, R., & Carpenter, W. (2018). Preventive strategies for mental health. *The Lancet Psychiatry*, 5(7), 591–604. [https://doi.org/10.1016/S2215-0366\(18\)30057-9](https://doi.org/10.1016/S2215-0366(18)30057-9)
- Ardoin, N. M., & Bowers, A. W. (2020). Early childhood environmental education: A systematic review of the research literature. *Educational Research Review*, 31, 1-16. <https://doi:10.1016/j.edurev.2020.100353>
- American College Health Association. American College Health Association-National College Health Assessment III: Reference Group Executive Summary Fall 2021. Silver Spring, MD: American College Health Association; 2022.
- Astell-Burt, T., Feng, X., & Kolt, G. S. (2013). Mental health benefits of neighbourhood green space are stronger among physically active adults in middle-to-older age: Evidence from 260,061 Australians. *Preventive Medicine*, 57(5), 601–606. <https://doi.org/10.1016/j.ypmed.2013.08.017>

- Baker, M. A., Shane Robinson, J., & Kolb, D. A. (2012). Aligning Kolb's experiential learning theory with a comprehensive agricultural education model. *Journal of Agricultural Education*, 53(4), 1–16.
<https://doi.org/10.5032/jae.2012.04001>
- Bashir, A., Bashir, S., Rana, K., Lambert, P., & Vernallis, A. (2021). Post-COVID-19 adaptations; the shifts towards online learning, hybrid course delivery and the implications for biosciences courses in the higher education setting. *Frontiers in Education*, 6, 1-13.
<https://doi.org/10.3389/feduc.2021.711619>
- Becker, M. H. (1974) The Health Belief Model and Personal Health Behavior. *Health Education Monographs*, 2, 324–508. <https://doi.org/10.1177/109019817400200407>
- Berman, M. G., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., Kaplan, S., Sherdell, L., Gotlib, I. H., & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. *Journal of Affective Disorders*, 140(3), 300–305.
<https://doi.org/10.1016/j.jad.2012.03.012>
- Beyer, K. M., Kaltenbach, A., Szabo, A., Bogar, S., Nieto, F. J., & Malecki, K. M. (2014). Exposure to neighborhood green space and mental health: evidence from the survey of the health of Wisconsin. *International Journal of Environmental Research and Public Health*, 11(3), 3453–3472. <https://doi.org/10.3390/ijerph110303453>
- Blunsdon, B., Reed, K., McNeil, N., & McEachern, S. (2003). Experiential learning in social science theory: An investigation of the relationship between student enjoyment and learning. *Higher Education Research & Development*, 22(1), 43–56. <https://doi.org/10.1080/0729436032000056544>
- Bole Williams, B., Boyle, K., White, J. M., & Sinko, A. (2010). Children's Mental Health Promotion and Support: Strategies for Educators. *Helping Children at Home and School III*, 5(7), 1–4.
- Bratman, G. N., Anderson, C. B., Berman, M. G., Cochran, B., De Vries, J., Folke, C., Frumkin, H., Gross, J. J., Hartig, T., Kahn Jr., P. H., Kuo, M., Lawler, J. J., Levin, P. S., Lindahl, T., Meyer-Lindenberg, A.,

- Mitchell, R., Ouyang, Z., Roe, J., Scarlett, L., ... Daily, G. C. (2019). Nature and mental health: An ecosystem services perspective. *Science Advances* 5(7), 1–14.
<https://doi.org/10.1126/sciadv.aax0903>
- Bratman, G. N., Daily, G. C., Levy, B. J., & Gross, J. J. (2015). The benefits of nature experience: Improved affect and cognition. *Landscape and Urban Planning*, 138, 41–50.
<https://doi.org/10.1016/j.landurbplan.2015.02.005>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101.
- Brunwasser, S. M., Gillham, J. E., & Kim, E. S. (2009). A meta-analytic review of the Penn Resiliency Program's effect on depressive symptoms. *Journal of Consulting and Clinical Psychology*, 77(6), 1042–1054.
- Burch, G. F., Giambatista, R., Batchelor, J. H., Burch, J. J., Hoover, J. D., & Heller, N. A. (2019). A meta-analysis of the relationship between experiential learning and learning outcomes. *Decision Sciences Journal of Innovative Education*, 17(3), 239–273.
- Buzzelli, M., & Asafo-Adjei, E. (2023). Experiential learning and the university's host community: rapid growth, contested mission and policy challenge. *Higher Education* 85, 521–538.
<https://doi.org/10.1007/s10734-022-00849-1>
- Carey, R. N., Connell, L. E., Johnston, M., Rothman, A. J., de Bruin, M., Kelly, M. P., & Michie, S. (2019). Behavior change techniques and their mechanisms of action: A synthesis of links described in published intervention literature. *Annals of Behavioral Medicine*, 53(8), 693–707.
<https://doi.org/10.1093/abm/kay078>
- Charles, N. E., Strong S. J., Burns, L. C., Bullerjahn, M. R., & Serafine, K. M. (2021). Increased mood disorder symptoms, perceived stress, and alcohol use among college students during the COVID-19 pandemic. *Psychiatry Research*, 296, 1–11. <https://doi.org/10.1016/j.psychres.2021.113706>

