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Best Practices for Including Students with Autism, Disabilities, and Special Needs in Environmental Education

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Best Practices for Including Students with Autism, Disabilities, and Special Needs in Environmental Education

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Abstract

There have been numerous studies conducted on the benefits of outdoor and environmental education for students with special needs, but there have been very few studies on how to include students with special needs in these education types. This study attempted to answer the question “What are the best practices for including children with special needs, autism, and disabilities in environmental education?” This research was completed for Thorne Nature Experience in hopes that it could benefit students with special needs at other outdoor and environmental education facilities in the future.

The data collection for this research included interviews and observation. These methods were approved by the Institutional Review Board at the University of Colorado. Eleven people were interviewed, including eight volunteers and staff members from Thorne Nature Experience and three people from other environmental education organizations. Preliminary observation data were gathered in September at the field trip program operated by Thorne Nature Experience at the Sombrero Marsh location in Boulder. In February, an after-school program at a local Boulder elementary school was observed.

The interviews and observations revealed that there are numerous ways to better include students with special needs. If a program has sufficient resources, a separate, more unstructured class should be offered for students with special needs. Instructors should receive advance notice of any students with special needs attending a program. If an inclusiveness problem arises, the instructor should involve all the students in creating a solution. Activities should be team-oriented for students, and open-ended questions should be asked.
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Preface

I would like to thank my primary advisor Heidi Souder for her continued recommendations, edits, and encouragement throughout the entire process. Her constant support, quick replies to emails, and positive attitude made the process so much easier.

I would like to thank the other two members of my thesis committee including Dale Miller and Diana Oliveras. My weekly meetings with Dale kept me on track and motivated, and he was a great guide throughout the process of writing a thesis. Diana Oliveras joined my committee toward the end of the process, but she showed enthusiasm for my project and provided useful edits on my paper.

I would also like to thank Corrie Colvin Williams for helping me with whatever I needed during the year. She provided editorial support and valuable resources on whatever topic I needed.

Thorne Nature Experience provided me with support throughout my research, and made it easy to find interview participants and collect observation data. Angela Myers was my main contact, and I would like to thank her in particular.

This research wouldn’t have been possible without the interview participants, so I would like to thank them for taking the time to talk with me and share their experiences and knowledge.
Introduction

The benefits of physical activity, especially outdoor activity for students with special needs has become a subject of much research recently. There has also been a great deal of research on special needs students within the public school system. However, one area that has not been looked at in depth is how to include these special needs students in outdoor education (Bialeschki, 1981). Environmental and outdoor education can be very beneficial for students, including those with special needs. It is critical that all students are included in these opportunities.

This research study addressed the question “What are the best practices for including children with special needs, autism, and disabilities in environmental education?” Thorne Nature Experience (Colorado, USA) was founded in 1954 and is an environmentally focused non-profit that works in the Boulder and Littleton areas to connect children to nature. Thorne Nature Experience strives to make its programs accessible and enjoyable for all populations, and this research is working to inform their inclusiveness plan. These best practices were developed specifically for Thorne Nature Experience in hopes that they can eventually be applied to students with special needs at other outdoor and environmental education organizations.

Research methods for the study included interviews with instructors from Thorne Nature Experience and other environmental education organizations, and observation data collected from programs run by Thorne Nature Experience. The interviews were conducted with staff at Thorne Nature Experience and other professionals who have experience working in the
environmental education field or with students with special needs. Observations were collected at programs run by Thorne Nature Experience to better understand the curriculum, see how instructors taught, and to evaluate where these best practices could be implemented.
Background

The Difference Between Environmental and Outdoor Education

Environmental education and outdoor education have numerous qualities in common, but they are in fact two separate entities. Outdoor education has its roots in camping and survival education, but has broadened to include a wide range of outdoor experiences (Adkins and Simmons, 2002). Peter Smith stated that outdoor education allows students to be involved in their own learning process through first-hand experiences that promote personal growth and education, and a greater understanding of certain subjects (Smith, 1987). According to some experts, environmental education became a separate entity in 1969 with the publishing of the “Journal of Environmental Education” (Adkins and Simmons, 2002). Environmental education uses similar practices as outdoor education, but focuses more on the relationship between people and their surroundings, and an understanding of the problems facing the environment (Smith, 1987). In the 2015 report from the National Environmental Education Advisory Council (NEEAC), environmental education is defined as

the use of a diverse range of activities to teach individuals of all ages and backgrounds, as well as communities of varying scales, to explore their environments, engage in critical thinking and problem solving, and make informed decisions about how to use and conserve resources and environments (National Environmental Education Advisory Council, 2015).

Environmental education can be found in formal education settings, “out-of-school environments” such as nature centers, and learning in day-to-day activities (National Environmental Education Advisory Council, 2015). Thorne Nature Experience considers itself
an environmental education organization, but these best practices could be implemented in environmental and outdoor education settings.

