

THE IMPACT THAT NATURALIST PRACTICES CAN HAVE ON STUDENTS

by

Emily Suesan Pavlisich

A professional paper submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Science Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

July 2024

©COPYRIGHT

by

Emily Suesan Pavlisich

2024

All Rights Reserved

TABLE OF CONTENTS

1. INTRODUCTION & BACKGROUND	1
Context of the Study	1
Focus Question.....	2
2. CONCEPTUAL FRAMEWORK	4
Demographics	4
Teaching Framework.....	4
Being a Naturalist.....	5
Naturalist Framework	6
Physiology.....	7
Connection to Place	9
Data Collection	9
Conceptual Framework Conclusion.....	11
3. METHODOLOGY.....	12
Demographics	12
Treatment	12
Data Collection Strategies.....	13
4. DATA ANALYSIS	16
Results	16
How Naturalist Practices Impact Student Learning	16
Impact on Wolf Ridge Graduate Program.....	19
Ease/Difficulty of Implementation.....	22
Practices and the Natural World.....	24
5. CLAIM, EVIDENCE, AND REASONING	27
Claims From the Study	27
Main Research Question	27
Sub-Question 1	28
Sub-Question 2.....	29
Value of the Study and Consideration for Future Research	29
Impact of Action Research on the Author	30

TABLE OF CONTENTS CONTINUED

REFERENCES CITED.....	32
APPENDICES	34
APPENDIX A: Wolf Ridge Naturalist Practices	35
APPENDIX B: Wolf Ridge Graduate Naturalist Descriptions	37
APPENDIX C: Class Observation Protocol	40
APPENDIX D: Presurvey	45
APPENDIX E: Midpoint Survey	47
APPENDIX F: Final Survey	50
APPENDIX G: Individual Interview Questions	53
APPENDIX H: IRB Exemption.....	55

LIST OF TABLES

Table	Page
1. Data Triangulation Matrix.....	14
2. Qualitative themes in graduate naturalist responses to ‘what do the practices provide you as a learner,’ (N=14).	17
3. Qualitative themes in graduate naturalist responses to ‘how do the naturalist practices impact the Wolf Ridge graduate program?’ (N=14)..	20
4. Students responses to “what have the Wolf Ridge naturalist practices taught you about the natural world?” (N=14).	24

LIST OF FIGURES

Figure	Page
1. A graph showing the summary of qualitative response themes related to the main research question, “how can the naturalist practices impact you as a learner,” ($N=14$).	17
2. A graph showing the summary of qualitative response themes related to the first sub-question, “how do the naturalist practices impact the Wolf Ridge graduate program,” ($N=14$).	20
3. A graph showing the difficulty of implementing naturalist practices in student learning, ($N=14$).	22
4. A graph showing the qualitative response themes related to the second sub-question, “what can the Wolf Ridge naturalist practices teach you about the natural world,” ($N=14$).	25

ABSTRACT

This project was investigating what impact a new framework of learning has on graduate students at Wolf Ridge Environmental Learning Center in Finland, Minnesota. The framework being investigated was the Wolf Ridge naturalist practices which consists of different routines to use while exploring the natural world. These four practices include slowing down, noticing surroundings, gathering data, and sharing with others. The students being investigated were the fourteen student naturalists in the 2023-2024 Wolf Ridge graduate naturalist program. The practices were introduced to the graduate students through professional development sessions and through their graduate classes. Throughout the semester, data was gathered related to what the practices provided students in their learning, how the practices impact the Wolf Ridge graduate program, and by using the practices, what could the students learn about the natural world. Data was collected through observations of the graduate student's natural history classes, through surveys administered through Google Forms, and through individual interviews. It was found that the practices provided the students with a strong framework and skills for learning about natural history and for teaching environmental education. The practices make the Wolf Ridge graduate program welcoming to all students, regardless of their education background prior to the start of the program. The practices teach students how to be an explorer of the natural world as well as specific pieces of natural history such as identification of trees and animals.

CHAPTER ONE

INTRODUCTION & BACKGROUND

Context of the Study

As a teacher that has worked in both formal and informal education, I have seen the need for change in our classrooms. When students are able to engage in outdoor learning, they get to form incredibly powerful connections to the topics being investigated. There's also such a noticeable shift in their attitudes and their ability to interact with their peers. My research topic involved an educational framework and the impacts that it can have on students. This framework was developed at Wolf Ridge Environmental Learning Center in Finland, Minnesota where I work as a naturalist. At Wolf Ridge, we run a 10-month graduate naturalist training program where students live on campus taking classes related to environmental education as well as teaching classes to the K-12 school groups that visit our campus.

The framework that I investigated is the Wolf Ridge naturalist practices (Appendix A) and the impact that they have on the graduate naturalists as learners. This framework helps students explore the natural world through four practices; slow down, notice surroundings, gather information, and share with others. These are practices that Joe Walewski (2020) spent years observing in naturalists at Wolf Ridge and through reading biographies of great naturalists. As a member of the Wolf Ridge program team this study is significant to me because it will help shape the Wolf Ridge graduate program, Wolf Ridge K-12 programming, and Wolf Ridge teacher outreach programs.

Focus Questions

The purpose of my research is to investigate what impact using Wolf Ridge naturalist practices has on graduate student learning. As this is a new framework of learning, I am curious to see how it is able to teach the students about the natural world, as being a learner, and as being an educator. This will allow me to help future graduate students that go through the Wolf Ridge naturalist program grow in their learning of environmental education. It will also give me evidence to share with the teacher workshops that Wolf Ridge provides teachers across the state of Minnesota, about what benefits these practices can provide students.

My focus question was, How does using Wolf Ridge naturalist practices impact students in their learning?

My sub-questions include the following:

1. How does using the Wolf Ridge naturalist practices impact the Wolf Ridge graduate naturalist program?
2. What can using the Wolf Ridge naturalist practices teach students about the natural world?

Through my main research question, I investigated how the graduate students are impacted in their learning by using the naturalist practices. These students were a part of the 2023-2024 Wolf Ridge graduate program where they earned credits towards a master's degree in environmental education. I purposely left the question a bit broad so that I might gain understanding on what the practices provide them in their learning of the natural world, on their learning of environmental education as a concept, or their learning as environmental educators.

Through sub-question 1, I was hoping to gain an understanding on how the graduate students believe that using the naturalist practices as a framework for learning impacts the Wolf

Ridge graduate naturalist program. This will allow us to make changes to the program that benefit future students.