- Cheung, M., & Delavega, E. (2014). Five-Way Experiential Learning Model for Social Work Education. *The International Journal of Social Work Education, 33*(8), 1070–1087.
<https://doi.org/10.1080/02615479.2014.925538>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396. <https://doi.org/10.2307/2136404>
- Cohen-Cline, H., Turkheimer, E., & Duncan, G. E. (2015). Access to green space, physical activity and mental health: a twin study. *Journal of Epidemiology and Community Health, 69*(6), 523–529.
<https://doi.org/10.1136/jech-2014-204667>
- Collado, S., Corraliza, J. A., Staats, H., & Ruiz, M. (2015). Effect of frequency and mode of contact with nature on children’s self-reported ecological behaviors. *Journal of Environmental Psychology, 41*, 65–73. <https://doi.org/10.1016/j.jenvp.2014.11.001>
- Crnic, M., & Kondo, M. C. (2019). Nature Rx: Reemergence of pediatric nature-based therapeutic programs from the late 19th and early 20th centuries. *American Journal of Public Health, 109*(10), 1371–1378. <https://doi.org/10.2105/AJPH.2019.305204>
- Cutler, D. M. (2004). Behavioral health interventions: What works and why? In N. B. Anderson, R. A. Bulatao, & B. Cohen (Eds.), *Critical Perspectives on Racial and Ethnic Differences in Health in Late Life*. National Academies Press.
- de Vries, S., Ten Have, M., van Dorsselaer, S., van Wezep, M., Hermans, T., & de Graaf, R. (2016). Local availability of green and blue space and prevalence of common mental disorders in the Netherlands. *BJPsych Open, 2*(6), 366–372. <https://doi.org/10.1192/bjpo.bp.115.002469>
- Dewey, J. (1938). *Experience and Education*. Kappa Delta Pi.
- di Carmine, F., & Berto, R. (2020). Contact with nature can help ADHD children to cope with their symptoms. The state of the evidence and future directions for research. *Visions for Sustainability, 15*, 24–33. <https://doi.org/10.13135/2384-8677/4883>

- Djernis, D., Lerstrup, I., Poulsen, D., Stigsdotter, U., Dahlgaard, J., & O'Toole, M. (2019). A Systematic Review and Meta-Analysis of Nature-Based Mindfulness: Effects of Moving Mindfulness Training into an Outdoor Natural Setting. *International Journal of Environmental Research and Public Health*, *16*(17), 1–19. <https://doi.org/10.3390/ijerph16173202>
- Duffy, A., Saunders, K. E. A., Malhi, G. S., Patten, S., Cipriani, A., McNevin, S. H., MacDonald, E., & Geddes, J. (2019). Mental health care for university students: A way forward? *The Lancet Psychiatry*, *6*(11), 885–887. [https://doi.org/10.1016/S2215-0366\(19\)30275-5](https://doi.org/10.1016/S2215-0366(19)30275-5)
- Fernandes, D., Lynch Jr, J. G., & Netemeyer, R. G. (2014). Financial literacy, financial education, and downstream financial behaviors. *Management Science*, *60*(8), 1861–1883.
- Flatt, A. K. (2013). A Suffering Generation: Six factors contributing to the mental health crisis in North American higher education. *College Quarterly*, *16*(1), 1–17.
- Frumkin, H., Bratman, G. N., Breslow, S. J., Cochran, B., Kahn Jr., P. H., Lawler, J. J., Levin, P. S., Tandon, P. S., Varanasi, U., Wolf, K. L., & Wood, S. A. (2017). Nature contact and human health: A research agenda. *Environmental Health Perspectives*, *125*(7), 1–18. <https://doi.org/10.1289/EHP1663>
- Gavillet, R. (2018). Experiential learning and its impact on college students. *Texas Education Review*, *7*(1), 140–149. <http://doi.org/10.26153/tsw/21>
- Gillham, J. E., Reivich, K. J., Jaycox, L. H., Seligman, M. E. P. (1995). Prevention of depressive symptoms in schoolchildren: Two year follow up. *Psychological Science*, *6*(6), 343–462.
- Graça, J., Godinho, C. A., Truninger, M. (2019). Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions. *Trends in Food Science & Technology*, *91*, 380–390. <https://doi.org/10.1016/j.tifs.2019.07.046>

