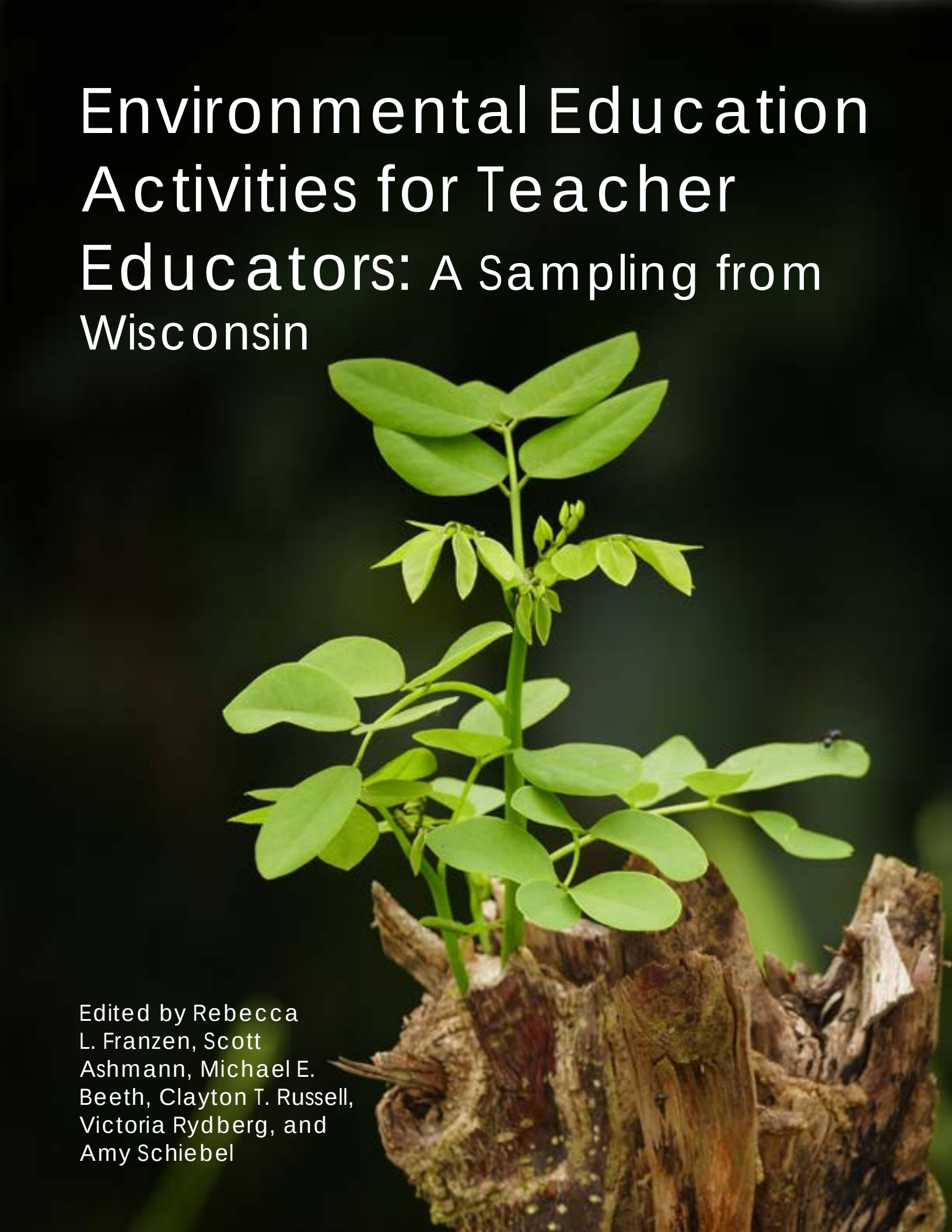
Environmental Education Activities for Teacher Educators: A Sampling from Wisconsin



Edited by Rebecca L. Franzen, Scott Ashmann, Michael E. Beeth, Clayton T. Russell, Victoria Rydberg, and Amy Schiebel

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Tanzeem Ali, University of Wisconsin-Superior
Angela Bazan, Edgewood College
Jennifer Collins, University of Wisconsin-Platteville
Evan Coulson, Northland College
Christin DePouw, University of Wisconsin-Green Bay
Ernie Didomizio, Cardinal Stritch University
Lynn Diener, Mount Mary University
Joel Donna, University of Wisconsin-River Falls
Debra Dosmagen, Mount Mary University
Leah Dudley, University of Wisconsin-Stout
Erin Edgington, University of Wisconsin-Platteville
Susan Finkel-Hoffman, University of Wisconsin-Oshkosh
Becca Franzen, University of Wisconsin-Stevens Point
Molly Gerrish, University of Wisconsin-River Falls
Laurie Gharis, University of Wisconsin-Stevens Point
Jake Griffin, Edgewood College
Stephen Guziewski, Edgewood College
Mary Hedenstrom, University of Minnesota
Becky Hitchcock, University of Wisconsin-Oshkosh
Katherine Jenkins, Northland College
Scott Kirst, St. Norbert College
Kathy Kremer, Concordia University Wisconsin
Rachael Lancor, Edgewood College
Kendra Liddicoat, University of Wisconsin-Stevens Point
Sara Manders, Edgewood College
Heidi Masters, University of Wisconsin-La Crosse
Stacey McGee, University of Wisconsin - Oshkosh
Danielle McKeithen, Silver Lake College
Jacquelyn Meetz, University of Wisconsin - Oshkosh
Melissa Nigh, Northland College
Rachel Portinga, University of Wisconsin-Superior
Praopan Pratoomchat, University of Wisconsin-Superior
Lorena M. Rios Mendoza, University of Wisconsin-Superior
Amy Schiebel, Edgewood College
Ray Scolavino, University of Wisconsin-Milwaukee
Randa Suleiman, Alverno College
Corey Thompson, Cardinal Stritch University
Jordan Thorton, University of Wisconsin-Oshkosh
John Whitsett, University of Wisconsin-Oshkosh
Georjeanna Wilson-Doenges, University of Wisconsin-Green Bay
Lenore Wineberg, University of Wisconsin-Oshkosh
Kevin Zak, Northland College

Designed by Melissa Alexander

Introduction

Why is Environmental Education important? Why this compilation?

Environmental education (EE) is one of those things that many people think, "That's a great idea, but how do you fit it in?" Why do people think it is a good idea? Why do people put it so low on the priority list of things to do?

Let's take a closer look at what environmental education really is. Environmental education aims to increase citizen environmental literacy, doing so by increasing awareness and knowledge, providing an opportunity to explore values and practice skills relating to environmental issues (UNESCO, 1978). As a result of environmental education, it is hoped that people will take action to protect and improve the environment, including the social, ecological, and economic aspects (Hollweg, et al., 2011).

Not only do people take steps to help the environment, but there are other benefits of environmental education, too. For example, students who learn using the environment as the integrating context have been found to have better scores on standardized tests, increased engagement in school, and positive social interactions with others. Students who participate in environmental education have also been found to be healthier, both mentally and physically (Liebermann & Hoody, 1998). Who wouldn't want that?

So, how do we get more environmental education for Wisconsin residents? One way is to connect with teacher educators and influence how preservice teachers are prepared in environmental education. So, we decided to do just that. We reached out to teacher educators across the state and invited them all—whether they are methods instructors or content experts, college deans or first year faculty, we want to help them improve EE in their preservice coursework.

Setting the context

Environmental education in teacher education programs has a long history in Wisconsin. In 1938, it was deemed that all teachers needed to be prepared to teach conservation education. In 1998, the state published the Wisconsin Model Academic Standards for Environmental Education. These standards were revised in 2018. Administrative code PI 3 declared that all teachers needed to be prepared to teach environmental education and the revised PI 34 administrative code does the same. Specifically, teacher education programs should enable all students to demonstrate knowledge and understanding of environmental education, including the conservation of natural resources, for those seeking licensure in agriculture, early childhood, middle childhood to early adolescent, science and social studies. Additionally, state statute 118.19(6) indicates that instruction on the conservation of natural resources is required for courses in science and social studies.

Ashmann and Franzen (2015) documented current practice of EE in Wisconsin teacher education programs. Programs are meeting the requirement through either course-based or activity-based ways. In other words, programs are either requiring that students take a specific course (or choose from a list of courses that include EE components) or that they participate in a particular activity that may or may not be part of the course. Additionally, four trends emerged from the data. The first was that students can choose to include EE in methods assignments, but they don't have to. The second was that it depends on the instructor—faculty members have a lot of freedom in what they choose to include or what they choose to emphasize. Third, there were weak connections to social studies. Finally, there's no evidence of the impacts of including EE in teacher education programs—no one is conducting follow-up surveys or studies of their graduates.

So, where do we go from here? There are requirements to include EE and it benefits students and our environment. But, we aren't hitting the mark as teacher education programs in Wisconsin. The documents within provide support for teacher educators to address environmental education in their courses.

How this resource is organized

The following activities are organized in alphabetical order by the last name of the author. Each activity starts by setting the context--what kind of college course was it developed for and who was the audience. Materials, step-by-step directions, assessments, and resources are also included to help you pick up this resource and find ways to integrate the activities into your own teaching. Additionally, many of them can then be used by your preservice teachers in their future classrooms. One appendix identifies content areas that are addressed by the activities and point you to the correct page number. Each activity is also identified by the anticipated license of the audience. Additionally, the activities are crossed with the North American Association for Environmental Education Guidelines for Excellence: Professional Development for Environmental Educators (2017). The *Guidelines* are identified in the activity and an appendix. Another appendix links the Guidelines to the Wisconsin Teacher Standards.

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Outdoor Education Review Report

Tanzeem Iqbal Ali, University of Wisconsin-Superior
tali1@uwsuper.edu

Context

This activity is for preservice teachers in a teacher education program for early childhood, elementary, and middle school. This is a stand-alone activity that introduces them to outdoor education/ place-based education in their science methods course.

The goals are to: (a) Guide preservice teachers to experience science teaching using / environmental education/ outdoor education/ place-based activities and (b) develop a resource to tap into within the preservice teacher's community for teaching science through place-based lessons. The lesson is focused on science but can be integrated in other content areas such as math, literacy, social studies and arts.

Approximate activity time
6-7 hours

Licensure
Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.1, 4.2, 4.3, 4.6

Theme 6
Guidelines: 6.1, 6.2

Materials

Journal for taking notes, video recorder/ camera (optional), transportation to the location

Step by step directions

The 5 E inquiry based teaching strategy (engage, explore, explain, elaborate and evaluate) is modeled for students in this particular assignment. This is assigned at the beginning of the semester and due on the Friday of the sixth week of classes. A mini lecture on environmental literacy and foundations of environmental education takes place the week the related videos and online discussion begins.

Engage: approximately 5 minutes

1. Listen to podcast of NPR on outdoor education in Virginia. Check out what an elementary science teacher in Vermont, USA is doing through this podcast: out-of-the-classroom-and-into-the-woods

Explore: approximately 10 minutes

1. Watch a video clip of outdoor education in Norway. http://www.youtube.com/watch?v=d8bqISOTsCE

Explain: 45 minutes

1. Participate in discussion responding to following prompts:
   a. Post your thoughts on the video sharing which basic and integrated process skills were highlighted in the outdoor education in Norway video.
   b. Who is in charge of the learning taking place? Which theories are at play here?
   c. If you were to design a similar activity what would you prefer to study with elementary/ middle school students in the Northland winters?
   d. Create your post reflecting on the three key areas that highlights the benefits for promoting place-based/ environmental education in your future classroom and respond to one other post following the discussion rubric.

Elaborate: 5-6 hours

1. Conduct the outdoor education review and complete the report by choosing from the list provided or choose one that is nearest to your location.

Evaluate:

1. Check in with the rubrics for self- assessment before submission.

Assessments

Please see subsequent pages for assignment, web links and rubrics

Resources

Outdoor Education Review Report

Instructions:

- For this assignment, you will be exploring and **researching a place-based/ outdoor/environmental education program and compiling a report**. There are numerous programs available to choose from. **Feel free to pick one from this list or add one that is accessible close to your place of residence.**
- **Use the outdoor education review rubric as a guide to prepare your assignment.** In case your schedule does not permit you to complete the review in person, seek permission from the instructor for an alternative assignment by emailing or announcing in the virtual office post ASAP.
- Because you will need to provide your own transportation, you are encouraged explore all the links to find the site that allows you to complete your assignment before the due date.

Your report should include, but is not limited to the following:

1. **Cover page/ title page**: Report title, course title and details, your name, year.
2. **Table of contents**
3. **General program information/ Introduction (15 points)**:
   a. An overall description of the place-based/outdoor/environmental education program/center
   b. Include any costs associated with the program
   c. Discuss equipment needed to participate in the program. Is it included, can it be rented, borrowed?
   d. How to participate in the program, who to contact, etc.
   e. Are there any professional development or professional training opportunities available through the program/center?
   f. Include a copy of any brochures available
4. **Science and environmental education connections (15 points):**
   a. A description of any curriculum or lesson plans they have available (describe what they do, in case they do not have printed resources or website links to lesson plans)
   b. Identify where the 5 E's of Inquiry can be observed or practiced within this program
   c. Does the curriculum align or could it be aligned with Environmental Literacy and Sustainability standards AND the Next Generation Science Standards?
5. **Lesson plan critical review (15 points)**:
   a. Attach a lesson plan and your thorough review of it. Note,if they do not have any lesson plans, you create one for your classroom.
   b. Include a narrative of how you would incorporate it into your future classroom
   c. Support your position as to why and how you would make changes to the lesson for your future classroom
6. **References and Writing mechanics (5 points)**

Resources for Outdoor Education Programs
Please choose from the following. If you have another location to suggest, please email the course instructor.

