Summer 2024

Stories Elicit Feelings of Kinship and Inspire Pro-Environmental Behavior

Ellen Shaw

Stories Elicit Feelings of Kinship and Inspire Pro-Environmental Behavior

by

Ellen Verschoor Shaw

A capstone submitted in partial fulfillment of the requirements for the degree of Natural Science Master of Arts in Education.

Hamline University

August 2024

Capstone Project Facilitator: Trish Harvey
Committee Member: Ashlie Adkins

TABLE OF CONTENTS

CHAPTER ONE..... 3
Background.....3
My Story is Tied to My Creek.....4
Childhood Stories with More-Than-Human Characters.....7
Positionality Statement.....8
Research Question.....9
Chapter Two-Four Overview.....10
CHAPTER TWO.....11
Introduction.....11
Traditional Ecological Knowledge.....12
Traditional Ecological Knowledge, Indigenous Science, and Native Science.....12
Kinship.....13
Reciprocity.....18
Storytelling.....20
Elders.....20
Knowing the Complete Story.....22
Pro-Environmental Behavior.....25
Positive Emotions, Positive Behaviors.....25
Conclusion.....26
CHAPTER THREE.....28
Introduction and Established Understandings.....28
Middle Schoolers: The Creek and the Crawdad.....30
The Method of Storytelling.....30
Telling an Animal Story.....32
Subject of Choice.....32
Evaluation.....34
Timeline.....34
Conclusion.....35
CHAPTER FOUR.....37
Introduction.....37
Reflections and Conclusions.....38
Future Research and Recommendations.....41
Conclusion.....43
REFERENCES.....44

LIST OF FIGURES

Figure 1: Waterholes along the Tingari Track……...15

Figure 2: An Indigenous Curriculum Mandala for Science from a Native American Perspective…….23

CHAPTER ONE

Introduction

Indigenous ways of understanding recognize the personhood of all beings equally important, not in a hierarchy but a circle.

- *Braiding Sweetgrass*, Robin Wall Kimmerer

Background

Storytelling is the oldest form of passing information on to future generations. Storytelling transcends format. From oral tellings, drawings and paintings, to symbols on paper and moving photographs, all can hold the knowledge of a community. Outsiders can gain understanding by examining stories of different cultures and of the past. Stories enable humans to build connections and find commonalities. In the twentieth century, modern humans engage with their environment on an industrial and utilitarian basis or a recreational passerby level. Indigenous humans, however, have a long history of a more intimate and connected interaction. Indigenous means referring to, or relating to, the people who originally lived in a place, rather than people who moved there from somewhere else (Byerly, 2019). The environment and lessons on how to survive within an environment were passed down to each generation. My curiosity was piqued and I began this capstone which explores the question: *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?*

My Story is Tied to My Creek

My experience within my highly-rated public high school during the early 2000's was one where competition and large-scale future-based pressure surrounded all

activities. I constantly compared myself to the progress of everyone else and reliably found myself lacking. My anxiety and fear of failure grew with each assignment and assessment. I began to find not turning my work in was far less overwhelming than the possibility that my work might be deemed a failure on its own merits. My experience is not a unique one as Jiang et. al. (2022) noted: “they bear pressure from all sides, including learning tasks, learning expectations, and interpersonal relationships. Excessive academic pressure is bound to lead to emotional changes in teenagers" (p. 7). As a young person with mental health issues, I struggled to meet exterior expectations and pushed back against being told I had to do something. I dealt with deep feelings of depression, and drowned in failing academics and unhealthy relationships. In the most difficult of times, my father would take me outside for a walk through the woods. Walking pumped blood throughout my tired limbs. The broken beams of light created hopscotch patterns on the path in front of me. My eyes wandered from shining leaf to shining leaf. The woods brought my headspace back to stability. I found comfort in putting the thoughts bouncing around my head onto paper. Journaling and songwriting morphed into poetry. I found solace in writing my own story. By giving words to my lived experiences, I was able to have a broad perspective. I felt how stories and time in my natural environment led to a greater sense of wellness and connection.

The majority of my life has been spent in the Ohio River Valley. The land has been sculpted by glaciers and covered in by an ancient sea. The Ohio River connects the creeks of northeast Ohio and Pennsylvania to the Mississippi River and the Gulf of Mexico. My love for creeks was well established as an early adolescent and as an adult I found the perfect public school to share my passion. As of 2024, I have been teaching at a

public middle school in Southwest Ohio for the last ten years. The best part of my job and the school I teach is that just a short walk from my classroom is a wooded frisbee golf course perimetered by a winding creek. During my first eight years of teaching I shifted from teaching eighth and then sixth-grade science, to seventh grade STEM. Recently I became the STEM teacher for the entire Middle School with 125 different students each quarter. During the months of first and fourth quarter, I host Environmental Gratitude and spend my days studying and playing in the creek with my students. The creek is a place where timid, unsure young students reach wary hands out to touch the hard back of a captured crawdad. Confidence builds while they find stability on the tippy well eroded limestone creek rock. It is the perfect place to learn geologic time standards of 8th grade science and to practice observation and classification of species within a food web.

Visiting a small tributary creek inspired much of my work over the course of my graduate studies. I taught for eight years before beginning my graduate studies and by the time I began, I knew exactly what I wanted to study, Environmental Education. I conducted preliminary research and found a school with a top rated Environmental Education program. A class called Community Science taught me lessons of correlation and connection. In my group project, my partner in Maryland and I in Ohio observed our respective maple trees, collected data and searched for patterns. We wondered why, despite our distance from each other, our trees acted on a parallel timing. My course work at Hamline pushed me to seek out the full story of my familiar home creeks and I learned the colonization story of Europeans traveling via the waterways, stumbling upon and proceeding to exact the physical and cultural extermination of the Indigenous population of Shanwnee. During a course on climate change, I unraveled the inspirational power of

sharing one's own climate story and saw how one's place can inspire a story. I wrote the following ode to my evolving relationship with my creek:

Ode To My Creek

as a child

A **place** to hop, teeter, and slip across slabs of creek **rock**.

The **rocks** are full of long bone-shaped ridges and miniature **fans**.

The peak of a crawdad's **fan** as it wooshes to **escape** my grabbing fingers.

The **escape** of regimented learning to wander and explore a new habitat.

as a teacher

A **place** where geologic time is evidenced by brachiopods and branch corals in sedimentary limestone **rocks**.

The **rocks** now twisted with plastic trash enrage and activate innovative generations of nature's newest **fans**.

Awareness **fans** out as sloped creek beds invite eager climbers to scramble up the interconnected veins of fallen tree limbs **escaping** the forest floor.

The **escape** to a familiar yet now newly understood place cements humanity's role as curious caretakers just as the fossils lie in the creek rock.

My ode shows how a foundation of curiosity and play inspired my journey towards close familiarity through scientific study of my favorite place. Both pieces, informal play and academic study are at the center of how I interact and teach with and about my place. Without my early years of outside exploration would I have been as inspired as an adult?

The literature review will address how time spent outside engaging with one's natural environment as a child is a critical foundation piece for developing an emotional tie with the lives of plants and animals. When children cannot physically get outside, what happens to their relationship to their environment? My capstone project, a storyboard which centers on a crawdad protagonist seeks to provide an answer to the question, *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?*

Childhood Stories with More-Than-Human Characters

There have been stories written with more-than-human characters before. As a mom to young children who love to read and listen to stories, most non-human nature books have humans as main characters or are targeted picture books for young readers with large illustrations. *Charlotte's Web*, *Stuart Little* and *Watership Down* are commonly found in elementary-aged childrens' libraries. A spider weaves words to showcase human attributes possessed by a pig which should deem him unworthy of slaughter. Rabbits live in groups that war with other groups to take control of female rabbits all while outrunning the gunshot of an angry farmer. A mouse lives as a member of a human family in New York City who adventures out into the world to search for his missing bird friend. Each story is amassed with personification and places each more-than-human character on a plot of human interaction and expectations. There is a lack of stories which result from the direct observation of the environment and daily lives of the more-than-human species. Where the true story is celebrated and shared with great imagery.