Finally, through sub-question 2, I was hoping to gain an understanding about what else the naturalist practices can teach the graduate students about the natural world. Many of them come into the graduate program with little to no knowledge about the natural history of the area, so I hope to understand what they learn about the area through these practices.

CHAPTER TWO

CONCEPTUAL FRAMEWORK

Demographics

Throughout my time working as both a classroom teacher and as a naturalist at Wolf Ridge Environmental Learning Center, I have had a chance to explore several different types of educational frameworks. The Wolf Ridge naturalist practices are another educational framework that helps students explore the natural world. This is a great starting point for a big shift in science education, especially in Minnesota, where I currently reside.

The Next Generation Science Standards (NGSS) framework is a tool that is being used throughout the United States as a way to improve science education. As it is a big shift from the way science has previously been taught, there is a need for ways that educators help their students explore the natural world before they expect them to be able to ask deep questions about it. One of my driving factors for this research was that the world needs more good scientists, and we as science teachers have the ability to help shape good scientists. As educators, we need to help our students see that science is everywhere and they are indeed scientists. As Edward O. Wilson wrote to young scientists, "...I urge you to stay on the path you've chosen and to travel it as far as you can. The world needs you- badly" (Wilson, 2013, p.13).

Teaching Framework

Throughout this research process, I was investigating the Wolf Ridge naturalist practices as a framework for learning from the student perspective and of the teacher perspective. I wanted to be able to explore different frameworks throughout my own teaching of students, but also have different frameworks to be able to share with other teachers through Wolf Ridge's teacher outreach programs. Another style of pedagogy that the Wolf Ridge naturalist practices align with

that I plan to incorporate into my teaching of both students and teachers is the idea of Wild Pedagogies. Wild pedagogies require teachers to be open to several different concepts, which include learning alongside their students, posing questions as a way of seeking answers, appreciating that answers might not yet be known, working with open-ended and collective problem-solving approaches, and remaining sensitive to the phenomenon of place (Green & Dymont, 2018). This pedagogy style works itself well in connection with the NGSS and naturalist practices, as all are a framework of teaching that allows students to explore science while asking questions and trying to construct answers. The key point is that they are posing questions themselves based on what they are observing. Jean-Jacque Rousseau stated,

Teach your scholar to observe the phenomena of nature; you will soon rouse his curiosity, but if you would have it grow, do not be in too great a hurry to satisfy this curiosity. Put the problems before him and let him solve them himself. Let him know nothing because you have told him, but because he has learnt it for himself. If ever you substitute authority for reason he will cease to reason, he will be a mere plaything of other people's thoughts... (Rousseau, 1914, p.112).

Being a Naturalist

The term naturalist and natural history have been around for ages, but the terms have taken on different meanings throughout the years. Natural history started out as texts being stressed more than experiences and scientists trying to bring order to nature by naming and classifying living organisms (Farber, 2000). As natural history evolved throughout the 1700's, naturalists were seen as collectors, where specimens were killed and brought on display to personal collections (Farber, 2000). As time has moved forward, so has the idea of what being a naturalist means. Whereas the field started out as wanting to be able to name and classify living things, naturalists have a sense of responsibility for the natural world and seek to engage in fieldwork and experimental design to uncover patterns and principles in nature (Farber, 2000).

Howard Gardner is famous for his book, *Frames of Mind*, where he lists eight different forms of intelligences that humans have that allow them to process data in different ways, all of which are independent of each other (Gardner, 1983). However, Gardner has since published *Intelligence Reframed* where he introduces three additional types of intelligence, one of which is naturalist intelligence (Gardner, 2000). He describes this naturalist intelligence as showing skill in recognition and classification of the flora and fauna of an environment, having extensive knowledge of the living world, being comfortable in the world of organisms, and being able to distinguish species and chart relationships among them (Gardner, 2000). Richard Louv (2008) discusses this naturalist intelligence in *Last Child in the Woods* by describing how this intelligence has such strength with teachers who might otherwise overlook the importance of natural experience and its connection to a student's learning and development.

Naturalist Framework

A challenge that many teachers have, whether they are beginning teachers or teachers with experience, is that our students can sometimes have very limited connections with the natural world (Green & Dymont, 2018). These students do not even have to be K-12 students, as the Green and Dymont (2018) article is focusing on their students, which are preservice teachers. With the advancement of technology and the readiness with which it is available, I have experienced so many of my students having little to no experience with the natural world, even within their own natural spaces. Green and Dymont propose that “one of our greatest challenges in interacting with our students is how to best guide them towards developing their own affinity with the natural world, thereby altering their relationships with this world...” (p.12).

The naturalist practices framework developed by Joe Walewski (2020) for the Wolf Ridge Environmental Learning Center graduate program. These are also referred to as natural history

practices as they focus on how to engage with the natural history of an area. This framework is made up of four key practices that naturalists do (Walewski, 2020). These practices are as follows:

1. Slow Down
2. Notice Surroundings
3. Gather Information
4. Share with Others

This framework provides practices that allow someone to be able to better interact and develop a connection with the natural world. While these practices could be utilized in a classroom setting, getting the most out of them would include being outside in the natural world. These practices then provide a starting point for learning. The framework gets students exploring the natural world and finding what they are curious or passionate about. This then naturally leads them into the NGSS science and engineering practices.

Physiology

Taking the outlined naturalist practices out into the natural world also can also be linked to physiology. Exercise improves the brains of children, as they are able to identify visual stimuli faster, concentrate better, and can perform tasks for longer periods of time (Medina, 2008). Exercise helps these things by increasing blood flow across the tissues of your body and also creating nitric oxide, which is like feeding your body more of what makes it healthier (Medina, 2008). The naturalist practices get students out in in the natural world, which typically involves exercise of some kind, even if it is just simply walking to the natural space where the investigation is occurring. Combining the naturalist practices with NGSS practices can then lead to even deeper connections in student learning.

John Medina (2008) also states, “We know that information is remembered best when it is elaborate, meaningful, and contextual” (p.114). This is phrased again in *Mind, Brain & Education*, with the author stating, “the most efficient and effective learning incorporates emotion into the cognitive knowledge being built” (Sousa et al., 2010, p.76). By integrating naturalist practices into lessons, teachers are providing opportunities for students to have lessons that are meaningful and that bring out emotions in students.