1. Own Backyard or school grounds.
2. Hartley Nature Center http://hartleynature.org/
3. Great Lakes Aquarium http://glaquarium.org/learning/for-teachers/professional-development/
4. UM-Duluth Planetarium http://www.d.umn.edu/planet/programs/index.html
5. University of MN-Extension - Monarchs in the Classroom http://monarchlab.org/education-and-gardening/curricula/
6. University of MN-Extension - Schoolyard Ecology Explorations http://monarchlab.org/education-and-gardening/gardening-for-monarchs/teaching-in-a-garden/
7. Wisconsin Green Schools Network - Project WET (Water Education for Teachers) https://www.projectwet.org/where-we-are/partners/wisconsin-green-schools-network
8. Wisconsin Center for Environmental Education - Project Learning Tree https://www.uwsp.edu/wcee/project-learning-tree/
9. Wisconsin Green Schools Network - Project WILD http://dnr.wi.gov/education/educatorresources/wild.html
10. Wisconsin Center for Environmental Education - K-12 Energy Education Program (KEEP) https://www.uwsp.edu/wcee/keep-wisconsins-k-12-energy-education-program/
11. Wisconsin Center for Environmental Education - K-12 Forestry Education Program (LEAF) https://www.uwsp.edu/wcee/leaf-wisconsins-k-12-forestry-education-program/
12. The Aldo Leopold Foundation Teach and Learn with resources from the Aldo Leopold Foundation Aldo Leopold was a conservationist, forester, philosopher, educator, writer, and outdoor enthusiast. He is considered by many to be the father of wildlife ecology and the United States' wilderness system.
13. Wolf Ridge Environmental Learning Center http://wolf-ridge.org/class/
14. National Phenology Network https://www.usanpn.org/education
15. Cornell Lab of Ornithology http://www.birds.cornell.edu/page.aspx?pid=1663
16. Hawthorne Hollow http://www.hawthornhollow.org/

Discussion Board Rubric

	Minimal (15 and below)	Excellent (18 and above)
Original Post (8)	Very little of the assignment is attempted. There are many inaccuracies and / or omissions. Work is poorly done, incomplete with little effort demonstrated. Work shows a lack of understanding (< 6)	Assignment is complete and on time. Post includes detailed answers with thorough explanations and examples from current work and/or past educational setting and assigned readings. Work is organized, neat and easy to follow. (7.44+)
Response (7)	Agrees/disagrees without providing support statements (me, too, or I agree). Respectful to others and their thoughts. (< 5.25)	Responses are clearly stated. Makes references to textbook materials. Expand on information with specific examples. Cites other text and work. Respectful of other people's opinions and feelings. Gives constructive feedback. (6.51+)
Writing Mechanics (5)	Disorganized and difficult to follow. Has several grammatical, syntax and spelling errors. (< 3.75)	Well-structured and eloquently stated, free of grammatical, syntax and spelling errors. (4.65+)

Outdoor Education Review Report Rubric

Components and points	Minimal (30 and below)	Excellent (45 and above)
General program information (15)	The description, key features, materials and contact information are lacking detail. Children's "take away" is unclear. Potential barriers and potential solutions to participating are not discussed. (< 9)	The description, key features, materials and contact information are identified in detail. The program's targeted age levels are identified and discussed. Children's "take away" clearly available and appropriate with the program's key learning. Potential barriers and potential solutions to participating are discussed in detail. (13.5+)
Science and environmental education connections (15)	Science and environmental education standards and key learning incorrectly identified for the lesson plan reviewed/ created. (< 9)	Science and environmental education standards and key learning correctly identified for the lesson plan reviewed/created. (13.5+)
5E's of Inquiry lesson plan (15)	Some components (or gaps) of inquiry learning outlined and identified. (< 9)	All components (or gaps) of inquiry learning outlined and identified correctly. Pre and post activities to enhance students' experiences and learning discussed in detail. (13.5+)
Writing Mechanics (5)	Disorganized and difficult to follow. Has several grammatical, syntax and spelling errors. (< 3)	Well-structured and eloquently stated, free of grammatical, syntax and spelling errors. (4.5 +)

Introducing Place-Based Education in Social Studies

Angie Bazan, Edgewood College

Context

This lesson has been created for a Secondary Social Studies Methods course. Specifically, these students are in the Accelerated Secondary Program (ASP) and all have Bachelor's Degrees, returning for teacher certification. In the methods course we learn about the *Thinking Like a Historian* framework for teaching social studies that focuses on the ideas of inquiry, evidence and interpretation. We work on getting our students to ask questions about history, find primary source documents and then interpret those documents and how they address their initial question.

In addition, placed based education can be used to engage students in the social studies classroom. Students are able to identify either a question/ problem in their community that they can work to solve and improve, or use the actual environment for learning in itself (e.g., cemeteries, architecture, and historical locations).

In this lesson, students are introduced to what place-based learning (PBL) is, how it relates to social studies, find examples of how PBL is used in social studies, and then ask them to create a PBL lesson plan of their own for future use.

Licensure
Secondary

NAAEE Guidelines for Excellence
Theme 3
Guideline: 3.1

Theme 4
Guideline: 4.2

Materials

Access to computer/internet, copies of readings

Step by step directions

1. Begin the lesson by assigning students to read the following article prior to coming to class: Resor, Cynthia Williams. "Place-Based Education: What is its Place in the Social Studies Classroom?" *The Social Studies* (2010) 101, 185-188. http://docs.kedc.org/schools/TAH/Documents/Place_basedEducation.pdf
2. At the beginning of class, discuss the idea of Environmental Education and what role social studies plays in it. Show students the WI Model Academic Standards for Environmental Education and give them a few moments to look over them- and place a checkmark next to all of those that pertain to social studies (which is many). We would then take a look at how those ideas might crossover into their future classrooms, and discuss connections between the Thinking Like a Historian teaching framework of inquiry, evidence and interpretation and the EE standards, especially standard A.
3. Next, as a class, we would discuss the article; defining as a group what place means (both absolute and relative), what PBL is, and how it might be used in a social studies classroom, citing any examples they may have/be seeing in their practicum experiences.
4. Students would then watch a short video about place-based learning and how to use it in your classroom, followed by discussion: Video on PBL
5. Students would have time to explore PBL linked to Social Studies and look for examples that they find interesting or could see themselves using in their future classrooms, and identify the learning that might occur. Students will need to find 1 social studies related example that they can share out with the rest of the class. Students would be given 20- 30 minutes, and the following sites to get them started (though they can research and find others as well):
    a. Promise of Place - website contains definitions, curriculum and planning ideas, research and evaluation sources, as well as searchable data of stories/examples from the field that can be searched by topic.
    b. Getting Smart - this site has numerous articles and video examples of Social Studies specific PBL.
    c. Handbook on Place-Based Learning - provides examples of how and where PBL takes place.
6. When we reconvene, students share the examples that they found of PBL being used in social studies classrooms, and also identify what sort of learning/essential outcome was going on in each example. Students would discuss how this learning may benefit students academically, socio-emotionally, etc.
7. Next, students would be broken into four groups; each group would receive a location where place-based learning could occur, (Local, State (WI), National (USA) and Global) and would be given the task of creating/researching/exploring ideas for projects in those areas and creating a list to share out.
8. After being given time to work, each group would share out the ideas that they had for how PBL could be done locally, state-wide, within the US and on global projects. All ideas and resources would be put onto the class Blackboard site for future reference.
9. As homework, students would be tasked with creating a Place-Based Lesson Plan for use in their future social studies classroom. They would need to create a lesson that surrounds both an EE and SS standard and provides students with an authentic learning experience.

Assessments

Students would create a PBL lesson plan for use in their future secondary social studies classroom. The lesson would be required to meet an established rubric and would be shared in the next class.

Trees as Storytellers

Jennifer Collins and Erin Edington, University of Wisconsin-Platteville

Context

The audience for this are senior level elementary education majors. Students will be introduced to the concepts of place-based learning through a series of integrated social studies and science lessons.

The initial investigation will introduce students to what constitutes primary source documents and lead into discussions of the different types of primary source documents that are available. Further discussion will ask students to consider how First Nation people, specifically the Ho Chunk, used trees and nature to tell stories and provide historical information. An important question for students will be "How can we validate traditional written historical narratives using narration from nature, oral tradition and traditional ecological knowledge (TEK)?"

Simultaneous considerations will include intentionality in integrated learning design, considering developmentally appropriate practices, in a place-based learning context. Universal Design for Learning will also be considered.

Licensure
Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2

Theme 4
Guideline: 4.2

Materials

Social Studies: Primary source document samples, Ho Chunk stories/reading materials, Ho Chunk elders – Jamie Mallory / Patti Lowe or Ho Chunk Tribal Office, Platteville Journal articles (or any archived local newspaper), Library of Congress – Teaching with Primary Sources, LOC – videos http://loc.gov/teachers/professionaldevelopment/, Wisconsin Historical Society www.wisconsinhistory.org, Digital Public Library of America https://dp.la/

Science: DBH and standard measuring tapes, tree cookies, stereoscopes, TREES Lab and instructor, trees on campus

Step by step directions

Social Studies
Week 1
1. Introduce foundational ideas related to place-based learning.

Week 2
1. What are primary source documents?
2. What types of primary source documents can historians use?
3. What are some non-traditional primary source documents that have been used by First Nation, specifically Ho Chunk, people?

Week 3
1. How can we validate oral, written and historical narratives using narratives from nature?

Senior Seminar
Week 1
1. Introduce foundational ideas related to integrated instructional design.

Week 2
1. Take measurements of trees on campus, determined by the professor.
2. Ask yourself how the tree has a story to tell about its life and experiences. Additionally, consider how a tree holds clues and a story to our past.
3. Take the measurements and consider the relationship between the numbers.

Week 3
1. Work in the TREES lab, "reading" tree cookies telling a historical narrative.
2. Students will engage in an activity matching historical stories to the tree cookies.

Week 4
1. Revisit integrated learning design and inquiry learning models of instruction. Additional considerations include: developmentally appropriate practices and UDL.

Assessments

Social Studies
Informal: Using a pre-assigned tree cookie, students will write an autobiography depicting the life of the tree, in first-person narrative.

Formal: Students will analyze a sample tree cookie and make a prediction about the story the tree cookie tells (a natural phenomenon that occurred during the life of the tree). Students will then validate those predictions by choosing the correct local newspaper article depicting the phenomenon.

Senior Seminar
Informal: Students will be asked to communicate informally, through discussion, how each activity engages them in an integrated learning opportunity.

Formal: Students will analyze a sample tree cookie and make a prediction about the story the tree cookie tells (a natural phenomenon that occurred during the life of the tree). Students will then validate those predictions by choosing the correct local newspaper article depicting the phenomenon.

Time Well Spent: A Facilitated Solo Experience to Ignite Environmental Literacy

Evan R. Coulson, Northland College

Context

The intended audience for this field-based activity is undergraduate students interested in utilizing place-based, experiential outdoor education methodology for teaching toward the development of environmental literacy in their students / participants. This activity models the facilitation of a series of sequenced, structured experiences which aim to elicit an awareness of time, place, and the power of being fully present. This activity can be adapted to a wide range of audience age, experience and ability with minimal effort.

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.4

In proposing a framework for effective assessment, scholars associated with the North American Association for Environmental Education identified four essential interrelated components of environmental literacy: competencies, knowledge, dispositions, and environmentally responsible behaviors (NAAEE, 2011). Environmental knowledge encompasses what a person knows about the physical ecological world around them, social systems around them, environmental issues related to the world around them, and strategies for addressing these issues. Dispositions toward the environment relate to how a person responds to issues concerning the environment, such as the individual's interest, sensitivity, responsibility, locus of control, and motivation to act. Competencies include a person's ability to identify and analyze environmental issues, to evaluate potential solutions, and to propose and justify actions. Environmentally responsible behaviors emerge from the complex and ever evolving interplay of what a person knows, what a person can do, and how a person feels/what a person believes about what they know and can do.

Gilbertson et al. (2006) described four stages of environmental learning for developing environmental literacy. The first stage is *survival*, which incorporates the progression of moving from a state of fear to one of comfort such that a person becomes open to awareness of the ecological world around them. The second stage is *physical skill acquisition*; as awareness sets in, a person can become motivated to develop the skills necessary to safely and comfortably access the natural world and experience it at a closer and deeper level. The third stage is the development of *personal relationships* with the land and its inhabitants. As comfort in an outdoor setting expands, and physical outdoor skills improve, people tend to become more aware of the details present in the environment around them. Meaning and personal values may begin to develop from the growing awareness of these details. When a person has become familiar with their surroundings, has acquired an adequate skill set, and this skill, awareness, knowledge, and experience begins to integrate with the place they are in, a sense of oneness or harmony can start to emerge resulting in a fourth and final *metaphysical* stage. In this final stage of environmental learning, a person is primed to more fully understand environmental issues and is most prepared to propose, justify, and pursue actions in line with this deeper understanding and motivation.

This activity focuses on facilitating a smooth transition through the first stage of environmental learning. Throughout this experience, students are invited to become oriented to place and to begin developing an awareness of, and comfort with, their surroundings through intentional use of their senses (smells, sounds, visualization of flora/fauna/landforms, etc.). The dawning of this sensory awareness is intended to invite both a comfortable familiarity with the natural setting as well as to help open participants up to developing an emerging sense of curiosity, wonder, and desire to learn more.

Materials

Outdoor classroom site/location, co-instructor, solo challenge list handout, journal, writing utensil, emergency signaling devices

Recommendations
Outdoor classroom site/location- select a quiet and secluded natural area large enough to accommodate a 15' radius 'solo site' for each participant. Ideally, each participant will be positioned such that they will not be able to see any other participants to ensure an experience of solitude.

Human resources- Ideal to have a co-instructor to aid in participant placement at solo sites, participant supervision during activity, as well as help in collecting participants from their solo sites at the conclusion of the activity.

Physical materials- solo challenge list as a handout; each student will need a journal with adequate blank pages for all activity components and a writing utensil (multiple colors / mediums optional); an emergency signaling device for each participant and instructor (e.g. whistle); proper clothing for the conditions; and adequate food & water for all participants/instructors.

Step by step directions

1. Introduction: Time. Lead students to a pre-selected outdoor teaching site/space. Gather the group in a place free from distractions to frame the coming experience with the intro activity outlined below.
   b. Ask participants to draw a circle on one full page of their journal.
   b. Next, ask participants to divide the circle into 24 equal sized 'pie slices'.
   c. Once the circle has been divided into 24 sections, inform participants that each section or 'slice' represents one hour in a 24-hour day. Ask participants to do the following:
      - Shade in the average number of hours that they spend sleeping each day;
      - Shade in the average number of hours that they spend eating each day;
      - Shade in the average number of hours that they spend bathing and other personal care processes each day;
      - Shade in the average number of hours spent at school each day;
      - Shade in the average number of hours engaged in after school work each day;
      - Shade in the average number of hours spent engaged in entertainment (TV, movies, games, cat videos, etc.) each day;
      - Shade in the average number of hours spent engaged with social media each day;
      - Shade in the number of hours spent engaged in responsibilities to someone else or in service to others each day.
   d. Ask participants to examine their circles and to consider sharing out how many hours in an average day are left free?
   e. Ask participants if they are surprised by the results indicated by their 24-hour clock? What surprised them? How do they feel about their results?

f. Ask participants to consider the hours that are left free (if any) and then ask them to shade in the average number of hours spent in the presence of another person or people out of what hours are left.
g. Ask participants to consider not only how much time that they actually have free from some form of obligation or distraction in their daily lives, but how much free time that they actually have for just themselves.

2. Inform participants that they will now be receiving a rare and precious gift: *time*. This time is intended for them to experience a substantial chunk of their day free from all normal daily distractions and obligations; this time is for them to be completely free and to be able to focus on simply being with themselves for themselves in a supportive and inspiring setting.