History of Environmental Education

Environmental education has existed for a long time. Since the 1700s, educators have understood the importance of the outdoors in education (McCrea, 2006). The first published account recognizing the need for the environment in education was in the Hadow Report in 1926. This document discussed the importance of studying subjects such as science, history, and geography in outdoor settings (Smith, 1987). The Norwood Report in 1943 stated the necessity of connecting children with natural features such as oceans and mountains (Smith, 1987). In 1945, the Field Studies Council was created in the United Kingdom, and it was one of the first organizations to promote first-hand experiences in the environment (Smith, 1987). This organization is still an important entity in the environmental education field today. The Field Studies Council promotes an understanding and love for the environment through multiple outlets including research projects, outdoor classes and natural history courses, and professional development opportunities for environmental educators (Field Studies Council). “The Journal of Environmental Education” was first published in 1969 and helped environmental education become a separate entity from other forms of education (Adkins and Simmons, 2002). Another significant event in the history of environmental education was the National Environmental Education Act in 1970. This act was passed to increase environmental literacy in the United States (Adkins and Simmons, 2002). According to some environmental educators, environmental education truly began with the Belgrade Charter in 1976, which indicated
The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (Adkins and Simmons, 2002).

A few years later, in 1977, the Tbilisi Declaration was adopted by the first Intergovernmental Conference on Environmental Education (Adkins and Simmons, 2002). This declaration expanded on the Belgrade Charter and sought to help people understand their environments, and provide them with the skills necessary to solve and mitigate environmental problems (Adkins and Simmons, 2002).

In recent years, children in the western world have been spending far less time outdoors because of advances in technology, more protective parenting, and change in school policies that have cultivated an environment that disconnects children from the outdoors (Moore, 1997). Richard Louv, author of *Last Child in the Woods* (2005) refers to this phenomenon as nature deficit disorder. This disorder can have serious implications for children’s mental and physical health and may limit their knowledge of their surrounding environments. To counteract this, many outdoor environmental education centers have been working to reconnect children with nature through outdoor-based learning experiences. This type of education can be successful for all students because it combines enjoyable outdoor activity with education about the environment. In a world where our environment is being threatened by human-caused pollution, development, and climate change, environmental education is critical. People of future generations will have
to face multiple environmental problems, and environmental education can equip them with the knowledge they need to address these issues.

**Thorne Nature Experience**

Thorne Ecological Institute of Colorado was founded in 1954 by Dr. Oakleigh Thorne. The institute is now called Thorne Nature Experience, and it is classified as an environmentally focused non-profit organization. It was one of the first environmental organizations of its kind in Colorado, and since its creation it has connected 250,000 children and adults to nature. (Thorne Nature Experience, 2015). Thorne Nature Experience has two locations, one on Sombrero Marsh in Boulder and the other at Waterton Canyon in Littleton. Sombrero Marsh and its associated programs were the focus of this study.

Thorne Nature Experience has a variety of courses to reach youth in the Boulder and Littleton areas. It runs a camp each summer, operates field trips for Boulder Valley School District at their Sombrero Marsh location, and it has an in-school and an after-school program. The first summer camp at Thorne Nature Experience occurred in 1957. There are a variety of classes offered during summer camp for children ranging from three years old to 15 years old. The field trip program started in 1999 and is offered to fourth-grade-students in Boulder Valley School District. The students go to Sombrero Marsh for the day to learn about birds, wetlands, plants, and water pollution. The in-school program consists of three visits from Thorne Nature Experience staff members to schools surrounding the facilities in Boulder and Littleton with a focus on low-income and low-scoring schools. The curriculum varies but always focuses on topics relating to science and nature. The after-school program offers students a chance to go
deeper into the subject of environmental science. This course is offered for two hours a week over a twelve-week period (Thorne Nature Experience, 2015).

Thorne Nature Experience is working on an inclusiveness plan to ensure that all the youth in Boulder County have the opportunity to participate in their education programs. This plan was developed in 2012 and implemented in 2013. (Thorne, 2012). The project targets low income and Latino populations in the area, but recently Thorne Nature Experience has recognized the need to include special needs students as well.

**Students with Special Needs**

The term “special needs” can have a variety of definitions. In this paper, the term “special needs” will refer to any student who needs extra support or attention due to a physical disability, disorders such as attention-deficit hyper-activity disorder (ADHD), autism spectrum disorder, or sensory processing disorders.

Autism spectrum disorder is a neurological developmental disorder that can disrupt thinking, speaking, emotions, and the ability to relate to others (American Psychiatric Association, no date). Autism is usually a life-long disorder, and it is detected when the individual is a child. One in 68 children are diagnosed, and boys are three to four times more likely to be diagnosed than girls (American Psychiatric Association, no date). Sensory processing disorder (SPD) causes sensory signals to get mixed so they don’t organize into the appropriate responses (SPD Foundation, no date). SPD can cause anxiety, depression, struggles in school, and motor skill problems (SPD Foundation, no date). Attention-deficit hyper-activity disorder (ADHD) affects
five percent of children and two-and-a-half percent of adults (American Psychiatric Association, no date). Symptoms of ADHD can include hyperactivity, inability to pay attention, and impulsive actions (American Psychiatric Association, no date).

Thorne Nature Experience doesn’t encounter many students with physical disabilities in any of their programs, although it occasionally has a student in a wheelchair on a field trip. It mainly has students with autism spectrum disorder, attention-deficit hyper-activity disorder, or sensory processing disorders.

Benefits of Outdoor Play and Education

Numerous studies have found that being outdoors, or even having views of the outdoors, can be beneficial for people’s well-being regardless of age. One article summarizes the research that has been conducted on the outdoors and well-being (Appendix A; Maller et al., 2006). When people use outdoor spaces, stress level reduction can be observed, as well as increased socialization (Munoz, 2009).

