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## **The Use of Universal Design for Better Inclusion of People Who are Deaf/Hard of Hearing or Have Other Invisible Disabilities in Environmental Education**

Magill Schumm

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**The Use of Universal Design for Better Inclusion of People Who are Deaf/Hard of Hearing  
or Have Other Invisible Disabilities in Environmental Education**

by

Magill Schumm

A capstone project submitted in partial fulfillment of the  
requirements for the degree of Master of Arts in Education: Natural Sciences and Environmental  
Education.

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## Chapter One

### Introduction

Most things in the world, including physical infrastructure, clothing, and media are designed with the *ideal* or *standard* person in mind. Sometimes, after the fact they may have been adapted to fit the needs of more people. There is a better world, however, where these things could be designed to be functional for disabled and otherwise diverse people in the first place.

There is a movement and a whole design philosophy created to promote access for the broadest range of users possible, including users with disabilities (Vanderheiden, 2000). Universal Design (UD) aims to create environments and services that can be accessed, understood, and used by all people, regardless of the various privileges or abilities they may or may not have (National Disability Authority, 2020a). UD takes into account all of the diversities people contain and produces products and services that can be used fully by the greatest number of people possible. Rather than being created for the “average” user, universally designed products are designed for use by the widest diversity of people possible by using design features that maximize inclusion and access for some people without inhibiting access for others (National Disability Authority, 2020b).

Formal classroom education is often tailored to the individual needs of students through Individualized Education Programs, or IEPs, as well as through relationships between teachers and students. This is wonderful when it can give each student the support they need and help push them towards appropriate individual challenges and goals. Environmental education (EE), however, is often offered in short, single-day, large group lessons. Groups often contain mixed academic and physical abilities to promote greater social inclusion than in their everyday

classrooms. However, these mixed groups often do not allow for individualized environmental education. Instructors must find a way to engage and include all of their students, which can be challenging when students, chaperones, or the instructors themselves have disabilities.

My personal and professional experiences with disability have led me to the following question: *How can universal design be used to create more inclusive environmental education for people who are deaf/hard of hearing or have other invisible disabilities?*

This chapter discusses some of the barriers people with disabilities face in nature and EE settings. It also discusses my relationship with disability, how I became interested in UD, and a brief overview of its seven main principles.

## **Background**

Environmental educators work hard to create access to nature for huge numbers of people. They offer physical and social-emotional skill development, a sense of wonder, interdisciplinary learning, and opportunities to strengthen relationships. Often, they also facilitate schools meeting state education standards for students spending time outdoors (Harte, 2013; National Environmental Education Foundation, 2021). Unfortunately, in my experience, the inclusion of people with disabilities has been, at best- found through specialized programs for people with particular needs or, at worst- nonexistent.

## ***Inclusion Barriers***

There are plenty of barriers that make it harder for people with disabilities to access environmental education and harder for educators to deliver appropriate programming for inclusion. For example, if a class was designed to go for a hike in the woods, that may prevent wheelchair users from participating, unless they have specialized off-road chairs. Similarly, someone with chronic pain may not have the stamina to hike the prescribed distance. This does

not mean these participants should be left behind, nor does it mean the instructor should have to abandon their lesson plan entirely to do something half-planned in a less inspiring space. UD suggests that the ability to adapt should be written into the curriculum in the first place.

As a seasonal naturalist at a nature center a few years ago, I worked with many elementary school groups visiting for day-long field trips. We offered short lessons that were usually less than one hour in duration. Thus, we did not have long to get to know students or their needs particularly well. That being said, I still noticed some unfortunate patterns. Many students who had a paraeducator accompanying them on the field trip rarely interacted with the other students or directly with instruction. These students sometimes left lessons early for what was deemed “disruptive behavior”. Although these students were paired with paraeducators, I still struggled to identify which students might have additional needs and what those needs might be until most of the way through the class. I felt as though I was failing to include these students and offer them the educational experiences in nature that they deserved.

### ***Physical Disabilities***

Later in my career when I worked as an instructor at a residential environmental learning center working primarily with middle schoolers, the barriers to inclusion that struck me the most were for students with physical disabilities. This was especially prevalent in our classes that focused on personal challenges and team building. We offered opportunities for students to push themselves to build confidence and trust. Many of these activities were physical, and it was not easy to include disabled students in activities designed to be physically challenging for non-disabled students. There is nothing wrong with physical skill-based challenges and activities; however, we simply did not have great options for students who could not participate physically in the narrowly defined manner to be included in the class.



An example of a class that I felt particularly unprepared for was one of these team-building classes. I knew ahead of time that I would have two wheelchair users in my group, so I would need to adapt my lesson plan to meet their needs and avoid leaving them out. I talked to other educators, read through the curriculum, and had ideas for how I could get everyone involved during the class. When class started, however, I discovered that the students' wheelchairs could not be out in the rain for extended periods of time, so we would need to remain in the classroom for the duration of the three-hour class if the rain would not let up. It was inside the classroom with this group of students that I first saw how many details I had to consider for everyone to be included in even the less physical indoor activities. For a group puzzle where students fit wooden triangles together into squares, I discovered that it did not work to spread the puzzle pieces out on the floor because not everyone would be able to reach or see the puzzle. I tried out different roles for various students, but the students in wheelchairs ended up being the observers/coaches almost the entire time. I did my best to make it possible for the entire class to participate in each activity, but the lesson was not as rigorous as I would have liked. I felt like the entire class ended up missing out, and again I had failed at proper inclusion.

### ***Family Experience***

My attention to physical disability inclusion goes beyond the professional and into the personal as well. I have close family members with both lifelong and temporary disabilities. While I have a lot of non-disabled privileges, I do have bilateral hearing loss and a genetic condition that affects my joint stability, and these realities have impacted my experiences with the outdoors and even with environmental education.

One of my family members is completely deaf in one ear and uses a hearing aid. As a child, one memory of environmental education that stands out to her is playing games that

modeled how some nocturnal animals use their senses of hearing to hunt in the dark. She remembers being blindfolded and instructed to find where the sound was coming from. She simply didn't understand how the other kids were doing it. She did not understand her unilateral hearing loss well enough to know that it prevented her from having directional hearing that people with bilateral hearing take for granted. To this day, she describes my ability to tell where my ringing phone is hidden as a magic trick. These hearing games were not enough to ruin her EE experiences, but they are an example of how instructors and curriculum designers may be oblivious to the needs of certain disabled people, especially children who might not understand their disabilities fully or how to advocate for themselves.