Intended outcomes and Instructor judgment: Set the length of the solo / solitude experience based on factors such as participant age/experience, site/weather conditions, other logistical or programmatic demands of the day, experience goals and outcome objectives, etc. Some facilitators have conducted a successful 10 to 15 minute mini solo experience for young elementary students. Others have used 20 to 30 minutes short solos for older elementary school, middle school, high school, and college/university students. With high school, college students, and adults, 30 to 60 minute solo experience can be quite powerful. Some outdoor education and wilderness-based programs regularly utilize more structured and supported solo experiences ranging from several hours to several days in length. Do advocate for making this solo time as long as realistically possible. Never underestimate the power of giving a person the gift of real, true, and free time.

3. Communicate parameters and expectations for students during their solo time:
   a. As each student is 'dropped off' at their site, help them walk off a 15' radius so that their solo site becomes clear to them;
   b. Students are asked to remain within their assigned solo site for the duration of the activity. If the student has an emergency situation, they are to use their signal device to call for help, but should stay put unless immediate physical safety is in jeopardy;
   c. Students are invited to choose from a menu of different challenges to complete during their solo experience.

4. Develop a system for placing students out at their solo sites. Ensure that each site is far enough apart from others that the student will not be within eyesight of other students, but not so far apart that students will not be able to hear an instructor's 'return' signal, or that instructors will not be able to hear a student's emergency signal.

5. Content: Awareness Challenges. Walk students as a group to their individual solo sites, 'dropping' off each student at their individual solo site as you come to it.
   "During your solo, choose and complete at least seven of the awareness challenges listed below:"

   Look
   a. In your journal, create a detailed map of your solo site;
   b. Choose an interesting 3 foot X 3 foot section of your solo site. Take a 'micro hike' to explore every square inch of this section. In your journal, create a map of this micro trail system that you just 'hiked';
   c. In your journal, create an inventory of every living thing that you can see in your solo site;
   d. In your journal, create an inventory of every *non*living thing that you can see in your solo site;

   e. In your journal, create a diagram that illustrates any connections or links that you think may exist between any of the living and/or nonliving things in your solo site inventories;
   f. In your journal, describe how you think your solo site may change over time;
   g. In your journal, write a short story of how you would utilize the space and resources present only within your solo site if you had to live here for an entire month. Are there any other additional resources that you would want added to your site?

   Listen
   a. Create a sound map
      - In your journal, draw yourself in the center of your solo site;
      - Draw/label every sound you hear around you in relation to you.
   b. Count and identify all the sounds that you can hear around you for a full 20 minutes.

   Feel
   a. Center yourself by kneeling in the center of your solo site with your eyes closed for a full 20 minutes. Concentrate on your breathing. Focus intently on the feel of each breath coming in as well as each breath going out of your mouth/nose/lungs. Focus on the feeling of the ground beneath your knees. Focus on the feeling of the sun on your skin. Focus on the feeling of the wind on your face and in your hair. Focus on the feeling of each hair follicle as the wind moves the hair. Focus on the feeling of your heart beating in your chest. Focus on the feeling of the blood moving through your arms.
   b. Lay on the ground and allow yourself to feel the full effect of the Earth's gravitational force on every limb of your body.
   c. Find and document in your journal 10 different textures within the radius of your solo site.
   d. Sit still, with eyes closed, and tune in every nerve ending in your body until you can detect the rotation of the Earth upon which you are seated.

6. At the end of the pre-determined solo time frame, signal students to return to the predetermined/pre-communicated meetup site.
   a. If a co-instructor is available, have one instructor walk to the very last student solo site and walk with the farthest student back toward the meetup site, checking each student solo site to ensure that no student is left (napping?) at any site;
   b. Ensure that all students have returned safely from their solo site before moving on to the activity conclusion.

7. Conclusion: Values. Gather the group in a quiet, distraction free setting to conclude the activity and bring a strong ending to what was likely a rather powerful individual experience.
   a. Facilitate a round of reflection questions with the group, which may include some of the following:
      - How was your time out there?
   b. Invite participants to share a word or phrase to describe how they felt about spending so much time with just themselves and the world around them
      - What did you see?
   c. Invite participants to share any maps created
      - What did you hear?
   d. Invite participants to share any sound maps created
      - What did you do? –How did you utilize this free time?

- What did you notice that you did not expect?
- What spent free time with you at your solo site?

e. Journal Prompt- Following this initial round of group reflection questioning, invite participants to find a quiet spot near the group and consider the following individual reflection questions, writing their answers in their journal:
   - What was happening at your site during your solo?
   - What will continue to happen at your site, even after you are gone?
   - What effect do you think that you may have had on your site while you were there?
   - What would you like to see happen at or to your site even after you have left?
   - What effect do you think you may be able to have on your solo site even after you leave today?
f. Reflection Paper Prompt- Ask undergraduate students to continue the reflection process further; upon returning home from this activity experience, ask students to consider the following questions in a short (*no more than 4 pages!*) reflection paper:
g. What did it feel like to spend so much time free from distractions, obligations, and the fast pace of your home/work/school life?
h. How do you think spending this time in a natural setting influenced your awareness of, and connection to, that environment?

- How do you see this activity affecting the stages of environmental learning articulated by Gilbertson et al. (2006)? Furthermore, do you see experiences such as this influencing the development of environmental literacy?

Group Safety & Risk Management: When selecting an outdoor classroom for this activity, be mindful of potential environmental hazards, such as direct exposure to the elements (rain, wind, sun) as well as potential distractions that could minimize the experience of solitude. When placing each student out on their mini 'solo' experience, ensure that each student has snacks, an adequate water supply, proper clothing, and an emergency signaling device (e.g. whistle). Set clear boundaries and ensure that students know the predetermined/pre-communicated signal to return to a predetermined/pre-communicated rendezvous location. Great solo locations are self-contained with natural backdrops or 'guard rails' and are free from overly hazardous environmental conditions (e.g. questionable ice, fast moving water, cliff edges, etc.).

Assessment

Once reconvened as a group, participants will be asked to share out highlights from the challenges they completed at their solo sites as well as thoughts from their concluding journal entry. Additionally, with undergraduate students, a follow up reflection paper will be assigned. Responses will be examined in relation to the NAAEE Guidelines Theme One, Guidelines Two and Four.

References

Gilbertson, K. (2006). Outdoor education: Methods and strategies. Human Kinetics. Champaign, IL.

Hollweg, K. S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. (2011). *Developing a framework for assessing environmental literacy*. Washington, DC: North American Association for Environmental Education.

Mapping Historical Land Cessions of Current WI Tribal Nations as Context for Treaty Rights and Sovereignty

Christin DePouw, University of Wisconsin-Green Bay

Context

The intended audience is undergraduate preservice teachers and serves as a foundation for integrating environmental education through the social studies. These students will be certified in a range of areas, including elementary, middle, and secondary grades. The lessons included here could be replicated in a secondary classroom with little modification.

This lesson is appropriate for preservice teachers because many preservice teachers do not understand treaty rights or tribal sovereignty as part of political science. Further, the lesson advances a deeper and more complex understanding of the politics of geography and natural resources in state-level historical context.

Teachers can modify this lesson for elementary classrooms by removing the component that focuses on treaty language in primary documents. Further, it is recommended that the modified lessons begin in grade 3 and that the key concepts of the lessons be broken down into much more simplified and slower lessons. For instance, the concept of treaties should be accompanied by an in-class activity in which students try to determine "ownership and use" rights to a playground, and negotiate terms between two groups unequal in power and in numbers.

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2

Integrated subjects include geography, history, political science, economics, and environmental education.

The activity will take place after prior lessons on 1) First Nations as sovereign nations and the heterogeneity of tribal nations, 2) a lesson on the meaning of the term "sovereignty" and what it signifies in regard to government-to-government relationships to the United States federal government under the US Constitution, and 3) a lesson on the concept of treaties. After students have a clear idea of First Nations as sovereign governments, we will talk about the treaty era and land cessions in the US (1774-1885) with a specific focus on transfer of land and wealth.

Materials

Computers or tablets, paper handouts of primary sources, pens or pencils

Step by step directions

For the activity sequence, we will examine primary documents about land cessions and treaties, create a timeline, and develop a series of maps that reflect territorial changes based on land cessions.

Student grouping: Students will be divided into small groups of 3-4 people and assigned to focus on one tribal nation that currently resides in Wisconsin. This activity would therefore include the Oneida nation (part of

Six Nations) and the Stockbridge-Munsee Mohicans, even though both originated in the northeastern United States and later moved to Wisconsin due to displacement and colonial pressures. Similarly, there are currently 11 federally recognized tribal nations in Wisconsin, six of whom are bands of Ojibwe in northern Wisconsin. Students assigned to bands of Ojibwe will be able to look to treaties that impacted Ojibwe peoples as a broader group rather than band by band.

To begin the lesson, students will be provided a table in which different columns are labeled: Tribal Nation, State/Territory, date, land ceded.

Tribal Nation	State/Territory	Date	Description

Students will then be asked to examine sections of a primary document that is relevant to the tribal nation upon which they will focus. The primary document is *Indian Land Cessions in the United States, 1784-1894 (*Accessed at the Library of Congress: http://memory.loc.gov/ammem/amlaw/lwss-ilc.html) We will begin by reading a paper handout with an example of an historical treaty in order to learn how to read the document (see image below):

SCHEDULE OF INDIAN

INDICATING THE NUMBER AND LOCATION OF EACH CESSION BY OR RESERVATION FOR THE
1894, TOGETHER WITH DESCRIPTIONS OF THE TRACTS SO CEDED OR RESERVED,
THE NAME OF THE TRIBE OR TRIBES AFFECTED THEREBY,

Date[1]	*Where or how concluded*	*Reference*	*Tribe*[2]	*Description of cession or reservation*
1784 Oct. 22	Fort Stanwix, New York.	Stat. L., VII, 15.	Six Nations of New York.	Article 3 of the treaty defines the western boundary of the Six Nations.[3] Article 3, after defining said western boundary, provides "that the Six Nations shall and do yield to the U. S., all claims to the country W. of said boundary." By article 3 the U. S. also reserve 6 miles square around "the fort of Oswego."
1785 Jan. 21	Fort McIntosh.	Stat. L., VII, 16.	Wyandot, Delaware, Chippewa, and Ottawa.	Defines their boundaries and reserves to the use of the U. S. sundry tracts at various points named.
Nov. 28	Hopewell on Keowee river, South Carolina.	Stat. L., VII, 18.	Cherokee.....	Article 4 fixes the following boundary between the hunting grounds of the Cherokee and the lands of the U. S., viz: Beginning at the mouth of Duck river on the Tennessee; thence running NE. to the ridge dividing the waters running into Cumberland from those running into the Tennessee; thence eastwardly along the said ridge to a NE. line to be run, which shall strike the river Cumberland 40 miles above Nashville; thence along the said line to the river; thence up the said river to the ford where the Kentucky road crosses the river; thence to Campbell's line, near Cumberland Gap; thence to the mouth of Cland's creek on Holstein; thence to the Chimney Top mountain; thence to Camp creek near the mouth of Big Limestone on Nolichnckey; thence a southerly course 6 miles to a mountain; thence S. to the North Carolina line; thence to the South-Carolina Indian boundary and along the same SW. over the top of the Oconee mountain till it shall strike Tugaloo river; thence a direct line to the top of the Currohee mountain; thence to the head of the S. fork of Oconee river.

[1] The date in this column, in case of treaties, refers to the time of signing the treaty and not to the date of the proclamation.
[2] The recent spelling of the tribal names is followed in this column so far as practicable.
[3] The spelling of the Indian names in this column follows that of the treaties, etc.

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Students will then be able to explore the interactive document online, exploring the digitized primary source as well as related sites that allow the students to browse by tribal nation and by state/territory.

The essential questions are:

1. What are some key dates and treaties that led to land cessions for the tribal nation under study? How do these dates and territories give us clues as to what else was going on during these historical moments? (EX: Six Nations treaties during 1780-1790s in New York and Revolutionary War era)
2. Approximately how much land was transferred from the tribal nation and into government hands by the end of the treaty era (1885)?

Question 1: What are some key dates and treaties that led to land cessions for the tribal nation under study?

Students can find this information within the primary document's "Date" and "Where & How Concluded" sections. Students will also be instructed to read the "Description of cessation" column for more detailed information on the transaction and to summarize this information in the "Description" column of their table. To help students translate historical names for tribal nations with contemporary names, provide them with a handout from the National Park Service NAGPRA site (https://www.nps.gov/NAGPRA/ONLINEDB/Land_Cessions/INDEX.HTM):

Question 2: Approximately how much land was transferred from the tribal nation and into government hands by the end of the treaty era (1885)?

The "Description of cessation" within the primary document provides clues for how much land was transferred. The Library of Congress also has a collection of maps (1899) that visualize the land cessions (https://lccn.loc.gov/13023487) in WI and reservations in 1899. The map collection does not provide a quantity, but does provide a visual description of the loss of territory. Another map archive that might be used is the National Park Service NAGPRA website at https://www.nps.gov/NAGPRA/ONLINEDB/Land_Cessions/INDEX.HTM

In order to more clearly answer the question of how much land was transferred, provide students with a link to this animated map: https://indiancountrymedianetwork.com/news/animated-map-shows-loss-of-western-tribal-lands-from-1784/

In the Courts of the Conqueror: The 10 Worst Indian Law Cases Ever Decided by Walter R. Echo-Hawk provides additional information: "By 1881, Indian landholdings in the United States had plummeted to 156 million acres. By 1934, only about 50 million acres remained (an area the size of Idaho and Washington) as a result of the General Allotment Act of 1887. During World War II, the government took 500,000 more acres for military use. Over one hundred tribes, bands, and Rancherias relinquished their lands under various acts of Congress during the termination era of the 1950s."

Final component: Students will write an analysis of what the land cession primary document included and what it left out in providing a history of treaties and land cessions. Students will then talk about the significance of land transfers for both the tribal nation in question and the federal government in terms of gained or lost resources and place.

For the next lesson:

As part of the interdisciplinary nature of the unit, we will move from the activity on land cessions to an examination of the impact of land cessions on how land was occupied, utilized, cared for, and what/how resources were extracted. This conversation on shifts in land utilization and occupation will also relate back to the prior discussion on treaty rights by highlighting usufructuary rights to hunt, fish, and gather on ceded territories and the significance of those rights to First Nations peoples.

Assessments

Students will write an analysis based on the data in their table and the related primary sources and maps.

EPA History, Impact and the Present

Steven Levsen and Lynn Diener, Mount Mary University

Context

This is intended for a science content class that addresses the environmental education requirement and that education students typically enroll in. This assignment asks students in groups to learn about the U.S. Environmental Protection Agency during some historical period moving from its inception up to the present. Time periods can be modified based on the size of the class and the size of the groups. The NEPA act, which originated the U.S. EPA, was passed in 1969. Students learn about the EPA during their assigned time period and compare it to the EPA now.

Licensure
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.3, 1.4

Materials

assignment printout (or electronic access), assignment resources

Step by step directions

Self-directed learning by the students.

