
Place-Based Education and Nature Journaling for High School Students

MAEd NSEE Capstone
Project: Understanding by
Design Curriculum
Development

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Research Question

An effective and popular tool of teaching found in nature study and place-based education is the nature journal. Nature journaling is the most popular method of studying nature, going back so far in human history, it's difficult to determine when the practice began. Our most ancient writings describe natural phenomena, the works of naturalists have relied upon the nature journal as a primary tool of study for centuries, and nature has been a fundamental subject of study since the founding of public education. Harvard biologist Edward O. Wilson declares, "the creative process of nature journaling helps to make the best of experiences the most lasting in memory for anyone wishing to enjoy it" (Walker Leslie 2021, ix).

The following capstone project dedicated to natural science and environmental education asks, in what ways could nature study and place-based education be taught to students who live in the urban environment? Goals, learning benefits, and results of nature study and place-based education have been discussed with conclusions in the essay portion of the capstone, which has led to the project part of the capstone, an Understanding by Design curriculum development that uses nature journaling as an educational tool to teach scientific cross-cutting concepts and may help to promote "sense of place" in learners. Environmental education for all children is a matter of justice. Nature in cities needs to be seeded, grown, and nurtured as commons (Maddox, Nagendra, Elmqvist, and Russ 2017).

Setting and Audience

Preferably, to produce nature journals, educators will find some way to take students outside in schoolyards or to natural places in the communities they live to make observations; the more often the better. Every season, or perhaps even once a week, would be possible in the correct setting, it only depends on available resources to the teacher. Use of public transit is suggested for teachers in urban environments, to reach natural areas like city parks. Such an idea is not at all out of the realm of possibility, high school students travel capably on buses to and from school every day. If students were to be taken every season for field trips, nature journals could serve as an end of the year class project. If students were taking an elective course allowing for more access to nature during school hours, they could produce nature journals with more content. Various types of high school elective teachers could work on a nature and place-based journaling project with students; it has the possibility to cover an interdisciplinary range of subjects: science, art, geography, writing, history, humanities, and the environment. Humans are part of nature, and nature is everywhere, even if it may not always seem that way in a city. Educators should help students to understand by creating real-life learning experiences outside of the classroom. Experiential learning can help with differentiation, students discover and understand at individual paces, they examine what most interests them. High school students were chosen as the learners of the curriculum development because they are more likely to be able to work on journals independently, outside of school at times, if necessary making observations at home in the backyard, or elsewhere in the community; and bring those to school to transfer knowledge with classmates and teachers.

Students going through the transitional stage of adolescence may excel personally and academically when given the voluntary and authentic transformational learning experiences

nature and place-based curriculums offer. Transformative learning aligns with the transitional stage of adolescence, and has the transformational qualities involved in the maturation process that can be fostered and enhanced to make successful life transitions (Singleton 2015, 4). High school students could perhaps come to feel a "sense of place" through transformational learning experiences. The intended audience for the work developed here is educators in public schools who hope to bring nature study to the classroom, with specific attention and suggestions given to those living in urban environments, who may face the specific challenge of access to nature. Curriculum formulated here intends to be adaptable enough to meet some standards for high school students nationally through the NGSS cross-cutting concepts, and specifically follows Wisconsin State Standards for Environmental Literacy and Sustainability.

Learners who are part of the urban landscape often have less access to nature both at school and out of school. Programs that expose them to ecological experiences make it more possible for them to gain a sense of place where they live and expose them to the ideas that make up ecological literacy. In the case of high school students attending public high schools in urban environments, nature study may be a last effort to help them build strong positive connections with their communities before they begin life outside of the public classroom. PBE has been an effective method for interdisciplinary teaching, research shows students have more success when participating in this kind of experiential learning. Studies comparing students in the same schools who are exposed to PBE and those who are not, conclude those students showed improved achievement across subjects; development of critical thinking, problem-solving, increased enthusiasm and engagement in learning, and even gains in summative measures of achievement like test scores and grades (Sobel 2004, 25).