These examples are not meant to shame any organizations that encountered these challenges. In fact, most organizations have worked hard to develop adaptations to allow students to participate. Often, such adaptations lead to separate and ideally equitable experiences, but rarely fully inclusive ones. Disability and general diversity need to be considered during the inception of the curriculum and throughout the program design process, not just at the end. This is where UD can offer great benefits. EE curriculum design should incorporate UD principles to create more inclusive programming. Therefore, the aim of this capstone is to provide educators with the tools to write and teach more inclusive EE programs in line with the principles of UD.

UD, as developed by a team led by Robert Mace at North Carolina State University in 1997, has seven main principles that guide the design of products, environments and services to make them more usable. The seven principles are: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use (National Disability Authority, 2020c). This capstone investigates how these principles can be adapted for use in environmental education.

No one service, product, or environment can be all things to all people, but these principles can help bring us closer to a goal of 100% inclusion. These are traditionally seen as principles to be used in designing physical items such as products or buildings, and there are some principles that will be easier to incorporate than others, but they can be used to make curricula better as well. Due to the specific and often unseen needs of people with invisible disabilities, I am interested in how UD can improve inclusion for this group as a whole. I will focus on deaf/hard of hearing people as a subset of the larger group of people with invisible disabilities as a way to have a more specific analysis. Thus I asked the question, *How can universal design be used to create more inclusive environmental education for people who are deaf/hard of hearing or have other invisible disabilities?*

### **Summary**

All people deserve access to environmental education, regardless of their disability status. Environmental education must be more inclusive for people with visible disabilities, invisible disabilities, and the non-disabled alike. This capstone aims to break down barriers to inclusion in environmental education for people with invisible disabilities, with a focus on people who are deaf/hard of hearing. There is a long way to go for many reasons, but one place to start is by writing curricula using the principles of UD and Universal Design for Learning (UDL) for environmental education. The incorporation of UD and UDL into EE could allow people with invisible disabilities to participate more fully and receive many of the same benefits of EE as their non-disabled peers.

Chapter two discusses disabled identity and the complications of invisible disabilities in general, and hearing loss in particular. It also includes a literature review of how UD has been applied to education through UDL, and how these frameworks have been applied to

environmental education. Following that, chapter three lays out plans for creating a workbook for educators looking to incorporate UD into their curricula. Finally, chapter four will review my completed workbook and how it can promote inclusion in environmental education for people who are deaf/hard of hearing or have other invisible disabilities.

## **Chapter Two**

### **Literature Review**

#### **Introduction**

How can Universal Design (UD) be used to create more inclusive environmental education curricula for people who are deaf/hard of hearing or have other invisible disabilities? This literature review discusses invisible disability and how hearing loss is included in this designation. This chapter first provides a definition of terms used for the purpose of the research and project construction. It describes UD, how it has been adapted specifically to education through Universal Design for Learning (UDL), and how it can accommodate people who are deaf/hard of hearing and people with other invisible disabilities. Finally, it shows how disability and UDL specifically can improve environmental education.

#### **Definition of Terms**

*Disability* - a physical or mental impairment that significantly impacts at least one major life activity

*Invisible Disability* - a disability that may not be visibly apparent, but still significantly impacts one's life

*Hard of hearing* - someone with mild to severe hearing loss, but still with some functional hearing, generally uses spoken language to communicate

*deaf* - the physical condition of having a profound hearing loss with little or no hearing, a deaf person may or may not be a part of the Deaf community

*Deaf* - describes membership in the Deaf community, a cultural and linguistic minority group

## **Disability**

Disability as an identity is impacted by how people treat a person, the ease or effort with which a person can navigate the world around them, and the medical realities of a person's life (Reaume, 2014). People with invisible disabilities, including hearing loss, face further identity complications as others may not see them as disabled if they do not disclose their disability status (Evans, 2019; Valeras, 2010). People with undisclosed invisible disabilities therefore may not face the stigma that other people with disabilities might, but also may not receive the accommodations they need (Evans, 2019). This is a large group of people often not considered when planning outdoor and environmental education programs.

### ***Defining Disability***

The term *disability* is used to describe a wide range of lived experiences and conditions. When asked to picture a person with a disability, many people may automatically think of someone who uses a wheelchair. However, disability is a much broader category than physical conditions that prevent the use of one's legs. The Americans with Disabilities Act (1990) defines disability as "(A) a physical or mental impairment that substantially limits one or more major life activities of such individual; (B) a record of such an impairment; or (C) being regarded as having such an impairment" (§ 12102(1)). While the ADA does not include a list of conditions, by this definition, *disability* includes physical conditions ranging from vision loss to limb amputation to chronic pain and fatigue, as well as mental conditions such as schizophrenia and PTSD, and anything that would be considered a cognitive disability.

A mental or physical condition itself does not necessarily make someone disabled. Disability is caused by the inaccessibility of services, lack of accommodation, and ableist expectations of others (Warren, 2020). In fact, there is a whole field of study that challenges the

traditional deficit-based view of disability. The field of critical disability studies is shared by academics and activists who challenge the idea that people with disabilities need to be fixed or pitied (Reaume, 2014). Instead of focusing on disability in terms of limitations caused by individuals' bodily condition, critical disability studies use the social model of disability which interrogates the societal structures that systematically disadvantage people in disabled bodies (2014). This capstone uses critical disability studies and the social model of disability to inform the discussion of disability and the approach toward creating inclusive curricula.

### ***Invisible Disability***

Not all disabilities are obvious just by looking at someone, but an invisible disability may still have a significant impact on a person's life. These disabilities are often overlooked when people discuss accessibility. This section will define invisible disability, describe complications in invisible disability identity, and disability disclosure.