Incorporating naturalist practices as a way to lead into science and engineering practices will provide students with opportunities for more experiences in the natural world. This is key to learning, as research has shown that when students have more experiences, they connect those experiences to previous experiences and those connections allow them to obtain and apply that new knowledge to other situations (Sousa et al., 2010). Ford and Blenkinsop (2018) raise the question, “what might happen when young people have wild experiences within and alongside, or as a part of, their formal education?” (p. 309). Giving students experiences in the natural world will allow them to connect those experiences to past or future experiences they have and enhance their knowledge.

Connection to Place

By using naturalist practices to enhance science and engineering practices, we can help students develop a connection to their natural world. Particularly, we can help students establish a sense of place. Green and Dymont (2018) describe using place as a co-teacher and that having authentic experiences in their local place is critical for learners. It is critical that we get young students developing a sense of place in the natural spaces that they have available to them. Beery

states through his study of 12 undergrad students at the University of Minnesota Duluth that a deeper consideration for place is an important element of a person's behavior and that programs are more successful when individuals "grew the norm rather than those that tried to educate the public" in relation to environmental behaviors (Beery, 2013, p. 11). By using naturalist practices in the natural world that is familiar to students, we are creating wild experiences that are meaningful and contextual. Some may feel limited in their ability to have students in the natural world by the time and space they have in their educational settings. However, the writings of Aldo Leopold (known to many as the man at the heart of environmental education) disagree with needing elaborate outdoor classrooms and school forests. Leopold (1949) states in *A Sand County Almanac* that "the weeds in a city convey the same lesson as the redwoods" and farther along the page "perception, in short, cannot be purchased with either learned degrees or dollars; it grows at home as well as abroad, and he who has a little may use it to as good advantage as he who has much" (p.174).

Data Collection

The research methods for data collection that I used in my research project were modeled after Scott Morrison's (2018) approach in his article "Everyday environmental education: five practices of ecologically minded teachers." In his research of 7 ecologically minded teachers, the direction of the group's conversation revolved around talking about teaching practices and not trying to scrutinize lessons or be talking about the work of specific students (Morrison, 2018). Morrison's role was that of a participant-observer in this study and he was considered part of the world that is studied and not an expert giving an exact picture of the world. These methods provided him with a large amount of data that he reflected on after the conversations and then was able to analyze and break the data down into data reduction, data display, and conclusion

drawing and verification with qualitative data in the form of participant quotes (Morrison, 2018). This is the role that I took in my study, as I was the one introducing these practices and I was also teaching them to the K-12 groups that visit Wolf Ridge and thus part of the world that is being studied.

While Morrison used focus group interviews, Beery (2013) used individual interviews for his data collection. I believe that a mix of the two types of interview styles will provide a rich amount of information for my research project. Our focus group work involved group professional development sessions where the participants were able to discuss the implementation of the practices with small groups. Another piece of inspiration from Beery that I included in my project came from the suggestions from his research participants. One way that they say will make a difference in the environmental habits of someone is to see “positive role modeling of instructors sharing sustainability-oriented behaviors” (Beery, 2013, p. 9). From this information, I modeled the practices that I wanted my students to enhance in their teaching while they were observing me teach or while we were having discussions.

Conceptual Framework Conclusion

Naturalist practices provide a framework for learning that, when combined with NGSS practices, can help students have more authentic ways of exploring the natural world. They will be able to retain information better from being active outside and having natural experiences as their way to connect to science practices and content.

CHAPTER THREE

METHODOLOGY

Demographics

My research project was done at Wolf Ridge Environmental Learning Center in Finland, Minnesota. Wolf Ridge is a residential environmental learning center where we run several types of programming. The program that I worked with for my study was the 10-month graduate naturalist training program. This program brings graduate students from all over the country to Wolf Ridge to get 12 master's credits and a certificate towards a degree in environmental education through Antioch University in New Hampshire. These graduate naturalists spend time attending seminars on environmental education, learning about the natural history of the area, and teaching three-hour environmental education classes to the K-12 school groups that come to Wolf Ridge for 3- or 5-day field trips. The graduate naturalists varied in age ranging from 22-37 years old and came from a variety of backgrounds. There were 14 graduate naturalists in my study and descriptions of each individual can be found in (Appendix B).

Treatment

The treatment of my study included introducing the Wolf Ridge naturalist practices to the group of graduate naturalists through the professional development section of our weekly staff meetings. This section takes about 15-20 minutes of our hour-long weekly staff meeting at the beginning of each week. I took five weeks to introduce the concept to the naturalists in small segments. I started these sessions during the 4th week of their naturalist training program.

The first week was introducing the idea of the naturalist practices and that they are a framework that we can use to help us explore the natural world. The second week, I dove deeper into the first practice of slowing down by reiterating the practice and giving them an activity to do. The activity included a picture of a nature scene and the only prompt question they were given was to slow down as they were looking at the picture. The third week, we looked at the second practice of noticing surroundings. I again reiterated the practice and then we went into a different room from where we have our usual weekly meeting. I tested the observation skills of the naturalists by asking them 10 questions written down about the conference room that we have our weekly meeting. The questions included things like ‘how many windows are in the conference room’ or ‘how many drawers does the filing cabinet in the corner of the room have’. The final week, I combined the practices of gather data and share with others into one session. I reiterated the practices and then we did an activity that included all four of the practices. I split the group into 5 smaller groups and each group was given an object, such as a potted plant, and a large sheet of paper. While we were tying together all four practices, I really emphasized the process of gathering data and sharing the experience with the group throughout the activity. After each session, I encouraged the graduate naturalists to continue to use these practices in their own exploration of the Wolf Ridge campus.

Data Collection Strategies

For my research, all 14 of the 2023-2024 Wolf Ridge graduate naturalists participated in the study. This group was selected over the K-12 students that come to Wolf Ridge for programming because I do not frequently interact with the K-12 students and when I do, it is only for one 3-hour class the whole time they are here. I work with the graduate naturalists frequently each week over the 10-months that they are here for their graduate program. Table 1 is

a matrix that shows the relationship of my main research question and sub questions to the methods of data collection that were used to address them.

Table 1. Data Triangulation Matrix.

Question Being Addressed	Data Collection Methods		
	Class Observations	Surveys	Individual Interviews
Main Research Question: How does using Wolf Ridge naturalist practices impact students in their learning?	X	X	X
Sub-Question #1: How does using the Wolf Ridge naturalist practices impact the Wolf Ridge graduate naturalist program?		X	X
Sub-Question #2: What can using the Wolf Ridge naturalist practices teach students about the natural world?		X	

The first method of data collection that I used was a class observation protocol, which can be found in (Appendix C.) Through this observation protocol, I observed classes that the graduate naturalists were taking as a part of their Natural History class and lead by another member of the Wolf Ridge program staff and made qualitative observations throughout the class. This observation protocol gave me a framework to follow for each class that I observed so I had a set procedure each time.