Positionality Statement

Throughout my learning at Hamline, I fully understand the colonization story of my particular place. Prior to beginning my capstone, I knew that the topics I wanted to research were grounded in the culture of Indigenous peoples. I knew the knowledge of Indigenous communities is very typically whitewashed by intruding researchers. I am a thirty-five year old German-Dutch American mother of two currently getting divorced and I would not be another white woman sharing Indigenous wisdom as though it were new understandings. I had specific Indigenous authors which I wanted to include and their word choices did not need to be paraphrased by me. In my capstone literature review, I cite the works of these authors yet I am choosing to not follow exact APA guidelines. As a woman getting divorced, it is slightly painful to know that my first published work will only be cited via my current husband's last name and a year. During the research period for this capstone, I made purposeful choices to learn the wisdom and insight of particular authors. The authors quoted in Chapter Two are men and women of particular Indigenous nations around the world. To honor the full personhood of certain authors quoted, I will state their full name as well any pertinent identity-based information.

As with all discipline-specific words, the words used have a familiar conversational meaning, however, I used the word with a deeper understanding. The words identified here provide a brief overview, as they will be central to fully understanding the scope of the following literature review. **Story** as more than a plot with characters and setting but, the collective understanding of how to interact with the natural world communicated using dramatic elements. **Elder** as more than a great grandparent or

older human but, a human who grew up surrounded by the culture and traditions of an Indigenous community and often shares language and stories of generations past. **Interconnectedness** shows the tie between all life, the commonalities amongst all living things inspiring a deep feeling of connection. **More-than-Human Life** acknowledges the plant and animal lives as equal and worthy of autonomy and a healthy environment just as any human life. **Kinship** means a relationship where the success of one is intertwined in the success of the other, an emotional connection where joy is felt at the health of the other and sadness is felt at the destruction. **Reciprocity** is the action piece of cultivating a kinship with the more-than-human lives; to intentionally act as caretakers of the Earth knowing, the Earth cares for us.

Research Question

My personal history of playing, leading to understanding while in my creek intertwined with my realization of the Indigenous history of my place and centered by my science, STEM, Environmental Gratitude classes teaching inspired me to ask, *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?* In response to this question, I created a storyboard that centers on a crawdad protagonist. The storyboard describes the natural environment, flora and fauna which are all interconnected with the main character. The crawfish/crawdad/crayfish all are synonymous and are regional colloquial variations. Crawdad is how my state of Ohio and school community refers to the crustaceans. Crayfish is used in the eastern part of the United States and crawfish in the western part of the United States. The storyboard

includes the dramatic elements of plot: exposition, rising action, climax, falling action and resolution tied to various events of a crawdad's life.

Chapter Two-Four Overview

The subsequent literature review found in Chapter Two addresses the following concepts: what are the elements of one's place and how has the place Indigenous humans lived inspired the stories passed down by community elders. The literature review continues by comparing Traditional Ecological Knowledge and Indigenous Science, and introducing different Indigenous authors showcasing how their communities' relationship to place inspired storytelling. These stories all highlight the interconnectedness of the more-than-human characters with their environment. The concept of reciprocity is established as a centering view grounding pro-environmental behavior. Chapter Three dives into my decision to write a story centering on a more-than-human protagonist. Chapter Four will reflect on my experience creating the storyboard and authentically honoring the story of my more-than-human animal protagonist.

CHAPTER TWO

Literature Review

The story of our relationship to the earth is written more truthfully on the land than on the page. It lasts there.

- *Braiding Sweetgrass*, Robin Wall Kimmerer

Introduction

In order to inspire pro-environmental behavior grounded in reciprocity one must feel a sense of connection with the more-than-human lives of their place. The end goal of this capstone is to create a storyboard for a novel that inspires feelings of interconnectedness, which are the foundation to launch pro-environmental behavior changes. The research found within this literature review will show *How a story can lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?*

The literature review begins by explaining the nuances between the concepts of Traditional Ecological Knowledge and Indigenous Science. Next, the literature review will introduce the stories of different Indigenous authors and establish the concepts of kinship and reciprocity. The human and environment connection shown in the stories passed down by community Elders. Finally, the literature review will discuss best practices for motivating pro-environmental behavior.

Traditional Ecological Knowledge

This section of the literature review shares the writings of various Indigenous authors. These authors will share how the understanding developed by their ancestors on how best to live aligned with the patterns of nature.

Traditional Ecological Knowledge, Indigenous Science, and Native Science

Indigenous means referring to, or relating to, the people who originally lived in a place, rather than people who moved there from somewhere else (Byerly 2019). Traditional Ecological Knowledge is the cumulative base of knowledge gathered and changed over time and handed down for generations, typically centering the relationship of living beings with one another and their place (Berkes et al., 2000). Traditional Ecological Knowledge or TEK is the knowledge of the interconnectedness of life with itself and the environment. TEK revolves around the living elements of a particular place and weaves together ecological information and cultural significance.

Potawatomi Nation scientist and author Robin Wall Kimmerer's *Gathering Moss* (2003) shared the path to developing TEK. "Plant knowledge comes from watching what the animals eat, how Bear harvests lilies and how Squirrel taps maple trees. Plant knowledge also comes from the plants themselves. To the attentive observer, plants reveal their gifts" (Kimmerer 2003, p. 101). It is through lived experience that TEK develops. TEK is an umbrella term for the knowledge developed via observation and manipulation of inputs to study their outputs by groups typically left out of Western academia. In defense of formalizing the term to best describe TEK, an Indigenous educator from the Kimberly Islands off the coast of Australia, Wiggan (2019), articulated the shift in categorizing understandings of Indigenous people, "I refer to it as Indigenous Science because it is a foundation of knowledge that was developed through the same principles as Western knowledge; observation, experimentation, analysis" (TED, 2019, 4:02).

The shift in nomenclature adds to the validity of Indigenous knowledge and positions it on the same plane as Western Science. Native American educator, author and

Tewa Indian from New Mexico, Gregory Cajete (2004) defined Native Science as born of lived and storied participation with natural landscape and reality. Daily life for Indigenous nations is deeply intertwined with the cycles of the environment. The use of the terms Traditional Ecological Knowledge, Indigenous Science and Native Science are all describing the same discipline of knowledge cultivated in parallel ways. Indigenous Science is tied to direct observation of the more-than-human lives and purposefully setting their living habits in alignment with the established patterns of nature. Kinch (2022) introduced both threads of ecological values shared by Indigenous communities, kinship and reciprocity. “A symbiotic exchange between people, their lives, and nature. Because these relationships display the harmony of human interactions with the environment, Indigenous worldviews portray the egalitarian coexistence possible between them” (p. 7).

Kinship

The literature shows that the Indigenous populations of different locations see their role with the natural environment as one of a caretaker. For Indigenous populations, the biotic pieces of an environment are referred to with love and reverence as their plant and animal relatives. Plants and animals take on important and equal, at times more wise, roles to humans.

Kimmerer *Gathering Moss* (2003) wrote about the interconnectedness of all living things, recognizing that “all beings are non-human persons, and all have their own names” (p. 12). Individuals are recognized and given the recognition of names and pronouns. Time is dedicated to noticing the daily moves and habits of the more-than-human lives. Building on Wiggan’s (2019) idea of how words and naming

influence the treatment of Indigenous Science, Kimmerer applies the concept of naming to distinguish treatment of resources and living things. While discussing how to name the more-than-human lives on earth Kimmerer's *Braiding Sweetgrass* (2013) wrote:

> When we tell them that the tree is not a *who*, but an *it*, we make that maple an object; we put a barrier between us, absolving ourselves of moral responsibility and opening the door to exploitation. Saying *it* makes a living land into 'natural resources.' If a maple is an *it*, we can take up the chain saw. If a maple is a *her*, we think twice (p. 57)

The importance of word choice is critical because the rights afforded to living things is dependent on how they are referenced. Both Wiggan (2019) and Kimmerer (2013) know the status afforded based on noted classification. When referring to the more-than-human lives, the treatment of such lives may be shifted as the nomenclature changes. The emotional investment in the named lives and concepts is greater than just the surface level. Expanding on how treatment of places can be shifted simply through a change in naming Byrnes (2001) wrote,

> Space becomes place by being named and therefore the removal of meaning from places allows for the creation of an abstract space, void of meaning. Once void of its previous history and culture, these newly emptied spaces are ready to be filled with industry (p. 5)

To take away value one must take away the connection to previous history and culture which is held within the names of places. Once the knowledge of the connection is broken and forgotten, the downgrade in treatment can begin.