Place-Based Education and Nature Journaling Curriculum Development:

Rationales and Goals

To begin to answer my research question, although there are different approaches to environmental education educators could decide to use, nature journaling as practice is one proven way to teach nature study and place-based education to students, even for those who live in urban environments. Benefits and results of nature journaling activities align well with the student accomplishment goals of Understanding by Design theory. Literature dedicated to place education frameworks and how to use nature journaling as a learning method consists of an array of subjective guidelines educators could choose to follow and develop. My curriculum project attempts to better establish a set of goals for educators who would like to immediately teach using place-based education and nature journaling methods, as there can be an abundance of suggestions within the literature to consider before actual work of development can be done. Summaries of these goals may initially seem complicated, but they follow general environmental education guidelines that have already been established on global, national, and local levels; these guidelines of various scales align well when fused together to create more concrete goals.

Educators need not use all the suggestions to curriculum goals here, but hopefully can find a few of the goals helpful to utilize while using nature journals as a learning method and may easily be able to adapt unique place-based curriculum dedicated to the different urban environments they teach in as a result of my project. Incorporation of place-based education goals and the intended outcomes of nature journaling into an Understanding by Design curriculum unit provides more validation for nature journaling projects to educators in public schools, who may need to substantiate claims of benefits to learning using these

approaches. Established goals and assessments for learning in the environmental curriculum shared here demonstrate the validity of using place-based and nature journaling approaches.

We must ask ourselves, what ways can we change public education to make students more excited about learning? What methods are truly the best ways to learn? Experiential learning rooted in place-based education proves to be effective in addressing both these concerns. Feelings of well-being and positivity toward learning, and improved performances, could very well be the outcomes of curriculum units like the one presented here. In addition to these beneficial reasons for promoting a nature study curriculum, PBE framework along with nature journaling as a teaching tool, are culturally relevant learning methods.

Place-based education is culturally relevant because it's the study of local culture. It gets students into the community to learn through it. It helps them come to better know themselves through the place they live. The most substantive goal of PBE involves connecting learners to their communities, for them to feel a sense of belonging, "sense of place". We can all learn about the places we live, each other, and figure out how to make the places we live as good as they can be. Communities should be inclusive and equitable to society and the environment. We all have an influence on our communities and even personal acts can make a positive difference for all of us. Building empathy and changing attitudes aren't usually discussed as actual academic goals, PBE challenges such a viewpoint (Sobel 2004).

Culturally relevant pedagogy such as place-based education has the potential to change individual attitudes toward learning and community positively in a multitude of ways. Cultural relevance remains an extremely important aspect in developing lessons for urban environments educators should consider, as they are very often teaching learners with a mosaic of backgrounds. Nature study is a culturally relevant practice, evidently a most effective one,

continually utilized in some form by people all over the world. Culture, art, history, geology, and ecology are some of the common subjects PBE focuses on. PBE is culturally relevant in that it helps to highlight shared culture and promote community engagement and gives way to plenty of self-expression and interpersonal learning through collaboration. Knowledge shared and investigated attempts to be inclusive, inclusion creates equity in education.

Theory and Framework: Understanding by Design

Backwards design, also known as Understanding by Design or UbD, was used as the curriculum-planning framework for my project. By using UbD design standards, educators can more purposefully review and improve our unit designs, our teaching, and student achievement (Wiggins and McTighe 2011, p.11). Design standards help educators to specify the desired qualities in unit plans and provide a mechanism for quality control, a validation of curriculum design. Additional validation of the principles and practices of UbD comes from emerging research on the neuroscience of learning. Implications discovered by this research include: (1) Pattern generation by the brain happens when new material is related to previous material, assisting neural connections and long-term memory, (2) experiential and hands-on learning stimulates the senses, making it the most engaging type of learning and assisting with long-term memory, (3) information is best remembered when learned through multiple and varied exposures, followed by authentic use of the knowledge (Wiggins and McTighe 2011, p.6). Wiggins and McTighe (2011) conclude, research findings on the neuroscience of learning provide conceptual support for UbD; and “should guide curriculum and assessment design, as well as instructional practice” (p.6).