The second method of data collection that I used was whole group surveys. I gave a pre-survey (Appendix D), a midpoint survey (Appendix E), and a final survey (Appendix F). These were administered through a Google Form and were spread out through the fall semester. I had the location of these surveys go to my Google Drive, so only I had access to the results.

The final method of data collection that I used was individual interviews, and a copy of the interview questions can be found in (Appendix G). I interviewed each of the research

participants over the course of a week for around 5-10 minutes for each interview. I recorded the information on a spreadsheet on my computer so only I had access to the interview answers and could have them separated by each individual and each question.

To help ensure the validity in my data collection instruments, I created a data collection matrix (Table 1) to show how my data collection instruments contributed to each of my research questions and this triangulation process helped to ensure that several instruments would collect data on each question. I also got my instruments reviewed by peers at Wolf Ridge as well as my professor at Montana State University. I received IRB exemption approval for my research study and a copy of the IRB exemption can be found in (Appendix H).

CHAPTER FOUR

DATA ANALYSIS

Results

I collected my data through surveys, individual interviews with students, and observations of classes that the students were taking as a part of their graduate program. In this chapter I categorized the qualitative data that I collected into different qualitative themes for my main research question and my two sub-questions.

How Naturalist Practices Impact Student Learning

Through my data collection, there were several qualitative themes that emerged in student's responses. Each of my instruments included some version of the main research question, "how can the naturalist practices impact you as a learner?" Table 2 summarizes the qualitative themes that emerged across all three instruments as well as the key words in the graduate naturalist responses that caused it to be included in that theme. Some responses included multiple parts that fit into several qualitative themes. Figure 1 then summarizes the total numbers of responses for each qualitative theme across all the data collection instruments for the main research question.

Table 2. Qualitative themes in graduate naturalist responses to ‘how can the practices impact you as a learner,’ (N= 14).

Qualitative Theme	Key Terms from response that fits into theme	Number of Responses that fit theme from Interviews	Number of Responses that fit theme from Class Observations	Number of Responses that fit theme from Surveys (3)	Total Number of Responses across data collection instruments
Exploring the natural world	Naturalist, Natural world, Surroundings	3	4	8	15 (28%)
Support	Support, Sharing, Community, Confidence	0	3	6	9 (17%)
Provides a framework for learning	Learn/Learning/Learner, Framework, Curiosity	8	4	3	15 (28%)
Applicable to other fields	New Skill, Universal, Applicable	4	0	4	8 (15%)
Intrapersonal feeling	Wonder, Well-Being, Gratitude, Mind-Set	0	3	3	6 (11%)

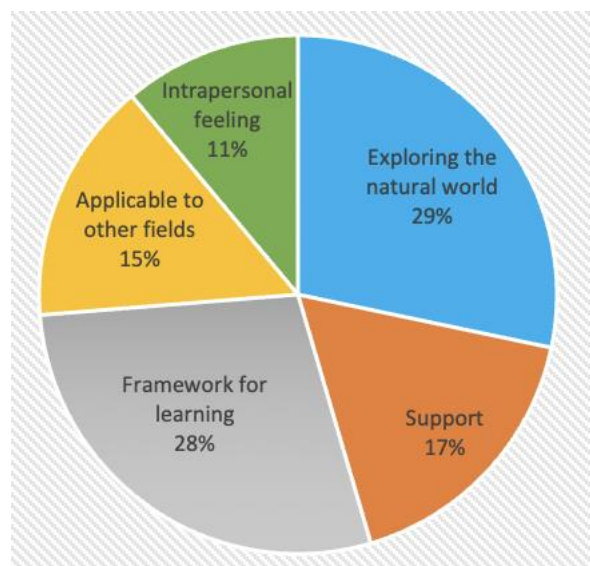


Figure 1. A graph showing the summary of qualitative response themes related to the main research question “how can the naturalist practices impact you as a learner,” (N=14).

Through the three data collection instruments, five qualitative themes emerged in student's responses to how the Wolf Ridge naturalist practices impacted them as a learner. The first qualitative theme was related to exploring the natural world which came up in 28% of responses throughout the three data collection instruments. These responses were related to being a naturalist, exploring, and current surroundings. One student responded that the naturalist practices, "give a better understanding of the natural world" while another student responded that, "they help me see things clearer in the surroundings that I'm currently in".

The next qualitative theme was support which appeared in 17% of responses throughout the three data collection instruments. In this theme, graduate naturalist responses mentioned feeling supported by the Wolf Ridge community by having others interested in what they are learning about as well as having others to engage in the practices with. One student said, "when we're intentional about the practices, they get us out [exploring] as a group, which is something that I wouldn't really feel comfortable doing alone".

Another qualitative theme was providing a framework for learning which was mentioned in 28% of responses throughout the data collection instruments. Many of the graduate naturalists had responses that had the key words to fit them in this qualitative theme. However, it wasn't just the framework of the learning that they thought the practices provided them as learners, but also the autonomy to learn as they saw fit. While one student said, "they provide independent learning so we can choose what to be invested in", another responded with, "it helps guide my own learning where I can explore and follow my own interests."

The fourth qualitative theme was that the naturalist practices are applicable to other fields which appeared in 15% of the responses. This theme included responses that mentioned the skills

being universal and transferable and that they don't just have to be used when exploring nature. One graduate naturalist mentioned, "they're applicable to everything as naturalists, in new jobs, new areas, and new skills."

The final qualitative theme from student responses were related to intrapersonal feelings and was identified in 11% of the responses through the three data collection instruments. The responses included feels of well-being, providing gratitude, a sense of place and welcoming. A powerful student response was, "the practices help me explore a sense of wonder in myself."

Impact on Wolf Ridge Graduate Naturalist Program

The next data set collected from students' individual interviews and surveys addressed how the Wolf Ridge naturalist practices impact the Wolf Ridge graduate naturalist program. Through this immersive graduate program, students are gaining experience in environmental education, which involves learning about the natural history of northern Minnesota as well as a teaching fellowship aspect where they teach environmental education to the K-12 students that come to visit Wolf Ridge. Table 3 summarizes the qualitative themes from both instruments as well as the key words that prompted them to be put into each category. Throughout the surveys and interviews, some students gave answers that multiple parts and thus covered multiple qualitative themes in their single response. These responses were counted in each theme they addressed. Figure 2 then summarizes the total number of qualitative responses for each theme across both data collection instruments.