An invisible disability is defined by the Invisible Disability® Association (2021) as “a physical, mental or neurological condition that is not visible from the outside, yet can limit or challenge a person's movements, senses, or activities” (para 1). Invisible disabilities can include chronic pain and fatigue, mental illness, brain injuries, hearing loss, vision loss, etc, and they are sometimes grouped into three categories: chronic illnesses, mental illnesses, and developmental disabilities (Invisible Disability® Association, 2021; Warren, 2020).

People with invisible disabilities must constantly decide in which situations they want to either pass as non-disabled or to embrace their disabled identity (Evans, 2019; Valeras, 2010). These decisions can have major impacts on people's lives. Furthermore, people with invisible disabilities do not always think of themselves as disabled (Valeras, 2010). This can be due to a

visceral rejection of the word or the limits that the label implies. Even if a person identifies as disabled, others may not believe them, making this a complicated identity to hold (2010).

Disability is a spectrum and many people with invisible disabilities fall somewhere in between the two extreme ends of disabled and non-disabled (Valeras, 2010). Thus, Valeras draws a connection between the identity of “bi-ability” that many people with invisible disabilities inhabit with the experiences of bisexual, bicultural, and intersex people (para 50). She draws this connection as in all of these cases people’s identities do not fall neatly into one binary category, but instead span multiple categories along the same spectrum of non-disability to disability (Valeras, 2010). Similarly, some people describe disclosure of a hidden disability as coming out, in a way analogous to people in the LGBTQ+ community coming out (Evans, 2019).

Many people, especially adolescents, work hard to hide their invisible disabilities (Gravett, 2018; Valeras, 2010). This is called “passing” and can be used to describe anyone who belongs to a marginalized group that can blend into a privileged group and “pass” as someone with a particular privileged identity (Valeras, 2010, para 48). Historically the word *passing* has been used to describe people of color who are able to appear white or LGBTQ+ people who can be perceived as straight or cisgender. People with invisible disabilities may do this as well (Valeras, 2010).

### ***Invisible Disability Disclosure***

Compared with people with visible disabilities, people with invisible disabilities may have a much wider range of decisions to make regarding the disclosure of their disability. In any given situation, people with invisible disabilities may choose to fully pass as non-disabled, to downplay their disability, or to fully disclose their disability (Evans, 2019). There are a variety of reasons someone may choose to disclose their disability or not in any given situation, and a



variety of manners in which they may disclose (Evans, 2019; Valeras, 2010; Warren, 2020). If someone chooses not to disclose their disability, that should not mean they lose the opportunity to be included in an experience or environment.

People with invisible disabilities may not disclose their disability due to feelings of shame, a desire to avoid stigma and stereotypes, or to prove personal independence (Warren, 2020). Some people with invisible disabilities may even internalize society's view of themselves as being non-disabled, leading them to feel a sense of guilt when they *do* identify as disabled or access services or accommodations (Valeras, 2010).

### ***Hearing Loss***

Being deaf/hard of hearing is often an invisible disability, as one cannot see if someone is deaf/hard of hearing just by looking at them (Invisible Disability® Association, 2021). A Deaf person may be obvious to an onlooker if that person primarily communicates using sign language such as ASL. However, ASL use is often an indicator that someone is part of the Deaf community, which considers itself part of a linguistic minority rather than a group of people with a disability. (Demare, 2019; Reaume, 2014). Thus, someone who is hard of hearing but not part of the Deaf community may be more likely to consider themselves as having a disability, albeit an often invisible one.

According to the World Health Organization, anyone with hearing thresholds less than 20dB in either ear is considered to have hearing loss. Around 5% of the world's population have what is considered a disabling hearing loss, or a hearing loss greater than 35dB (WHO, 2021). People who are hard of hearing have mild to moderate hearing loss, while people with significant hearing loss are considered deaf (2021). It is fairly common to have some degree of hearing loss. Someone may consider themselves Deaf, with an uppercase D because they are part of the Deaf

community, but may be considered hard of hearing by the WHO definition as they have some hearing (Demare, 2019; WHO, 2021). People in the Deaf community often do not consider themselves disabled (Reaume, 2014). However, not all people who would be considered deaf (with a lowercase d) or hard of hearing, are part of the Deaf community (Demare, 2019). Being Deaf as a cultural identity will be distinguished by the use of an uppercase “D” and being deaf as a physical condition will be distinguished by the use of a lowercase “d”. People who are deaf/hard of hearing who exist in non-Deaf communities, however, may identify as having a disability due to the challenges they face living in a hearing world.

### ***Disability Summary***

Disability is an extremely broad category. It includes people with physical, sensory, developmental, and psychological impairments (Americans with Disabilities Act, 1990). This capstone will specifically focus on invisible disabilities such as being deaf/hard of hearing. Invisible disabilities bring with them unique challenges such as questions of identity and disclosure, as well as the standard challenges of living in a world designed for non-disabled people (Evans, 2019; Valeras, 2010; Warren, 2020). This capstone uses elements of UD and UDL to make environmental education curricula inclusive for people with invisible disabilities regardless of how they identify or choose to disclose their disabilities.

### **Universal Design**

In 1997, the term “Universal Design” was coined by Mace (as cited in Pisha & Coyne, 2001) to describe environments that are designed for access and use by the broadest possible range of users. The term has since been expanded to describe products and services designed in the same manner (National Disability Authority, 2020a). A common example of UD is curb cuts,

which are necessary for people who use wheelchairs to easily and safely cross streets, move from a parking lot to a sidewalk, and to navigate anywhere there might be a rounded curb. Curb cuts end up benefiting more than just wheelchair users; they also help people pushing strollers, riding bikes, or travelers with rolling suitcases (Blizzard & Foster, 2007; Pisha & Coyne, 2001). UD creates accessibility for the widest range of users and often ends up creating a product, environment, or service that is beneficial to many, not just those with disabilities.

### ***Universal Design for Learning***

UDL is an approach to education based on neuroscience and education research (Meyer et al., 2014). In the early 1990s, CAST, formerly known as the Center for Applied Special Technology, was inspired to promote this approach by the flexibility offered by new computing technologies (2014). UDL aims to provide equitable learning opportunities across variable and diverse students. Instead of focusing on fixing students that are having problems with learning, UDL focuses on fixing problems with the curriculum that are causing students to struggle (2014).