There are several benefits of outdoor activity and education for all children, including students with special needs (Farnham and Mutrie, 1997). Time spent outdoors can be therapeutic in some cases. Richard Louv says “several of these studies suggest that thoughtful exposure of youngsters to nature can even be a powerful form of therapy for attention-deficit disorders and other maladies” (2005). A study found that a walk in the park, as opposed to a city, helped students with ADHD concentrate (Taylor & Kuo, 2009).
In 1994, Ruth Wilson published an article titled on outdoor education and special education. She provided reasons for combining these two forms of education but did not give a comprehensive guide on how to actually integrate the two. She discussed that learning about the environment and being a steward can help teach children to care for themselves (Wilson, 1994). The goals of special education and outdoor education are very similar. Outdoor education and special education both take a holistic view to allow children to expand their developmental growth (Wilson, 1994). Outdoor education can also encourage a positive attitude about school and may increase student attendance (Wilson, 1994). By combining these two forms of education, students’ knowledge about the outdoors and their ability to be independent can drastically increase.

Mary Farnham and Nanette Mutrie conducted a study that looked at the potential benefits to children with special needs from participating in outdoor education (1997). They found that after a four-day outdoor program, students with special needs showed a decrease in anxiety, more self-confidence, and an increase in cohesion within the group (Farnham and Mutrie, 1997). Many of these students had physical disabilities and struggled with some of the activities, but they still were positive and worked hard (Farnham and Mutrie, 1997).

Typical classroom settings are not always the most learning arrangement for students with autism or special needs. Outdoor locations can allow students to excel in ways they normally do not when learning in a classroom. Being outdoors can lead to increased confidence, motivation, and positive attitudes toward learning (Cooper, 2012). One mother noticed that her dyslexic daughter was on the same level as the other students when playing in the woods, while the child
was normally at a different level in the classroom. This girl struggled to keep pace with her classmates when completing normal classroom assignments, but excelled at activities and challenges outside (Chawla et al., 2014).

**Current Special Education Practices**

Farnham and Mutrie’s study on the benefits of outdoor education for special needs students also discussed useful models for outdoor programs. They state that

the less-vigorous and more interactive style of outdoor programmes are considered useful for individuals with special needs as they promote learning, via the experiential cycle, about communication skills, group work and individual achievement (Farnham and Mutrie, 1997).

Kolb created a four-step model that is useful for students with special needs (1992). The four steps are 1. The actual outdoor activity 2. Talking about and analyzing the activity 3. Discussing why certain parts of the activity were hard and how this was overcome and 4. Creating a context for why this activity is relevant for everyday life (Kolb, 1992). Shortened, this model is Do, Review, Think, Apply (Figure 1, Kolb, 1992).

![Kolb's Learning Model](image)

Figure 1. The learning model developed by Kolb to help students with special needs (1992).
Bialeschki’s (1981) work on the environmental education needs of special populations evaluated how Minnesota’s Department of National Resources could make their programs and parks more accessible for all people. She noted that educators often view their students as similar in age, beliefs, and abilities. It is important that educators create programs that are relevant and accessible for people from different backgrounds and avoid focusing on just one specific population (Bialeschki, 1981).

Students with special needs often receive aid in traditional classrooms through an instructional assistant. One study found that teachers did not see the education of the child with an aide as their responsibility, and that it was the aide’s duty to teach that child (Giangreco et al., 1997). Students with aides are sometimes asked to skip school if their aide cannot be present because the teachers do not feel comfortable taking responsibility of that child (Giangreco et al., 1997). This practice could put students with special needs at a severe disadvantage if they are not getting direct attention from the teacher, and they are missing school when their aide cannot be present.

A few strategies have been developed to decrease student dependency on an aide. Other students in the classroom can be a valuable resource. A classroom observation study found that children will often help the special needs student when the assistant steps away (Giangreco et al., 1997). Such behavior is beneficial for the special needs students because these students are learning and having social interactions with others their age. It is also valuable for the other children because it allows them to better understand the material and gain experience teaching. Instead of having
an aide with the student at all times, the aide could interact with the whole class and help the special needs students only when needed (Giangreco et al., 1997). An additional strategy is to create an activity schedule that shows students everything they need to do that day with prompts to encourage them to complete these activities (Milley & Machalicek, 2012). This strategy allows students more independence in moving from activity to activity and can reduce dependence on an aide overall.

The Colorado Alliance for Environmental Education created a document for educators leading hikes and activities for people using wheelchairs. Strenuous activities such as hikes aren’t always accessible for those with physical disabilities, and this document provides criteria for trails usable by wheelchairs such as acceptable slope, surface type, and width (Colorado Alliance for Environmental Education, no date). The document also lists educational outdoor activities for students using a wheelchair. A picture of the trail descriptions and the example activities can be found in Appendices B and C respectively. For the full document, follow the link in the bibliography (Colorado Alliance for Environmental Education, no date).

There are currently a number of organizations that specialize in outdoor activities and education for those with special needs. These organizations can be found in Colorado and across the nation. These programs include EXPAND in Boulder (City of Boulder Colorado, no date), the Breckenridge Outdoor Education Center (Breckenridge Outdoor Education Center, no date), and Wilderness Inquiry (Wilderness Inquiry, no date). Children tend to play with children who play similarly to themselves (Rubin et al., 1994), so such programs can be valuable options for students with special needs.
These strategies could be useful when integrated into environmental education. Student aides could work with the entire classroom and assist students with special needs only when necessary to foster inclusion and team work. Environmental education programs should be developed with a diverse population in mind so every participant can be included. Kolb’s model can be used to analyze the outdoor experience and understand how it applies to daily life (Kolb, 1992). When these approaches are combined with the results from this study, comprehensive best practices for students with special needs can be created for Thorne Nature Experience, and for other environmental and outdoor education facilities.
Methods

Collection Methods

Data were collected by conducting interviews of staff and volunteers at Thorne Nature Experience and other environmental education facilities, and observing programs run by Thorne Nature Experience. These two methods were chosen because when combined, they provide a comprehensive approach to creating the best practices to include students with special needs. The Institutional Review Board at the University of Colorado approved both the interview and observation aspects of this research. All observation and interview data was kept anonymous to protect the privacy of everyone involved in the study.