The section above established how word choice and naming can influence the emotional attachment to and treatment of a place. Maya Choti' and Zapotec scientist and author Jessica Hernandez (2022), wrote about the kinship her father established with a labeled invasive plant. Hernandez's father was a boy during the civil war in El Salvador and hid among the banana groves to escape being taken by the army. Hernandez (2022) recalled her father sharing:

> Yes, under the lens of Western environmentalism, banana are an invasive species to my ancestral native lands. However, to us, bananas are not invasive; they are displaced relatives that have adapted well to our climates and are now incorporated into our traditional diets. Ultimately, the kinships and relationships we have developed with them have made them our relatives as well. (p. 24)

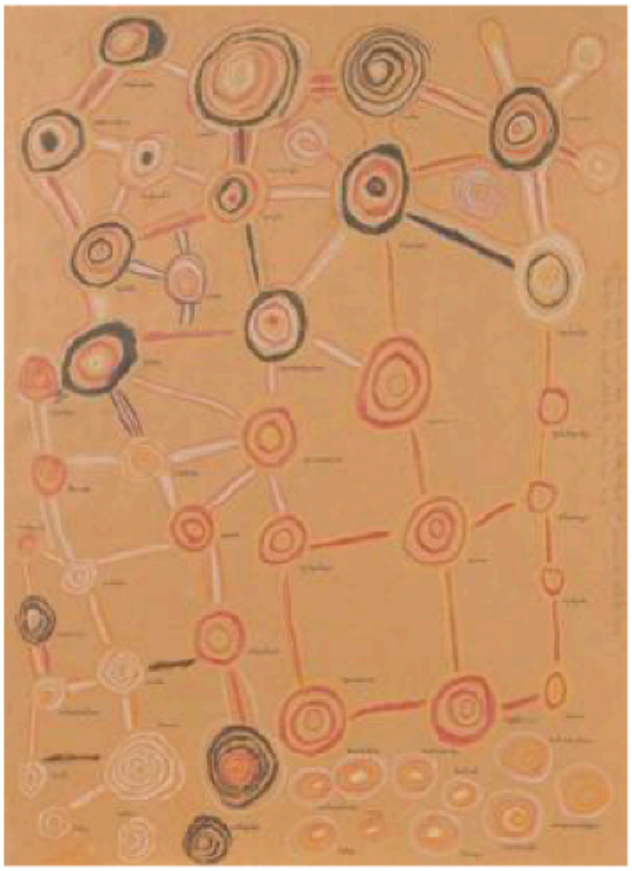
The banana groves throughout El Salvador started due to colonialism and capitalism yet became closely tied to the Indigenous diet and culture. Although deemed invasive, the kinship was established through the inclusion of the banana plant in intimate daily living.

The Indigenous stories are not always communicated via written word. The extensive TEK can be communicated in a visual presentation. An Australian Aboriginal map titled Waterholes (see Figure 1 below) along the Tingari river shows not only the location of the water holes but the way one should think about traveling through the landscapes. The map shows different concentric circles which may represent daily living destinations and patterned lines showing traveled paths. In describing the map, Carter (2010) shared, "All are connected. Indigenous understandings of space are far more intuitively inclusive of the hybridity and interconnectedness which is evident in the map." The depth of understanding the land went beyond the needs of humans. The Aboriginal

map communicates the stories of the more-than-human lives existing within the same place as humans, demonstrating the respect and status placed on the experiences of the animals and how the Indigenous population learned from them.

Figure 1

Waterholes along the Tingari Track



Note: This figure comes from the American Museum of Natural History and shows the paths of various traveling animals and resources sought. (Carter 2010)

On Shikoku Island, Japan, a do-nothing farmer and scientist shared his steps for living in harmony with the native lives; demonstrating that when acts are taken to care for and not interrupt the cycles of nature, one can reap bountiful harvest. Fukuoka (1978)

lived his ecological knowledge which he learned from experimentation and observation on his father's citrus farm. His decades of high growing yields and the restoration of soil quality all while fitting into the natural cycle and not using any weeding or tilling of the ground nor any chemicals. Fukuoka shared how "If nature is left to itself, fertility increases…The fertility of nature, as it is, is beyond reach of the imagination (Fukuoka, 1978, p. 36)." Without human influence, nature can flourish. For humans to flourish alongside nature, humans must align themselves with the patterns of nature. The Great Way was written by T'San (6th century) and is a Buddhist zen teaching which reminds us of the oneness of everything and how the true nature of earth is one of balance and enough-ness. The following, stanza four and stanza twenty discuss the oneness of nature:

Live neither in the entanglements of outer things,

nor in inner feelings of emptiness.

Be serene in the oneness of things and such

erroneous views will disappear by themselves.

Continuing….

To understand the mystery of this One-essence

is to be released from all entanglements.

When all things are seen equally

the timeless Self-essence is reached,

No comparisons or analogies are possible

in this causeless, relationless state.

Humans need to live within the balanced cycles of nature and Fukuoka (1978) shared "...living such a life, it becomes possible to contemplate the Great Way. I believe if one fathoms deeply one's own neighborhood and the everyday world in which he lives, the greatest of worlds will be revealed" (Fukuoka, 1978, p. 110). Through observing and considering the ongoings of your own place, the oneness and interconnectedness of all living beings will be revealed. The beauty of kinship feelings of interconnectedness is the ease at which they can be cultivated, not through any large, effort-intensive acts but through stillness and considerations of the happenings within each present moment at a particular place. Once the foundation of emotional connection via kinship is laid, one can consider their role within the web of interconnectedness.

Reciprocity

The last sections established the need for kinship with the more than human lives, seeing them as equal partners and their stories as worthy of being shared. Now that human's role within the interconnected ecosystem web is established, the behavior of the individual can be considered. Kinship with the more-than-human elements of one's place can lead to a relationship grounded in reciprocity. The Potawatomi description of reciprocity is, "to keep the gift in motion through self-perpetuating cycles of giving and receiving" (Kimmerer, 2013, p. 165). This involves taking care of the health of the soil, the water, the plants and the animals so in turn those elements can sustain your own life. The health of humanity and nature are intertwined.

One example of reciprocal behavior in nature can be seen in symbiotic relationships between different living organisms. In reference to lichens (algae and fungus), Kimmerer (2013) stated:

> These ancients carry teachings in the ways that they live. They remind us of the enduring power that arises from mutualism, from the sharing of gifts carried by each species. Balanced reciprocity has enabled them to flourish under the most stressful conditions. Their success is measured not by consumption and growth, but by graceful longevity and simplicity, by persistence while the world changed around them. (p. 275)

A balance of give and take, each species shifting roles as the environmental needs change, taking and giving at different times. Both organisms rely on the other's survival for their own. The success of one is to the benefit and success of the other, acts are either mutually beneficial or mutually harmful.

By studying the relationships between the more-than-human lives one can learn how to mimic our relationship to the Earth. One's place and the more-than-human beings living there are the best teachers; after a trip to the woods with her graduate students Kimmerer (2013) reflected,

> The land is the real teacher. All we need as students is mindfulness. Paying attention is a form of reciprocity with the living world, receiving the gifts with open eyes and open heart. My job was to lead them into the presence and ready them to hear (p. 222).

Closeness with nature leads to awe and inspires the feelings of kinship and interconnectedness in humans and inspires acts of reciprocity.