1. Students are placed in groups and assigned a time period in the history of the EPA
2. Students research the EPA, both during their assigned time period and currently
3. Students develop a paper and PowerPoint in groups to present what they learned
4. Students individually respond to questions specific to their own disciplines.
5. Student groups present their findings in class, preferably chronologically.

Assessments

1. Students write group research papers, responding to the questions below.
2. Students create and present group PowerPoint presentations (or other format, depending on instructor's preference).
3. Individual students consider their specific discipline and respond to additional questions.

Resources

EPA history, impact and the present

You have been divided into small groups to look at the purpose, function, and accomplishments of the EPA within a given time frame. You should include these and any other interesting facts in your research paper and presentation. In addition to your time frame for discussion, please consider our current EPA. Included below is a link which indicates the current mission of the EPA.

The mission of the EPA is to protect human health and the environment.
https://www.epa.gov/aboutepa/our-mission-and-what-we-do

EPA's purpose is to ensure that:

- all Americans are protected from significant risks to human health and the environment where they live, learn and work;
- national efforts to reduce environmental risk are based on the best available scientific information;
- federal laws protecting human health and the environment are enforced fairly and effectively;
- environmental protection is an integral consideration in U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade, and these factors are similarly considered in establishing environmental policy;
- all parts of society -- communities, individuals, businesses, and state, local and tribal governments -- have access to accurate information sufficient to effectively participate in managing human health and environmental risks;
- environmental protection contributes to making our communities and ecosystems diverse, sustainable and economically productive; and
- the United States plays a leadership role in working with other nations to protect the global environment.

After researching your assigned time frame and reviewing the mission, please respond to the following in your paper and presentation:

1. Does this mission seem consistent with the time frame you were assigned? Compare and contrast.
2. Is the mission being accomplished? How so?
3. Is this mission relevant in today's society? Include supporting statements.
4. Do we still need the EPA or has our society and business climate matured to a point where the oversight and other roles of the EPA are no longer relevant? Please explain.

Individually, consider your field of study. How does what you learned affect your field of study? Could any of the things you learned impact your future career? If so, how? Be sure to include your responses in your paper and presentation.

Integrating Environmental Education Practices into Science Education

Joel Donna, University of Wisconsin-River Falls

Context

Science and environmental education overlap and have separate aspects. Through lecture and discussion, this activity provides the opportunity for preservice science teachers to explore these differences and consider how the overlaps can affect their own future classrooms.

Goals of Environmental Education

- Changing values and behaviors individually and collectively
- Stewardship and environmental responsibility
- Seeing interconnectedness of domains
- Honoring different ways of knowing

Frames for Environmental Education Investigations

Using the local and global environment, and problems within the environments, as a context for learning interpreted through multiple lenses

Pedagogies of Environmental Education

- Problem-Based Learning
- Project-Based Learning
- Service-Learning
- Place-Based Learning
- Helping students think at both sides of an issue (trade-offs in decisions to avoid advocacy)
- Citizen Science (through information and communication tools such as apps, GIS, Probeware)
- Service-Learning

Helping Preservice Teachers Understand Connections to Science Education

Activities to help Science Educators think about integrating EE

- Take a science disciplinary core idea (NGSS) and consider the EE connections (develop guiding questions for each) aligned to EE standards
- Take an existing science lesson and look for EE connections (e.g. does it involve food, water, or energy? Where do humans come into the story? humans?)
- In field experiences and student teaching, makes sure teachers walk around school area and look at community assets (and issues) related to the content within the natural and designed world (Especially helpful for the EdTPA)
- Connecting with School Gardens

Licensure

Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence

Theme 3
Guideline: 3.1

Theme 4
Guidelines: 4.2, 4.6

Resources

- Wals, A. E., Brody, M., Dillon, J., & Stevenson, R. B. (2014). Convergence between science and environmental education. Science, 344(6184)
- McDonald, J. T., & Dominguez, L. A. (2010). Professional preparation for science teachers in environmental education. In The inclusion of environmental education in science teacher education (pp. 17-30). Springer Netherlands

“Let’s See What’s Out There” Jean-Luc Picard

Deb Dosemagen, Mount Mary University

Context

The activity will be conducted in a general methods course for EC/MC/EA license areas addressing science, health, and social studies strategies and methods.

Lesson design appropriate to each subject area will be modeled in class with an activity. Then, students will view a variety of videos (see appendix at end of plan) which illustrate a variety of strategies, and explore a variety of resources related to Pre-K-8 subject-specific concepts (environmental science in this case, but integration of content is encouraged). They will then construct a unit (in science, a series of 3-5 lessons constructed using the Understanding By Design format and including a cycle of the 5Es), create an assessment or develop an integration plan.

The description below is for the first lesson modelling the 5E (Engage, Explore, Explain, Elaborate, Evaluate) Cycle. It will be nature-based and should be conducted outside. Focus on Engage, Explore, Explain, and Elaborate components.

Licensure

Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence

Theme 2
Guideline: 2.2

Theme 3
Guidelines: 3.1, 3.2

Theme 4
Guidelines: 4.2, 4.4, 4.6

Theme 5
Guidelines: 5.1, 5.2, 5.3

Theme 6
Guideline: 6.2

Materials

Outdoor space, photos for the Zoom-In/Zoom-out Engage exercise, adaptation of the Nature Journal for exploration prompts or A-Z Chart, hula hoops to define specific observation spaces, magnifying glasses, i-Pads for research (drawings preferred to capture observations)

Step by step directions

Steps in this lesson are specifically designed to model the 5E framework.

1. **ENGAGE**: In-class Zoom-out activity -- use pictures of a natural item on campus and ask the question, what else is out there? Provide some basic information about the outdoor site (how big is it? how has land use of the area changed over time? e.g. 80 acres, a farm prior to 1920, proximity to Menomonee River)
2. **EXPLORE:** Working in groups, students explore the campus. They will be given a Nature Journal to help direct their exploration (15 minutes). After they have generally explored an area, they will place a hula hoop at a location of interest to them and do a more detailed observation of the region outlined in that circle (15 min.). Throughout the observation, they are encouraged to draw artifacts of interest. (Note: drawings are used instead of pictures to force observation of details).
3. **EXPLAIN:** Upon returning to the classroom, using post-it notes, students will share the observations they identify as “most interesting” by attaching the sticky note to a large campus map in the location they studied. Part of this exercise will involve the see-think-wonder strategy to process and summarize the information being shared.
4. **ELABORATE:** Students will choose three things that they “wonder” about and research information that may help to answer the questions that they raised. This information will then be shared with the class.
5. **EVALUATE:** Having directly experienced the first 4 parts of the cycle, first in small groups and then as a class, students will discuss ways in which their learning could be assessed in light of the Environmental Education Standards.

Assessments

The assessment in this class period will be informal. Students will watch a video of a PreK-8 learning experience with children and identify the 5Es in the children’s learning experience. If any of the E’s are missing from the example, students will brainstorm ways the teacher might have included it. This will be done individually and then shared in large group discussion.

Individual Record Sheet

Learning Cycle	Observed Activity	Possible Activity
Engage		
Explore		
Explain		
Elaborate		
Evaluate		

Individual Record Sheets will be collected at the end of class as an “exit ticket” to assess students’ understanding of the 5E Learning Cycle.

Resources

Videos:
Simulating an Oil Spill to Understand Environmental Impact:
https://www.teachingchannel.org/videos/natural-resources-lesson-plan

Students Teaching Students: Lessons from the Desert
https://www.teachingchannel.org/videos/students-teaching-students

Applying Knowledge at a Museum
https://www.teachingchannel.org/videos/how-students-get-most-from-museum-visit-getty

Farming in the Guilded Age: A Simulation
https://www.teachingchannel.org/videos/using-simulation-in-the-classroom

Antique’s Road Show: Show and Tell
https://www.teachingchannel.org/videos/show-and-tell-themes

Resources:
When Your School is a Museum:
https://www.edutopia.org/article/when-your-school-is-a-museum-beth-hawkins

Outdoor Education and Waldorf Schools:
http://blog.waldorfeducation.org/2016/04/outdoor-ed-beyond-environmentalism/

WI Center for Environmental Education
https://www.uwsp.edu/wcee/wisconsin-center-for-environmental-education/

National Center for STEM Education
https://www.stkate.edu/academics/institutes-and-centers/center-for-stem

Enhancing Education: 5Es
http://enhancinged.wgbh.org/research/eeeee.html

5E Model of Instruction
http://www.wisd.org/users/0001/docs/GVC/5E%20Model.pdf

Place-Based Education
http://peecworks.org/index

Center for Place-Based Education
https://www.antioch.edu/new-england/resources/#centers

EPA and Environmental Education
https://www.epa.gov/education

North American Association for Environmental Education
https://naaee.org/our-work/programs/guidelines-excellence

Art to Zoo
http://www.smithsonianeducation.org/educators/lesson_plans/history_close/ATZ_HistoryClosetoHome_NovDec1983.pdf

WI Model Academic Standards for EE
https://dpi.wi.gov/sites/default/files/imce/standards/pdf/envired.

Introductions in General Botany

Leah Dudley, University of Wisconsin-Stout

Context

This activity can be used as a way to gage students' content knowledge and skill levels in drawing and research for a General Botany course that science focused teachers must take for certification.

Materials

Herbarium specimens, internet access, computer/smartphone, FlipGrid application (online video tool), camera for FlipGrid video, colored pencils, blank paper, markers, sketchbook, copier

Step by step directions

1. Pull a plant (one for each student) from the herbarium that can also be found living on campus (cover identifying information). Make sure to span the major plant groups.
2. Place specimen in front of each student in the classroom and discuss proper handling techniques of herbarium specimens.
3. Ask each student to identify and describe their specimen using whatever resources they wish. Have a couple of dichotomous keys out in front of the room but do not point them out; this will evaluate whether students know what a dichotomous key is and how to use it (prior knowledge).
4. Let students know that they will be producing a 1.5 minute video using FlipGrid about their specimen
5. After producing the video, have students sketch and label as many parts as possible of their plant (provide name of student and plant)
6. Ask them to write out additional information that they wish they had put on the video
7. **Follow up:** have each student locate their plant on campus and produce a map as a class
   a. Use Google Earth to place pins. If possible, put map online as a resource for the institution.
   b. May need a flag to help students relocate, especially herbaceous specimens. If possible, work with the university grounds crew to utilize clay marquees (or something similar).
8. **Follow up:** each student will produce a journal on the plant's phenology during the semester
   a. Ask students to visit each week on the same day of the week outside of class time
   b. During the first visit, the student will create an outline image that will be copied for subsequent visits
   c. During each subsequent visit, indicate color changes and shape changes (if herbaceous)
   d. At the end of the semester, journals will be turned in and scanned so that images may be linked to map locations. You may have students augment with photos taken at the same time as the sketches are made and placed into a photo album, also to be linked to the map.
9. **Follow up:** research on historical or cultural uses of the plant (medicinal, culinary, religious etc.)
10. **Follow up:** research on ecological significance of the plant

Additional thoughts: You might continue using these plants as case studies throughout the semester. For example, when studying monocot vs dicot, bring out/make cross sections of plant examples. For example, when content is covering secondary chemicals, focus on exemplary examples from the original group of plants.

Licensure

Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence

Theme 1
Guidelines: 1.1, 1.2

Theme 2
Guideline: 2.2

Theme 4
Guidelines: 4.1, 4.5, 4.6

Assessments

The video & drawing will help to assess students' current knowledge and skills.
The follow-up at the end of the semester will assess the progress students have achieved in knowledge and skill.

A Walk in the Park

Susan Finkel Hoffman, University of Wisconsin-Oshkosh

Context

This lesson was created for a course called *Students with Disabilities in General Education*. This course is designed to provide a rigorous overview of current best practices regarding legal issues, service delivery, differentiation, Universal Design for Learning (UDL), Response to Intervention (RtI), collaboration, issues of eligibility, cross cultural competence, disproportionality, and transition to adulthood. Emphasis is placed on the legal right to access general education curriculum while supporting students with disabilities in general education settings. The course addresses teaching students with learning disabilities, emotional behavioral disabilities, intellectual disabilities, and autism.
This course is designed to meet the state statutory requirement of understanding disabilities and special education. Students must complete their human relations hours requirement and get to know a student with a disability as part of this course.
Students will explore a local accessible playground and identify components of UDL present in the playground. As a later assignment students write lesson plans in small groups. They will be encouraged to focus their lessons in the area of environmental education.

Approximate Activity Time
90-minute class session

Licensure
Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.3, 4.6

Theme 5
Guidelines: 5.1, 5.2

Materials

Clipboards (one for each group), mapping paper (one for each group),
Rebus paper (one for each group), scissors (one for each group), UDL Prompt Cards (one for each student), sample Rebus Packet (one for each group)

Step by step directions

Before the class session:

1. Instructor will visit park to identify areas where UDL components are visible
2. Students will have read course materials to have a background knowledge of UDL practices

During the class session:

1. Students will explore the park equipment and play for approximately 15 minutes.
2. Instructor will bring group together and have them sit together in their teams.
3. Instructor will introduce the practice rebus packets. Student groups will solve the practice rebus. Rebus puzzles are word picture puzzles with hidden meanings.
4. Instructor will provide mapping instructions that have students create a rebus, break the rebus into at least 3 parts, hide each part separately in a given space, and create a map that has clues to find the parts of the rebus. Students groups will receive a packet containing mapping materials, rebus materials, and their assigned UDL component.
5. Student groups will select an area of the playground that is supported by UDL. They will map the area, create a rebus, hide the parts of the rebus and return to the group.

6. Student groups will exchange their maps. Groups will then locate the playground area on the map, find the hidden rebus parts, complete and solve the rebus. They will then locate where the UDL principle is evident.
7. After all are completed, we will do a group review of each component in the playground.

Assessments

Completed maps and rebus. Discussion of the UDL components evident on the playground.

Awareness of Risk: Inside, Outside, and Beyond

Molly Gerrish, University of Wisconsin-River Falls

Context

This is an activity for preservice student teachers in their environmental education class as well as in a curriculum course. The students are in 2 different programs, those in the environmental education course (place-based science) are students enrolled in an early childhood major degree completion program (licensure EC). The students in the curriculum course (preschool curriculum) are those who are elementary education majors and early childhood education minors, their licensure will be EC/MC.

Licensure
Early Childhood

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.1, 4.6

The activity helps students to begin to understand how to "scout" (assess) their environment (place) for risks as well as opportunities, and how to account for the risks they may face in various settings. Risk is defined and explored in various ways, including physical risk, cognitive risk, social risk, and emotional risk. This activity is vitally important for early childhood educators who must be able to articulate to parents, administrators, and other interested stakeholders, why they do what they do and how they are aware of the risks inherent in certain activities. Additionally, being able to articulate how they are using these "risks" as opportunities that are developmentally appropriate as well as connected thoroughly and thoughtfully to standards. There are various types of risk/hazards/benefits (not only physical risk) that are to be focused on in this activity in order to help students think more broadly.