Table 3. Qualitative themes in graduate naturalist responses to “how do the naturalist practices impact the Wolf Ridge graduate naturalist program?,” (N=14).

Qualitative Theme	Key terms from responses that fit into theme	Number of responses that fit theme from interviews	Number of responses that fit theme from surveys	Total number of responses that fit theme
Improves teaching practices	•Teaching •Educator •Practices	4	6	10 (29%)
Guide your own learning	•Independent •Learning •Interests. •Discover •Naturalist	5	7	12 (35%)
Understandable regardless of background	•Background •Aren't Teachers	4	0	4 (12%)
Strong framework for program	•Universal-Tool •Approach •Process •Foundation	6	2	8 (24%)



Figure 2. A graph showing the summary of qualitative response themes related to the first sub-question “how do the naturalist practices impact the Wolf Ridge graduate program,” (N=14).

From Table 3 and Figure 2, the qualitative theme with the most total responses from both the individual interviews and the surveys (35%) was related to guiding your own learning. Students appreciated this framework to explore and follow their own interests in relation to both their natural history skills as well as their environmental education pedagogy. One student mentioned that these practices allowed for “independent learning where we can choose what to be invested in”.

The next qualitative theme with the highest overall responses (29%) was related to improving teaching practices. The Wolf Ridge graduate students teach a variety of three-hour classes to visiting K-12 students from across Minnesota and even into northern Wisconsin and eastern North Dakota. The graduate program focuses on environmental education and one of the focuses is teaching environmental education to these visiting K-12 students. These responses in this qualitative theme included that the practices “helps me become a better educator” and that they “help apply to our own teaching.”

The third qualitative theme that emerged from the surveys and interviews was that the naturalist practices provide a strong framework for the graduate program (24%). Students were all able to phrase this differently by one saying that the practices are an “authentic process,” another saying they are a “genuine approach to learning,” and a third student saying that the practices are a “universal tool”. The practices were also described to be able to “provide fundamental principles to come back to.”

The last qualitative theme from Table 3 and Figure 2 relates to the practices being understandable regardless of one’s education background. Of the 14 graduate students, only one (7%) of the students had a degree in education and five (36%) of the students have degrees in environmental sciences/studies which means that eight (57%) of the students had little to no

background experience in this field prior to entering this program. This qualitative theme was mentioned in 11% of the overall responses and included responses that individuals don't need background experiences in teaching, biology, or environmental education to be successful with this framework.

Ease/ Difficulty of Implementation

The graduate naturalists were also asked which of the naturalist practices were the easiest to implement in their learning and which were the hardest to implement in their learning and why. Figure 3 shows the graduate naturalist responses to which practices were easiest/hardest to implement in their learning.

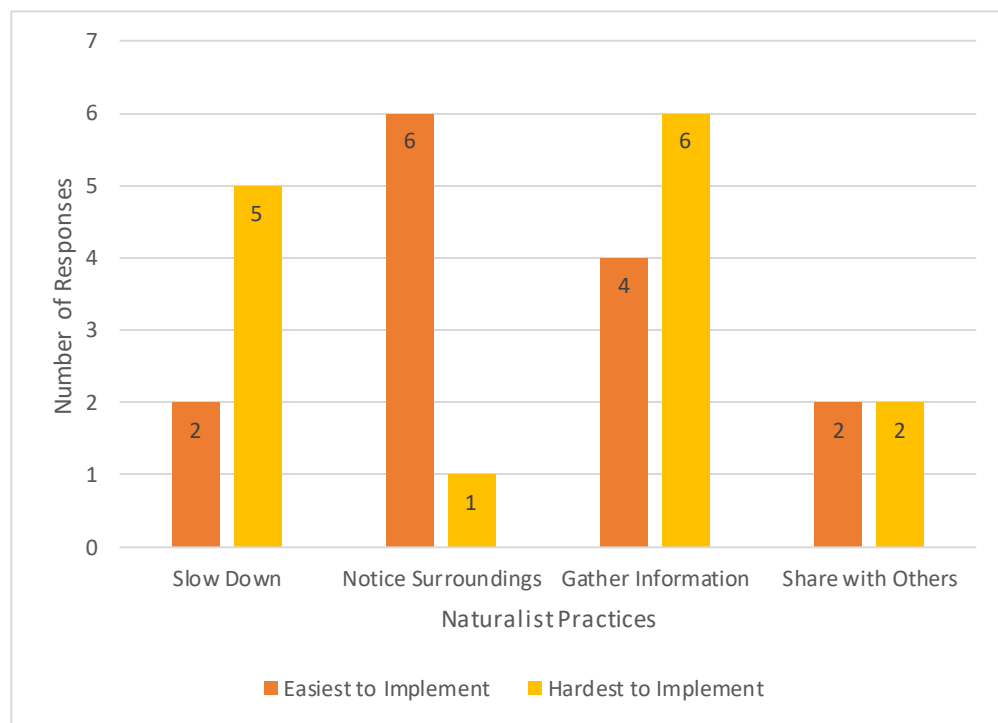


Figure 3. A graph showing the difficulty of implementing naturalist practices in student learning, (N=14).

Forty-three percent of the graduate naturalists said that the practice of noticing surroundings was easiest to implement in their own learning while only 7% of them said that the same practice was the hardest, which is a difference of 36%. When asked why it was the easiest practice, these naturalists gave explanations regarding that the practice comes naturally to them, it an easy skill to build, and that you don't need to be exact in your observations. One student mentioned, "being a naturalist to me means being curious. I'm in a new place and this helps me explore it."

Another key takeaway from Figure 3 was the 22% difference between responses for the practice of slowing down. While 36% of graduate naturalists said this was the hardest practice to implement in their learning, 14% of them said it was the easiest. In regard to it being the hardest practice, responses included feelings of being easily distracted and having a hard time focusing. One student mentioned, "I usually have a lot of things going on in my brain at one time, so I find it hard to slow down and focus." On the other hand, one student mentioned this being the easiest practice because "it applies to everything and makes the other steps easier. It's a very natural 1st step to being out and exploring." As that "very natural 1st step," the practice of slowing down was mentioned frequently throughout the data collection process. Through a survey, a student commented that these practices have allowed them to "slow down and take more time to notice things." This certainly isn't the last student quote that was collected related to the practice of slowing down, as a student stated in a survey answer "I feel like we often try to cram information but the best way to learn is to slow down."