This section has established how different Indigenous cultures view the more-than human relatives of their places. Next, the topic introduces storytelling as the method of

passing down a community's Traditional Ecological Knowledge. The literature review will end by highlighting how to inspire pro-environmental acts.

Storytelling

Throughout human history, the stories a group of people shared showed their cultural values and passed on meaningful information. This section will demonstrate how the place one lives and how to best interact within that environment inspired the stories passed down. Many of the voices speaking to represent the Indigenous stories are community Elders, the gatekeepers of traditional ecological knowledge. Bowman (2018) informed his reader of a central truth: "Storytelling is one of the very few human traits that are truly universal across culture and through all of human history. The transgenerational transmission of the wisdom of Elders via storytelling is as old as humanity itself (p. 3)." In Indigenous communities, stories used dramatic elements which captured attention in order to impart collected understandings about how best to survive within their place.

Elders

Elders are the voice of community knowledge as stories passed down from one generation to the next show a culture's values, beliefs, and societal structures. This section critically examines the narrative power of excluding *or* including particular storytellers. In conclusion, the section will reinforce how the inclusion of Traditional Ecological Knowledge or TEK is defined as the traditional knowledge and wisdom of long-resident, oral peoples acquired over thousands of years of direct human contact with local environments (Snively, 2001). Direct human contact with nature, this knowledge was collected as Indigenous people lived within their environment. Gathering plants,

traversing terrain, following herds and collecting water were activities which were essential for basic survival. The environment sustained lives and required simply that one pay attention to and understand the cycles of Earth.

A Canadian study on an Outward Bound program for Aboriginal youth by Lowan (2009) introduced the writings of Marie Battieste, Indigenous author, educator, and member of the Potlotek First Nation in Nova Scotia. Battieste (2005) established how ecological knowledge is passed on by the community Elders writing,

> Building relationships with the land and its inhabitants, Elders come to understand the forces around them. Each generation then passes their knowledge and experience of the social and cultural contexts of their ecological origins to succeeding generations (p. 5).

The contexts of the ecological origins meaning the lessons learned from living alongside the more-than-human lives within their shared environment. Through the building of relationships with the inhabitants of the land, Elders learn how best to coexist in balance with the patterns of nature. These relationship-based insights are then passed to the next generation via storytelling.

Cajete's book *Look to the Mountain* (1994) shared the cultural significance of oral storytelling and how it became the method for ecological learning,

> The oral tradition became an essential aspect of traditional teaching. Thus, story becomes a source of content and methodology for Indigenous community education. Story allows individual life, community life, and the life and processes found in the natural world to be used as primary vehicles for the transmission of Indigenous culture (p.167).

Story goes beyond entertainment value and shares important insights necessary for the survival of future generations. Cajete (2004) explained how Indigenous stories exhibit a complex, layered ideological system that positions life and its intrinsic meanings within a cohesive, inclusive approach to local environments.

Knowing the Complete Story

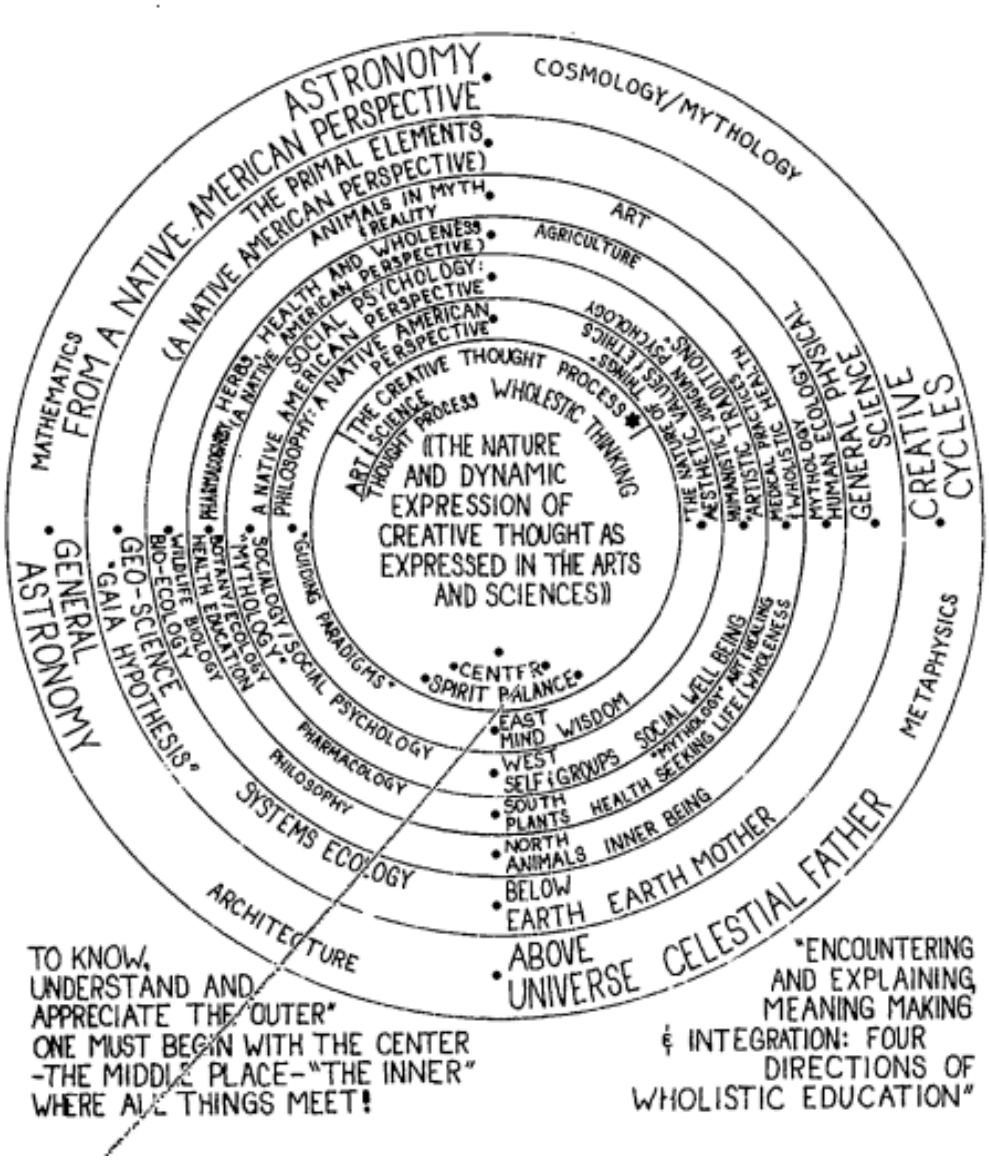
Storytelling is a powerful method of communicating values. However, as the American environmental historian Cronon (1992) argued, human interests and values shape the narrative of a story and give it meaning and purpose. As a narrator makes decisions about where in time to start and finish, and who is excluded or included, a story is also an expression of power: "whatever its overt purpose, it cannot avoid a covert exercise of power: inevitably sanctions some voices while silencing others" (p.4). When walking through any given place, the full story is not always apparent. Some stories in the landscape are not readily readable without knowledge of past activities (Stewart, 2008). Western history is the history of colonialism with scars of industrial carved into once cherished landscapes. Colonization is the story of the nullification of Indigenous peoples' ways of knowing, being and doing, and relationship with non-human others (Thorton et al., 2020). There is the need to find narratives to challenge the dominant culture. In the establishment of the discipline of Indigenous Science, Traditional Ecological Knowledge collects and ascribes greater value to the stories passed on by Indigenous community Elders. Where Western environmental education centers humans as the custodians of the natural world, Indigenous cultures put humans as a part of a larger interconnected web of interdependence.