Because early childhood settings can be quite diverse, it is important for preservice teachers to understand their place and how their activities, environment, and materials are providing opportunities for students to take developmentally appropriate risks across the areas of development. Teachers of young children also serve as a model for behavior, and it is important to identify their own comfort level--what situations do they deem too "risky" for their students or are concerned about parental and administrative push-back? With the use of a goal-ladder and spiral approach to planning, activities and environments can meet both students and their teachers where they are all most comfortable while still offering appropriate challenge and room for growth.

Materials

Risk sort pictures (example pictures may include bleach, scissors, sticks, outlet, untied shoelace, worksheet, child sitting alone, litter, etc), outdoor setting at your own school or daycare, indoor setting at your own school or daycare

*really any indoor and outdoor space is appropriate as early childhood teachers need to have these skills regardless of where they are with young children.

Examples of (some) pedagogical methods used include:
*Crossover Learning, as the students are exploring various environments and bringing the information they have gathered back to the classroom (or, in the case of an online course, bringing the information to the discussion board).
*Field-based instruction as students will be engaging in various places outside their university classroom.

*Interactive lecture and Socratic questioning to engage critical and deep thinking. A main goal is to inspire students to ask big questions, search for big answers, and apply critical thinking. Another goal is to have students be able to take the main content of the lesson and be able to understand how they will use it and apply it in their own real-world setting.
*Experience-based environmental projects and analysis (whole student approach- physical, social, emotional, cognitive and is sensory based)
*Integrated content
*Structured Academic Controversy

Step by step directions

1. Begin by brainstorming as a large group (using a Y chart) what does Risk look like, feel like, sound like; what does hazard look like, feel like, sound like; what does benefit (opportunity) look like, feel like, sound like. The large group will discuss:
   a. What comes to mind when you hear the word RISK?
   b. What are the biggest risks in an EC classroom, playground, home?
   c. What are some struggles you have had with advocating for risky play in your EC setting?
   d. Why do you think this is so?
   e. Is there a difference between RISK and CHALLENGE; BENEFIT and OPPORTUNITY and if so, what?
2. Students will participate in a comfort continuum (1 being very comfortable offering risky play in their teaching to 10, very uncomfortable). Based on that, we will discuss spiral curricula and how to use a goal ladder within our teaching. Instructor will demonstrate and then students will choose a common early childhood skill/activity and practice.
3. Students will take time in small groups to define and explain the various types of risks from their perspectives and then reconvene as a large group to share.
   a. Social Risk- isolated, living in a vacuum, unengaged with others or with the environment.
   b. Emotional Risk- resilience, emotional development, expression of emotion in appropriate ways.
   c. Physical Risk- risk to the body, physical development, injury.
   d. Intellectual Risk- topics and materials that are not engaging, not challenging, not authentic- may result in the child's brain "turning off". Conversely, topics, materials and expectations that are not developmentally appropriate may also be an intellectual risk.
4. To illustrate how risk and opportunity are highly contextual and influenced by culture, expectation, and background, small groups will be given several photos and be instructed to sort the images in various piles; things they consider risk, opportunity, and hazard. The large group will then reconvene and share out what they determined for each photo. Since groups are given the same photos, it can lead to interesting conversations as various groups may sort things differently. The instructor will provide thought-provoking questions as needed to help students see various perspectives. Once all have shared, students are then instructed to list opportunities they see within each photo sorted into the "risk" pile.
5. Students will then be directed to take a silent journey around the classroom/playground (or any environment accessible) where they are instructed to observe, take notes, and be mindful of the activities set up in this place- either intended or unintended. Students then consider what the following words mean that we have just discussed as a group as they are on their silent journey: Safe, Hazard, Benefit, Risk. Students are to look for things in the space or place that they consider intended activities as well as unintended activities that could occur in that space.

   Unintended Activities- those that may result in the space due to materials available or not available, supervision, the students in attendance at that time, curiosities, things that invite exploration. What will the children do with the "seeds" you have left for them, or not provided for them? Whether you meant to or not…think intentionally here, what may result in this space that you had not planned for?

   Intended Activities- those planned by the teacher or materials provided to encourage a result or outcome. What you had in mind vs. what actually happens.
6. After students have had sufficient time in the space you directed them to, reconvene in small groups and discuss what they found and why.
7. Spend time discussing dynamic risk assessment and the DEEP GRASS acronym with students as a way to manage risk assessment:
   a. Dialogue (Licensing agents, parents, teachers)
   b. Environment (understand your place)
   c. Emergency Plan (be prepared)
   d. Policy and Practice (observe, intervene, manage)
   e. Gear (get the proper gear and equipment)
   f. Record (keeping appropriate and detailed records)
   g. Administration
   h. Safety (with daring; being as safe as necessary, NOT as safe as possible)
   i. Supervision (appropriate supervision)

   Dynamic risk assessment, model how to involve CHILDREN in the risk assessment (similar to what you might do within the classroom while setting up classroom rules) by involving the college students. Go as a group to an environment (note, this can be in the same space they just explored or in another area) and practice dynamic risk assessment:
   a. What do you see that might _____?
   b. How do you think we could/should use this?
   c. What are other things we should think about?
   d. What do you think PARENTS would find risky/beneficial? What do you think ADMINISTRATORS would find risky/beneficial? What do you think CHILDREN would find risky/beneficial? Assign small groups of students a group (parents, children, administrators) and have them look at the risk from that group's perspective. Using a Structured Academic Controversy approach, students will then "defend" or explain the perspective of their assigned stakeholder group as other groups attempt to explain it from their perspective. Taking on another's perspective can lead to important attitudinal changes and an ability to see things from another's point of view, very vital skills when working with the families of young children.
   e. DEEP GRASS assessment practice

8. Students will then work in groups of 2 and find their own "place." They will be given a variety of student types they will need to consider as they assess. Students will prepare a goal ladder or spiral curriculum document for their place (noting how they would differentiate for a variety of learner-types).

   They will do a risk analysis as a pair. The students will then prepare an activity within that space they feel will provide appropriate opportunity to engage in risk/challenge and how they intend to account for the risks that the various stakeholders might identify. Using the *Guidelines for Excellence: Early Childhood EE Programs*, the small group will explicitly connect how their place, activity and risk assessment meet their chosen guideline.

They will then lead the others to their place and ask them:

a. What do you see that might _____?
b. How do you think we could/should use this?
c. What things do you think we need to be aware of?
d. What else can you do here?

The students will then implement their activity idea with their peers (using goal ladder differentiation).

9. To complete the activity, after each group has shared, the large group will reconvene and share take-aways and discuss what this means in their work with young children.

Assessments

Informal: Informal assessments will include observation and discussion. Students will have an opportunity to apply this work to an additional final project (not described in the scope of this activity) wherein they do an analysis of outdoor and indoor play environments at various field sites (using several outdoor rating scales as well as the ECERS-R) and plan developmentally appropriate activities for young children.

Formal: Working in teams, students will apply their knowledge of risk analysis to an outdoor field site of their choosing and an indoor field site of their choosing. The students will complete a risk/opportunity template. For each stated "risk", students will articulate how they would manage that risk as well as the learning opportunities across the spectrum of development.

References

Bailie, P. (2007). "List of ten reasons to connect children with nature", *Seeds of Learning Conference*, River Falls, WI.

Bishop, Geoffrey (2015). Nature, the first and essential prepared environment, UWRF Nature Conference, River Falls, WI

Brodsky, Chenfeld, M. (2007). *Celebrating Young Children and Their Teachers,* Red Leaf Press, St. Paul, MN.

Brodsky, Chenfeld, M. (2002). *Creative Experiences for Young Children,* Heinneman, Portsmouth, NH.

Brodsky, Chenfeld, M. (2001). *Teaching by Heart,* Red Leaf Press, St. Paul, MN.

Cornell, J. (1989). *Sharing nature with children II.,* Dawn Publications, Nevada City, CA.

Davis, J. (2010). *Young Children and the Environment: Early Education for Sustainability.* Cambridge Press, Australia.

Gerrish, M. (2011). *Become a SEER of the Outdoors.*

Green Hearts Institute for Nature in Childhood, Omaha, Nebraska www.greenhearts.org

Kaiser Family Foundation (2005), USA Today, July 12, 2005

Louv, R. (2008). *Last child in the woods*. Algonquin Books of Chapel Hill, Workman Publishing Co., New York, NY.

National Wildlife Federation

Warden, C. (2014) *Risk It* Conference, Madison, WI

Conflict Resolution with Bioenergy

Laurie Gharis, University of Wisconsin-Stevens Point

Context

This activity considers energy sources, use of forests, and possible conflicts surrounding natural resource management. The activity would be appropriate for secondary science, social studies, and/or integrated subject teachers. Students will break up into categories of stakeholders (wood pellet/energy producer, environmental advocacy organization, forestry agency, private forest landowner, and energy buying citizen), listen to a real-life radio segment from their stakeholder's perspective, develop an evaluation tool to consider solutions, and then propose a mutually acceptable solution to a real life natural resource management issue.

Licensure
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3

Materials

Access to internet, computer, projector, and speakers

Step by step directions

Pre-activity

1. Students should develop a timeline of energy sources over time (sun, wood, wind, coal, natural gas, nuclear energy …).
2. Students should develop a list of pros and cons for the energy sources.
3. Students should propose how certain laws and/or agreements might affect current energy sources.
4. Students should contemplate conflicts that could occur regarding energy sources.

Activity

1. Break students into five groups (wood pellet/energy producer, environmental advocacy organization, forestry agency, private forest landowner, and energy buying citizen).
2. Have students listen to the radio episode and answer the following questions from their assigned perspective. Radio Segment: http://whqr.org/post/coastline-emerging-wood-pellet-market-boon-nc-opponents-say-it-decimates-forests
   a. Explain the idea behind wood pellets.
   b. Explain the objectives of your stakeholder (i.e., wood pellet/energy producer, environmental organization, forestry agency, private forest landowner, or energy buying citizen).
   c. Describe the overall conflict discussed in this radio segment.
3. As a class, research pictures of hardwood forests in the south on the internet and discuss the following three questions.
   a. Why is the southeast US supplying pellets? Possible answers might include:
      - Robust forestry industry
      - Mostly privately-owned forests
      - Climate conducive to growing (i.e. longer growing seasons, productive soils, relatively abundant water)
   b. What are environmental, social, and economic benefits of forests? Possible answers might include:
      - Flood & erosion control
      - Climate change – carbon sequestration through forests
      - Habitat
      - Recreational opportunities
      - Environmentally friendly materials
   c. What will happen if (1) no wood pellets can be produced or (2) wood pellets can be produced without any limitations?
4. Break back into groups (wood pellet/energy producer, environmental advocacy organization, forestry agency, private forest landowner, and energy buying citizen) to discuss the issue and consider solutions Solutions will vary from class to class but they should contain key components (stakeholders, how solutions can be developed, what is objective criteria, and impacts to consider).
5. Then, come together as a class to develop a tool to evaluate possible solutions. Solutions will vary from class to class, but students should consider each of the following key components when developing and evaluating their possible solutions: a) Who should be involved (stakeholders), b) How solutions may be developed, c) What is objective criteria (e.g. professional standards, scientific judgement, efficiency, equal treatment), and d) What impacts may be considered (i.e. economic, social, environmental).

Post-Activity

1. De-brief students on the activity. What worked/did not work?
2. Identify other natural resource conflicts that occur in the U.S.
3. Postulate whether the tool students developed would be useful for other conflicts (outside of natural resources).

Assessments

Assessments for this activity are mostly informal and may include the following items:

1. Are students able to explain objectives for different stakeholders?
2. Are students able to identify environmental, economic, and social benefits of forests?
3. Were students able to develop and describe an evaluation tool to resolve conflicts?
4. Were students able to demonstrate how to resolve natural resource conflicts effectively?

Sorting Trash with Static Electricity: A Case Study

Stephen Guziewski, Edgewood College

(Adapted from Dr. Rachael Lancor, Edgewood College; adapted from original source by Bruce C. Palmquist Department of Physics/Department of Science Education Central Washington University)

Context

Chapters on static electricity sometimes only cover types of charge and Coulomb's Law, leaving the student to wonder if there are any uses for static electricity and how it relates to the environment. This case study ties into real applications of physics and the environment and describes how to use the triboelectric series and accompanying triboelectric effect to improve the efficiency of separating different plastics for recycling. This case study was developed for the static electricity section of an introductory college physics class. Calculus is not needed for the analysis of the case, so this case would be appropriate for an algebra-based college physics class or even a high school physics class that covers static electricity concepts.

Licensure
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3

Materials

Article "Sorting Trash with Static Electricity" from Bruce C. Palmquist Department of Physics/Department of Science Education Central Washington University

Step by step directions

This is an adapted lesson that can be used during a static electricity unit to tie in environmental education. Students initially study electrostatics basic concepts and real world uses of static electricity and practical applications. Then, hand out the article.

Have students work in groups of three or four. In this type of case study, students complete each section, answering the questions and getting class feedback before getting the text for the next part. They use only the information given to them in the case to critically think through the scientific process. However, the instructor decides to assign groups, the groups stay together for the entire case study, allowing them to get used to each other's working style.

Each group presents ideas to the rest of class and submits answers to questions for each section on a separate sheet of paper before getting the next section**.** This lesson could take multiple days depending on length of class time. One possible way to assess the activity is with the following rubric.

Assessments

Grading Rubric

Grading Rubric created for "Sorting Trash with Static Electricity" by Bruce C. Palmquist

	Excellent (5)	Good (4)	Proficient (3)	Not proficient (2-1)
Part I: Analysis Introduction to the study	Complete understanding of the study; develops clear, complete, and appropriate questions, predictions and/or hypotheses.	Reasonable understanding of the study; develops clear, complete, and appropriate questions, predictions and/or hypotheses.	Partial complete understanding of the study; develops somewhat clear, complete, and appropriate questions, predictions and/or hypotheses.	Incomplete understanding of the study; questions, predictions and/or hypotheses unclear and/or incomplete and inappropriate.
Part II: Inference Hypothesis and application	Highly appropriate, clear, and complete hypothesis; very effectively applies appropriate physics principles; experimental plan is clear, complete, and reproducible.	Appropriate, clear, and mostly complete hypothesis; effectively applies appropriate physics principles; experimental plan is clear and nearly complete.	Somewhat appropriate, clear, and incomplete hypothesis; partially applies physics principles; experimental plan is unclear and partially complete.	Inappropriate clear, and complete hypothesis; does not apply appropriate physics principles; experimental plan is significantly lacking.
Part III: Inference The experiment	Complete and highly accurate description of quantitative data and resulting inferences; extensive support for inferences.	Nearly complete and accurate description of quantitative data and resulting inferences; support for inferences.	Somewhat complete and accurate description of quantitative data and resulting inferences; some support for inferences.	Inadequate description of quantitative data and resulting inferences; no support for inferences.
Part IV: Evaluation Results	Highly complete, clear, and accurate data interpretation; clearly relates predictions and results; accurately evaluates the main findings of the case.	Complete, clear, and mostly accurate data interpretation; relates predictions and results; evaluates the main findings of the case.	Partially complete, clear, and accurate data interpretation; partially relates predictions and results; poor evaluation of the main findings of the case.	Inadequate data interpretation; no prediction-results relationship; no evaluation of the main findings of the case.