The data shown in Figure 3 is important because as an educator of these naturalist practices, I can see which ones might be easier and which might be more difficult for students to implement. Based on Figure 3, the practices of slowing down and gathering information are practices that I

would want to spend more time working on with students to build a strong foundation in the naturalist practices as there was large differences in the naturalists perceived abilities in these practices.

Practices and the Natural World

Finally, students were asked what using the Wolf Ridge naturalist practices taught them about the natural world. Table 4 shows the qualitative response patterns related to this question collected through surveys as well as key terms from the responses that fit them into the qualitative theme. Figure 4 then summarizes the total number of responses for each qualitative theme related to the second sub question.

Table 4. Student responses to “what has using the Wolf Ridge naturalist practices taught you about the natural world,” (N=14).

Qualitative Theme	Key terms from responses that fit that theme	Number of responses from surveys that fit theme
How to explore the natural world	Slow down, lens, looking closely, learning	7 (50%)
Specifics related to natural world	Beauty, cool, trees, animals, complex, identifying, endless, levels	7 (50%)

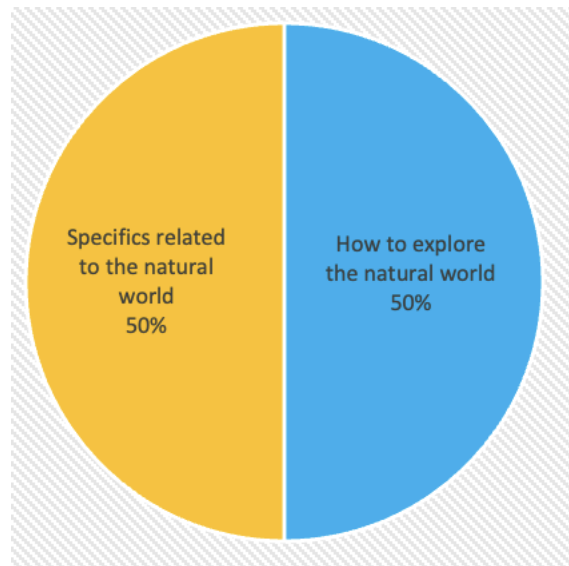


Figure 4. A graph showing the qualitative response themes related to the second sub question “what can the Wolf Ridge naturalist practices teach you about the natural world,” ($N=14$).

From Table 4 and Figure 4, there were two qualitative themes that each received 50% of responses. The first was that the practices taught them how to explore the natural world. Of those responses, 4 of them directly related their response to the practice of slowing down and how it has impacted their learning and exploration. A student mentioned that “If you slow down, you start to notice more.” Through this qualitative theme, two powerful student quotes really stood out to me for showing the importance of these practices related to exploring the natural world. The first student explained a change in their skills by saying “typically I would view nature through one lens at a time, but now I believe that I am becoming a well-rounded explorer.” The next student’s statement was “I would not explicitly say that the practices themselves are teaching me! Instead, they provide opportunities for learning.”

The second qualitative theme that also received 50% of responses was specific related to the natural world. While this category was a bit broader in responses, each response related to something specific about the natural world rather than how to explore it like the other qualitative

theme. While one response was very eloquent stating, “the natural world is more beautiful, complex, ever-changing, and radically brilliant than anything else” another simply put, “small things are cool.” Students also mentioned learning physical things relating to identification and information about trees and animals. Finally, students responded about the complexity of the natural world with its many levels and the vastness of systems.

CHAPTER FIVE

CLAIM, EVIDENCE, AND REASONING

Claims From the StudyMain Research Question

Through my research study, I was investigating how using the Wolf Ridge naturalist practices impacted students in their learning. After investigation, the Wolf Ridge naturalist practices provide learners with a framework of learning that can help them explore the natural world. This is supported by qualitative evidence gathered where the most mentioned key themes in graduate naturalist's responses to what the practices provide them were related to a strong learning framework, exploring, and feelings of support and wonder. For example, students described these practices as a "universal tool" and that they teach them to "slow down when looking at the natural world." Even though 36% of students rated the practice of slowing down as the hardest practice to implement, so many of their qualitative responses were related to slowing down. One student mentioned that the practices have taught them to "slow down to take more time to notice things" and yet another said, "I feel like we often try to cram information but the best way to learn is to slow down."

Through the interpersonal feelings qualitative theme, I feel that the research done by Green and Dymont (2018) about students developing a connection to the natural world by finding a sense of place was supported. Student responses for this qualitative theme included key phrases such as wonder, well-being, gratitude, and mind-set. I believe that these phrases go along with finding a sense of place and that students were able to develop this through their work with the naturalist practices.

These practices will be able to stick with the graduate students in their continued learning of the natural world, in teaching of the Wolf Ridge K-12 programming and in other fields that they choose to pursue after leaving the graduate program. Students mentioned that the skills were universal and could be used by anyone, which I think makes them very transferable to other work that these students choose to pursue after their graduate studies.

Sub-Question 1

In response to my question about what the Wolf Ridge naturalist practices can provide the Wolf Ridge graduate program, I found that the practices give the Wolf Ridge graduate program a strong framework to support students as they guide their own learning of both natural history and of environmental education. By continuing to use this framework, Wolf Ridge will be able to help shape strong naturalists that can go on to work in many different fields with these easily transferable skills. These graduate students mentioned that the practices are a universal tool that can be applied to other skills as well as feeling supported in what they choose to invest their learning time in. While they can be applied to many different fields, I feel that the ultimate goal would be to use them as one is moving through the outdoors as it then connects with Howard Gardner's definition of naturalist intelligence (Gardner, 2000), as well as John Medina's research that exercise improves the brains of children (Medina, 2008).

These practices also welcome students into the graduate program regardless of their educational background, as 57% of the graduate students in this cohort did not have a background in education or environmental science/studies at the start of the program. Students mentioned that the practices were welcoming to those who "don't come from teaching backgrounds" and are "a good base for people who aren't teachers."

Sub-Question 2

Finally, I was investigating what using the Wolf Ridge naturalist practices could teach students about the natural world. It was found that the practices taught students both how to explore the natural world as well as some specifics related to the natural world. I saw this finding as very productive as I wanted students to be able to see beyond just learning specifics about the natural world. I hoped that they would be able to learn these skills and then be able to use them in other situations. A powerful quote from a student related to this was “I would not explicitly say that the practices themselves are teaching me! Instead, they provide opportunities for learning.” One student stated “if you slow down, you notice more” which ties the two findings from this question together as students mentioned not just the use of the practices but by slowing down, they were able to learn more information about things such as trees and animals and were able to build up their identification skills of them as well.