Interviews

Eleven people were interviewed, including eight volunteers and staff members from Thorne Nature Experience and three instructors from other environmental and outdoor education facilities. The participants at Thorne Nature Experience were chosen based on recommendations from a contact at this organization. The instructors from other organizations were already known by the researcher, and their past experiences were relevant to this study. Participants interviewed from Thorne Nature Experience included new interns, volunteers, and staff members who had been there for multiple years. The different subjects provided a variety of perspectives. Educators and other professionals involved in the outdoor environmental education field were interviewed about their experiences working with students with special needs. The interview questions for staff and volunteers from Thorne Nature Experience and for professionals from other organizations are located in Appendix D and Appendix E respectively.
Observation

Preliminary observations were collected at the Sombrero Marsh field trip program in September of 2015 in Boulder. The other observation data were collected at the after school program conducted by Thorne Nature Experience. The after-school program was observed for one day in February of 2016. These observations were used to further understand Thorne Nature Experience’s programs and assess the problems of inclusiveness that Thorne Nature Experience was facing.
Results

Thorne Nature Experience Interview Findings

Who was Interviewed

Eight people from Thorne Nature Experience were interviewed. They had worked at Thorne Nature Experience from one month to more than three years (Figure 2). This range of experience allowed for different perspectives on training and teaching. Some of the subjects interviewed were staff members, while others were volunteers. These subjects worked on the after-school programs, the field trip program, and summer camp.

The subjects decided to work at Thorne Nature Experience for a variety of reasons. One subject stated that she wanted to learn more about Colorado flora and fauna. A few participants voiced the importance of connecting children to nature, and shared that Thorne Nature Experience did a good job of fostering this connection. There were a few subjects who wanted to gain experience in the environmental education field. A staff member used to work in public education, but decided that environmental education was a better fit. Another respondent used this position to decide if teaching elementary school was the right career.
Figure 2. This graph shows how long subjects worked or volunteered with Thorne Nature Experience.

**Training**

Respondents were asked what types of training they received at Thorne Nature Experience. There are different levels of training depending on the position an employee holds at Thorne Nature Experience. Interns receive a packet and a short training and learn by shadowing other instructors, while full-time staff members receive more extensive instruction. One volunteer didn’t receive training, but learned by watching the instructors. This volunteer also shared that a lot was learned from a supervisor through observation. An instructor at the field trip program who also helped at the after-school program stated that she received training on how to teach the classes and felt sufficiently prepared to lead small groups of children. Another volunteer stated that her training was short but provided her with all the information needed to instruct courses.

All subjects stated that none of these trainings included a specific section relating to students with special needs. One interviewee reported that staff members want to include all students, and they desire a program that train them to work with students with differing abilities. The
support staff member at Thorne Nature Experience had prior training to work with special needs students because this person is pursuing a career in occupational therapy.

**Students with Special Needs at Thorne Nature Experience**

Participants were asked questions about their experiences with students with special needs while working at Thorne Nature Experience. Their responses are shared in this section.

Thorne Nature Experience currently has two staff members who become involved when there is a student in a program who needs extra support. They assist the instructor by joining the program and addressing the child’s needs. These two staff members also teach the instructor how to work with the child.

One participant who had a student with special needs in the program said that extra attention was given to this child instead of spreading the attention across all of the students. There was a second student with special needs in another program who had an aide. The interviewee said that the aide was very helpful and allowed for the program to run smoothly. A different interviewee had a similar response, stating that if there is no extra support for a student with special needs, there can be complications, especially if instructor doesn’t have experience working with this population of students.

Another interviewee shared that students with certain special needs can get fixated on a specific subject such as insects, and could talk about that subject throughout all of camp.
Inclusiveness

Several questions related to inclusiveness in environmental education at Thorne Nature Experience and in general were asked. This section summarizes these responses.

One subject stated that having an instructor and an assistant made it possible for every child to participate and be included.

There was an instructor who never had a student with special needs in the class, but shared that it might be difficult for these students to engage with their peers in some of the programs. This subject also stated that students with special needs might not complete the activities as quickly as some of the other students.

A volunteer who ran the bird station at Sombrero Marsh stated that it would be difficult for students to participate in this program if the students could not proceed along the trail to the gazebo or be quiet to watch the birds.

The field trip at the Littleton location offers students the chance to go off trail. Once there was a student in a wheelchair who was not able to participate in this portion of the program. The same problem could arise at the Sombrero Marsh location in Boulder.

Another participant stated that many of these students, especially those with autism spectrum disorder or sensory processing disorders, don’t want to be included. They enjoy less structured play away from the group where they can explore on their own. Students with sensory processing disorder can get overwhelmed by large groups.

Thorne Nature Experience works with classroom teachers for the field trip and after-school program to ensure that children with special needs have the resources they need. If students require an aide in the classroom, they also require an aide at Thorne Nature Experience. The
interviewee stated that gathering information from parents about the needs of each student could be helpful. This interviewee also stated that some children are turned down if they require more attention than the staff at Throne Nature Experience can offer.