UDL not only benefits students with disabilities but also benefits students without them (Bradshaw, 2020; Meyer et al., 2014). Edyburn (2021) describes these shared benefits as a necessary aspect of UD. For example, an assistive piece of technology can benefit the primary beneficiary—the person it is designed for—but it can also benefit a secondary beneficiary, which is someone who also benefits but was not the intended user. If only the primary beneficiary benefits, it is just assistive technology. If a secondary beneficiary can benefit as well, it is UD (2021). To return to the curb cut example, curb cuts allow wheelchair users to move over curbs. In this case, wheelchair users are the primary beneficiaries. People pushing strollers, riding bicycles, or pulling carts have an easier time as well, making them the secondary beneficiaries.

### ***Basic Aspects of Universal Design for Learning***

The most basic aspects of UDL are offering multiple means of engagement, multiple means of representation, and multiple means of action and expression (Harte, 2013; Meyer et al., 2014). In other words, information and instruction should be displayed in more than one form, such as through a combination of text, oral delivery, and pictures. Learners should be able to engage with the material in different ways by giving them as much autonomy as possible when it comes to goal setting and particular focus. Finally, learning should be assessed through a variety of forms such as writing, drawing, or acting (Harte, 2013; Meyer et al., 2014).

### ***Promoting Inclusion***

While not one of the three major guidelines, UDL is most effective at promoting inclusion when there is advance planning (Harte, 2013; Pisha & Coyne, 2001; Warner & Dillenschneider, 2019). UDL curricula plan for students to have choices so that the curricula can meet the needs of each student. When this is included in curriculum design from the beginning, the result is far more inclusive and successful than if these principles are used to attempt to adapt older curricula (Pisha & Coyne, 2001).

UDL can also benefit participants with unknown or undisclosed disabilities (Bradshaw, 2020). It is not always possible to tell that someone has a disability immediately upon meeting, and this can make it difficult for instructors and facilitators to make appropriate accommodations for participants who might be hesitant to speak up (Davis, 2005). Hesitance to advocate for accommodations can be due to fear of being labeled or discriminated against, or a general preference to pass as non-disabled rather than disclosing one's disability (Bradshaw, 2020; Evans, 2019). The individual choices built into UDL allow participants to make decisions for themselves without explicitly disclosing their disability.

When it comes to using individual choice as a part of UDL to promote inclusion, it is important to remember that not every student will be interested in every topic. That does not mean that students should not learn things they do not immediately have a passion for. Instead, educators using UDL should offer choices for *how* students engage with a topic, and having multiple means of engagement should help students find an aspect that interests them. Whenever possible, educators should consider learner preferences and interests (Pisha & Coyne, 2001). Similarly, scaffolding and support should be offered to students so they can find an appropriate level of challenge. If students are not becoming discouraged by failure, their engagement will improve (Pisha & Coyne 2001).

Individual choice allows students to learn about aspects of topics they are truly interested in, engage with appropriate challenge levels, and advocate for themselves without disclosing the particulars of their disabilities. Having these choices built into curricula from the beginning of their inception ensures that these choices are available to students, and are not dependent on accommodations improvised by a teacher.

### ***Benefits of Universal Design for Learning for people with invisible disabilities***

In response to recommendations to incorporate physical activity into the classroom on a regular basis, Gravett (2018) raised some concerns about how this might disadvantage some disabled students. The recommendations included asking students to get up and skip, creating physical timelines, encouraging students to walk to different stations around the room, and other ways to energize a classroom through movement. Gravett argues that these techniques assume that these actions are easy for all students, but in reality may create unnecessary barriers to learning for disabled students (2018). Even if alternatives are offered for students with known disabilities, there may be others who do not wish to disclose their disabilities (Evans, 2019). The

UD principles of “equitable use”, “flexibility in use” and “low physical effort” (Gravett, 2018, p. 212) should be considered when incorporating physicality into the classroom. Alternatives to movement-based activities should be available to all students so that students can choose how to engage without necessarily disclosing their disabilities to the instructor or other students. This could be as simple as giving all students the invitation to “stand if you are able or comfortable” (Gravett, 2018, p. 212). This allows students the option to participate or not without disclosing any disabilities. This could also benefit students who are not feeling up to activity at that particular moment.

### ***Overcoming barriers for people who are deaf/hard of hearing through Universal Design***

Being deaf/hard of hearing can cause specific challenges and barriers to inclusion in many aspects of life for people living outside the Deaf community. In learning environments, deaf/hard of hearing students may miss parts of instruction or discussion (Blizzard & Foster, 2007). UD can be used to make these environments more accessible for people who are deaf/hard of hearing while benefiting a variety of other students as well.

English-speaking Americans tend to talk over each other, especially when engaging in debate (Blizzard & Foster, 2007). This does not work well for deaf students using interpreters, as interpreters cannot easily keep up with overlapping speakers. Even if there were multiple interpreters, it would create visual chaos that would be difficult to understand; as such, it is uncommon for Deaf people to sign over each other (2007). Instead, for a classroom to incorporate UD and be accessible to deaf/hard of hearing students, speakers must take turns. In order to help facilitate this, some classes at the Rochester Institute of Technology (RIT) use a Beanie Baby as a communication artifact that is passed around to designate a person’s turn to speak (2007). This avoids overlapping speech, slows down the discussion to allow for

interpretation and more processing time, and gives deaf/hard of hearing students time to identify who is speaking (2007). The visual cue can also aid the professor in tracking the discussion. Yet another benefit of the Beanie Baby method is that it draws attention to who is actively participating in the discussion, thus encouraging self-monitoring of over or under-contribution (2007).

The Rochester Institute of Technology also includes sign language interpreters in all classrooms that include both Deaf and hearing students (Blizzard & Foster, 2007). Interpreter processing time is the delay between spoken English and the time it takes for the interpreter to process spoken English and translate it into American Sign Language (ASL). This means that hearing students get information slightly before the students who rely on ASL. However, when the speaker waits to continue until the interpreter has caught up, it ends up benefitting anyone for whom English is a second language or who needs more time processing verbal information (2007). Thus, ASL interpreters are an aspect of UD because they not only facilitate communication between people who speak spoken English and those who use ASL, but also because interpreter processing time ultimately benefits other students as well.