- Griffith, J., & West, C. (2013). Master resilience training and its relationship to individual well-being and stress buffering among army national guard soldiers. *The Journal of Behavioral Health Services & Research, 40*, 140–155. <https://doi.org/10.1007/s11414-013-9320-8>
- Guppy, N., Verpoorten, D., Boud, D., Lin, L., Tai, J., & Bartolic, S. (2022). The post-COVID-19 future of digital learning in higher education: Views from educators, students, and other professionals in six countries. *British Journal of Educational Technology, 53*, 1750– 1765. <https://doi.org.ezproxy2.library.colostate.edu/10.1111/bjet.13212>
- Hammen, D. (2005). Stress and depression. *Annual Review of Clinical Psychology, 1*, 293–319. <https://doi.org/10.1146/annurev.clinpsy.1.102803.143938>
- Hawtrey, K. (2007). Using Experiential Learning Techniques. *The Journal of Economic Education, 38*(2), 143–152. <https://doi.org/10.3200/JECE.38.2.143-152>
- Houge Mackenzie, S., Son, J., S., & Hollenhorst, S. (2014). Unifying psychology and experiential education: Toward an integrated understanding of why it works. *Journal of Experiential Education, 37*(1), 75–88. <https://doi.org/10.1177/1053825913518894>
- Hunter, M. R., Gillespie, B. W., & Yu-Pu Chen, S. (2019). Urban nature experiences reduce stress in the context of daily life based on salivary biomarkers. *Frontiers in Psychology, 10*, 1–16. <https://doi.org/10.3389/fpsyg.2019.00722>
- Keeton, M. T., & Tate, P. J. (1978). *Learning by experience: What, why, how*. Jossey-Bass.
- Kobau, R., Seligman, M. E.P., Peterson, C., Diener, E., Zack, M. M., Chapman, D., & Thompson, W. (2011). Mental health promotion in public health: Perspectives and strategies from positive psychology. *American Journal of Public Health, 101*(8), 1–9. <https://doi.org/10.2105/AJPH.2010.300083>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

- Kondo M. C., Jacoby S. F., South E. C. (2018). Does Spending Time Outdoors Reduce Stress? A Review of Real-Time Stress Response to Outdoor Environments. *Health Place, 51*, 136–150.
<https://doi.org/10.1016/j.healthplace.2018.03.001>
- Kondo, M. C., Oyekanmi, K. O., Gibson, A., South, E. C., Bocarro, J., & Hipp, J. A. (2020). Nature prescriptions for health: A review of evidence and research opportunities. *International Journal of Environmental Research and Public Health, 17*(4213), 1–16.
<https://doi.org/10.3390/ijerph17124213>
- Kuo, F. E., & Taylor, A. F. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: evidence from a national study. *American Journal of Public Health, 94*(9), 1580–1586.
<https://doi.org/10.2105/ajph.94.9.1580>
- Lewis, L. H., & Williams, C. J. (1994). Experiential learning: Past and present. *New Directions for Adult and Continuing Education, 1994*(62), 5–16. <https://doi.org/10.1002/ace.36719946203>
- Liang, J., & Fu, Y. (2016). Otter.ai. [Computer Software]. Otter.ai.
- Lipson, S. K., Lattie, E. G., & Eisenberg, D. (2019). Increased rates of mental health service utilization by U.S. college students: 10-year population-level trends (2007–2017). *Psychiatric services, 70*(1), 61–63. <https://doi.org/10.1176/appi.ps.201800332>
- Lipson, S. K., Zhou, S., Abelson, S., Heinze, J., Jirsa, M., Morigney, J., Patterson, A., Singh, M., & Eisenberg, D. (2022). Trends college student mental health and help-seeking by race/ethnicity: Findings from the national healthy minds study, 2013–2021. *Journal of Affective Disorders, 306*, 138–147. <https://doi.org/10.1016/j.jad.2022.03.038>
- Meredith, G. R., Rakow, D. A., Eldermire, E. R. B., Madsen, C. G., Shelley, S. P., & Sachs, N. A. (2020). Minimum time dose in nature to positively impact the mental health of college-aged students, and how to measure it: A scoping review. *Frontiers in Psychology, 10*, 1–16.
<https://doi:10.3389/fpsyg.2019.02942>