One participant shared that students with special needs are usually included by other students during the field trip program because the students are peers and interact together daily in the classroom. Students with special needs tend to be excluded by other students more often during summer camp since these students aren’t their classmates. If students with special needs aren’t comfortable interacting with other students, they can be left out during group activities as well.

Benefits of Outdoor and Environmental Education for Students with Special Needs

Participants were asked what benefits they saw for students with special needs from environmental education.

Two contributors stated that hands-on learning is always a good thing when working with students with special needs. These programs allow students to get educational experience related to nature outside of the classroom that they normally wouldn’t get, and some students could focus better outdoors than when they are in the classroom.

According to another participant, students seemed to connect to nature and understand it. The pleasures of nature were easily understood and approachable. Another response was that environmental and outdoor education allow students to connect with things other than people. This connection can be great for students who don’t interact well with other people.

One instructor reported that this type of education allows for students to utilize all their senses. It can also lead to increased independence for the students.
Another participant listed increased “creativity, self-expression, self-motivation, confidence, joy, teamwork, friendship, and concentration” as examples of how environmental education benefits students.

An observation made by one instructor was that students with special needs could get absorbed into one activity and repeat it over and over, which had a calming effect. Summer camp can offer a good break from the normal routine for these students, allowing time for them to explore and do the things they want to do.

Recommendations from Interviewees

When asked how teachers could be better equipped to work with students with special needs, one instructor stated that having a “tool belt” of different strategies would be very useful. This interviewee said he/she would like to have a plan for every possible situation that could arise concerning students with special needs.

Another participant indicated that having a separate lesson plan for students with special needs could allow students to gain a deeper understanding of the subject. This interviewee also recommended that students with special needs work together. The participant said that she would like to see an environmental education program offered specifically for students with special needs.

An interviewee stated that programs should receive advance notification of students with special needs to allow time to adequately prepare for these students. Also, she said that the student should have an aide or support person so the instructor could work with all the students equally. Another respondent shared that advance notification of the specific needs of the student would be very helpful so the instructor would know how to interact with the student. For example,
students with sensory processing disorder cannot be taught in the same way as students with ADHD.

One participant said that intuition and having experience working with special needs children is critical. She stated that being observant of the small things specific to each student is also helpful. Children won’t always vocalize what they want or need, so paying attention to their emotions and how they react to specific situations can allow the instructor or aide to understand each student better. This interviewee noted that allowing students with special needs, especially those with autism spectrum disorder or sensory processing disorders, to explore and work on their own can be beneficial for the students and the instructor.

If instructors want to have a set schedule for the program, a visual schedule can be used for students with autism spectrum disorder. One instructor volunteered at the Joshua School where iPad schedules with timers were used. These schedules help students transition from one activity to the next and stay on task.

This instructor stated that instead of viewing students with special needs as having behavior problems, they should be looked at as wanting something different from the other students and the instructor. Handling any outbreaks in class as behavioral instead of recognizing the special needs of the student can cause the outbreak to get worse.

Interview Findings from Other Organizations

Who was Interviewed

There were three subjects interviewed who did not work or volunteer with Thorne Nature Experience. These participants worked for different environmental education facilities. Programs taught by these interviewees included fish dissection, pioneer life, lake ecology,
ornithology, Native American skills, canoeing, a challenge course, a night hike to explore the senses, ecology, geology, human impacts on the environment, and an animal signs and observation hike.

Training

Subjects were asked what types of training they received at their organizations. One participant received three weeks of training to teach the programs. The instructors were given different strategies specific to each program in order to address any special needs. The goal was to make sure all children were included regardless of ability. For example, if a student could not collect insect samples in the water, the student could become the instructor’s personal assistant in sorting the samples.

Another participant received training through the Environmental Education and Interpretation Departments with the National Park Service. The training taught the staff how to frame the presentation so anyone could understand and participate in the outdoor program. This instruction didn’t specifically refer to students with special needs, but learning how to frame presentations for all audiences could be expanded to include the unique requirements of special needs students. The other participant was taught various environmental education techniques as well knowledge about the material in the curriculum. This training also did not address special needs.
Students with Special Needs and Inclusiveness.

Interviewees were asked to describe their experiences working with students with special needs at their environmental education facilities. Many responses to this topic overlapped with the inclusiveness section, so these two sections of the paper were combined.

One subject said that her organization had special needs students attend their programs often, and adaptations often had to be improvised immediately to ensure all students in the program were included. At first it was stressful for this subject to change the lesson plans, but she stated that students were always flexible and often helpful with including the student with special needs.

This instructor took advantage of that cooperation, and sometimes had the students work together to develop strategies to make sure everyone was included. This subject gave an example of a girl who used a wheelchair and wasn’t able to see some of the posters the students were passing around. The students saw this, and made room for her so she could see the posters and participate. This same subject also noted that in some cases students got frustrated with the slower pace of students with special needs, and that this difference can be difficult to handle.

One participant struggled when there was a student with special needs in the class without an aide. The student’s behavior disrupted the rest of the class, and the instructor lost teaching time addressing the disruption. The instructor handled the situation like he would have with any other student. This same instructor thought that some concepts from the programs might be more difficult for students with special needs to grasp.