A primary goal of UbD is student achievement- to develop student understanding, to make meaning of learning, and transfer it to new situations (Wiggins and McTighe 2011, p.3). One of the tenets of UbD defines understanding as six facets of capacity, to: explain, interpret, apply, shift perspective, empathize, and self-assessment (Wiggins and McTighe 2011, p.4). These capacities serve as indicators of understanding. Students demonstrate understanding when they autonomously make sense of and transfer learning through authentic performance (Wiggins and McTighe 2011, p.3). Nature journals are the perfect tool to assist educators with student understanding. Explanation, interpretation, and application are all accomplished through nature journaling. Empathy and shifts in perspective about the environment could be supported and may be more likely to occur through the nature journaling process and the real-life learning activities it offers.

Standards and Assessment

Goals of environmental education outlined by the UNESCO Tbilisi Declaration on Environmental Education consist of knowledge, attitudes, and skills (Russ Ed., 2015, p.9). Nature journaling curriculum shared here attempts to follow recommendations of the Tbilisi Declaration, an internationally guided effort to develop environmental education worldwide, with desired outcomes as follows : (1) gain knowledge about the environment and nature, (2) develop empathy and beliefs that foster an ethic of environmental responsibility, including positive attitudes towards nature and human-environment interactions, (3) gain critical thinking skills related to identification, prevention, and tackling environmental problems. Environmental education goals are meant to be globally applicable and are important for educators to consider when developing an environmental curriculum. Preferred outcomes of *knowledge, attitudes, and skills* guide the nature journaling curriculum unit here, focused on place and natural science.

Framework of PBE closely follows the objectives of environmental education, showing how EE has come to evolve and be put to use. Simplified recommendations of EE detailed here and the more specific goals of PBE align perfectly with the tool of nature journaling.

Based on these preferred outcomes, qualitative evaluation approaches will be used to measure resulting knowledge, attitudes, and skills of participants; parallel to the curriculum approach of nature journaling based on qualitative observations. Educators will have learners fill out an open-ended evaluation at the end of the program that asks: what they learned overall, if feelings or attitudes toward nature changed resulting from the project, and how satisfied they are after participation in a nature journaling project. Educators will also observe engagement and satisfaction levels of learners throughout the course of the program, to help measure positive attitudes resulting from the curriculum. Using qualitative survey methods, it can be possible to produce a more quantitative evaluation if desired (Russ Ed., 2015, p.12-13). For example, educators could measure how many students were satisfied after participation and reach a percentage rate. Rubrics will be used to evaluate knowledge gained about "the nature of place" through inquiry activities students record in nature journals.

Students will produce individual nature journals based on the place they live for assessment. Final journals can be in either hard copy or digital format, dependent on the preference of the teacher and differentiations for classrooms and students. Nature journals will integrate subject matter; particularly science, art, and writing. Formative assessment will be in the form of completed final journals, demonstrating compilations and reflections of knowledge. Summative assessment will be in the form of journal keeping during each individual lesson, to create content for the final composition, which allows educators and students to assess knowledge as they take part in the activities. Educators should refer to the unit rubrics and

student self-assessments at the end of the unit. Instructional strategies for nature journaling will be shared in the unit guide for teachers.

Wisconsin State Standards for Environmental Literacy and Sustainability (2018) will attempt to be met in the first standard of "**Connect**: Students develop and connect with their sense of place and well-being through observation, exploration, and questioning" (p.28). These standards could be applicable to any place-based education framework, they seem to align well with the goals of PBE. Perhaps similar standards for environmental literacy and sustainability already exist in other states where educators would like to better promote environmental learning experiences. These standards meant to "connect" students to places they live could potentially be accomplished through a nature journaling curriculum, which has proven to be an effective tool for learning as discussed within the literature review. The following Standards for Environmental Literacy and Sustainability will attempt to build connection, to promote "sense of place" in learners:

C1.B: Sense of Place

- ELS.C1.B.h Analyze relationships between parts of local and global natural and cultural systems. Compare and contrast historical and current resource use, and analyze the effects on local, regional, and global natural and cultural systems.

C1.C: Curiosity and Wonder

- ELS.C1.C.h Investigate and analyze one's own curiosities about patterns that emerge from outdoor exploration to develop new questions, draw conclusions, or formulate new ideas or solutions. Reflect and share how one's perspectives

influence personal curiosity, the pursuit of knowledge, and respect for others and the environment.