- Michie, S., van Stralen, M. M., West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(42), 1–11. <https://doi.org/10.1186/1748-5908-6-42>
- Moeller, C., King, N., Burr, V., Gibbs, G. R., & Gomersall, T. (2018). Nature-based interventions in institutional and organisational settings: A scoping review. *International Journal of Environmental Health Research*, 28(3), 293–305. <https://doi.org/10.1080/09603123.2018.1468425>
- Moon, K., Brewer, T. D., Januchowski-Hartley, S. R., Adams, V. M., & Blackman, D. A. (2016). A guideline to improve qualitative social science publishing in ecology and conservation journals. *Ecology and Society*, 21(3). <https://doi.org/10.5751/ES-08663-210317>
- Morris, T. H. (2020) Experiential learning – a systematic review and revision of Kolb’s model. *Interactive Learning Environments*, 28(8), 1064–1077. <https://doi.org/10.1080/10494820.2019.1570279>
- Miller, M., Godfrey, N., Levesque, B., & Stark, E. (2014). *The case for financial literacy in developing countries: Promoting access to finance by empowering consumers*. World Bank.
- Mittelstaedt, R., Sanker, L., & VanderVeer, B. (1999). Impact of a week-long experiential education program on environmental attitude and awareness. *The Journal of Experiential Education*, 22(3), 138–148.
- Mygind, L., Kjeldsted, E., Hartmeyer, R., Mygind, E., Bolling, M., & Bensten, P. (2019). Mental, physical and social health benefits of immersive nature-experience for children and adolescents: A systematic review and quality assessment of the evidence. *Health & Place*, 58, 1–19. <https://doi.org/10.1016/j.healthplace.2019.05.014>
- Neuwirth, L. S., Jović, S., & Mukherji, B. R. (2021). Reimagining higher education during and post-COVID-19: Challenges and opportunities. *Journal of Adult and Continuing Education*, 27(2), 141-156.

- Norwood, M.F., Lakhani, A., Fullagar, S., Maujean, A., Downes, M., Byrne, J., Stewart, A., Barber, B., & Kendall, E. (2019). A narrative and systematic review of the behavioural, cognitive and emotional effects of passive nature exposure on young people: Evidence for prescribing change. *Landscape and Urban Planning*, *189*, 71-79. <https://doi.org/10.1016/j.landurbplan.2019.04.007>
- Ncanywa T., Magadana, Z., Matolengwe L.G., Landu M.C , Somfongo, K., Buqa N. & Nontiya, L. (2022). Perspectives in Adopting a Practical and Technology-Integrated Approach in the Teaching and Learning of Commercial Courses in the Post-COVID- 19 era in Higher Education. *E-Journal of Humanities, Arts and Social Sciences* 3(11), 36-50. <https://doi.org/10.38159/ehass.2022sp3114>
- O'Brien, L. (2009). Learning outdoors: The forest school approach. *Education*, *37*(1), 45–60. <https://doi.org/10.1080/03004270802291798>
- O'Brien, L., Burls, A., Townsend, M., & Ebden, M. (2011). Volunteering in nature as a way of enabling people to reintegrate into society. *Perspectives in Public Health*, *131*(2), 71–81. <https://doi.org/10.1177/1757913910384048>
- Orban, E., Sutcliffe, R., Dragano, N., Jöckel, K. H., & Moebus, S. (2017). Residential Surrounding Greenness, Self-Rated Health and Interrelations with Aspects of Neighborhood Environment and Social Relations. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *94*(2), 158–169. <https://doi.org/10.1007/s11524-016-0112-3>
- Oswald, T. K., Rumbold, A. R., Kedzior, S. G. E., & Moore, V. M., (2020). Psychological impacts of "screen time" and "green time" for children and adolescents: A systematic scoping review. *PLOS ONE*, *15*(9), 1-52.
- Owens, M. & Bunce, H. L. I. (2022). The potential for outdoor nature-based interventions in the treatment and prevention of depression. *Frontiers in Psychology*, *13*, 1–14. <https://doi.org/10.3389/fpsyg.2022.740210>

- Petkus Jr., E. (2000). A theoretical and practical framework for service-learning in marketing: Kolb's experiential learning cycle. *Journal of Marketing Education*, 22(1), 64–70.
- Pichler, C., Freidl, J., Bischof, M., Kiem, M., Weisböck-Erdheim, R., Huber, D., Squarra, G., Murschetz, P., & Hartl, A. (2022). Mountain Hiking vs. Forest Therapy: A Study Protocol of Novel Types of Nature-Based Intervention. *International Journal of Environmental Research and Public Health*, 19(7), 1–17. <https://doi.org/10.3390/ijerph19073888>
- Prince, H. E., (2021). The lasting impacts of outdoor adventure residential experiences on young people. *Journal of Adventure Education and Outdoor Learning*, 21(3), 261–276. <https://doi:10.1080/14729679.2020.1784764>
- Qualters, D. M. (Ed.). (2010). *Experiential education: Making the most of learning outside the classroom*. Wiley.
- Rakow, D. A., & Eells, G. T. (2019). *Nature Rx: Improving college-student mental health*. Cornell University Press.
- Razani, N., Morshed, S., Kohn, M. A., Wells, N. M., Thompson, D., Alqassari, M., Agodi, A., & Rutherford, G. W. (2018). Effect of park prescriptions with and without group visits to parks on stress reduction in low-income parents: SHINE randomized trial. *PLoS ONE*, 13(2), 1–17. <https://doi.org/10.1371/journal.pone.0192921>
- Razani, N., Niknam, K., Wells, N. M., Thompson, D., Hills, N. K., Kennedy, G., Gilgoff, R. Rutherford, G. W. (2019). Clinic and park partnerships for childhood resilience: A prospective study of park prescriptions. *Health Place*, 57, 179–185. <https://doi.org/10.1016/j.healthplace.2019.04.008>
- Rhodes, H. M., & Martin, A. J. (2014). Behavior change after adventure education courses: Do work colleagues notice? *Journal of Experiential Education*, 37(3), 265–284. <https://doi.org/10.1177/1053825913503115>