Another organization held inclusiveness as a priority, but some classes were too unsafe for students to participant. For example, students in wheelchairs or with severe disabilities were not allowed to participate in the challenge course or in canoeing. The staff at this organization held a
meeting every Monday to look over the students attending programs that week, and determined if any had special needs. If staff members had worries about how to include everyone, they could ask others at the meeting for strategies and ideas. This subject thought that students with disabilities might tire more easily than other students, and fatigue could cause them to participate less.

Another interview participant had students with special needs in his program twice, but in both cases, the students had aides. These students occasionally needed extra guidance from their aides, but they were able to participate in group activities with the help of their peers. The instructor noticed that individual tasks could exclude students with special needs because these students focused on trying to keep up with the children instead of focusing on the learning objectives. This participant also shared that open-ended questions instead of yes-no allow students to respond using their own thought process.

Benefits of Outdoor and Environmental Education for Students

One instructor thought that creating a connection between children and the environment was important for all students, but especially for those with special needs who might not have the opportunity to be outdoors. This instructor stated that hands-on learning was valuable for all children. Another benefit was that confidence and happiness could increase in the students with special needs since the instructor was demonstrating confidence in them, and they were completing the same activities as other children.
One instructor shared that students with special needs were more comfortable answering questions and working with others than in a classroom setting. Another response was that this type of education has an inspiring effect for all students, including those with special needs.

Recommendations from Interviewees

At the end of the interviews, the subjects were asked if they had any recommendations for how instructors could be more equipped to teach students with special needs. Their advice is discussed below.

Experience is often the best way to learn, and one instructor shared how she learned to include every student without singling one out. This instructor found that training alone was not sufficient to work effectively with special needs students; experience in the classroom and teaching students with special needs was the most informative. However, this subject thought that more in-depth training on the subject of inclusiveness would be beneficial for all. The training should discuss awareness of each student and their individual needs.

One instructor stated that being flexible with the programs was important regardless of who was being taught. This instructor said that having team-oriented goals helped include students with special needs, allowing them the opportunity to work with their peers and be viewed as equals.

These instructors were passionate about connecting children to the environment. One stated that “When you are successful at being inclusive and work really hard to encourage each student to
participate regardless of their ability, others notice and truly appreciate it. That feeling of satisfaction is hard to beat.”

Observation Data

One after school program run by Thorne Nature Experience was observed for this research project. The program was conducted at an elementary school in Boulder County. There were ten students led by an instructor and an intern. The program was held outside with an inside art project for the last ten minutes. There were no students with special needs in this particular program but the observation was still useful in noting how Thorne Nature Experience runs its programs.

The program started with unstructured play time. This activity allowed the children to get out the pent-up energy from the school day and interact more actively with their peers. Students received “nature stamps” on their hands and in a small booklet when they completed certain activities. These rewards provided motivation for students to stay on task. During this unstructured time, students were told they could get a stamp if they found any insect eggs. This task gave the children something educational to focus on while playing. The instructor and intern roamed around during this time pointing out various natural things to the students.

The main focus of the afternoon was learning to start a fire using a bore drill or flint and steel. The students split into teams to work together to learn to use the tools. During this time, there were students occasionally left out as teams changed or there were debates over whose turn it was to use the tool. Students were never alone for long, and each student always found a group
to join. The students also played a game about the characteristics of Colorado animals that was both educational and fun.

At the end of the day, the students sat around a table and were told to paint their imaginary campsite, their name animal, or whatever else came to mind. While painting, each student was asked what they were grateful for that day. If students interrupted each other, the instructor reminded them that the other students had listened to them earlier, so it was their turn to listen. Instead of telling them to be quiet, the instructor used a method that taught respect and patience. Ending the program on what the students were grateful for allowed them to reflect on the day and end on a positive note.
Discussion

Best Practices

These best practices are summarized from the interview results, the observation data, and the background literature review. Every student is different, and therefore practices will have to be adapted to fit every individual. These practices are given as a base from which to expand.

A short training on special needs could be added at Thorne Nature Experience to give instructors a starting framework. Many interview participants discussed the usefulness of observing other instructors as part of the training process. New instructors could learn valuable skills by observing the experienced staff at Thorne Nature Experience working with students with special needs.

An instructor training program can emphasize the importance of being patient and observant when working with students with special needs. Some students may not share what they want vocally, so observing their body language and emotions can be very helpful. Students have different triggers that will cause them to be upset, and learning what these triggers are will help the student and instructor be more successful.

For students with special needs, especially those with sensory processing disorders, having a separate program with a one-to-one or one-to-two teacher-to-student ratio could be beneficial for all. Students have different needs, but children tend to play with students who play similarly to themselves (Rubin, et al., 1994). One interviewee stated that students with sensory processing disorders and autism spectrum disorder often want play that is more unstructured than most
programs at Thorne Nature Experience. Having a program that fits these needs would allow the children to be happy and prevent behavioral outbreaks from these students in other more structured programs.

If the resources aren’t available for a separate program, instructors should allow the student to explore and complete activities by themselves. Some students with sensory processing disorders can get overwhelmed by large groups, so allowing them to explore on their own can be very peaceful. Students who are physically unable to complete certain activities can be given an alternate activity that still allows them to be included. If other students go off trail to collect samples, this student could sort the samples on the trail.

According to the background literature review and interviews, visual schedules can be helpful for keeping students with autism spectrum disorder on task. If an instructor wants to offer some unstructured play prior to giving a lecture and specific assignments, a visual schedule could help this transition go smoothly. The Joshua School uses IPads with timers so students can see how long they have for each activity. One study used a variety of prompts such as pictures of the next activity to encourage students to transition (Milley & Machalicek, 2012). For an outdoor program, the schedule could be on a clipboard, a key ring with notecards, or something else depending on the specific class.