References

Herreid, C. (2005). The interrupted case method. Journal of College Science Teaching, 35(2), 4–5. Knight, R. (2013). Physics for Scientists and Engineers, 3e. San Francisco: Pearson. Matsushita, Y., Mori, N., and Sometani, T. (1999). Electrostatic separation of plastics by friction. Electrical Engineering in Japan, 127(3), 33–39.

Winter Inquiry Project

Mary Hedenstrom, University of Minnesota

Context

Elementary preservice teacher candidates develop inquiry investigation questions based on initial winter observations in their place-based setting to share in an informal science conference to be completed in one or two class periods.

Licensure
Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2

Materials

Option 1: Snow or signs of life in the urban winter environment
Hand lenses, science notebooks, writing utensils, thermometers, rulers, snow collection containers, optional camera, outdoor site to be determined

Option 2: Bird observations in the urban winter environment
Binoculars, science notebooks, bird field guides, optional camera, outdoor site to be determined

Step by step directions

These lessons allow students to engage in an inquiry investigation and science conference while learning more about their "place." The lessons model a strategy for teacher candidates to lead upper elementary students in inquiry investigations. Because the students choose their question, it is a student- centered lesson which allows students to construct their own knowledge about winter/snow/birds in their "place," supporting a place-based framework.

Option 1: Observing snow/winter signs of life

1. Students organize into learning teams and engage in snow observations or look for signs of life in self-defined areas on campus.
2. After 5 minutes of making observations, students write questions or things they wonder about the snow or signs of life.
3. Students engage in OKW (observe, know wonder).
4. Looking at the questions in W, students categorize question types into three types: E=ask an expert or look it up, B = too broad or unanswerable without modifying the question, T = observe or test with an investigation
5. Introduce the sentence frame question, "How does_____affect_____?" and come up with a table of independent and dependent variables to create multiple testable questions. Discuss that the thing you change or specify is the independent variable (first blank) and the thing you count or observe is the dependent variable (second blank).

Write your question in the science notebook.

Example:

Independent variable	Dependent variable
location of snow	color of snow
depth of snow	depth of snow
	texture of snow
	temperature of snow

Possible questions:
How does location affect the color of the snow? How does location affect the depth of snow?
How does location affect the texture of snow?
How does the location affect the temperature of the snow?
How does the depth of snow affect the color the snow?
How does the depth of snow affect the texture of the snow?
How does the depth of snow affect the temperature of snow?

6. Students will choose a question and write multiple hypotheses to promote students' thinking around possible explanations for why a hypothesis will be true, prevent researcher bias, and discourage students from thinking their results are "wrong".

Example:
How does location affect the depth of snow?
HA1 = The snow adjacent to the building is deepest.
HA2 = The snow adjacent to the sidewalk is deepest.
HA3 = The snow adjacent to the tree is deepest.
HA0 = The snow in all locations is the same.

Write your multiple hypotheses in the science notebook.

7. Students will list the materials they need and create a data table and write it in the science notebook.

Materials: ruler, pencil, science notebook

Location:	Snow depth
next to building	
next to sidewalk	
next to tree	
between building and sidewalk	

8. Go outside to collect data and complete data table.
9. Students will create a graph of data and write a discussion or rationale of the study along with the results.
10. Students write a conclusion that starts like: My results support hypothesis HA1, the snow is deeper next to the building. Next time, I will make more observations over time and collect the temperature and sky observations.
11. Students post their question, hypotheses, materials, results, and conclusion on a poster paper, and share

them with the class in a mini-science conference. Encourage students to ask questions.
12. Reflect with students on all study results as a group. What did we learn about winter/snow in this place? What did we learn about this place in general? What new things did you learn about snow/winter? What new things did you learn about this place?
13. Reflect with students on the learning theory, philosophy of teaching, and whether the lesson was student- or teacher-centered, and why? How do you think students would respond to this lesson?

Option 2: Observing birds

1. Students organize into learning teams and engage in snow observations or look for birds in a self-defined area on campus. Limit it to one tree, bush, branch, or bird feeder.
2. After 5 minutes of making observations, students write questions or things they wonder about the snow or signs of life.
3. Students engage in OKW (observe, know, wonder).
4. Looking at the questions in W, students categorize question types into three types: E=ask an expert or look it up, B = too broad or unanswerable without modifying the question, T = observe or test with an investigation
5. Introduce the sentence frame question, "How does_____affect_____?" and come up with a table of independent and dependent variables to create multiple testable questions. Discuss that the thing you change or specify is the independent variable (first blank) and the thing you count or observe is the dependent variable (second blank).

Example:

Independent variable	**Dependent variable**
type of tree	type of birds
height of tree	number of birds
type of bird feeder	
type of bird seed	
location of tree	

Some possible questions:
How does type of tree affect the number of types of birds? How does type of tree affect the number of birds?
How does height of tree affect the number of type of birds? How does height of tree affect the number of birds?
How does the type of bird seed affect the number of birds?
Write your question in the science notebook.

6. Students will choose a question and write multiple hypotheses to promote students' thinking around possible explanations for why a hypothesis will be true, prevent researcher bias, and discourage students from thinking their results are "wrong".
Example:
How does location of the tree affect the number of types of birds?
HA1 = The tree adjacent to the building has more types of birds.
HA2 = The tree adjacent to the sidewalk has more types of birds.
HA3 = The tree between the building and the sidewalk has more types of birds.
HA0 = The number of types of birds is the same in all locations.

Write your multiple hypotheses in the science notebook.

7. Students will list the materials they need and create a data table and write it in the science notebook

Materials: bird field guide, pencil, science notebook, Optional: binoculars

Location:	Type of bird	Number of bird
next to building		
next to sidewalk		
between building and sidewalk		

8. Before going outside, review common birds and guide students to them in the field guide. Go outside to collect data and complete data table.
9. Students will create a graph of data and write a discussion or rationale of the study along with the results.
10. Students write a conclusion that starts like: My results support hypothesis HA1, the tree adjacent to the building has more types of birds. Next time, I will make more observations over time and collect the temperature and sky observations.
11. Students post their question, hypotheses, materials, results, and conclusion on a poster paper, and share them with the class in a mini-science conference. Encourage students to ask questions.
12. Reflect with students on all study results as a group. What did we learn about birds in this place during winter? What did we learn about this place in general? What new things did you learn about birds? What new things did you learn about this place?
13. Reflect with students on the learning theory, philosophy of teaching, and whether the lesson was student- or teacher-centered, and why? How do you think students would respond to this lesson?

Assessments

Formal: Science conference poster and presentation, final science notebook product

Informal: Ability to create a testable question and use multiple hypotheses, ability to work in a group, discussion on importance of place-based environmental education

References

Oberhauser, K. (Ed.). (n.d.) *Schoolyard ecology explorations: An inquiry-based curriculum.* Saint Paul, MN: University of Minnesota.

Citizen science: Process of science. (2017) Retrieved from: https://www.extension.umn.edu/environment/citizen-science/driven-to-discover/resources/process-of-science/

Meeting Nature in New Ways

Katherine Jenkins, Northland College

Context

This is intended for undergraduate college students, fall semester (first year – senior).

Brief Philosophy: "We cannot win this battle to save species and environments without forging an emotional bond between ourselves and nature as well – for we will not fight to save what we do not love." Stephen Jay Gould.

At a time in human history when new health issues such as 'nature deficit disorder' are being established, it is important to help students become as comfortable as possible working outside, hopefully falling in love with the natural world, particularly in supporting them in becoming teachers of environmental and outdoor education. As we make requests (and/or as varying issues of the Earth make it obvious) for teachers to integrate environmental and outdoor education into curriculum, it is necessary that those teachers and leaders have a personal relationship and level of comfort with the outdoors as their foundation. They have to be able to model what it is they are asking of their students, and they need to be able to express themselves in connection with their ecological self (for some this may be a new concept and they will be newly identifying with this part of themselves…while for others it may be something they already find deep meaning and connection with…). It would be difficult to model it effectively without having a developed ecological self. Developing an ecological self takes many forms and this lesson offers creative ways to deepen skills in attention and awareness and broaden perspective.

Approximate activity time

2 hours

Licensure

Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence

Theme 1
Guideline: 1.1

Theme 5
Guideline: 5.1

This lesson will be implemented on the second or third day of the course as a pre-assessment activity and will be implemented at the end of the course as a post-assessment. The series of activities are designed to provide students with the opportunity to experience and reflect on their connection with the natural world, comfort level interacting with the outdoors and express their relationship with the natural world referencing their experiences in the activities.

This lesson can be applied with any student population or discipline where people are asked to connect with, teach about, or study/research the outdoors. The activities are experiential, interdisciplinary and meet diverse learning styles.

Goals - Students will be able to…

- … interact with and communicate with peers during activities.
- … assess and explain their level of comfort being outdoors.
- … articulate the value of paying attention.
- … actively reflect on lesson activities in a guided dialogue with peers.

… explain whether or not slowing down and paying attention supports personal comfort in being outside and/or relationship with the natural world.

Materials

Each student will have a journal, quotes on attention and awareness

Step by step directions

Pre-lesson set-up: Students will have been introduced to the course already, reviewed the syllabus and had some reading assignment on attention, awareness, perception, and, movement and relationship with the natural world (probably Thomas Fleishner.) Students will have been given the following homework.

Homework: "Watch a Pot of Water Boil"

1. Read all of these steps so you are familiar with questions.
2. Set up a pot of water to boil. Don't turn on the heat yet.
3. In your journal answer the following:
    a. What is the origin of the water, heat and cookpot? Make your best guess.
    b. What do you think your experience will be while waiting for the pot of water to boil?
4. Turn on the heat and watch the pot of water until it boils. Pay attention to your experience: What do you notice about your thoughts? What do you notice about your body? (i.e., tension, calm, impatience, fluttering, excitement). Make note of how your experience changes as the water turns from sitting water to a boil.
5. Once the water has boiled answer the following in your journal:
    a. Describe (through art, poetry, song, essay, diagram, bulleted points, etc.) your experience watching the pot of water boil.
    b. Was your experience what you thought it would be? Share three to four examples.
    c. Based on your experience, what skills, if any, did you learn or further develop?

Class Introduction (15 minutes): Explain to students they will have the opportunity to explore their personal connection with the outdoors through two different activities which will end with a dialogue about the experience with their peers. Prior to going outside, take a few minutes for students to share homework experience.

Have students find a partner and take turns sharing about homework with each other.

1. Ask them to write down (in their journal) any skills they accessed or learned to complete the exercise.
2. Consider the question: What do you think watching a pot of water boil has to do with connecting with the natural world? Ask them to consider and include any ideas from Fleishner.
3. Have them write down two to three connections. Share skills as a large group. Most likely they will come up with words such as attention, curiosity, surprise, impatience, joy, focus, present-moment.

Explain to the full class that these ideas will be explored further outside.

Go outside. Share quote:(5 minutes)

"Attentiveness to what surrounds us—which flowers are blooming, which animals are passing through, what shape the clouds are forming this moment—is the oldest continuous practice of our species." Fleischner

Ask how many picked the skill of paying attention. Give students the opportunity to share other skills. Create a short discussion about attention as the oldest continuous practice and consider if the other skills mentioned are just as important. Have each student pick a skill they want to practice. Have them state this skill.

Mindful Walk (20 minutes): Explain to the students that they will apply the skill from the homework assignment into the following activity. Explain that they will be practicing a Mindful Walk to a location and back, but that with each step they say the word (in their mind, not aloud). Saying the word is to help them move very, very slowly. Once they get the pace, they don't have to say the word anymore. Practice with them for a bit before setting them off on their own. Remind them to go at their own pace. Remind them they are working on an ancient art. As students return, have them wait quietly for others to finish.

Large Group (10 minutes): Reflect on the experience together. Were they able to practice the skill? What was it like compared to watching the pot of water boil? Is there a difference in doing this outside? Does this practice of slowing down, paying attention (state other skills students mentioned) support us in feeling comfortable being outside? Why? Why not? Don't spend a lot of time on the last question but let it connect you to the next activity.

Continue exploration of attention and comfort in the outdoors.

Second Activity (20 minutes): Have each student find a spot to sit within hearing distance of your voice. Invite them to simply pay attention to their surroundings, allowing space for the skill they are practicing to arise and fall as they remember. When time is up, have students stay where they are and journal.

Individual Journal (10 minutes): Ask students to draw a picture of themselves in each of the three activities and to include the skills or 'ah-ha' moments that occurred to them through each activity: watching water boil, mindful walk, simple sit in paying attention.

Come back together into small groups.

Small Group Shares (20 minutes): If time is running short, skip this step and move to large group discussion or add final question in large group to small group sculpture share.

1. Students share journal drawings and experiences with each other.
2. Students then discuss whether or not they think the activities contribute to their level of comfort in being outside. Why? Why not? Give examples.
3. Each small group will make a group body sculpture that reflects their answer. For example: if the group feels like all the activities contributed to them not only feeling comfortable outside but also made them feel more calm and curious, they may make a sculpture by having two people lie down side by side with smiles on their faces and hands on their eyes creating a binocular shape to reflect curiosity while the other sits between them with a look for wide eyed joy on their face, intentionally touching their palms to the earth in gratitude.

Large Group (20 minutes): Each small group will perform their sculpture and explain. This will lead into a large group dialogue about the value of slowing down, paying attention and whether or not these contribute to an increase in relationship with the natural world.

Possible Homework/Extensions:

1. Research origin of pot, heat and water and make diagram of these in journal.
2. Pick a spot on campus that will be used for the rest of the course as a weekly study area. This can be the same location used for the Simple Sit or they can find somewhere new.
3. Make a map of campus in journal and mark the location of the Simple Sit.
4. Return to the Simple Sit spot and identify five species. Sketch each species. Write two to three interesting facts about each species.

Assessments

Assessment of goals is through the use of journal drawings, sculpture activity and large group dialogue. End of semester assessment may also occur by completing activities again and comparing student experience from the beginning to the end of the semester.

Facilitating Preservice Teachers to Create an Engaging Place-Based Activity for Elementary School Students

Scott Kirst, St. Norbert College

Context

The intended audiences are EC/MC and MC/EA preservice teachers in a teacher education program. The activity will provide: 1) steps needed for a teacher to design an engaging place-based activity, 2) a chance to participate in an instructor-led model, and 3) sample discourse questions for preservice teachers. This activity is appropriate in this setting as the preservice teachers are not aware of the planning needed to engage in place-based learning. This activity will also provide an initial conceptual framework for this model of pedagogical instruction.