- Sahlin, E., Ahlborg Jr., G., Matuszczyk, J. V., & Grahn, P. (2014). Nature-based stress management course for individuals at risk of adverse health effects from work-related stress—Effects on stress related symptoms, workability, and sick leave. *International Journal of Environmental Research and Public Health*, *11*, 6586–6611. <https://doi.org/10.3390/ijerph110606586>
- Sahlin, E., Johansson, B., Karlsson, P-O, Loberg, J., Niklasson, M., & Grahn, P. (2019). Improved wellbeing for both caretakers and users from a zoo-related nature based intervention— A study at Nordens Ark Zoo, Sweden. *International Journal of Environmental Research and Public Health*, *16*(24), 1–23. <https://doi.org/10.3390/ijerph16244929>
- Sato, A., & de Haan, J. (2016). Applying an experiential learning model to the teaching of gateway strategy board games. *International Journal of Instruction*, *9*(1), 3-16.
- Seligman, M. E. P. (2006). *Learned optimism: How to change your mind and your life*. Knopf Doubleday Publishing Group.
- Seligman, M. E. P., Ernst, R. M., Gillham, J., Reivich, K., & Linkins, M. (2009). Positive education: Positive psychology and classroom interventions. *Oxford Review of Education*, *35*(3), 293–311.
- Shanahan, D., Astell–Burt, T., Barber, E., Brymer, E., Cox, D., Dean, J., Depledge, M., Fuller, R., Hartig, T., Irvine, K., Jones, A., Kikillus, H., Lovell, R., Mitchell, R., Niemelä, J., Nieuwenhuijsen, M., Pretty, J., Townsend, M., van Heezik, Y., ... Gaston, K. (2019). Nature–based interventions for improving health and wellbeing: The purpose, the people and the outcomes. *Sports*, *7*(6), 1–20. <https://doi.org/10.3390/sports7060141>
- Shanahan, D. F., Bush, R., Gaston, K. J., Lin, B. B., Dean, J., Barber, E., & Fuller, R. A. (2016). Health benefits from nature experiences depend on dose. *Scientific Reports*, *6*, 1–10. <https://doi.org/10.1038/srep28551>

- Shanahan, D. F., Fuller, R. A., Bush, R., Lin, B. B., Gaston, K. J. (2015). The health benefits of urban nature: How much do we need? *BioScience*, 65(5), 476–485.
<https://doi.org/10.1093/biosci/biv032>
- Shuda, Q., Bougoulias, M. E., & Kass, R. (2020). Effect of nature exposure on perceived and physiological stress: A systematic review. *Complementary Therapies in Medicine*, 53, 1–8.
<https://doi.org/10.1016/j.ctim.2020.102514>
- Siegner, A. B. (2018). Experiential climate change education: Challenges of conducting mixed-methods, interdisciplinary research in San Juan Islands, WA and Oakland, CA. *Energy Research & Social Science*, 45, 374–384. <https://doi.org/10.1016/j.erss.2018.06.023>
- Stamatis, C. A., Broos, H. C., Hudiburgh, S. E., Dale, S. K., & Timpano, K. R. (2022). A longitudinal investigation of COVID-19 pandemic experiences and mental health among university students. *British Journal of Clinical Psychology*, 61, 385–404. <https://doi.org/10.1111/bjc.12351>
- Stern, P. C., Dietz, T. A, Abel, T. D., Guagnan, G. A., & Kalof, L. (1999). A Value-Belief-Norm Theory of support for social movements: the case of environmentalism. *Human Ecology Review*, 6(2), 81–97.
- Stieger, S., Aichinger, I., & Swami, V. (2022) The impact of nature exposure on body image and happiness: An experience sampling study. *International Journal of Environmental Health Research*, 32(4), 870–884, <https://doi.org/10.1080/09603123.2020.1803805>
- Stockwell, S., Trott, M., Tully, M., Shin, J., Barnett, Y., Butler, L., McDermott, D., Schuch, F., & Smith, L. (2021). Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: A systematic review. *BMJ Open Sport & Exercise Medicine*; 7, 1–8.
<https://doi.org/10.1136/bmjsem-2020-000960>