Many interviewees stated they did not receive advance notice that students with special needs would be in their program. Having time to adequately prepare for these students and to alter the program in a way needed to fully include that student is critical. It is also important to know the
exact special needs of the student so the instructor can act accordingly. If a student has a sensory processing disorder and any outbreaks in class are treated as behavioral, the situation could get worse.

At Thorne Nature Experience, these changes could take a few different forms. For the Field Trip Program, a notice could be sent to the teacher asking if anyone in the class has special needs. The After School Program and Summer Camp could have a section on the registration form for parents or guardians to describe the special needs of their student. This way, Thorne Nature Experience can provide support staff to the instructors or modify the program slightly to ensure every student is included.

The interview results showed that a successful approach to improve inclusiveness is to allow the entire class to work together to create strategies that involve every student in the program even if some participants have special needs. Allowing the class to have some responsibility in this process gives children the chance to voice what they want from the program, while working together to make sure their peers can participate as well. It can foster cohesion in the class and give children a positive attitude about the changes being made to the program instead of having them suffer disappointment at the change in the itinerary. Having team-oriented goals instead of individual goals can ensure that all students are included. Also, using open-ended questions instead of yes-no questions allows students to work through the question using their own thought process.

These best practices are summarized into bullet points in Appendix F.
Limitations

In this study, there was a setback due to a new online system at the University of Colorado Boulder. It took longer than expected to receive approval from the Institutional Review Board because I could not log into the system to apply for approval for several months. More interviews and observations could have been conducted without this delay, allowing for more data to be collected.
**Recommendations**

Since this study was limited on time, a future study could interview a wider range of participants from the environmental education and special needs fields. This could include professionals in the environmental education field, as well as specialists from standard academic institutions. Having more interview data could allow for more best practices to be found. A future study could also gather more observational data from environmental education facilities to inform these best practices.

In this study, no implementation and observation of the best practices created were conducted. A future study could test these practices during an outdoor education program at Thorne Nature Experience or a similar organization and gather observation data. These practices could be tried and refined until they prove successful for students and educators.
Bibliography


Appendices

Appendix A.

Table 1: A summary of evidence supporting the assertion that contact with nature promotes health and well-being

<table>
<thead>
<tr>
<th>Assertion</th>
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<tbody>
<tr>
<td>There are some known beneficial physiological effects that occur when humans encounter, observe or otherwise positively interact with animals, plants, landscapes or wilderness</td>
</tr>
<tr>
<td>Natural environments foster recovery from mental fatigue and are restorative</td>
</tr>
<tr>
<td>There are established methods of nature-based therapy (including wilderness, horticultural and animal-assisted therapy among others) that have success healing patients who previously had not responded to treatment</td>
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<tr>
<td>When given a choice people prefer natural environments (particularly those with water features, large old trees, intact vegetation or minimal human influence) to urban ones, regardless of nationality or culture</td>
</tr>
<tr>
<td>The majority of places that people consider favourite or restorative are natural places, and being in these places is recuperative</td>
</tr>
<tr>
<td>People have a more positive outlook on life and higher life satisfaction when in proximity to nature (particularly in urban areas)</td>
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<tr>
<td>Exposure to natural environments enhances the ability to cope with and recover from stress, cope with subsequent stress and recover from illness and injury</td>
</tr>
<tr>
<td>Observing nature can restore concentration and improve productivity</td>
</tr>
<tr>
<td>Having nature in close proximity, or just knowing it exists, is important to people regardless of whether they are regular ‘users’ of it</td>
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<table>
<thead>
<tr>
<th>Evidence</th>
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<tbody>
<tr>
<td>A, anecdotal; T, theoretical; E, empirical.</td>
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</tbody>
</table>

Key reference/s |
(Friedmann et al., 1983a; Friedmann et al., 1983b; Parsons, 1991; Ulrich, et al., 1991b; Rohde and Kendle, 1994; Beck and Katcher, 1996; Frumkin, 2001) |
(Parsons, 1991; Newell, 1997; Herzog et al., 2000) |
(Kaplan and Kaplan, 1989; Kaplan, 1992a; Lewis, 1996; Leather et al., 1998; Kuo, 2001; Kuo and Sullivan, 2001) |
(Ulrich, 1984; Parsons, 1991; Ulrich et al., 1991b) |
(Tennessen and Cimprich, 1995; Leather et al., 1998; Taylor et al., 2001) |
(Kaplan and Kaplan 1989; Cordell et al., 1998) |

Appendix B.

Choosing Location

**Surface type** - The harder the surface, the better. Crusher fines, hard packed dirt, and boardwalks work the best. Cement is great, but takes away from the nature experience.

**Cross Slope** - Cross slope should be less than 5%. Otherwise wheelchair hikers will expend all of their energy trying not to roll off of trail.

**Slope** - Slope should be less than 8.3%. Exceptions for short distances are acceptable.

**Width** - Most wheelchairs are less than 3’. Trail should generally be 3’ wide and 6’ wide at intervals for passing.

**Obstacles** - Curbs and lips of bridges should be no larger than 2”. Roots, branches, and rocks should be no larger than 3” high on flat ground and no larger than 2” on sloped ground.

**Be aware of trail conditions before leading hike!!!**

Appendix B. Ideal trail conditions for those in wheelchairs (Colorado Alliance for Environmental Education, no date).
Appendix C.