These two examples of using a communication artifact to designate a speaker's turn and including ASL interpreters in the classroom are straightforward ways that UD can be used to make learning environments more inclusive for deaf/hard of hearing people while benefiting other students as well. In addition to these behavioral and personnel design elements, UD can inform choices made about physical spaces to make environments more acoustically inclusive.

### ***Physical Space***

There are physical space accommodations that can be made to improve acoustics and thus speech perception for deaf/hard of hearing people (Millett, 2009). However, modification of

the physical environment is often not practical or possible for outdoor education due to the simple fact that it is outside. Traffic from nearby roads, construction, lawnmowers, airplanes, and wind can all cause background noise significant enough to impede the intelligibility of speech (Ryan & Mendel, 2009). Thus, instructor awareness of acoustic conditions is important. Instructors can adjust their volume of speech, wait for background noise to die down, or move to an area with better acoustics for discussions and important instruction.

### ***Universal Design Summary***

UD can improve access to spaces, products and services for people both with and without disabilities (Edyburn, 2021; National Disability Authority, 2020; Pisha & Coyne, 2001). UDL is a separate set of guidelines with the same goal as UD but is specific to educational settings (Meyer, et al., 2014). For people with invisible disabilities, UD and UDL are especially well suited, as disability disclosure is not required for UD and UDL to function. Instructors who use UD and UDL principles in their teaching improve accessibility for students with hearing loss and other invisible disabilities.

UD and UDL help create access and inclusion for people who are deaf/hard of hearing or have other invisible disabilities (Blizzard & Foster, 2007; Gravet, 2018; Millet, 2009). The following section will explore how these design principles can be applied to environmental education more specifically.

### **Disability in Environmental Education**

Outdoor and environmental recreation and education have countless benefits, for non-disabled and disabled people alike (Counsell & Agran, 2012). Specifically, a study found deaf students who participated in an environmental education program surrounding community



recycling experienced increased self-confidence and self-concept (Lostroh, 1995). In theory, there is not much disagreement about *if* people with disabilities should be able to recreate and learn outside, but there is a great deal of debate about *how* (Block & Malloy, 1998; Counsell & Agran, 2012; Warner & Dillenschneider, 2019). Some people argue that specialized, separate programs are better for people with disabilities, while others see more benefit in inclusive programming for people with disabilities and those without alike (1998; 2012; 2019).

### ***The debate between disability-specific and integrated recreation programs***

Therapeutic outdoor adventure programs and adaptive recreation programs such as the Special Olympics are often targeted at groups of people with specific needs, such as youth with behavioral needs, people with substance use disorders, or people with particular types of disabilities, and often only include people without the targeted need as staff or volunteers (McAvoy, et al., 1989; Counsell & Agran, 2012). There is debate among disability rights advocates about the advantages of integrated recreation programs vs. specialized programs (2012). On one hand, specialized programs are able to target programming and resources to participants' needs, which can be a major step toward equity (Warner & Dillenschneider, 2019). On the other hand, segregated programs can reinforce the idea that people with disabilities are inferior to those who are non-disabled (Counsell & Agran, 2012).

Warner & Dillenschneider (2019) argue that programs do not necessarily need to be inclusive in order to be equitable. Programs that are tailored to specific identities or participant needs may be a better fit for certain people in certain situations than integrated programs (2019). However, Counsell and Agran warn against the infantilization that can occur in programs like the Special Olympics when activities are only for people with disabilities. This type of segregation can reinforce a two-class system of disabled people and non-disabled people (2019).

McAvoy et al. found that participants, disabled and non-disabled alike, in integrated wilderness adventure programs experienced decreased anxiety upon return, with this decrease lasting up to one month after the programs. Participants reported other changes in aspects of their lives following integrated wilderness adventure trips, including positive changes in interpersonal relationships and attitudes toward disabled people (1989).

### ***Barriers to outdoor opportunities for people with disabilities***

Many outdoor service providers are hesitant to work with disabled people because they perceive them as being at a greater risk of liability (Burns, et al., 2013). While many people seek outdoor adventure opportunities *for* the risk they provide, people with disabilities are often denied this opportunity due to a lack of experience, preparation, and knowledge on the part of the outdoor activity providers (Burns, et al., 2013). Instead, outdoor service providers tend to try to eliminate all risks for people with disabilities, rather than giving them the agency to make risk analyses for themselves. (Burns, et al., 2013). Burns et al. describe an example of a downhill wheelchair racing group that was not allowed to use privately owned trails due to the landowner's perceived risk of the activity. The landowner allowed cyclists to engage in downhill racing activities but would not permit wheelchair users to do the same. This was despite the wheelchair users' assertion that their accommodations to the activity were actually lower risk than the cyclists. These liability-related restrictions contribute to a lack of inclusion and personal agency for disabled people in outdoor recreation (Burns et al., 2013).

### ***Barriers specific to people with invisible disabilities***

People with invisible disabilities may not be identified and excluded due to perceived risk, but their participation in outdoor activities and education is not without challenges. It is difficult for instructors and facilitators to make accommodations for disabilities they do not

know about. If a participant chooses not to disclose their invisible disability—which they may choose to avoid for a variety of reasons—the instructor likely will not know about it (Warren, 2020). Similarly, children may not understand their disability well enough to explain it and their needs to an instructor. Without a universally designed curriculum, participants with invisible disabilities may not have an equitable experience in environmental education. Thus, it is vital to find ways to integrate UD into environmental education to ensure people with invisible disabilities are included to the fullest extent possible.

### ***Environmental Education and Universal Design for Learning***

In their 2013 article, Harte discusses examples of how UDL can be used in outdoor learning in early childhood education. Some examples of multiple means of engagement in this context include bringing outdoor objects inside the classroom, bringing students into outdoor spaces to play and explore beyond traditional playgrounds, asking students questions, encouraging students to collaborate, and creating space for individual needs such as offering breaks as needed and providing sensory buffers such as ear muffs. Multiple means of representation for early childhood outdoor education could include using picture and tactile cues in addition to verbal, encouraging the use of multiple senses, pre-teaching vocabulary, being aware of low muscle tone needs, and providing stools and ramps to improve access to outdoor spaces. Finally, multiple means of expression for young learners outside could be drawing or telling stories, orally sharing ideas, taking photographs, or making clay sculptures (Harte, 2013).