Value of the Study and Consideration for Future Research

This study has great value for classroom teachers and Wolf Ridge ELC. For classroom teachers, it shows what value implementing these practices with their students can provide. These practices provide students with lifelong skills that can be applied to any context, so they are an excellent tool to get students comfortable using. Ideally, these practices would be done outside, so teachers can provide justification for pushing colleagues in their district to get their students doing outdoor learning.

For Wolf Ridge, this study impacts our graduate naturalist program, our K-12 programming, and our teacher outreach program. Our graduate naturalist program benefits from our students having a framework where they guide their own learning. By doing this, they can discover and enhance their interests in the fields of environmental and outdoor education and take that learned knowledge with them after they leave the graduate program. Our K-12

programming benefits by exposing K-12 students that visit Wolf Ridge to a safe and supportive framework for exploring the outdoors. They can then use these skills in their own outdoor environments and continue to grow through their outdoor learning. Finally, our teacher outreach program will benefit from the findings of this study as these practices can be taught to the teachers during our teacher workshops and they can then implement the practices with their students.

This study could continue by implementing the practices in a classroom with K-12 students and observing how they explore the natural world through this new lens. It could then be followed up by investigating how using these practices then compliment the use of the NGSS science and engineering practices with students.

Impact of Action Research on the Author

From this research, I was able to shape several parts of my role at Wolf Ridge ELC. I am the coordinator for our teacher outreach program where we do workshops with teachers to build their confidence and skills in outdoor learning. With this study, I can share with the teachers what value our graduate naturalists felt they gained from using the practices to show what an impact they had on their learning. They will then be able to use those practices with their students in their own classrooms.

The other biggest impact that this research has on me will be how I work these practices into the Wolf Ridge graduate naturalist program. By training the graduate naturalists to use this framework, I would like them to transfer those skills to the classes that they teach to our K-12 programs that visit Wolf Ridge. That way, more students across Minnesota are being exposed to a framework that will help them explore the natural world and help spark curiosity about what is around them. Additionally, as this research showed that many naturalists had difficulty with

slowing down, I will be able to generate a list of teaching strategies that they will be able to use to practice slowing down in their own learning and then transfer that knowledge into helping students slow down while exploring as well. This will create a strong foundation for their use of the naturalist practices and from there they will be able to build their other exploration skills.

REFERENCES CITED

- Beery, T. (2013). Making sustainable behaviors the norm at the University of Minnesota Duluth. *Journal of Sustainability Education*, 5.
- Farber, P. L. (2000). *Finding order in nature: The naturalist tradition from Linnaeus to E.O. Wilson*. Johns Hopkins University Press.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. Basic Books.
- Gardner, H. (2000). *Intelligence reframed: Multiple intelligences for the 21st century*. Basic Books.
- Green, M., & Dymont, J. (2018). Wilding pedagogy in an unexpected landscape: Reflections and possibilities in initial teacher education. *Journal of Outdoor and Environmental Education*, 21(3), 277–292. <https://doi.org/10.1007/s42322-018-0024-7>
- Leopold, A. (1949). *A sand county almanac: and sketches here and there*. Oxford University Press.
- Louv, R. (2008). *Last child in the woods*. Algonquin Books.
- Medina, J. J. (2008). *Brain rules*. Pear Press.
- Morrison, S. A. (2018). Everyday environmental education: Five practices of ecologically minded teachers. *Environmental Education Research*, 24(11), 1527–1545. <https://doi.org/10.1080/13504622.2018.1496227>
- Rousseau, Jean-Jacques. (1914). *Emile, or Education*. London: J.M. Dent & Sons Ltd. pp 112.
- Sousa, D. A., Ansari, D., Christodoulou, J. A., Coch, D., Dehaene, S., Eddy, M. D., Fisher, K. W., Gabrieli, J., Hardiman, M. M., Heikkinen, K., Immordino-Yang, M. H., Posner, M. I., Williams, D. L., & Willis, J. (2010). *Mind, brain & education: Neuroscience implications for the classroom*. Solution Tree Press.
- Walewski, J. (2020). Naturalist/Natural History Practices.
- Wilson, E. O. (2013). *Letters to a young scientist*. Liveright. pp 13.

APPENDICES

APPENDIX A

WOLF RIDGE NATURALIST PRACTICES

Naturalist/ Natural History Practices

Slow Down

Our lives move fast; distractions come easily. By slowing down, we increase our capacity to succeed with other practices. We also allow others in our midst to engage and succeed differently. Clear your mind and observe with intention.

Notice Surroundings

We can notice a range of phenomena by zooming in and zooming out. Toggle your perspective slowly and intentionally. Pay attention to all your senses as well as your emotions.

Gather Information

Data, story, feelings. Gather it all. Objective and subjective information help to provide a clear view of the world as it really is. That's really real reality. Capture it with field notes, cameras, collections, and more.

Share With Others

The emerging story develops and evolves most effectively in community. Sharing with others should include: 1) other scientists, 2) community members (for example, through citizen science or publications), and 3) other members of the natural world.



Figure B1: Wolf Ridge naturalist practices.

APPENDIX B

WOLF RIDGE GRADUATE NATURALIST DEMOGRAPHICS

Table A1: Graduate Student Naturalist Demographics

Graduate Student Number	Graduate Student Age	Graduate Student Pronouns	Graduate Student Educational Background	Graduate Student Interests
Student #1	22	She/Her	B.A. Environmental Studies	Being outdoors, singing, swimming, traveling.
Student #2	23	She/Her	B.A. Anthropology	Hiking, swimming, fly fishing, reading.
Student #3	22	He/Him	B.A. Environmental Studies with Geoscience minor	Hiking, spending time in water, videogames.
Student #4	22	She/Her	B.S. Geosciences B.A. Studio Art	Exploring the natural world, art, geology.
Student #5	25	They/Them	B.A. Forestry	Learning about natural history of lived places.
Student #6	28	She/Her	B.S. Environmental Science and Biology	Rock climbing, skiing, hiking, biking.
Student #7	23	She/Her	B.A. Environmental Studies	Outdoor aquatic activities, reading.
Student #8	23	He/Him	Numerical Computation	Making music and videos, hockey, photography.
Student #9	22	She/Her	B.S. Human and Organizational Development	Hiking, collaging, being outdoors.
Student #10	33	She/They	B.A. Global Studies	Meditation, creative writing, art.
Student #11	37	She/They	B.A. Sociology	Growing food, biking, art, cooking.