Substance Abuse and Mental Health Services Administration. (2021). Prevention and treatment of anxiety, depression, and suicidal thoughts and behaviors among college students.

https://store.samhsa.gov/sites/default/files/SAMHSA_Digital_Download/PEP21-06-05-002.pdf

Taylor, G. W., Stumpos, M., L., Kerschbaum, W., Rohr Inglehart, M., & Habil, P. (2014). Educating dental students about diet-related behavior change: Does experiential learning work? *Journal of Dental Education*, 78(1), 64–74. <https://doi.org/10.1002/j.0022-0337.2014.78.1.tb05658.x>

Vujcic, M., Tomicevic-Dubljevic, J., Grbic, M., Lecic-Tosevski, D., Vukovic, O., & Toskovic, O. (2017). Nature based solution for improving mental health and well-being in urban areas. *Environmental Research*, 158, 385–392. <https://doi.org/10.1016/j.envres.2017.06.030>

West, R., Michie, S., Rubin, G. J., & Amlôt, R. (2020). Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour*, 4, 451–459.

<https://doi.org/10.1038/s41562-020-0887-9>

White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science*, 24(6), 920–928. <https://doi.org/10.1177/0956797612464659>

Williams, F. (2017). *The Nature Fix*. W. W. Norton.

Williams, L., & Sembiente, S. F. (2022). Experiential learning in U.S. undergraduate teacher preparation programs: A review of the literature. *Teaching and Teacher Education*, 112, 1–13.

<https://doi.org/10.1016/j.tate.2022.103630>

Xiao, H., Carney, D. M., Youn, S. J., Janis, R. A., Castonguay, L. G., Hayes, J. A., & Locke, B. D. 2017. Are we in crisis? National mental health and treatment trends in college counseling centers.

Psychological Services, 14(4), 407-415. <https://dx.doi.org/10.1037/ser0000130>

Younan, D., Tuvblad, C., Li, L., Wu, J., Lurmann, F., Franklin, M., Berhane, K., McConnell, R., Wu, A.H., Baker, L.A., & Chen, J-C. (2016). Environmental determinants of aggression in adolescents: Role

of urban neighborhood greenspace. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(7), 591-601. <https://doi.org/10.1016/j.jaac.2016.05.002>

Appendices

Appendix A – Cover Letter for Control Group

Appendix B - Recruitment Email Text for Participants in the Intervention Group

Appendix C - Interview Guide

Appendix D - Survey Instrument

Appendix A - Cover Letter for Control Group

Information Sheet to Participate in a Research Study

We are asking for CSU students to participate in a research study to help us better understand individual beliefs and behaviors related to spending time in nature as a well-being strategy. The outcomes of this research will help professionals and practitioners design programs and manage lands to better meet the needs of individuals and contribute to healthy individuals and communities

If you choose to participate, you will be asked to take a survey three times, approximately six weeks in between each survey administration. The survey will ask about your use of and motivations to use natural spaces and will take approximately 10 minutes to complete. Your answers will be kept strictly confidential.

Your participation in this research is voluntary. There are no known risks in participating in this research other than a possible loss of confidentiality. You will not directly benefit from your participation.

Participants will receive a \$10 gift card for their participation. If you decide to participate, you may withdraw your consent and stop participating at any time without penalty.

Final results will be available in Summer 2023, and available to you if you interested; you can contact us at one of the email addresses below. If you have any questions or concerns about your rights as a participant, please call the Research Integrity and Compliance Review Office at Colorado State University at (970) 491-1655.

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Appendix B - Recruitment Email Text for Participants in the Intervention Group

DEAR CSU Student,

My name is Dr. Sarah Walker and I am faculty member here at CSU in the Human Dimensions of Natural Resources in Warner College. I am working on a study focused on understanding the well-being benefits of time spent in nature. We are looking for students at CSU to participate in our study. Your participation would require filling in 3 short surveys during this summer and fall. You will \$10 gift card for your participation.

The goal of our research is to further the scientific evidence on using nature immersion as a strategy for supporting student well-being.