### ***Disability and Environmental Education Summary***

Disabled people are often relegated to outdoor and recreational activities separate from their non-disabled peers. This is sometimes in order to provide specialized services for disabled people—sometimes due to lack of accommodation available, and sometimes due to the risk

aversion of outdoor activity providers. Environmental education is a realm in which UDL can be used to create an inclusive space in the outdoors for people with and without disabilities alike.

## **Conclusion**

People with invisible disabilities face barriers to participation in many aspects of life due primarily to environments, services, and products that are created without accessibility in mind. This means environments, services, and products must be reworked to create access and reduce societal limits. UD and UDL can be used to make outdoor and environmental education inclusive for all people, including people who are deaf/hard of hearing or have other disabilities. Some of these UDL elements are already being used in early childhood outdoor education (Harte, 2013). While debates continue about the benefits of integrated programs as opposed to those that are specialized for particular groups, UDL provides a way to make integrated programs more inclusive (Counsell & Agran, 2012; Edyburn, 2021; Gravett, 2018; Harte, 2013, Meyer et al., 2014; Warner & Dillenschneider, 2019). Enhancing the inclusiveness of integrated options is especially important for people with invisible disabilities who may be hesitant to disclose their disabilities to ask for the services a specialized program may provide (Evans, 2019; Valeras, 2010).

Chapter three describes how this capstone will use UDL to create a workbook for environmental educators that can be used to make teaching in this field more inclusive. This workbook will use UD and UDL to analyze various aspects of outdoor and environmental education curricula and will provide structure to help educators improve their programming.

## **Chapter Three**

### **Project Description**

#### **Introduction**

This chapter describes my plan for creating a workbook that educators can use to answer the question: *How can universal design be used to create more inclusive environmental education for people who are deaf/hard of hearing, or have other invisible disabilities?*

This workbook can be used by non-formal environmental and outdoor educators to create inclusive curricula regardless of whether or not participants choose to disclose their invisible disability. It can also be beneficial when working with children who are not familiar enough with their disabilities to know how to ask for specific accommodations. It includes general considerations for creating inclusive environments, and how to build in flexibility and choice for participants so that individual adaptations can be easily made in the moment as they are needed.

Universal Design (UD) is a framework used when designing products or services that centers the design for the broadest range of users rather than the average user (National Disability Authority, 2020a; Pisha & Coyne, 2001). Universal Design for Learning (UDL) is similar but specific to the design of educational content. UDL uses the principles of multiple means of engagement, multiple means of representation, and multiple means of action and expression to make learning environments inclusive and effective for the broadest range of learners possible (Harte, 2013; Meyer et al., 2014).

This workbook includes an overview of UDL, a section about managing acoustic environments, an analysis of various discussion routines, ideas for ensuring sensory activities are inclusive, a worksheet to help plan inclusive programs, and post-program self-reflection prompts for educators. This workbook uses principles of UD and UDL, such as multiple means of

engagement, multiple means of representation, and multiple means of action and expression (Meyer, Rose, & Gordon, 2014) to make EE accessible to the broadest range of participants possible. While UD benefits many, there is a focus on its use specifically for people who are deaf/hard of hearing or have other invisible disabilities.

### **Audience and Setting**

Outdoor and environmental education (EE) programs are often provided by specialists outside of a formal learning environment. This means that instructors often do not know participants prior to the lesson. When this is the case, there is no time for instructors to get to know students and their needs well enough to create new adaptations for individual needs. Instead, inclusive elements and options for adaptations must always be available without additional planning or work.

This workbook was designed with program planning for participants in grades K-8 in mind, as this is a typical age for environmental field trip excursions. It is especially targeted at educators who work with a group of participants only once, and thus do not have prior familiarity with the individuals involved. However, elements from this workbook should be beneficial to EE curriculum design for all ages and in many different settings, including nature programming at nature centers, recreation programming in parks, and residential environmental learning centers.

### **Sections of the Workbook**

The workbook includes considerations for general applications of UDL in outdoor and environmental education settings, acoustic environment management, discussion routines, and inclusive sensory activities. Some aspects, such as acoustic environment management and discussion routines, directly impact each other. However, this capstone attempts to separate

considerations into groups for ease of implementation. Many considerations should be thought through in tandem with each other to create lessons that are inclusive in all aspects of their experience. Ideally, these considerations are made at the inception of curricula, to integrate UD and UDL to the fullest extent possible. However, they can also be added to lesson plans in advance of meeting participants and learning about their disability status. There is a worksheet for educators to use before teaching a lesson that breaks up sections of a lesson and encourages the educator to be intentional in implementing UDL. Finally, there are reflection prompts to be completed by instructors after programs to help think through successes and areas of growth for invisible disability inclusion in programming. UD elements can benefit people who are deaf/hard of hearing, people with other invisible disabilities, and those who are non-disabled as well, so these tools can be useful regardless of the disability makeup of the group.

### ***Acoustic environment management***

Outdoor and environmental education generally takes place outside. This means instructors have even less control over the acoustic conditions of their classes than in a classroom. In my experience as a hard of hearing instructor, paddling on the water, windy weather, noisy groundcover (such as crunchy leaves or snow), and face coverings can make hearing extremely difficult during outdoor activities and classes. Variations in acoustics greatly impact speech perception and must be considered when making an inclusive lesson (Millet, 2009). This workbook used studies of sound levels and UD concepts to make recommendations for managing acoustic conditions. Acoustics are important for students to hear the instructor, for the instructor to hear students, and for students to hear each other. The discussion routines following the section about managing the acoustic environment are only possible when the acoustic conditions allow all parties to communicate.

### ***Discussion routines***

Discussion is important for students to work through ideas and learn socially. It is an important tool for instructors to assess the learning of their students (BEETLES, 2021). For a learning environment to be inclusive, the format of discussions must be inclusive as well.