Cajete's Indigenous Curriculum Mandala for Science from a Native American Philosophy (1994, see Figure 2 below) shared a comprehensive guided exploration of Native science and culture. Through direct encounters with plants in their natural environments, students establish their own relationship with plants and the natural world. Cajete shared how "students gather plants, make teas and other herbal preparations, draw and create natural art forms using the plants that they have gathered, keep journals and create stories related to what they are experiencing as they encounter plants and Nature." (Cajete, 1994, p. 199). Students are surrounded by and using natural items during daily living and learning. These direct encounters are the foundation of a reciprocal relationship with one's local place. It is through direct interaction and observation that the foundation for reciprocal behaviors for the earth develops. Direct experience of examining and studying the daily lives of the more-than-human leads to growing awareness of the potential threats to these species.

A survey of professional environmentalists in the USA and Norway found childhood experience in the outdoors is the single most important factor in developing personal concern for the environment (Chawla, 2010). The center of the mandala (see Figure 2 below), where one begins, has the students first look to nature as inspiration for creativity. Seeing the beauty in natural surroundings and patterns inspires one's own creativity. By exploring the ways nature creates, you experience the wonder. In *Braiding Sweetgrass* Kimmerer (2013) wrote how, "It is through that wonder or awe that students go beyond simply observing nature and collecting data, to a deeper connection and desire to see a healthier world" (p. 222). Once the wonder is felt, no matter the originating source, the attitude towards more pro-environmental behavior has been catalyzed.

Figure 2

An Indigenous Curriculum Mandala for Science from a Native American Perspective



Note: Concentric circles represent the dependence on the center circles for foundational knowledge and skills leading to the larger-scale concepts found along the circumference. (Cajete, 1994, p. 203)

Pro-Environmental Behavior

The above sections addressed that the best methods for developing a connection with nature are ones that center on Indigenous Science principles such as kinship and reciprocity. Why are these emotions of interconnection with the more-than-human lives so important for developing humans who wish to act in ways that heal the environment?

Positive Emotions, Positive Behaviors

A study by Poskus (2020) found that humans with positive personalities were more likely to self-report positive pro-environmental intentions and behaviors. From the foundation of this personal connection with the environment, one can choose to act in a pro-environmental way. Kollmus et al. (2002) defined pro-environmental behavior as behaviors that mitigate the negative impact of one's choices. One method presented in the research is the Model of Responsible Environmental Behaviors cited within Kollmus et al. (2002) and published by Hines et al. (1986).

> Within this model six pillars are needed in order for one to act in a pro-environmental way: knowledge of issue, knowledge of action strategy, locus of control, attitude, verbal commitment, and individual sense of responsibility. The previous research confirms what this model articulates; emotional investment is critical for one to consider pro-environmental behaviors and personal/local, place-based actions are the most likely to elicit follow-through. (p. 6)

In close kinship with the more-than-human lives, coexisting humans can begin to make decisions and act in ways which heal the environment and stabilize the more-than-human lives surrounding us. Focused place-based, pro-environmental projects such as habitat restoration projects growing native flowers, shrubs and trees to plant in a watershed

environment acknowledges the following truth realized during a student interview of a farmer, “your resource is the land—what it’s good for, what it can do for you…I understand the land and what it’ll do and what it’ll give and how to improve it” (Santelmann et al., 2011, p. 6). In taking better care of our surroundings by acting pro-environmentally, humans can allow the Earth to provide for our own wellness. It is through a reciprocal relationship with all the interconnected life on earth, humanity might find balance and health.

Conclusion

The literature review worked to establish the congruence between Traditional Ecological Knowledge (TEK) and Indigenous/Native Science. The discussion focused on the reasoning behind the use of different word choices to denote relationship and formality. Why is it significant to transition from TEK to Indigenous Science? The emotion and assumptions behind the word choice is pivotal in how a concept is referenced. The literature review centered Indigenous authors and educators who laid the foundation for understanding concepts of kinship and reciprocity. When humans saw themselves as interconnected and experiencing feelings of kinship with the natural world’s inhabitants; humanity acted in ways which supported those species. Storytelling as the method to pass down TEK was presented; highlighting how elders bear the responsibility of transmitting the cultural relationship to place to future generations. Finally, the literature review highlighted the potential for a shift in pro-environmental behavior. If humans see their own survival as intertwined with the more-than-human lives, humanity will act in ways which are pro-environmental. Each topic within the literature review established the foundation to answer, *How can a story lead to*

adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity? Chapter Three looks at the creation of the capstone project: a storyboard with a more-than-human protagonist.

CHAPTER THREE

Project Description

We may not have wings or leaves, but we humans do have words. Language is our gift and our responsibility.

- *Braiding Sweetgrass*, Robin Wall Kimmerer

Introduction and Established Understandings

My capstone research seeks to address the following question; *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?*

The literature review in Chapter Two established the human connection to telling stories about their particular place on Earth. The literature review shared the parallels between Indigenous Science and the Traditional Ecological Knowledge passed on by community Elders. The literature review builds on how this connection to one's place and the living things within that environment establishes the motivation for adolescents to act in a pro-environmental way. For my capstone, I created a storyboard for a novel centering on a crawdad protagonist. The literature review established how stories transmitted the knowledge of Indigenous Science. Chapter Three examined my choice to use a first-person narrative, the best practice when sharing a story of a more-than-human protagonist. My intended audience for my storyboard, the timeline for creating my storyboard and how I assessed the relevance of my storyboard.

A Storyboard

The storyboard describes the natural environment, flora and fauna which are all interconnected with the main character. The crawfish/crawdad/crayfish all are synonymous and are regional colloquial variations. Crawdad is how my state of Ohio and school community refer to the crustaceans. Crayfish is used in the eastern part of the United States and crawfish in the western part of the United States. The storyboard includes the dramatic elements of plot: exposition, rising action, climax, falling action and resolution tied to various events of a crawdad's life.

A storyboard is a prewriting technique that allows authors to consider major events for the protagonist and roughly sketch them, creating a visual of the story's plot. The research shows that when developing a storyboard a good strategy is to consider plot events within a three act set. According to NY Book Editors (2022), a prospective author should identify key emotional moments within the story which anchor the plot and move the plot along. These key moments can be loosely drawn on notecards or paper and oftentimes allow the author to shift action sequences and potentially see holes within the plot that need to be addressed. The storyboard's visual medium will also be more accessible for my sixth grade students to evaluate the plot of my story as opposed to written paragraphs.

The elements of the setting are included as photographs focusing on my community of Cincinnati, Ohio. I live and teach in the watershed of the Ohio River, specifically along O'Bannon Creek. Here the larger river empties into multiple small creeks, weaving through the landscape, eroding deeper meanders as the waters flow. The land is sculpted into rolling hills by an ancient receding glacier. The sedimentary rocks

are filled with fossilized remnants of brachiopods, branch corals and trilobites. The potential secondary characters include the more-than-human lives interconnected with the daily moves of the crawdad. Buckeye trees, oak trees, maple trees, fly larva, bull frogs, deer, blue gill, crappie, bass, salamanders, cottonmouth snake, snails and more are all represented.

Middle Schoolers: The Creek and the Crawdad

The audience for the book is curious yet timid young adolescents. Eleven-year-old sixth graders are the ideal target audience for my novel. Their vocabulary and reading fluency is further developed than early readers in Elementary school and they handle figurative language, analogies, and some potentially darker plot twists. The connection between the gawky and awkward appearance of the crawdad parallel some of the feelings of a sixth grader's perceived appearance. This adds to the relatability of my protagonist. The curiosity of my reader is immediately awakened by the cover art and type of protagonist of my novel.

The Method of Storytelling

As presented in Chapters One and Two, stories create change and choosing whose story gets told is of great significance. A narrative is the presentation of someone's lived experience in a written form, typically within a novel. Most humans only interact with their own lived experiences and those of humans similar to themselves including family and friends. A novel can open one's field of vision to include others they've not noticed. Strange (2002) cited

> In their desire to be entertained by a story, the reader was willing to suspend their prejudices against the social group represented by the main characters, and since

> an important part of being entertained by a novel is perspective taking, they would empathize with the protagonists, thereby becoming more susceptible to concern for other members of the group in question. (p. 8)

The narrative allows the reader access to groups typically deemed outsiders. The reader develops an emotional tie to the protagonist and is involved in the outcome of their story.