			Masters in strategic leadership Towards Sustainability	
Student #12	23	He/Him	B.A. Environmental Studies B.A. Studio Art	Painting, drawing, backpacking, sculpting.
Student #13	23	She/Her	B.S. Environmental Geology and Education & Youth Studies	Swimming, board games, rock picking.
Student #14	25	He/Him	B.S. Fisheries and Wildlife Ecology M.S. Biology Thesis	Read, swimming, running, playing the piano.

APPENDIX C

CLASS OBSERVATION PROTOCOL

Class Observation Protocol - Emily Pavlisich Research Project

- Observing classes that the Wolf Ridge Graduate Naturalists are taking as students.

Observation Tool: Pre-Observation

Directions: Fill out the demographics sections about the class that is being observed.

Demographics

Date	
Time	
Class Observed (title and description)	
Class Participants	
Observer	

Observation Tool: Class Observation

Raw Data Collection Space (use additional pages as needed)

- Use timestamps, direct quotes, observations of student's interactions with each other and surroundings, movement, and behavior.
- Use diagrams, drawings, arrows etc. as needed in this space to record observations

Observation Tool: Post Observation

Directions: Compare your observations to the areas of focus for the study. Make notes on the group as well as individuals.

Focus	What to look for with students	Notes
Use of Naturalist Practices	Slow Down - At what pace are students moving while investigating? - At what level do students investigate (standing, kneeling, etc.)? Notice Surroundings - What senses are students using while exploring? - Are students making observations at different scales (zooming in/ zooming out)? Gather Information - Students are taking pictures. - Students are taking notes. - Students are collecting samples. Share With Others - Students are conveying data and observations with others.	
Exploration	How Do Students Explore? - Students explore on their own or with groups. What do students choose to focus on? - Students focus on task or goal of class. - Students focus on something other than task or goal of class. Interacting with others - Do students ask questions of others? - Do students share data and observations with others?	
Asking Questions	Students Asking Questions - Questions are observable. - Questions are measurable. - Questions are repeatable.	

--	--	--

APPENDIX D

NATURALIST PRACTICES PRE-SURVEY

Wolf Ridge Naturalist Practices Pre- Survey

Name: _____ **Date:** _____

1. How would you rate your current understanding of the Wolf Ridge Naturalist Practices?
a. Very confident b. moderately confident. c. somewhat confident. d. not at all confident

2. How would you rate your current confidence level using Wolf Ridge Naturalist Practices in your own exploration?
a. Very confident b. moderately confident c. somewhat confident d. not at all confident

3. How would you rate your current confidence level using Wolf Ridge Naturalist Practices in your teaching at Wolf Ridge?
a. Very confident b. moderately confident c. somewhat confident d. not at all confident

4. How would you rate your current confidence level on asking testable questions while doing self-exploration outdoors?
a. Very confident b. moderately confident c. somewhat confident d. not at all confident

5. How would you rate your current confidence level on guiding students in classes to ask testable questions?
a. Very confident b. moderately confident c. somewhat confident d. not at all confident

APPENDIX E

NATURALIST PRACTICES MIDPOINT SURVEY

Wolf Ridge Naturalist Practices Midpoint Survey

(Participation in this survey for Emily Pavlisich's research project is completely voluntary and
may be stopped by the participant at any time.)

1. How would you rate your UNDERSTANDING of Wolf Ridge Naturalist Practices?

1	2	3	4	5
Low Understanding				High Understanding

Can you explain why you rated yourself this way?

2. How would you rate your Implementation of Wolf Ridge Naturalist Practices in your own exploration/learning?

1	2	3	4	5
Have not tried to Implement				Fully implementing every adventure!

Can you give any reasoning or explaining on why you rated yourself this way?

3. How would you rate your Implementation of Wolf Ridge Naturalist Practices in your teaching?

1	2	3	4	5
Have not tried to Implement				Fully implementing every adventure!

4. What do you believe that Wolf Ridge naturalist practices can provide YOU as a LEARNER?

5. What do you believe that Wolf Ridge naturalist practices can provide YOU as a TEACHER?

APPENDIX F

NATURALIST PRACTICES FINAL SURVEY

Wolf Ridge Naturalist Practices Final Survey

(Participation in this survey for Emily Pavlisich's research project is completely voluntary and may be stopped by the participant at any time.)

1. How would you rate your UNDERSTANDING of Wolf Ridge Naturalist Practices?

1 2 3 4 5

Low Understanding

High Understanding

Can you explain why you rated yourself this way?

2. How would you rate your Implementation of Wolf Ridge Naturalist Practices in your own exploration/learning?

1 2 3 4 5

Have not tried to

Fully implementing every

Implement

adventure!

Can you give any reasoning or explaining on why you rated yourself this way?

3. How would you rate your Implementation of Wolf Ridge Naturalist Practices in your teaching?

1 2 3 4 5

Have not tried to

Fully implementing every

Implement

adventure!

4. What has using the Wolf Ridge naturalist practices provided YOU as a LEARNER and as an explorer of the natural world?

5. What have the Wolf Ridge naturalist practices taught you about that natural world?

6. How do you believe using the Wolf Ridge naturalist practices impact the Wolf Ridge graduate program?

APPENDIX G

INDIVIDUAL INTERVIEW QUESTIONS

Individual Interview Questions- Emily Pavlisich Research Project

(Participation in this interview and in this research project are completely voluntary and the participant may choose to end their participation in the research project at any time)

1. Which of the Wolf Ridge naturalist practices do you find to be the easiest to implement in your own learning? Why?
2. Which of the Wolf Ridge naturalist practices do you find to be the hardest to implement in your own learning? Why?
3. What can these practices provide you as a learner?
4. How do you believe that the Wolf Ridge naturalist practices impact the Wolf Ridge graduate program?

APPENDIX H

IRB EXEMPTION

At 1:30 PM on Tuesday, November 7, 2023, NoReply@TOPAZTI.com wrote

Hello Delfosse, Emily,

Your protocol was reviewed by the IRB and has been approved.

PI: Delfosse, Emily

Approval Date: 11/7/2023

Title: How Wolf Ridge naturalist practices impact student's ability to ask testable questions

Protocol #: 2023-1058-EXEMPT

Review Type: Exemption

Expiration Date: 11/7/2028

Work described under this protocol may now commence. The PI is responsible for ensuring that the protocol accurately describes research practices being conducted.