I've attached a information sheet with more details about the study. **If you would like to register, please sign up here:**

INSERT LINK HERE

Thanks,
Sarah

Appendix C - Interview Guide

Interview Prompts - Updated

Follow-up interviews with students from Nature and Well-being course

- 1) What were the biggest takeaways for you from the NRRT 280 course?
(ice-breaker question)
- 2) A. "When you reflect on this course, which of the experiences during the course influenced your learning about nature and well being the most?
B. "When you think about the course, which experiences during the course influenced your personal growth the most?
- 3) When you reflect about before and after the course, has the course led to any changes in how you *believe* nature can help manage your stress and well-being?
 - a) If so, how?
- 4) When you reflect on before and after the course, has the course led to any changes in how you spend time in nature for your well-being?
 - a) If so, how?
 - b) When have you seen the effects of this? (short-term, longer-term?)
- 5) From the data we collected in the surveys, we know that most students identified a shift in their motivation for going outside. While before the course, multiple students said they went outside to "clear their head" or "calm down," after the course, it appears students had more social reasons for going outside ("spending time with a friend, to stargaze with friends from NRRT 280"). Does this finding resonate with you? Why or why not?
 - a) Follow-up: if this does resonate with you, is your motivation still related to stress management? Is this just a more effective way?
- 6) From the data collected in the surveys, we also know that *types* of nature activities and *time spent in them* have also changed. While before the course students generally described nature experiences as short (20-45 minute) walks, a wide variety of activities were mentioned after the course (kayaking, stargazing, hammocking, simply sitting), and sometimes these were longer activities (2-3 hours). Does this finding resonate with you? Why or why not?

Reminders for interviews

- Questions are a checklist, not a script. Let interviewees drift around among the questions if that's the natural flow of their conversation
- Ask clarifying questions
- Paraphrase after: 'so what I heard you say is...'
- No assumptions about what they intended to mean (encoding = decoding)
- Mindful of body language, interjections, affirming comments ("yeah, I agree", or "that's a really good point")

Nature Immersion and Well-being Survey #1

Start of Block: Intro

Intro **Thanks for agreeing to participate in this study about beliefs and behaviors regarding spending time in nature as a well-being strategy!** The outcomes of this research will help professionals and practitioners design programs and manage lands to better meet the needs of individuals and contribute to healthy individuals and communities. If you have any questions about the research or your participation please contact either Dr. Sarah Walker (sewalker@colostate.edu) or Dr. Brett Bruyere (brett.bruyere@colostate.edu).

You will receive compensation for your participation at the end of the study in the form of a \$10 visa gift card. As a reminder, you will be asked to fill in 2 more short surveys (in addition to this one) over the course of the summer and fall semesters.

Study ID Study ID: Please type below **the last two digits of the year you were born** and **the last two digits of your phone number**. For example, if you were born in 1995 and your phone number is 970-889-6417, your study ID would be 9517. We'll use this four digit study ID to keep your data anonymous. Please remember this study ID for use on future surveys!

Page Break

Q98 What is your age?

Q96 Which of the following best describes your gender identity?

- Woman (1)
- Man (2)
- Non-binary (3)
- Prefer to self-describe (5) _____
- Prefer not to answer (4)

Q97 Which of the following racial or ethnic groups best describe you?

- American Indian or Alaskan Native (1)
- Asian / Pacific Islander (2)
- Black or African American (3)
- Hispanic (4)
- White / Caucasian (5)
- Prefer to self-describe (6) _____
- Prefer not to answer (7)

End of Block: Intro

Start of Block: Block 1 - Perceived Stress Scale

PSS Intro First we're going to ask you a few questions about your stress and well-being over the last two weeks.

Q1 In the last two weeks, how often have you been upset because of something that happened unexpectedly?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q2 In the last two weeks, how often have you felt that you were unable to control the important things in your life?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q3 In the last two weeks, how often have you felt nervous and stressed?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q4 In the last two weeks, how often have you felt confident about your ability to handle your personal problems?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q5 In the last two weeks, how often have you felt that things were going your way?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q6 In the last two weeks, how often have you found that you could not cope with all the things that you had to do?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q7 In the last two weeks, how often have you been able to control irritations in your life?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q8 In the last two weeks, how often have you felt that you were on top of things?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q9 In the last two weeks, how often have you been angered because of things that happened that were outside of your control?

- Never (1)
 - Almost Never (10)
 - Sometimes (11)
 - Fairly Often (12)
 - Very Often (5)
-

Q10 In the last two weeks, how often have you felt difficulties were piling up so high that you could not overcome them?

- Never (1)
- Almost Never (10)
- Sometimes (11)
- Fairly Often (12)
- Very Often (5)

End of Block: Block 1 - Perceived Stress Scale

Start of Block: Block 2 - Time Spent in Nature Intro

Q11 Next we're going to ask you about the time you've recently spent in nature.

Q12

Please take a moment to recall instances in the past two weeks when you were in nature for at least 15 minutes. Think green spaces - going for a walk by the trees counts and so does hiking in a state park!

Are you able to recall at least one instance of this?

Yes (3)

No (4)

Skip To: End of Survey If Please take a moment to recall instances in the past two weeks when you were in nature for at least 15 minutes. = No

Q13 Over the past two weeks, how many separate occasions did you spend at least 15 minutes in nature?

End of Block: Block 2 - Time Spent in Nature Intro

Start of Block: Nature Experience # 1

N1_1 Now we're going to ask you to reflect separately on each of the occasions you spent time in nature (up to 7). Think about your most recent experience and answer the following questions.