When telling a non-human story, first-person plural narrative is the most effective point of view. The narrator tells a story they experienced and is the main protagonist of the story. In a 2012 study, Geoff Kaufman and Lisa Libby observed that when readers looked at the same narrative written in first-person and third-person; the reader simulated the experience of the protagonist to a greater extent using a first-person narrative. To relate to the various events within the life of my crawdad protagonist, her (or his) story should be written in first-person voice. Since my protagonist is a non-human central character, the use of first-person point of view gives the animal their own voice. Malecki et al. (2019) found that through first-person voice "the animal is given a voice and speaks to the reader directly and again the words attributed to it are ostensibly crafted so as to appeal to readers' compassion and move them deeply" (p. 104). My story is purposeful in the point of view and word choices to ensure that my crawdad's story is one my readers care about.

Telling an Animal Story

As established in the literature review, storytelling is a part of human culture. Humans use their voices to speak and their hands to write the stories they want to share. However, how does one learn the stories of plants and animals? Without a common language, humans can, at best, observe and study the interactions of the

more-than-human. Malecki et al. (2019) introduced this difficulty, “among the many respects in which other species differ from us is that they cannot express their mental processes verbally” (p. 9). The relationships between individuals' daily struggles and accomplishments, and how any individual feels about their experiences is not as easy to access.

To uncover the stories of animals, repetitive and reliable direct observations and identifying individuals and specific communities are the best strategies. However, the story I tell will not be one that is entirely informative. I will use embellishment and drama to move the story at various plot points. Luckily Malecki et al. (2019) found that “according to some evolutionary explanations of the origin of storytelling, our willingness to treat stories seriously no matter what their source is in fact an evolutionary adaptation” (p. 81) As long as my story fits along the expectations of a crawdad life cycle and all supplemental characters are ones which would be found within the creekbed environment, the story I tell will be accepted as accurate and true.

Subject of Choice

Are certain animals more likely to elicit an empathetic response from humans than others? A study by Maleki et al. (2019) using Polish college students looked at attitude change towards animals by reading the same story with different animals as the main character: a chimpanzee, a pig, a parrot, a rat, a cat, a lizard, a hamster, a panda, and a hen. Malecki et al. found humans showed greater care for the animals perceived as more similar to them. The animal protagonist which elicited the most empathetic attitude was the ape. Excluding the ape, the animal that was perceived as closest on the evolutionary tree resulted in the largest emotional response. Contrary to this idea was the

results from the lizard, which scored higher levels of empathy compared to its evolutionary proximity. The researchers discovered that there was a cultural wordplay issue. The Polish word for lizard utilized a suffix which signaled that the protagonist of the story read was not just a lizard; but a baby lizard at that. As quoted within *Human Minds and Animal Stories* "we collectively feel more sympathy and affection towards those animals that possess juvenile features" (Boxenbaum & D'Souza, 2013, p. 186). Stories that include characters of juvenile animals such as one at the beginning of their life cycle will be useful to include in my crawdad's story to be sure that I have tapped into the inherent vulnerability of juveniles and desire to protect the vulnerable.

I offer the following critique of their above study and why I am still interested in centering the crawdad as the protagonist of the story I want to tell. Malecki et al. (2019) used Oriana Fallaci's *The Dead Body and the Living Brain*, a story about animal experimentation on a monkey at the hands of a human. The monkey's story was not their own and could be replaced by any other animal. The victim being tortured was simply a character in the larger discussion on animal experimentation. Consequently, the animals that were categorized as dissimilar to humans were also deemed as not worthy of individual autonomy and empathy. Will my readers care about a crawdad protagonist? I see the answer as yes. I am not simply using the animal as a supplemental character; I will develop the worldview from the perception of a crawdad. The story will be set within the crawdad's environment and focus on the relationships and interconnection of all living things within the creekbed. By focusing on the individual crawdad, the reliance on and connection to the whole of the creekbed community will be established. My reader

will care about the individual crawdad because they will see how their individual story fits the larger picture of the ecosystems on planet earth.

Evaluation

As a middle school teacher, I have rotating groups of students each school year. As my target audience is the youngest grade within my building, each upcoming group of sixth grade has not had any previous learning experiences with me. After the development of the storyboard during summer 2024; my new classes of sixth graders openly reflected on the readability, how much their curiosity was piqued, and how much they cared about the fate of Carson, the crawdad protagonist via a mentimeter survey. Incoming sixth graders who have never met me and have no prior relationship to color their opinion of my novel as presented via storyboard will be the perfect survey group.

Timeline

The spring, summer, and fall months of 2023 and 2024 were spent doing purposeful direct observation and description of specific communities of crawdads. The two years for observation aid in determining if there are patterns or changes between the two years. In spring 2024 I identified specific sections of O'Bannon Creek ideal for crawdads to conduct routine observation. I wrote regarding the environmental conditions of the creek and listed flora and fauna which the crawdad interacted with. By the end of this season, I had collected photographs and videos of crawdads confidently going about their daily activity. I revisited the same O'Bannon Creek during months of observations. Those written observations and photographs went towards building the artistic elements of my storyboard. During Summer 2024, I determined major events which would be triggering events of the plot. By the end of this season, I placed observed details into a

plot diagram structure and determined the name of my protagonist. As the season turns to Fall, I asked incoming 6th grade students to examine my storyboard and reflect on various elements of potential success.

Conclusion

Chapter Three introduced the idea for a story centering on a crawdad protagonist. The capstone project will be a storyboard showcasing the key moments within the life of a crawdad. Through the authentic storytelling honoring a more-than-human protagonist this capstone and resulting novel will show, *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?* Chapter Three addressed the research behind writing a story centering a more-than-human protagonist. The research showed the best point of view for writing an animal's story is first-person narrative. However, the research also showed that most novels centering on an animal protagonist still focused the main plot moments around the animal's interactions with humans. The animal was brought into the human's world. I seek to create a storyboard that shows the key moments of a crawdad's life are just as important, action-packed and worthy of reading. The visual nature of the storyboard allows for photographs of observations to be used. Chapter Four offers a reflection over the process of my direct observation of crawdad communities and the experience of fitting a more-than-human's life events into a human created plot diagram.

CHAPTER FOUR

Conclusion

The stories of buffalo and salamanders belong to the land, but scientists are one of their translators and carry a large responsibility for conveying their stories to the world.

- *Braiding Sweetgrass*, Robin Wall Kimmerer

Introduction

Growing up in the Ohio River watershed, I forged my bond with the environment through play and exploration of creeks. Indigenous Science would name the bond I felt with the creek's inhabitants, kinship. Chapter Two discussed the current insight regarding the question, *How can a story lead to adolescents developing a kinship with the more-than-human elements of a place and lead to pro-environmental behavior grounded in reciprocity?* This emotional kinship with nature was shown to be most easily developed through direct interaction with the environment. The current method to develop feelings of kinship and inspire adolescents to act in pro-environmental ways is to engage in hands-on environmental education either in public school or informal educational settings. One gap in this method is that access to the environment is not equal for all human communities. My Capstone Project seeks to fill this gap. For students with no access to the outdoors, reading a book with a crawdad protagonist immerses the reader in the excitement of existing in the creek. A change of emotion is the first step to a change of behavior. The story of Carson the crawdad, allows students to learn about the creek through shared experience with the crawdad, not data collecting. The reader will begin to care for Carson and whether or not Carson survives. That feeling of caring about a crawdad would be one of kinship with the crawdad. The story of Carson has the

potential to inspire feelings of kinship and persuade young people to act in pro-environmental ways, even those who do not have easy access to their local environment. My capstone project was a storyboard showcasing the key moments within the life of a crawdad. Here is the storyboard link: https://www.canva.com/design/DAGKjG7magc/z3xjgHcx5lgetM6eam3tDw/view?utm_content=DAGKjG7magc&utm_campaign=designshare&utm_medium=link&utm_source=publishsharelink&mode=preview

This chapter offers a reflection on the process of my direct observation of crawdad communities and the experience of fitting a more-than-human's life events into a human-created plot diagram. The process of conducting research and direct observation generated new questions and critiques. How did my current practice in my Environmental Gratitude classes perpetuate a colonizer and consumer viewpoint? Throughout the duration of observation, my own practices did not remain the same. Consuming the words of Indigenous authors brought me renewed awareness and deeper kinship with the crawdad and drove new considerations and priorities. In Chapter Four, I offer the ways in which my research inspired immediate changes in my Environmental Education teaching practices and inspired grande, overarching questions regarding the entire framework of Western Academia.