Approximate activity time

Instructor: 3 hours for planning, introduction, and assessment
Students: 2 hours for learning and creation

Licensure

Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence

Theme 1
Guideline: 1.2

Theme 3
Guideline: 3.2

Theme 4
Guidelines: 4.2, 4.3, 4.6

Materials

A model place-based learning activity developed by the instructor, local experts for the preservice teachers, notebook for documenting questions from preservice teachers during the model place-based activity

Step by step directions

The pedagogical methods include direct instruction, a guided place-based learning simulation, and facilitated discourse in the classroom.
Directions

1. Review the importance and rationale for Place-Based Learning (Sobel, 2005)
2. Communicate the objectives
   a. "The preservice teachers will be able to describe the steps of creating a place-based learning activity"
   b. "The preservice teachers will be able to identify the various steps during a model place-based learning activity"
   c. "The preservice teachers will be able to create their own place-based activity"
3. Hand out the following steps for designing a place-based activity cut in strips (after removing the numbers) and given to groups

   Steps to design a place-based activity

   1. *Determine a place/location that is accessible to the class*
   2. *Determine time needed for the activity*
   3. *Go to the place and observe various items or areas of interest based on your content goals/standards*
   4. *Write down the location and number of stops or items to focus on. Figure about 10 minutes for direct instruction and questions for each item (depending on the cognitive level of the questions you develop).*
   5. *Develop various questions. They may include:*

i. *What do you see here?*
ii. *What changes may have happened in the past? 1 day ago, 1 month ago, 1 year ago, 100 years ago, millions of years ago?*
iii. *What do you know about <<insert items>>?*
iv. *What would you like to know?*

6. *Work with content experts or other resources to develop a small direct instruction "script" regarding the items or the location appropriate for the grade level. For example, if there is a geological formation, you may want to talk to a geologist regarding the basic facts and history of it.*
7. *Identify the standards that are addressed when doing this place-based activity and modify the questions or experiences accordingly if needed*
8. *Create 2-4 specific objectives for the students regarding the activity*
9. *Create appropriate assessments for the 2-4 objectives*
10. *Put together a guide/script/notebook for you to use to document what you are going to do during the place-based activity.*
11. *Do a practice run through the place-based activity – possibly with a colleague or student*
12. *Modify the activity based on time, content, or conceptual needs.*

4. Have the preservice teachers take a first attempt at the chronological order in which the steps go to make an engaging place-based activity
5. Discuss the steps, remedy misconceptions, and formatively assess the steps and dialogue
6. Provide them one set of these beginning steps and explain that it is a <u>starting</u> framework
7. Refresh the characteristics of engaging work (Schlechty, 2002) and have them identify any that may be used during a place-based learning activity.
   a. Product focus
   b. Clear product standards
   c. Protection from adverse consequences for initial failures
   d. Affirmation
   e. Affiliation
   f. Choice
   g. Novelty and Variety
   h. Authenticity
8. The course instructor should now lead their place-based activity. This might be teaching a history of the town through aging a tree, discussing major events, or you might go to a field and discuss why it looks the way it does.
   a. Preservice teachers should write down where they think the specific steps of developing a place-based learning activity were modeled.
   b. Document responses to content questions in instructor journal (if any)
   c. Finish the place-based activity and ask for additional questions or comments.
9. Come back to the classroom and discourse (ask questions of each other and listen) the activity based on questions (you may include the ones the instructor developed in Step 5). Additionally, include the following questions:
   a. What did you learn?
   b. How does this new information impact you as a future teacher?
3. Preservice teachers will now go through the steps in designing a place-based learning experience as an assignment. You may vary the timeframe, number of locations, etc. for the preservice teachers based on course and content needs.

Assessments

The assessments of the three objectives will include:

1. The jigsaw activity and subsequent dialogue where the steps are cut apart in strips of paper and preservice teachers will put them in a sample chronological order. There is no perfect order, but they can use the framework given above as a starting point.
2. During the discourse, the instructor will ask the questions:
   a. "Where did you see me do the steps of creating, implementing, and assessing a place-based activity?"
   b. "Why (or why not) do you think this activity is an engaging activity?"
3. Final assessment would be the submission of a location, script, and identification of resources the preservice teachers create using the framework provided to the preservice teachers.

References

Schlechty, P.C. (2002). Working on the work. City, state:Jossey-Bass.

Sobel, D. (2005). *Place-based education: Connecting classrooms & communities.* Great Barrington, MA: The Orion Society.

Treasuring the Great Lakes

Kathy Kremer, Concordia University Wisconsin

Context

This activity is designed for preservice elementary teachers and integrates the major content areas, modified from the activity in the reference section. In this activity, learners will investigate the importance of the Great Lakes as a major source of the world's freshwater. They will make predictions about the location, shoreline, volume, depth, population, and fish harvesting of the Great Lakes and investigate actual data. Information will be used to realize how fortunate the Midwest is to have this resource readily available and the implications of this. This activity has been modified from another lesson plan (see reference list). This is an appropriate environmental education activity because it helps to raise awareness of how easily our environment can be taken for granted with the needs that it supplies with perceived ease.

Licensure
Early Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2

Materials

Walk along the shoreline of a Great Lake or video clip of a Great Lake, liter bottle of water, measuring cups/graduated cylinder, string, popsicle sticks, macaroni noodles, notecards, outdoor space

Step by step directions

Learners will begin by looking at the shoreline of a Great Lake and recognizing its importance as the source of 20% of the world's freshwater and the earth's largest freshwater "system." (Earth has only 3% freshwater; of this only 1% is usable.) They will then go on to explore the features of the Great Lakes such as their location, shoreline, volume, population, and fish harvest and the impact that these features have on the freshwater that they supply.

1. Take a walk to the shore of a Great Lake or watch a video clip of a Great Lake's shoreline. (Walk along the Shoreline of Lake Michigan: https://www.youtube.com/watch?v=zsAGVNY7RH0 Observe different features of the freshwater environment and consider their impact or concern. Record these thoughts on notecards. What are some questions? Assumptions? Discuss the impression of its features (primarily expanse).
2. Complete amount of freshwater on earth activity. Uses a 1 L bottle of water, reducing it by 97% for salt water, 2% for unusable freshwater, to obtain 1% of remaining freshwater (10 ml).
3. Identify that the greatest source of freshwater is found in the Great Lakes, 20% of this (2 ml).
4. Complete pre-assessment on current knowledge of Great Lakes which prompts for ranking of the Great Lakes by location, size, volume, population, and fish harvest.
5. Split in five groups. Give each group a piece of string of a premeasured and identified length (1 m = 1000 miles), proportional to the size (shoreline) of the Great Lakes. Have the group determine which lake it is and where the lake is located. Have them place the outline of the lake on the ground in the appropriate place and shape, with a card identifying which Great Lake it is. (Note: A map should NOT be used at this point.)
6. Show a map and have a discussion about the correct placement and labeling of the lakes.
7. Place a cup of 100ml of water in the middle of each lake and have the group distribute the amount they think appropriate to represent the relative volume in each lake (1 ml = 54 cubic miles). Discuss the implication of the depth for each lake.
8. Give each group 100 popsicle sticks. Have the group distribute the number of popsicle sticks they think represents the population around each lake (1 stick = 330,000 people).
9. Provide 100 macaroni noodles/goldfish crackers/Swedish fish to each group. Have the group distribute the number they think represents the fish harvest for each lake.
10. Have each group research the volume, population, and fish harvest and reevaluate their placed number of water, sticks, and noodles representing their lake. Alternatively, these statistics can be provided to each group.

11. Discuss the correct relationships of volume, population, and fish harvest for each Great Lake and any identified preconceptions or misconceptions that are realized as a result of this.
12. View video to summarize Great Lakes facts.
    What's So Great about the Great Lakes
    https://www.youtube.com/watch?v=gBRcOLcEwF0
13. Read article/story about Great Lakes to demonstrate the impact that they have on people's lives. (ex. *The Living Great Lakes* by Jerry Dennis, Chapter 1 on Lake Michigan)
14. Great Lakes Map Adventure
    Each group will create a map of an area along the shoreline of a Great Lake or other fresh water location. The map should indicate different places where "treasures" (information on a notecard) can be found about their Great Lake. This information should include, but is not limited to:
    - Physical features
    - Perceived or known environmental impact
    - Perceived or known environmental concerns

    These maps could be exchanged with other groups allowing for a sharing of information about each of the Great Lakes.
15. Discuss why this time was spent on exploring the Great Lakes, emphasizing the dependence of life on clean freshwater and its scarcity.
16. Reflect on what has been learned and how this information will affect thoughts, actions, and future instruction about the availability and use of freshwater. (Note: Connections can be made to current issues regarding requests from other states/cities to use water from the Great Lakes.)

Assessments

Pre/post assessment – Completion of activity sheet with ranking of Great Lakes for location, shoreline, volume, depth, population, and fish harvest.

- Great Lakes Map Adventure

References

How Well Do You Know the Great Lakes?
https://ohioseagrant.osu.edu/products/e86e9/how-well-do-you-know-the-gl

Dennis, J. (2004). *The living Great Lakes: Searching for the heart of the inland seas.* City, state: St. Martin's Griffin.

Central Sands High Capacity Well Controversy

Rachael Lancor and Francie Rowe, Edgewood College

Context

This activity was designed for a History & Philosophy of Science course, which is required for both preservice science teachers and students in the science communications minor. The course is also taken by general education students to fulfill their science requirement.

This activity centers on the controversy over high capacity wells that took place in the Central Sands of Wisconsin. In Spring 2017, bills came before the state legislature that would reduce regulations on high capacity wells in parts of Wisconsin. The proposed bill would not require renewal or review of current licenses, which would allow current well owners (i.e. agricultural companies) to continue to pump indefinitely without DNR testing. The landowners and recreation/tourism industry strongly opposed the bill, as the ground water is currently being over-pumped to the point of damaging local ecosystems (e.g. lakes drying up) and negatively affecting tourism.

This activity was conducted near the end of the semester, with the goal of helping students to see how an understanding of science is important for civic engagement and environmental advocacy work. It is situated at the end of a unit on the rise of ecology and environmentalism in the 20th century.

Approximate activity time
3 days

Licensure
Early Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Materials

Informational resources produced by parties on both sides of the controversy

Below are a few links that could be shared with students:

1. Assembly Bill 105: https://docs.legis.wisconsin.gov/2017/proposals/ab105
2. Senate Bill 76: http://docs.legis.wisconsin.gov/2017/proposals/sb76
3. Wisconsin Aquaculture Association: http://www.wisconsinaquaculture.com/News_Details.cfm?NID=729&LinkType=59
4. Central Sands Water Action Coalition: http://centralsandswater.org/

Step by step directions

Day 1 (80 minute period)

1. Before class: Have students read the Assembly Bill and/or Senate Bill. Write at least three questions they have on the bill (more information they would like, etc.).
2. Pre-assessment: How would you vote on this bill, given your current understanding of the situation? Briefly explain why you voted the way you did using claim-evidence-reasoning framework. (5 min)
3. Intro: Instructor provides brief introduction to the issue, including photos of damage by high capacity wells and maps of the area. (See, for example: http://america.aljazeera.com/articles/2015/11/12/wisconsins-central-sands-lakes-drying-up.html) (15 min)
4. Group work: Share your questions with other members of your group (3-4 students). Answer other people's questions as you are able. Come up with a list of topics that we need to research further. (15 min)
5. Large group discussion. Share questions out, and write on the board. Consolidate and edit so that it ends up being a list of questions that students can answer. Provide background information as necessary. Likely these questions will fall into four general categories: science, environmental concerns, business concerns, political process. (15 min)
6. Independent Research. Students will break into groups to find answers to the group's questions. Each group will answer at least three questions (or one per student). Use available resources (computers, books in classroom, etc.) to write up responses to questions. By end of period, email questions and answers to instructor, or post online to the whole class. (30 min)

Potential questions that may arise:

1. Science: Students will research the science of groundwater and how it is related to aquatic (lake) ecosystems.
2. Environmental concerns: How will the high capacity wells affect the lake ecosystems? Will drinking water be affected? Etc.
3. Business concerns: What is the benefit of high capacity wells for agribusiness? What is the economic impact of agribusiness in the area? Etc.
4. Political process: What is the role of the DNR in regulating wells? What is the role of the legislature in regulating the DNR? How do bills become laws?

Day 2

1. Before class: Read responses to questions from last period about groundwater/watersheds/ecosystems in Wisconsin.
2. Intro: Instructor reviews key points about each of the topics (science, environmental concerns, business concerns, political process) (20 min)
   a. Demonstration: groundwater model
3. Modified "follow the rain drop" activity. (40 min)
   a. Take students outside and trace path of raindrop to local waterbody
   b. If available look at stratigraphic cross-sections of local area.
   c. What would happen if we put in a high capacity well?
4. Prep for Hearing.(20 min)
   a. Break students into three groups:
      - Pro - This group is representing agribusiness, and will argue for the bill.
      - Against - This group includes the tourism industry and the environmentalists.
      - Students will work in their group to research their side's arguments and each student will prepare a statement to testify. They may wish to break down the various lines of evidence among the students so they are not all making the same argument in the hearing.
      - The third group is legislators, who ask questions of the advocates for each side. They need to be familiar with both sides of the argument so that they can ask appropriate questions. (We chose particularly strong and well-prepared students for this role.) We had two legislators in our class of ten students, so this was a smaller team than the other two.
   b. Instructor gives instructions for Senate Hearing that will take place during the next class period. The structure of the hearing will be as follows:
      - Each students will be given no more than 5 minutes to testify. We will alternate between students

who are arguing on the side for pro-high capacity wells and students who are arguing against the wells.
- After each presentation, the students on the "legislator" team will have the opportunity to ask questions of the testifier.

c. Watch a brief clip of a senate hearing as an example. Comment on the affective (values) components of the testimony. What is the goal of the people who choose to testify?

Day 3

1. Before class: Prepare a 3-5 minute statement arguing for (agribusiness) or against the bill (landowners and tourism). Legislators will write questions for the advocates. Post on Blackboard before class.
2. Senate hearing.
   a. Students alternate sides and give their testimony.
   b. At the end of the hearing, legislature will vote for or against the bill. Explain to the class why they voted the way they did.
3. Post-assessment: Students again vote, and explain their claim-evidence-reasoning.
4. Wrap up: Instructor reveals that the vote was for the bill in the end. Class discussion about the environmental consequences of this decision for the Central Sands Region. Discuss relationship between ecology and environmentalism.

Assessments

Students present oral arguments to the class. Arguments are assessed using a rubric.

Environmental Issue Investigation, Action, and Instruction

Kendra Liddicoat and Becca Franzen, University of Wisconsin-Stevens Point
(and previous course co-instructors Jeremy Solin, Steve Kerlin, and Ginny Carlton)
Kendra.liddicoat@uwsp.edu

Context

This is a semester-long assignment for a course for preservice teachers that includes both environmental studies content and environmental education teaching methods. This assignment is designed to help the students integrate those two facets of the course. Note that D2L is the course management software used for this course.