The discussion routines I analyze were published by BEETLES to engage in the mental effort of struggling with ideas and help students deepen their understanding of concepts explored in class (2021). I will assess five routines using the UDL framework. The routines I will assess are Think-Pair-Share, Walk and Talk, Turn and Talk, Whip Around, and Pass It On (2021). This project will discuss the inclusiveness of each routine for students with invisible disabilities, with a focus on those who are deaf/hard of hearing. This capstone will also suggest potential modifications and general considerations for any discussion format to make these discussions more inclusive for students who may have mobility issues, mental health conditions, and sensory impairments, regardless of the instructor's knowledge of these invisible disabilities.

### ***Inclusive and adaptable sensory activities***

Sensory activities are a popular choice for environmental educators encouraging engagement with nature. For example, many educators will have students spread out on a trail and sit quietly for a certain amount of time to focus on the sounds they hear. This might not be particularly meaningful for a deaf student, but it might give a hard of hearing student an environment where they can focus on the quieter sounds around them rather than the voices of others. This workbook will contain options to include while leading sensory activities such as this so that all students are able to have a meaningful experience. Options for participation and adaptation should be normalized as part of curricula so that participants do not feel singled out for choosing a different option than their peers. The instructor should be comfortable and



familiar with all adaptations—including equipment—ahead of time (Warner & Dillenschneider, 2019).

### **Project Summary**

This workbook includes sections about the the basic framework of UDL, the management of acoustic environments, discussion routines, and inclusive sensory activities. There is a worksheet to be used in planning inclusive lessons. It culminates in a worksheet of self-reflection prompts to be completed following programs.

### **Timeline**

I spent the spring semester of 2023 creating this workbook. I hope to incorporate it into my teaching and share it with other educators by the summer of 2023. Prior to this, I continued to read about UDL and discussed it with my colleagues. I have also continuously interrogated my own social identities and how they affect my work and the implementation of adaptations and UDL in my teaching practices.

### **Assessment of workbook**

When my workbook is complete, I will share it with other outdoor and environmental educators. I plan to share it with educators who focus on different aspects of outdoor and environmental education. In order to see if this workbook is effective and applicable in multiple settings, I will share it with colleagues in wildlife education, at a residential environmental learning center, at a local nature center, and with those focusing on outdoor recreation education. In each setting, I will ask them for feedback on its applicability and for their observations on aspects of the workbook's impact on participant experience. I will also engage in conversation with friends, family, colleagues, and participants who have chosen to disclose their invisible disabilities about the effectiveness of these tools.

## Summary

This workbook will lean heavily on frameworks provided by UD and UDL. It will provide considerations and ideas for the management of acoustic environments, analysis of discussion routines, options for ensuring sense-based activities are inclusive and adaptable, and worksheets to help implement and reflect on the outcomes of using these frameworks. This workbook attempts to answer the question: *How can universal design be used to create more inclusive environmental education for people who are deaf/hard of hearing or have other invisible disabilities?* It shows that there are small, yet necessarily intentional changes that can be made to curricula and lesson plans that make programs more inclusive. Implementing UDL, being aware of acoustic environments, intentionally using a variety of discussion routines, and ensuring any sensory activities provide options all make environmental education more accessible and inclusive. The following chapter will describe my experience creating this workbook and assessing its effectiveness.

## Chapter Four

### Critical Reflection

#### **Introduction**

This capstone attempted to answer the question: *How can universal design be used to create more inclusive environmental education for people who are deaf/hard of hearing or have other invisible disabilities?* It did this by reviewing the disability, Universal Design (UD), and environmental education literature, and by creating a workbook with recommendations, analysis, and worksheets. This chapter reflects on what I learned in the process of creating this capstone, connects the project back to the literature, discusses the project's implications, and makes explicit the limitations of this capstone. It also recommends future projects, declares my plans for the implementation of the workbook, and predicts how the project as a whole will benefit the fields of outdoor and environmental education.

#### **Learnings**

##### ***Universal Design for Learning***

In theory, creating inclusive programming through Universal Design for Learning (UDL) can in some ways be as simple as incorporating as much choice for participants as possible. Multiple means of representation can be done by using both visual and verbal instruction. Multiple means of engagement can be incorporated by validating interest in various aspects of a topic. Multiple means of action and expression can be built in by offering different ways to physically interact with the lesson. As with many things however, this is much easier said than done. This is why I created worksheets to help educators incorporate these choices intentionally into their programming.

One of the most exciting things that I learned is that I have already been using some UDL principles in my teaching without realizing it. I have found success in giving students options in terms of how they could engage in class and show me their learning. One example comes from an “Animal Signs” class I facilitated for a group of upper elementary students. I was having trouble keeping the students focused on looking for animal tracks and other evidence that animals had been around, because the students were just so excited to be outside in the snow with their friends. Instead of assigning them to each find at least two animal signs and to write a story about how they could have interacted with each other, I gave them options. They could write their story down, act it out with their classmates, draw it, or build sculptures representing the story with the snow. In my group of sixteen, I had students act, sculpt, and orally present their stories. The best part was how each student was able to show me they were engaged and understood the lesson. Without realizing it, I provided multiple means of action/expression.

### ***Language surrounding disability***

In the process of working on this project, I learned a lot about the world of disability justice. Diversity, equity, and inclusion initiatives have become widespread in recent years. However, disabled people are rarely explicitly included in these initiatives (Herson, 2022). The more I learned about disabled people through my research, the more I realized I needed to be learning *from* disabled people.

At the beginning of my research and writing process, I was careful to use exclusively person-first language in my writing. For example, I would always say “person with a disability” rather than “disabled person”. I thought there was consensus in the disability community that this person-first language was preferred, as many etiquette and style guides recommend it (United Spinal Association, 2015). The more I read and listened to disability experts and activists,

however, I learned that there was no such broad consensus. Not only do some subsets of the disability community have their own preferences, but every individual will also have their own opinions. As such, the National Center on Disability and Journalism updated its Disability Language Style guide in 2021 to encourage asking individuals for their preferences rather than automatically defaulting to person-first language. People in certain groups, such as those who are Deaf, may not consider themselves disabled at all, and see themselves more as being part of a cultural identity (National Center on Disability and Journalism, 2021; Reaume, 2014). As such, many prefer “Deaf person” rather than “person who is deaf”. Similarly, many autistic people prefer “autistic person” over “person with autism” (2021). Some argue that person-first language brings focus to people’s humanity and represents that a person themselves is far more important than their disability (Reaume, 2014). Others reason that person-first language adds to the idea that “disabled” is a bad word and just adds unnecessary wordiness to writing without doing anything actionable to make the world more accessible for disabled people (Gelbard, 2018).