N1_2 What was the setting of this nature experience? (e.g., the setting was a county natural area)

N1_3 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

N1_4 What was your main reason for spending this time in nature? Please be specific.

N1_5 How long (in minutes) did you spend in this nature experience?

N1_6 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

N1_7 Were you with other people during this experience?

No, I was by myself (4)

Yes, I was with friends (5)

Yes, I was with family (6)

Yes, I was with my significant other (7)

Yes, I was with someone else (8)

N1_8 Can you recall another experience in nature over the last 2 weeks?

Yes (1)

No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience # 1

Start of Block: Nature Experience # 2

N2_2 What was the setting of this nature experience? (e.g., the setting was a county natural area)

N2_3 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

N2_4 What was your main reason for spending this time in nature? Please be specific.

N2_5 How long (in minutes) did you spend in this nature experience?

N2_6 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

N2_7 Were you with other people during this experience?

No, I was by myself (4)

Yes, I was with friends (5)

Yes, I was with family (6)

Yes, I was with my significant other (7)

Yes, I was with someone else (8)

N2_7 Can you recall another experience in nature over the last 2 weeks?

Yes (1)

No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience # 2

Start of Block: Nature Experience #3

Q55 What was the setting of this nature experience? (e.g., the setting was a county natural area)

Q56 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

Q57 What was your main reason for spending this time in nature? Please be specific.

Q58 How long (in minutes) did you spend in this nature experience?

Q59 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

Q60 Were you with other people during this experience?

- No, I was by myself (4)
 - Yes, I was with friends (5)
 - Yes, I was with family (6)
 - Yes, I was with my significant other (7)
 - Yes, I was with someone else (8)
-

Q61 Can you recall another experience in nature over the last 2 weeks?

- Yes (1)
- No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience #3

Start of Block: Nature Experience #4

Q63 What was the setting of this nature experience? (e.g., the setting was a county natural area)

Q64 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

Q65 What was your main reason for spending this time in nature? Please be specific.

Q66 How long (in minutes) did you spend in this nature experience?

Q67 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

Q68 Were you with other people during this experience?

No, I was by myself (4)

Yes, I was with friends (5)

Yes, I was with family (6)

Yes, I was with my significant other (7)

Yes, I was with someone else (8)

Q69 Can you recall another experience in nature over the last 2 weeks?

Yes (1)

No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience #4

Start of Block: Nature Experience #5

Q71 What was the setting of this nature experience? (e.g., the setting was a county natural area)

Q72 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

Q73 What was your main reason for spending this time in nature? Please be specific.

Q74 How long (in minutes) did you spend in this nature experience?

Q75 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

Q76 Were you with other people during this experience?

No, I was by myself (4)

Yes, I was with friends (5)

Yes, I was with family (6)

Yes, I was with my significant other (7)

Yes, I was with someone else (8)

Q77 Can you recall another experience in nature over the last 2 weeks?

Yes (1)

No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience #5

Start of Block: Nature Experience #6

Q79 What was the setting of this nature experience? (e.g., the setting was a county natural area)

Q80 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

Q81 What was your main reason for spending this time in nature? Please be specific.

Q82 How long (in minutes) did you spend in this nature experience?

Q83 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

Q84 Were you with other people during this experience?

- No, I was by myself (4)
 - Yes, I was with friends (5)
 - Yes, I was with family (6)
 - Yes, I was with my significant other (7)
 - Yes, I was with someone else (8)
-

Q85 Can you recall another experience in nature over the last 2 weeks?

- Yes (1)
- No (2)

Skip To: End of Survey If Can you recall another experience in nature over the last 2 weeks? = No

End of Block: Nature Experience #6

Start of Block: Nature Experience #7

Q87 What was the setting of this nature experience? (e.g., the setting was a county natural area)

Q88 What was the type of activity of this nature experience? (e.g., going for a walk, sitting by the river etc.)

Q89 What was your main reason for spending this time in nature? Please be specific.

Q90 How long (in minutes) did you spend in this nature experience?

Q91 Approximately how far is this location from your home (in miles)? (e.g., 10 miles)

Q92 Were you with other people during this experience?

No, I was by myself (4)

Yes, I was with friends (5)

Yes, I was with family (6)

Yes, I was with my significant other (7)

Yes, I was with someone else (8)

End of Block: Nature Experience #7

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even though NBIs have been shown to have efficacy in the treatment of various mental health conditions in some contexts (Moeller et al., 2018; Sahlin et al., 2019; Shanahan et al., 2019; Razani et al., 2018; Razani et al., 2019)

Experiential education has been growing rapidly in higher education and elsewhere, including in STEM disciplines (Buzzelli & Asafo-Adjei, 2023) and other areas (Gavillet, 2018).