**Human Sculpture:** Participants build a model of something out of their bodies. The model must accurately represent the subject. That is, an insect model must have the correct number of legs, wings, antennae, etc.; a model tree needs roots, branches, bark, a trunk, leaves, etc. Add to it by making the model have to move, or have each part have a special message they must shout out. Leaves say, “Yum yum,” bark says, “Tough defense!” roots say, “Slurp slurp.”

**Secret Stalker:** Kid in the middle is blindfolded, the "prey". He can't see the others, who stalk him...but if he hears them, he must point, and the stalkers who are pointed at must freeze. See if anyone can tag the prey. A trustworthy adult must be the referee. Content: Hunting strategies of real animals: packs (one member distracts while others close in), sprinters (sneak up close, then make a sudden dash before prey can react), diversions (throwing a stick or rock to spook the prey), pads on the feet (some may want to go barefoot if appropriate). Kids often hit on these strategies on their own.

**Bat and Moth:** Cornell describes this activity well. A blindfolded “bat” must tag two or three “moths” inside a circle of “trees.” The bat can say, “bat” as often as she likes; and the moths must immediately answer, “Moth.” The bat hears and catches prey by echolocation, just like real bats do. (Often the moths cheat and have to be reminded to say moth; often the kid playing the bat doesn’t remember to say bat and just flails around silently. They will have to be reminded sometimes until you want to scream at them, making the game drag.) At the end of the game, I tell how I heard bats once on a special bat detector. As they zeroed in on a moth to make the kill, the frequency of their pulses went up greatly: “Bat........bat........bat...bat...bat...bat.bat.bat.bat.batbatbatbatbatbatbatbatbatbatbatbatbatbatbatbatbatbat,” giving them a very accurate picture. Every once and a while a smarter kid will discover this; usually, I have to model it at the end. The moths have to keep saying moth constantly and are easy to pick off. It’s very effective. Incidentally, this game can also be adapted to the marine ecosystem for whales and dolphins that use echolocation to hunt, e.g. “Porpoise!” “Fish!” “Porpoise!” “Fish!”

Appendix C. Sample outdoor activities for students in wheelchairs (Colorado Alliance for Environmental Education, no date).
Appendix D.

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>When did you start working/volunteering with Thorne?</td>
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<td>Why did you decide to work with Thorne?</td>
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<tr>
<td>What type of training did you receive to teach these programs?</td>
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<tr>
<td>Did this include anything related to special education?</td>
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<tr>
<td>Do you have any recommendations for how to improve this training?</td>
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<tr>
<td>While teaching a class, did you ever have special needs students?</td>
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<td>If so, did this cause any complications?</td>
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<tr>
<td>How did you handle those?</td>
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<tr>
<td>Were special needs students included by other students and staff in the</td>
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<td>programs?</td>
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<tr>
<td>Were there any aspects of the programs that left special needs students</td>
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<tr>
<td>out?</td>
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<tr>
<td>Did you receive advance notification of any students with special needs</td>
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<tr>
<td>attending programs?</td>
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<tr>
<td>Do you have any recommendations for how to educate teachers to be more</td>
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<tr>
<td>well equipped to teach special needs students?</td>
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<tr>
<td>What benefits have you seen for children, especially those with special</td>
</tr>
<tr>
<td>needs, through outdoor/environmental education?</td>
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</table>

Appendix D. Interview questions for staff and interns at Thorne Nature Experience.
Appendix E.

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>What experience do you have working with special needs students?</td>
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<tr>
<td>What training did you receive to teach these students?</td>
<td></td>
</tr>
<tr>
<td>In what ways could this training have been more beneficial?</td>
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<tr>
<td>Were special needs students included in the class/program/camp where you worked? Did staff or students make efforts to include them?</td>
<td></td>
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<tr>
<td>Did the program/class/camp leave special needs students out in any way?</td>
<td></td>
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<tr>
<td>Do you have any recommendations for including special needs students in education?</td>
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</tr>
<tr>
<td>What benefits have you seen for children, especially those with special needs, through outdoor/environmental education?</td>
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Appendix E. Interview questions for interviewees who don’t work at Thorne Nature Experience.
Appendix F.

Appendix F. Summary of the best practices collected from interviews, observation, and background literature research.

Including Students with Special Needs

- If the resources are available, offer a separate program for students with special needs with a one-to-one or two-to-one student to teacher ratio. This program should be more unstructured, and it should allow students the time to focus on the activities that they find enjoyable.
- If the resources aren’t available, allow the student with special needs to explore by themselves and focus on the activities that they find enjoyable.
- Add a short training on working with students with special needs. Observing an instructor who has experience in this field could be useful.
- Give instructors advance notice of any students with special needs attending the program. This allows time for the instructor to alter the curriculum or activities in any way necessary.
- When inclusiveness issues arise during a class, include all the students in the process to foster class cohesion and give every student a voice.
- Be patient and observant with students with special needs. Students may not be vocal with their wants and needs, so pay attention to emotions and body language.
- Have more team-oriented goals than individual goals to ensure that all students are working together and can participate equally.
• Ask more open-ended questions (not yes-no questions) so students can work through the question using their thought processes.

• Use Kolb’s model (1992) of Do, Review, Think, Apply to allow students to process the activity just completed, and apply it to daily life.

• For students with Autism Spectrum Disorder, a visual schedule can be helpful to encourage transition from one activity to the next. For example, knowing the schedule can assist students in transitioning from unstructured play to a specific group activity.