C1.D: Well-being

- ELS.C1.D.h Analyze the effects of environment and time outdoors on mental, socio-emotional, and physical health. Design and implement a home, school, or community wellness improvement plan that integrates the outdoors to develop mindfulness, confidence, and self-regulation; evaluate the outcomes, and communicate the results.

In addition, the nationally utilized Next Generation Science Standards Cross-Cutting Concepts will be used in the UbD curriculum development as "habits of mind" and "cross-disciplinary skills" to assist in the established goals of "connection" as students work on nature journals. Standards are to be met with direct consistent observation of natural phenomena to recognize and understand the cross-cutting concepts: patterns, cause and effect, structure and function, and systems modeling (Laws and Lygren 90).

Stage 1 Desired Results

<p>ESTABLISHED GOALS: CONNECTION</p> <p>1. Sense of Place-Analyze relationships between parts of local natural and cultural systems, both current and historical</p> <p>2. Curiosity and Wonder- Investigate and analyze emergent patterns, develop new questions, draw conclusions, or formulate new ideas.</p> <p>3. Well-being- Analyze the effects of environment and time outdoors on mental, socio-emotional, and physical health</p> <p>HABITS OF MIND/ CROSS-DISCIPLINARY SKILLS</p> <p>Observations of patterns, cause and effect, structure and function, systems and modeling</p>	<i>Transfer</i>	
	<p><i>Students will be able to independently use their learning to...</i></p> <p>Ask questions, make observations, and develop critical thinking skills.</p> <p>Apply concepts, use teamwork, formulate reflections through writing and story-telling, use data analysis to make inferences and comprehend environmental interactions.</p>	
	<i>Meaning</i>	
	<p>UNDERSTANDINGS</p> <p><i>Students will understand...</i></p> <p>The environments we live in have natural systems characterized by natural phenomena, that results in the unique natural history of places (climate, geography, ecology, human history).</p> <p>Students will come to understand connections within observed environments through real-world investigation. They will build upon current knowledge to better understand the connections between school subjects (literacy, science, art, history) within journaling activities. They will understand nature journaling can be used as a tool for interdisciplinary study.</p> <p>Students will understand we as living beings are part of natural observed environments. They may consider human-environment interactions historically and currently.</p> <p>Students may build positive attitudes and care for nature</p>	<p>ESSENTIAL QUESTIONS</p> <p>What is the nature of this place? Who, what, where, when, why</p> <p>What patterns in nature can we observe?</p> <p>What causes and effects in nature can we observe?</p> <p>What are the structures and functions of the natural phenomena (weather and earth processes) and ecology belonging to this place?</p> <p>Can we make comprehensive models of various scale to discuss elements of natural systems using the tool of a nature journal?</p>

	that form the feeling of belonging called "sense of place".	
Acquisition		
	<i>Students will know...</i> The natural history of a "PLACE", its geography, climate, weather, and ecology. They will be aware of human-environment interactions.	<i>Students will be skilled at...</i> Asking questions, making observations, using teamwork to build understanding, and conducting personal study through nature journaling

Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence
Nature Journal Project Rubric	PERFORMANCE TASK(S): <i>Students will show that they really understand by evidence of...</i> Creation of a personally reflective nature journal demonstrating meaning and transfer of learning
Surveys	OTHER EVIDENCE: <i>Students will show they have achieved stage 1 goals by...</i> Completing a self-assessment survey that reflects on experiences Educators will conduct a survey in the field by observing student attitudes during place-based experiences and investigations

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Educators will use Nature Journaling curriculum prompts given in the lesson plans to instruct students.

Pre-assessment of Students: Class discussion about the place we live to establish current knowledge

Learning Events: Student success at transfer, meaning, and acquisition depends upon...
Asking questions, using the senses, using teamwork, applying concepts, and formulating analysis, all of these lead to learning and complex performance. Of course, proper guidance from the teacher during learning events plays a critical role in student success.
As defined in UbD theory, understanding comes from capacity to: explain, interpret, apply, shift perspective, empathize, and self-assess. Repetition helps to understand and apply knowledge.

Differentiation methods and independent learning...
Nature journaling can be engaging and effective for all students because it allows for individual paces and student interests to develop. Most of all, both the goal and outcome of nature journaling is for students to learn how to ask questions independently, which guides them in lifelong learning skills.