Reflections and Conclusions

For two years, I have taught an Environmental Gratitude class to 6th, 7th, and 8th graders using the creek as my backdrop to all learning. The crawdad has been how I connect students to their environment as long as I have been accessing the creek. I found that many of my pictures of the creek and crawdad were of similar format; very up close

images of single crawdads pulled out of the water in the hands of children. Some images I came across are ones that show how I collected data on crawdads with human tools. Some videos show a pure outsider perspective; noticing without an agenda beyond bearing witness. Spending time watching, observing, and noticing without any agenda. Simple, intense curiosity is the key to developing a kinship with the natural world. When humans slow down and remove their agenda, the more-than-human lives are able to show their stories. The videos of different behaviors drove me to ask more questions. During my time at the creek, I have been inspired by these moments of crawdad standoffs and quick hunting as well as finding heavy machinery waste and pollution. The exposition found on the first two slides of the storyboard is where the science and my expertise in Environmental Education came in handy. In order to uncover the rest of the crawdad's story, I had to wait and watch by the side of the creek. In order to experience the story of the crawdad I had to get out of my Western Academia mindset and simply observe different crawdad communities. No measuring specific data was necessary. Without disturbing the rocks and pools of water, the crawdads were able to act without fear or self-consciousness. The videos showed intimate interactions between individual crawdads and groups of crawdads, allowing me to view their confident showings of bravado while competing for rock cover as well as their hunting behaviors. Learning how crawdads interact with their environment and other species allowed me to more accurately show gratitude for their stories and communicate them to an audience.

I did not get to photograph the creek bed with a rainstorm and thus utilized the AI resource Magic Image to generate an image. I provided the following input: A landscape painting of a shallow limestone rock creek in the Ohio River Valley surrounded by

hanging sycamore trees and honeysuckle during a dark thunderstorm with lightning and rain. In taking the first draft of the storyboard to the final version, clarity of media and of plot line was essential. I decided on using arrows and frames to point out the crawdads I want my viewer to notice. All of the images collected were done with various phone cameras. To take an image above the water of something which exists underwater created a level of difficulty I was wholly underprepared for. On the day I presented my storyboard to my professor I sat displeased with the final images of my protagonist and my elder. Throughout capturing images of the crawdads, the large crawdads were never ones to come out and act in the open unnecessarily. They were established in their own territories and disinterested in simply wandering around to display dominance. As I walked past this section of the creek I found two small crinoid columnal fossils. The creek offered my favorite fossil and the opportunity to capture the remaining photographs I wanted. I felt overwhelmed with gratitude and excitement to share what I had seen at the creek.

For kids with no access to the outdoors, reading a book with a crawdad protagonist immerses the reader in the excitement of existing in the creek. A change of emotion is the first step to a change of behavior. The story of Carson the crawdad, allows kids to learn about the creek through shared experience with the crawdad, not data collecting. The reader will see some human struggles parallel to those that are required for all living things such as food stability, reliable shelter, and connection. The reader will begin to care for Carson and whether or not Carson survives. That feeling of caring about a crawdad would be one of kinship with the crawdad. The story of Carson has the potential to inspire feelings of kinship and persuade young people to act in

pro-environmental ways, even those who do not have easy access to their local environment. While independently collecting videos and more intimate photographs of crawdads, three high school-aged boys whom I had taught in my Environmental Gratitude class were traipsing through the creek with nets and boxes proclaiming to me once recognition occurred how they were fishing along this protected piece of land. I felt ashamed and embarrassed that kids which I had exposed to the creek were now treating the creek as a resource to be exploited by them as long as they did not get caught. A wave of guilt and judgment washed over me. Had I unknowingly perpetuated this myth of settler colonialism to see the environment as a resource to be collected? How can Environmental Education practices take into the wisdom of Indigenous Science to change the way educators facilitate interacting with the environment?

As educators, what story is being centered in our discussions? Which lens is being used to look at the earth and the environment? The research presented in Chapter Two showed the history and transmittable nature of storytelling to pass on cultural norms and expertise. One heavy thought I had during this phase was to question which story is centered in my personal classroom as well as classrooms across the United States. Hamline taught me to look deeper into my personal educational experiences learning the history of Ohio and the United States.

My learning exposed the myth of Settler Colonialism. Settler Colonialism is the lens through which all learning typically occurs, often without any awareness. In the first images from 2023, hands hold crawdads against a measuring tape while a bucket holds dozens of individuals plucked from their homes to be counted. The collection of data was the goal of these experiences; to measure and to count. Crawdads attempted to escape as

they swam away; my students excitedly flipped over rocks to grab at the flash of movement. At the end of a class filled with twenty-eight teenagers collecting data on the more-than-human lives, the creek had been aggressively disturbed. My students smiled proudly up at the camera and made plans to come back to visit the creek with their families after school. They were energized and looking to hunt and collect more crawdads. Teaching four classes containing creek visits, I rarely brought students to the same location. Knowing that all the crawdads were hiding, traumatized by our exploration, my students would not find the same abundance of crawdads once a previous class had visited. Environmental Education curriculums often prioritize exposure and excitement through highly engaging hands-on activities. How can Environmental Education facilitate students interacting with the more-than-human lives and natural environment where children go into the experience expecting to learn from the natural world, not just about it?

The storyboard commences a dedication of my time to write the paragraphs describing what I witnessed in the creek. I have read author's notes which share how the process of writing a book takes years of dedicated time. With all the tumultuousness of my life; to know where I may be in 1,3,5, or 10 years from now is beyond comprehension. I can only state, with an added measure of certainty and conviction, that I have the desire to listen and learn from my more-than-human neighbors and to share their stories with those I am surrounded by.

Implications

The literature review showcased the writings of Indigenous authors and brought into question the word choices made, either purposefully or unintentionally. Kimmerer

(2013) reminded readers that by acknowledging the person-hood of trees and land, they are more likely to act in ways that respect the lives of trees. Via a strong emotional kinship with the more-than-human lives and acknowledging the interconnectedness of all living things, the desire to act pro-environmentally can be cultivated. As Environmental Educators seek to inspire pro-environmental behavior, this development of kinship is essential. Are the current best practices ones that look at the environment via data collection seeking answers to a self-driven question, or ones that allow young people to witness the authentic stories of the plants and animals that surround them? This is a question for every environmental educator. When students are done with their environmental education experiences, what is the condition of the natural environment and the more-than-human lives living there? In response to reading my capstone, I hope that educators will closely examine their own teaching practices to consider the implications for the more-than-human.

Limitations

Upon choosing the crawdad as the protagonist for my story early 2024, I began the process of focused observation. Luckily, the creek has always been a place I find myself; whether surrounded by students, my own children, my family and alone. I had images from years prior of crawdads in the hands of adolescents, even finding a close up photograph of a female crawdad with eggs hidden under her swimmerets. Unfortunately, during the collection of photographs where the individual crawdads are splayed out in a hand or piled on top of one another; I never considered the crawdad's well-being. Post literature review, new frameworks of engaging with the environment and all more-than-human life crept into all of my interactions. I began to wonder about the lives

of the individuals I found in the creek. As my visits to the creek became one of noticing and photographing from a distance instead of overturning rocks and grabby fingers, I witnessed much more intimate interactions. I watched as different individual crawdads interacted with other crawdads, other species and the natural environment.