I spent a lot of time going back and forth about what type of language I would use in this project. As the focus of my project is people with invisible disabilities, which is a group of people where not everyone may self-identify as “disabled” or view that as an important part of their identity, I decided to use the phrase “people with invisible disabilities”. Furthermore “invisibly disabled people” is an unnatural phrase. When talking about disabled people more generally, I use the phrase, “disabled people” as that is what people in my life prefer. When talking about people in the Deaf community as a distinct cultural and linguistic minority group, I use the phrase “Deaf people” to designate Deafness as an identity. When talking about people with hearing loss, I use the phrase “people who are deaf/hard of hearing.” Not all people with the physical conditions of deafness or hearing loss, like myself, consider ourselves part of the Deaf

community. People like us may experience their hearing loss as more of a disability than members of the Deaf community do. It is important to listen to members of the communities we write about and work with; careful attention to the language I used is one way my capstone strove to do this.

### **Connections to Literature Review**

The literature review was helpful for framing my project and its importance. It showed the challenges disabled people face when it comes to being included in outdoor spaces and environmental education. It defined invisible disabilities such as hearing loss and discussed the specific challenges people with them face. Finally, it discussed UD and UDL as potential solutions to the exclusions people with invisible disabilities face.

Invisible disabilities, by their very nature, are difficult to recognize because they are so often hidden. The literature review showed the importance of general awareness of invisible disabilities when leading outdoor and environmental education programming, but not the need to know any individual's specific situation. Not only may some individuals not want to disclose their invisible disabilities in these settings, but some people—especially children—might not fully understand or be able to communicate their needs. Thus, UD is a useful tool for making programming inclusive because it does not require specific knowledge of anybody's disability status.

When it came to developing my project, the most helpful parts of my literature review were understanding the experiences of people with invisible disabilities, and how UDL can be implemented in a variety of settings. I relied heavily on *Universal Design for Learning: Theory and Practice* by Meyer, Rose, and Gordon to inform the content of my workbook. My pre-program worksheet explicitly used their framing of multiple means of representation,

multiple means of engagement, and multiple means of action and expression to help plan inclusive lessons.

### **Implications**

With this capstone project, I hope to raise general awareness of invisible disabilities and how programs can be designed to better include people with them in outdoor and environmental education. It offers tools and opportunities for educators' self-reflection to make their programs more inclusive. My eventual hope is that this awareness, these tools, and this self-reflective mindset become ubiquitous in outdoor and environmental education.

### **Limitations**

Due to the reality of seasonal work for most early-career outdoor and environmental educators, I was not actively teaching during the development of the workbook. My 2023 season begins the week after the final product is due. Thus, I have not intentionally used the workbook in program preparation or reflection. I did take years of teaching experience into account during its development, but it will not be tested until after this paper's completion.

Invisible disability is a broad category and this capstone only touches on a few examples. There is a focus on people who are deaf/hard of hearing, but even this designation contains great diversity. Furthermore, this capstone intentionally does not make recommendations specific to programming with the Deaf community. The Deaf community is a distinct cultural group and people who are a part of it do not necessarily consider themselves disabled, especially when surrounded by other Deaf people (Demare, 2019; Reaume, 2014). The recommendations and analysis in this project are targeted at deaf/hard of hearing people attending programs taught in spoken English and primarily attended by hearing people, rather than programs led in ASL or otherwise specified for the Deaf community.

## **Future projects**

When I create new or update old curricula, I want to ensure UD and UDL are included from the beginning. UDL is most effective when used at the inception of curriculum design (Harte, 2013; Pisha & Coyne, 2001; Warner & Dillenschneider, 2019). My workbook is meant to be used for making small changes in the delivery of programs that already have a curriculum written. Many of the sources from the literature review and workbook development will be helpful for future curriculum design projects.

This summer, I will be designing and teaching a fire-building workshop. I will pay attention to the precepts of UD in the physical environment and materials we will be using, which my workbook does not touch on beyond acoustics. A helpful future project would be to create reference materials and worksheets that focus on the more physical aspects of UD in outdoor and environmental education contexts.

## **Plan for using results**

I will begin by using my workbook myself. I plan to return to my seasonal position as an outdoor recreation educator in mid-April of 2023, and will try using my worksheets on the first few programs I lead. If the worksheets prove helpful, I will share them with other educators in my department. I hope to give a presentation about invisible disability and using UDL in outdoor education during summer staff training to supplement our conversations about working with diverse campers and program participants.

## **Benefits to outdoor and environmental education**

Outdoor and environmental education has historically been for white, middle/upper-class, non-disabled men. The field is currently trying to expand to serve diverse populations beyond that historically narrow scope. Including disabled people in diversity, equity, and inclusion



initiatives is vital, but often overlooked (Herson, 2022). This project focuses on small, yet impactful changes that educators can make to their programs to make them more inclusive and accessible. Using a UD framework rather than adapting programs to meet the specific needs of participants can be even more effective because it doesn't require participants to disclose their disabilities in order to work (Bradshaw, 2020). Children especially often don't understand all of the ramifications of their disabilities, particularly if they are invisible disabilities, so having programs designed in such a way that they don't require people to ask for specific accommodations or have a certain level of knowledge of their disabilities is preferable.

### **Summary and Conclusion**

I learned a lot during the entire capstone process. My personal connection to invisible disability through my sister's experiences and my own motivated me to start this project in the first place, and helped drive my commitment to create a useful final product. My hope is that the workbook truly helps my outdoor and environmental education programs to incorporate UDL, and to be more inclusive for people who are deaf/hard of hearing or have other invisible disabilities. I also hope to raise awareness of invisible disabilities among outdoor and environmental educators, and to share tools that can be used by anyone to make the field more inclusive overall.

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