Progress Monitoring: Student progress toward acquisition, meaning, and transfer during learning events will be monitored through direct observation by the educator, who will follow a basic observational survey while students perform nature journaling exercises to keep an ongoing record of

progress, such observational surveys of participant progress are often the method of nature educators to measure success of learning goals. Students will be able to get the feedback they need by asking the educator questions to clarify knowledge, and educators will continually monitor nature journal progress to clarify continual transfer, meaning, and acquisition.

Nature Journaling Unit: An Instructional Strategy Guide, Curriculum, and Assessments for Teachers

"All dreams spin out from the same web"

- Hopi

Materials

Educators will need to ensure students have notebooks and writing utensils. Pens that do not smear easily should be considered. Perhaps an illustration marker and notebook with thick paper would be most appropriate. Colored pencils are another good option for students at the high school level who may want to create more detailed drawings. Art teachers can use other mediums to create renderings if they so choose, watercolors are another popular choice of the nature journalist. Field guides will be necessary for teachers to help students identify the wildlife they find in the places they visit. Naturally, field guides can be found in any school library and should be easy for educators and high school students to use for identification purposes during or after nature journaling exercises.

The nature journaling unit here has been greatly adapted from exercises in the book *How to Teach Nature Journaling* by Laws and Lyngren, with some thoughts from *Keeping A Nature Journal* by Walker Leslie. Information found to be redundant or unnecessary to teaching high school students has been omitted. As mentioned in my project essay, nature-based learning has been used most often for elementary learners, literature in the fields of environmental education and place-based education identifies the need for nature units aimed at the high school level.

Adapted exercises will not be discussing art techniques, though these books offer plenty of information about how to draw. The most important thing to remember to teach your students is, anyone can make a nature journal. We all learn new skills with time and practice. Educators need not know everything about the places they help students to study, they can learn and experience the "sense of wonder" nature gives together.

As defined in UbD theory, understanding comes from the capacity to: explain, interpret, apply, shift perspective, empathize, and self-assess. Repetition helps to understand and apply knowledge. Nature journaling has the capability to meet all these learning goals. Journaling exercises should be repeated often as possible to retain the preferred environmental education outcomes of *knowledge, attitudes, and skills*.

Instructional Strategy Guide

Sense of Place

Phenology is defined as the study of cyclic and seasonal natural phenomena, especially in relation to climate and organic life. Nature journaling collections represent a specific time and place, exercises here help to give learners a "sense of place", described in the literature review and project, particularly under the goal of ***Connection*** in my curriculum design. Keeping phenology records is a form of citizen science students can take an active part in, nature journaling is a real-life learning experience that connects learners to communities. When we journal, we start to see ourselves as part of nature, not separate from it; when we support students in self-expression, we deepen their relationships with their environments and themselves (Laws and Lygren 2020, p.134).

Ask: What is the nature of this place?

Use the 5 W's: Who, what, where, when, why

Curriculum: Best Nature Journaling Exercises (Repeat)

(1) Habitats: Team Observations

Goals: apply concepts, reflect, and use teamwork to observe natural phenomena. An essential question from Stage 1 will be applied here: can we make comprehensive models of various scale to discuss elements of natural systems using the tool of a nature journal? Use *Stage 1 Desired*

Results: Meaning and Understanding to guide this exercise.

Natural Phenomena: Students will observe a habitat of some kind and create a model to describe the elements of its system using nature journals. They should examine common natural forces at work in a system: weather, landscapes, and ecology.

Procedure: Ask, *what* is happening here? Label the natural forces you observe, use the model to make possible explanations for the system. Remind students, scientific understanding and data collection takes teamwork; allow them to work together to make observations. Share ideas with each other and make additions to habitat models. Try to take students to the same habitat regularly to see what changes over time. Encourage students to find other special places they can repeatedly observe, maybe somewhere they happen to see every day.

Discuss: How do models help us learn? They help us to clarify our thinking about what we know and better understand connections.