One limitation of my observations is the small amount of time I could dedicate to the project once I understood this connection. Only one season of life, Spring 2024 is represented well with my kinship to the crawdad my driving influence. Due to the informal nature of a storyboard, a majority of photographs are captured using a phone's camera. In future work, a higher quality camera will be beneficial as a majority of crawdad life occurs just beneath water's surface.

Future Research and Recommendations

I hope the literature review contained in Chapter Two and my storyboard lead to a reconsideration of what narratives are included in conversations on environmental education? How are the stories of the more-than-human lives treated? If a crawdad is simply a resource to be measured and harvested sustainably, then it only exists within the lens of its commercial value to humans. Wiggan (2019), Kimmerer (2013), and Byrnes (2001) all wrote on the weight of the words used to speak. Whether Traditional Ecological Knowledge vs Indigenous Science, it vs who, or space vs place the choice carries respect and influences the action taken. Future research could study ways to center Environmental Education around Indigenous Science's concepts of kinship and reciprocity. Studying the effect of implementing Cajete's Indigenous Curriculum Mandala (1994) with various student bodies in the 21st century is worthy of pursuit as well.

Communicating the Results

Fall 2024 incoming groups of 6th, 7th and 8th graders enter my classroom's doors to begin a new school year. Incoming 6th graders have never met me in person and my reputation is purely based on hearsay; they will have no influence of personal emotional connection to me as a person when interacting with the storyboard. The students in my 7th and 8th grade classes have forged a bond and watched me work through the process. In fact, some students I shared my idea for a story centering a crawdad are ones who will examine my storyboard. To gauge opinions of students and ease accessing those thoughts for later reflection, mentimeter was an effective tool. Upon completion of this capstone and storyboard, I question effective ways to communicate my research, elevate my selected authors, and workshop my storyboard. By exploring different avenues of publication for this capstone in various academic journals I will facilitate a wider reaching shift in conversation.

Benefits to the Profession

The Indigenous authors and writings elevated in the literature review are ones worthy of revisiting or reading if they are unknown to anyone. The public school classrooms built under the ideals of Western Academia overlook stories of Indigenous communities and consequently glaze over entire histories and ways of existing. By reading their stories the thread between these human cultures and the more-than-human lives becomes visible. The way Indigenous cultures are interconnected to the more-than-human lives means deep emotional feelings of kinship are felt. Due to this feeling of interconnected kinship, Indigenous cultures acted in ways that aided the populations of the more-than-human. Pro-environmental behavior was the only way of

behaving. Via a reciprocal relationship with the environment, Indigenous cultures existed and thrived for centuries prior to colonization. My hope is for more European, female educators; the like myself, to read the writings of Indigenous authors and share their stories.

The story of Carson the crawdad will be one to invite kids into the world of an Ohio creek. Carson faces many struggles which are common amongst humans. The struggle for reliable and safe housing is not unique to crawdads and perhaps an issue which my readers connect to. The feelings of fear, doubt, and helplessness Carson encounters after questioning mortality and danger are all emotions humans during middle childhood are apt to feel. Once an emotional bond, kinship with Carson the crawdad is established, the reader might consider how a crawdad like Carson might end up. The reader might wonder what happened to Carson. The reader might see the artificial creek restoration projects and the human brought machinery leaking pollution into the natural environment and wonder how humans can do better. The potential benefits for children who read Carson the crawdad's story is the development of feelings of kinship which could lead to increased pro-environmental behaviors.

Conclusion

When humans go into a space with the intent to study and collect data, the lens is one that is purely extractive. The data which is collected is then used to further the ideas and questions of the extractor. Reading the work of Indigenous authors I have come to respect the elder species, plants, and recognize the young species, humans. I did not need to concern myself with establishing a goal or employing methods, all Western Academic ways of understanding. I simply needed to put myself in the right environment to witness

the happenings of the crawdads; while minimizing my level of disturbance to not incite levels of fear and lead to the crawdads recoiling under protective rock outcroppings.

The stories which are told influence the emotions and behavior of the public. Will humanity continue to view the natural world as a resource for human consumption and in need of human sustainability methods? Or will the conversation shift to one of equity? A conversation where equal status is given to all different ways of knowing and all species of interconnected life on Earth. Where the story of a single crawdad is not just worthy of being told and consumed for entertainment; but one which ignites its readers' empathy and moves them to act in ways grounded in their newfound kinship with the more-than-human life on Earth.

REFERENCES

Berkes, F., Colding, J. & Folke, C. (2000). Rediscovery of Traditional Ecological Knowledge as Adaptive Management. *Ecological Applications, Volume 10, Number 5*. https://www.jstor.org/stable/2641280

Bowman, R. (2018). Teaching and Learning in a Storytelling Culture. *The Clearing House: A Journal of Educational Strategies, Issues, Ideas, Volume 91. DOI:10.1080/00098655.2017.1373547*

Cajete, G. (1994). *Look to the Mountain: An Ecology of Indigenous Education*. Kivaki Press.

Cajete, G. (2004). Philosophy of Native Science. *American Indian Thought, Chapter 5*. https://partiallyexaminedlife.com/wp-content/uploads/Cajete-2004.-Philosophy-of-Native-Science.pdf

Chawla, L. (1998). Significant Life Experiences Revisited: A Review of Research on Sources of Environmental Sensitivity. *The Journal of Environmental Education, Volume 29, Number 3.*

Cronon, W. (1992). A Place for Stories: Nature, History, and Narrative. *The Journal of American History.* *https://www.williamcronon.net/writing/cronon_place_for_stories_1991.pdf*

Fukuoka, M. (1978). *The One-Straw Revolution: An introduction to natural farming.* Rodale Press.

Hernandez, J. (2022). *Fresh banana leaves: healing Indigenous landscapes through Indigenous science.* North Atlantic Books.

Jiang, M., Gao, K., Wu, Z., & Guo, P. (2022). The influence of academic pressure on adolescents' problem behavior: Chain mediating effects of self-control, parent-child conflict, and subjective well-being. *Frontiers in Psychology, Vol 13*. https://doi.org/10.3389/fpsyg.2022.954330

Kimmerer, R. W. (2013). *Braiding Sweetgrass.* Milkweed Editions.

Kimmerer, R. W. (2003) *Gathering Moss*. Milkweed Editions.

Kinch, R. A. (2022). *INDIGENOUS STORYTELLING, CHEROKEE TRADITIONAL ECOLOGICAL KNOWLEDGE, and PLACE-BASED EDUCATION. [*Thesis, West Carolina University]. https://libres.uncg.edu/ir/wcu/f/Kinch2022.pdf

Lowan, G. (2009). Exploring Place from an Aboriginal Perspective: Considerations for Outdoor and Environmental Education. *Canadian Journal of Education, Volume 14*. exploring-place-from-an-aboriginal-perspective-lowan-2009-1.pdf

Malecki, W., Sorokowski, P., Pawlowski, B., & Cienski, M. (2019) *Human Minds and Animal Stories: How Narratives Make Us Care About Other Species.* Routledge. https://library.oapen.org/viewer/web/viewer.html?file=/bitstream/handle/20.500.12657/52763/9780429591990.pdf?sequence=1&isAllowed=y

Santelmann, M., Gosnell, H., & Meyers, S.M. (2011). Connecting children to the land: place-based education in the muddy creek watershed, Oregon. *Journal of Geography*. DOI:10.1080/00221341.2011.534172

Stewart, A. (2008). Whose place, whose history? Outdoor environmental education pedagogy as 'reading' the landscape. *Journal of Adventure Education and Outdoor Learning, Volume 8, Issue 2*. DOI: 10.1080/14729670801906125

Thorton, S., Graham, M., & Burgh, G. (2019). Reflecting on place: environmental

education as decolonization. *Australian Journal of Environmental Education.* https://doi.org/10.1017/aee.2019.31

T'San, S. (1978). *Zen and Zen Classics.* Vintage.

TEDXSYDNEY. (2019, July 15). *The Case to recognise Indigenous knowledge as science | Albert Wiggan* [Video]. Youtube. https://www.youtube.com/watch?v=X5QON5l6zy8