NGSS cross-cutting concepts:

- Patterns: Describe patterns. What forces and explanations are behind these patterns? Do we observe the same patterns in our journals?
- Cause and effect: What seen and unseen forces could be explanations for the patterns we observe? How do these forces affect each other? How might these interactions change over time? What evidence can we find?
- Systems and systems models: What are the parts of the habitat? How do they interact? What have we learned about ecosystems? What connections do we observe?
- Structure and function: What are the structures and functions of the natural phenomena (weather and earth processes) and ecology belonging to this place? Describe how parts of the habitat function individually. Describe how parts function together in an ecosystem.

Exercise adapted from: (Laws and Lygren 2020, p.115-124)

(2) Animal Behavior and Species Account: Literacy Skills

Goals: use writing and storytelling to create animal behavior storylines and species accounts, collect data, ask questions, make observations, conduct personal study

Natural Phenomena: Students will observe organisms and use nature journals to describe species, writing and illustrating stories. They should continue to examine as many aspects of biota in the environment as they can, for in-depth understanding of species and

working ecosystems. Students may use resources with more known knowledge such as field guides to assist understanding and develop stories.

Procedure: Share observations out loud. Help to verbalize observations of the organisms you encounter with your students. Describe details of how the animal looks and what it is doing. Ask, why is it here? How is it interacting with the environment and other organisms? Where has it been? What is it eating? Do the same species share behavior? What other notes can be made about the ecosystem- weather and landscapes affect animal behavior. Take notes and sketch. Record as much information as possible, observation time may take place quickly as animals pass by. Go back later to create a storyline about an animal using observations and sketches, write about what was seen to keep a record and understand habits of the animal. Use skills continually to develop work. Keeping records of animal patterns is part of phenology and citizen science. Keeping nature journals helps to understand how school subjects intersect.

Discuss: Why is record-keeping useful to science? Do nature journals have limits in how we can gain knowledge from them? Nature journals are limited because it is not possible for one individual to collect all data- records are specific to time and place, which is why collections are important to scientific knowledge. Share journals and appreciate different individual approaches to data collection. What did students learn from sharing?

NGSS cross-cutting concepts:

- Patterns: What patterns were observed in species? Possible patterns could be size, color, growth, behavior, or location. What are some explanations for these

patterns? Why might these patterns change- would the animal behave the same in other seasons or locations?

- Cause and effect: Why is the organism located where it is? What evidence can be found about how it may be affected by its environment? How does the organism affect the environment? How might these interactions change with seasons or locations?
- Systems and systems models: How do organisms in an ecosystem connect to each other? How do organisms affect the ecosystem? What effects does the environment have on organisms? The environment affects survival of organisms, it gives them adaptations- the structures and functions of species.
- Structure and function: What structures and functions of the species help its survival? Animals adapt to the environments they live in, study body parts and behaviors to learn how they survive.

Exercise adapted from: (Laws and Lygren 2020, p.69-75)

(3) Field Guide: Apply Knowledge

Goals: perform data analysis, relate data in reflective writing, and use teamwork to observe natural phenomena

Natural Phenomena: Students can locate collections in many outdoor places, even urban schoolyards. Most identification field guides are collections. Some ideas about common natural phenomena to study in a collection could be birds, mammals, rocks, trees, plants, leaves, or

landscape features. Evidence of cause and effect in weather systems, animal behavior patterns, or changing seasons are other examples of collections.

Procedure: Educators may determine what categories and collections can possibly be made by students given the resources of places around them. Focus topics if necessary. Use the rubric to guide learning expectations and recording of phenomena. Ask students to pay attention to similarities and differences. Look over regional field guides before the exercise for understanding. Students will learn how to use the guides as they record phenomena.

Discuss: What is interesting? What did others find interesting? Share field guides with each other. Consider interactions of past and present phenomena. Be descriptive. Use the senses to inspire feelings and make detailed observations.

NGSS cross-cutting concepts:

- Patterns- What features or structures are shared by your individual field guides?
What statements can we make about our categories based on observations?
- Cause and effect- Why are these observed phenomena occurring? Are there any environmental or human impacts caused by the phenomena?
- Systems and systems models- What different things have we found- organisms, landscape features, weather? How do these natural phenomena interact?
- Structure and function- What features and structures are shared by your individual field guides, and how do they differ in function?

Exercise adapted from: (Laws and Lygren 2020, p.57-60)

Assessments

Student Self-assessment Survey

Educators should give students a self-assessment survey after completion of the project. The survey attempts to help educators measure the goals of *knowledge*, positive *attitudes*, and *skills*.

- (1) What did you learn overall from your nature journaling experiences?
- (2) What was your favorite part of your learning experiences? Examples could be learning about animals, working with friends, drawing pictures, being outside, or anything you can think of to share.
- (3) Did your feelings toward nature change because of the project? How would you describe your feelings or attitudes toward nature before and now?
- (4) Did your feelings toward your community change because of the project?
- (5) Did you enjoy your experiences working on this project? How did this project make you feel? Would you like to work on projects outside or in your community again?
- (6) Was anything exciting or surprising to you? Do you think you learned new skills?

Teacher Observation Survey

Educators should complete this assessment survey during nature journaling activities by observing satisfaction and engagement levels of students in an attempt to measure the goal of positive "*attitudes*".

- (1) Are learners engaged with the community experience in working on the project? Are they interested in the content you have chosen to learn about?

(2) Do learners seem satisfied with activities? Are they enjoying learning as they guide themselves and work together? Is there any change in the attitudes of learners during this activity- in their feelings toward nature, learning, themselves, or each other?

Unit Rubric: How to Measure Outcomes of Nature Journals

Students and teachers will both use a straightforward rubric, adapted for my project, to guide nature journaling prompts and understand expectations (Laws and Lygren 2020, p.232). Keeping with the long tradition of teaching nature journaling to students, expertise in writing and drawing is not considered to be as necessary as accurate record-keeping. We can go back later to make writings accurate and improve drawings. What's most important is learning how to ask questions and make quality observations, these are the most essential processes of learning. With use of a nature journal, individuals can choose to follow what interests them and may develop more fondness for learning across subjects, and more confidence in themselves. Measure students by the individual growth you as an educator can observe, give feedback on areas of improvement. Educators and students should reflect on personal continuums of learning (Laws and Lygren 2020, p.231). Participation and effort are the key factors to determine the outcomes of knowledge, skills, and attitudes.

Rubric

- Record metadata: date, location, weather, specific observation objectives
(students should always ask themselves the 5W's to start)
- Descriptions: I notice...
- Connections: It reminds me of...

- Questions from observations: I wonder...
- Use of: words, pictures, numbers

Unit Outcomes

Environmental education goals of *knowledge, attitudes, and skills* will attempt to be developed through repetition of nature journaling exercises. As defined in UbD theory, understanding comes from the capacity to: explain, interpret, apply, shift perspective, empathize, and self-assess. Understandings that arise from the activity of nature journaling demonstrate complex performance and help to meet environmental education goals. Students will become skilled at asking questions, making observations, using teamwork to build understanding, and conducting personal study through nature journaling. Students will come to know the natural history of a "place"- its geography, climate, weather, and ecology. They will be more aware of human-environment interactions. Students may develop a "sense of place" by participating in community nature experiences. Goals of **connection** in the curriculum design can be met by helping students to develop and connect with their sense of place and well-being through observation, exploration, and questioning (Wisconsin State Standards for Environmental Literacy and Sustainability 2018, p.28). **Connection** goals are: 1) sense of place, 2) curiosity and wonder, and 3) well-being.

Conclusion

My project has contributed to the public scholarship of environmental education by developing place-based nature journaling curriculum for high school students. Environmental education has called for more equity and inclusion in all places and has described the specific

need for nature exposure in growing urban environments. Nature-based learning experiences are often focused on elementary level students, expansion to higher grade levels has been an identifiable gap in the literature and curriculum devoted to teaching nature and place-based education. My project addresses an overlying environmental education goal of bringing nature and community to mainstream public schools. Educators may be able to use these exercises in everyday classrooms for various high school electives or as an interdisciplinary project across subjects.

Hopefully, my curriculum project could in some way give public school teachers more ability to apply nature journaling as a learning method to the places they live and communities they teach for, although those places and communities may differ across unique landscapes. To give learners these experiences could help them feel a sense of belonging to the world; or discover a love of learning they have not yet known. May my project serve to inspire students, educators, and community alike; as the environmental works of many others have inspired me on my personal educational journey, giving me hope for the future of places and people.

Resources

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