Approximate activity time
Full Semester

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.2, 1.3, 1.4

Theme 2
Guideline: 2.2

Theme 3
Guideline: 3.1

Theme 4
Guideline: 4.7

Materials

Access to computers, resource books, online databases and websites

Assignment Guidelines (to be handed out to students):

This assignment is composed of four parts. (See your discussion schedule for due dates.)
1. Learn about an environmental issue and summarize relevant information based on research and careful reading.
2. Develop and implement a personal plan to take action in relation to the environmental issue.
3. Determine how you would teach about the topic and the issue. Write a lesson plan.
4. Prepare a reflection video or discussion post and comment on actions taken by your classmates.

Each part of the assignment has a specific focus, distinct guidelines, and its own due date, but all relate to the same environmental issue.

1. (15 points) Select an environmental issue. Provide background information by conducting research.

Choose an environmental issue from the following list: environmental health, human population growth and distribution, resource consumption, biodiversity and extinction, habitat conservation and loss, water pollution, water conservation and scarcity, food production and consumption/distribution, air pollution, climate change, energy production and conservation, mining, waste production and reduction.

Read the corresponding section of your textbook and narrow your topic to a more specific issue of personal, local, or regional relevance. Research your narrower issue using the websites and resource lists provided in your Discussion section. You need to use at least three approved sources in preparing your assignment. Your textbook, Project Learning Tree, Project WILD, and Project Aquatic WILD books can be referenced but will not count

toward the required three sources.

Write a short paper on your topic. Briefly explain the issue, develop an argument as to why this issue is important, describe the extent or scale of the issue (for example, is it a local or national issue), and explain the ecological, economic, and social impact of the issue. Your paper will serve as the background information section for your lesson plan and should be written for adults (with the appropriate level of complexity and detail) regardless of the grade level of the lesson plan. The background sections of many of the Project Learning Tree (K-8) and Project WILD activities can serve as a useful model. Your paper should be approximately 2-3 pages double-spaced. Sources should be cited in the text and at the end of your paper using APA style. Information on APA style can be found at http://library.uwsp.edu/Guides/VRD/APA_2010%5b1%5d.pdf and at https://owl.english.purdue.edu/owl/section/2/10/ .

2. (9 points) Develop and implement a personal plan.

The personal plan (1-2 pages) you develop and implement will address the issue that you have researched. What are steps that you, personally, will take to address this issue? Outline and describe each of the steps in your personal plan. What will you encourage others to do? How will the steps that you take affect the issue? You will implement this plan throughout this semester—so it should not focus on what you might do in your future classroom. Rather the focus should be on what you can achieve within your current home, work, and social settings.

3. (25 points total) Determine how you would teach about the topic and the issue. Draft a lesson plan (5 points). Provide feedback to other students' lesson plans as instructed by your discussion professor. Submit revised lesson plan to D2L dropbox (20 points).

Develop a lesson plan that integrates the topic and issue into your future classroom. The lesson plan will be developed using Understanding by Design strategies and be written according to the lesson plan template provided (modified version of UWSP School of Education lesson plan). You will submit a complete lesson plan, and then make changes based on feedback from your instructor and/or classmates before submitting a final version of the lesson plan. Additional assignment details will be provided during discussion meetings. Your lesson plan should include the background information from part 1 of this assignment.

4. (5+1 points) Reflect on progress of your personal plan from part 2.

Write a 1-2 page paper describing the how you implemented your plan, what challenges you faced, and what impact you think you had. Feel free to include photos or other visuals. Post your paper to the discussion board in D2L. Comment on a paper posted by a classmate to receive full credit for this potion of the assignment.

Place-Based Science – A Closer Look at Lake Wingra

Sara Manders, Edgewood College
smanders@edgewood.edu

Context

This lesson is designed for elementary education students; these specific preservice teachers (PSTs) are early in their education coursework and are able to partner with a local school and work with the fifth graders.

Summary: PSTs work with fifth grade students to make observations, ask questions, and do research about Lake Wingra. The observations, questions, and research are driven by the fifth grade students. PSTs help facilitate these lessons to practice teaching student driven lesson plans, which can be intimidating if they veer away from the anticipated.

Approximate activity time
6 days

Licensure
Early Childhood

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Theme 4
Guideline: 4.2

Theme 5
Guideline: 5.1

Materials

Ideal
Partnership with a local K-5 classroom, a local park or school yard, microscopes, petri dishes, hand lens, electronic devices

Optional
canoes, local body of water

Step by step directions

If possible, consider a partnership with a local K-5 classroom. For this write up, it is assumed that a partnership is already established. It is additionally assumed that the college/university has some sort of lake or forest area adjacent to explore. Finally, it is assumed that students have access to some sort of electronic device with an internet connection.

This write up is an outline, as this is a student driven unit. The observations the students make are unique and will lead to individualized questions. In turn, these questions will drive the research with which to plan an implementation.

The days do not have to be in succession. For example, day one and day two may be a week apart in chronological time for the logistics of the course.
Break PSTs into pairs and have the fifth grade teacher group her students into groups of 3-4.
G1 = Group 1 = 1 PST and 1-2 fifth graders
G2 = Group 2 = 1 PST and 1-2 fifth graders

Day One (1.5 hours - includes time to complete activities, walk to lake, and groups switching)
For the first half an hour, G1 will canoe and make observations on the water. Students will verbally discuss and make mental notes; written notes can be recorded once back on shore. G2 will be on the shore, making observations and recording their findings. PSTs should be asking pressing and probing questions to push the fifth

graders' thinking on their observations. For example, why do you think that? What is your evidence for ____ observation? After a half hour, G2 will go in the canoes and G1 will observe on shore.

Day Two (30 minutes)
PSTs will facilitate small group work with the fifth graders. The fifth graders should record all of their observations from Day 1 on a blank poster-sized paper. Then, the PSTs will help the fifth graders come up with questions that relate to their observations. For example, if the fifth graders noticed butterflies, the PST can help the fifth graders write questions that relate to butterflies. These questions should also be recorded in a public display of some sort.

Day Three (30 minutes)
PSTs will help students narrow down which question the group might like to research. PSTs should try to write 3-4 related questions to help focus the group's work. Each group member, then, can be assigned to try to bring answers to one question. Then, PSTs will help the fifth graders research the answers to the question. Research should be compiled in some sort of shared document, such as Google docs. This research can be started in class and completed outside of class.

Day Four (30 minutes)
The fifth grade students and PSTs should share their research with the rest of the group. If there are any lingering questions, PSTs and the fifth graders can use the time to complete the research. To wrap up this day, the group should determine an action that can result from their question. For example, if the group is considering the butterflies, the group may wish to make a butterfly habitat on the school grounds.

Day Five (30 minutes)
The group should make a to do list to complete the action plan. Who do they need to talk to? What materials will they need? When is it realistic to implement the plan? By the end of this class period, each group member should have a task to complete to implement the plan.

Day Six (30 minutes)
Each group should tie up any lingering questions. Plans should be ready to implement (if appropriate for the season). Consider dividing the implementation of the plans over the course of the year. For example, plans that could be completed indoors might be implemented in the winter.

Assessments
Observe the PSTs with the fifth grade teachers. Take field notes to indicate what kinds of questions they are asking the fifth graders to help prompt science sense making.

Review the Google docs that PSTs complete with their fifth graders. You should see evidence of rich research related to the question that the group is collaborating on together.

What is in Our Local Soil?

Heidi Masters, University of Wisconsin-La Crosse
hmasters@uwlax.edu

Context
This is an activity to be modeled for EC-MC – MC-EA preservice teachers after developing their knowledge regarding the theory behind place-based education. In this activity, the preservice teachers are exploring what type of soil exists in their local school yard. Before investigating the soil in their local school yard, they become familiar with soil components (i.e., clay, sand, and humus) by making observations and conducting the following soil tests: roll a ball test, smear test, and settling test. Using the results from their investigation of the three components of soil, the preservice teachers conduct the same soil observations and tests to identify what is in their local soil. Within this lesson, the students will be exposed to geography, history, math, science, and literacy.

Materials
Clay, Sand, Humus, Local soil, Pipettes, Magnifying glasses, Large test tubes with caps, Notecards, Poster Paper, Markers, Crayons or colored pencils, Soil Texture Calculator - https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167, WI Soil Map – http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/geotechmanual/gt-03-07.pdf, WI Soil History – http://www.soils.wisc.edu/extension/pubs/A3588.pdf

Approximate activity time
2-2.5 hours

Licensure
Early Childhood

NAAEE Guidelines for Excellence
Theme 1
Guideline: 1.1

Theme 3
Guideline: 3.1

Theme 4
Guidelines: 4.1, 4.2, 4.3, 4.6

Theme 5
Guidelines: 5.1

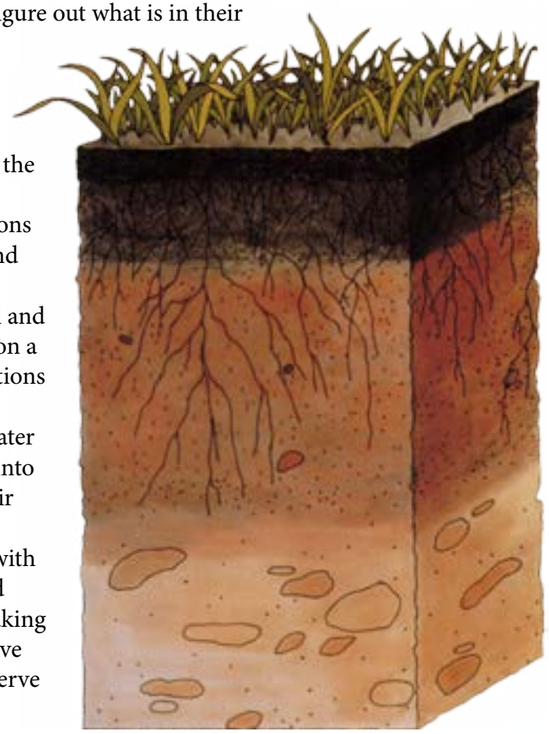
Theme 6
Guidelines: 6.1, 6.2

Step by step directions
1. Engage –
   a. Allow students to observe the three soil components: sand, clay, and humus. Ask them if they think their soil in the local school yard looks like any of the three soil components.
   b. Take the students to the school yard and allow them to compare the three soil components to the local soil.
   c. Allow the students to share out what they notice about the local soil in comparison to the three soil components.
   d. Inform the students that they are going to investigate the question: What is in our local soil?
2. Explore 1 –
   a. Based on the students' findings about the three components, have them predict what they think is in the local soil.
   b. Students begin by investigating the individual components of the local soil: sand, clay, and humus. These investigations can be set up as stations if you desire.
   c. Station 1: They should make physical observations of each soil type using their hands, eyes, and hand lenses.
   d. Station 2: They should slightly wet each soil type and then dab their pointer finger in it and smear it

on a notecard. Students should record their observations after smearing each soil. This test allows the students to observe the color and texture of the soil more.

e. Station 3: Next, they should add a little more water to each soil type and see if they can roll the soil into a ball in their hand. Students should record their observations for each soil type. This test allows the students to observe whether the particles in the soil are small enough to bind together well. Clay is the soil type that rolls into a ball the best.
f. Station 4: Finally, the last test to be conducted with each soil type is the settling test. Students should record what they observe immediately after shaking and then several hours later or the next day. Have students create label drawings of what they observe before and after settling. This test allows the students to begin noticing some of the different layers in the soil.

3. Explain –
   a. Assign groups of students to record their findings on poster paper for each soil type for one of the stations.
   b. Hang up the posters around the room and have the students complete a gallery walk. While they are observing the posters have them put an X next to observations on their recording sheet when they notice observations they made that are not represented on the whole class data charts. Students can place a next to observations they made on their recording sheet that are different from those their peers made.
   c. Engage the students in a discussion about the whole class data charts and modify the findings as needed.
   d. Inform the students that they are going to complete the same investigations on their local soil. The charts on each soil component will help them figure out what is in their local soil.
4. Explore 2 –
   a. Take students outdoors to collect a sample of the local soil to investigate.
   b. Allow students to conduct the investigations of the local soil outdoors using stations if you desire.
   c. Station 1: They should make physical observations of the local soil using their hands, eyes, and hand lenses.
   d. Station 2: They should slightly wet the local soil and then dab their pointer finger in it and smear it on a notecard. Students should record their observations after smearing the local soil.
   e. Station 3: Next, they should add a little more water to the local soil and see if they can roll the soil into a ball in their hand. Students should record their observations.
   f. Station 4: Finally, the last test to be conducted with the local soil is the settling test. Students should record what they observe immediately after shaking and then several hours later or the next day. Have students create label drawings of what they observe before and after settling.



5. Explain 2 –
   a. Assign groups of students to record their findings for the local soil for one of the stations.
   b. Hang up the posters around the room and have the students complete a gallery walk. While they are observing the posters have them put an X next to observations on their recording sheet when they notice observations they made that are not represented on the whole class data charts. Students can place a next to observations they made on their recording sheet that are different from those their peers made.
   c. Engage the students in a discussion about the whole class data charts and modify the findings as needed.
   d. Teach the students how to calculate the percentage of sand, clay, and silt using their settling test. After calculating the percentage of each, the following website can be used to determine what type of soil is in the school yard: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167
   e. Have students write a scientific explanation to answer the focus question – What is in our local soil? A great framework to use is the Claim, Evidence, Reasoning framework (CER).
6. Elaborate –
   a. To allow students to apply their understanding of how to identify what is in soil, allow them to explore the soil in a different location of the school yard, explore the soil around their home, or allow them to learn about soils in other parts of the country or world.
   b. Students should follow the same steps as they previous did and write an explanation about what is in the new soil they explore.
7. Evaluate –
   a. Engage – Students' initial ideas about what is in their local soil
   b. Explore – Students' observations and recordings
   c. Explain – Students' data analysis and construction of a scientific explanation
   d. Elaborate – Students' abilities to identify what is in a different type of soil and write an explanation

Assessments

1. The assessments that would be used in the actual activity are outlined in the evaluate phase above.
2. To evaluate the preservice teachers' understanding of place-based education, have them construct their own lesson plan that engages children in interdisciplinary learning experiences using the outdoors. This could occur after an in-depth discussion of how the activity above was developed and the steps to consider when constructing their own place-based education lesson.

Model for Course Evaluation and Infusing Place – Based Education into the Curriculum

Dr. Danielle N. McKeithen, Silver Lake College

Context

As a new faculty and new Department Chair, I have been thrown into understanding the workings of my department as a subset for SLC Education Biology Majors/Minors. Education faculty has flooded me with questions that until now I did not understand and had no way of getting a clear answer. The only link that I knew of between the two departments involved the EE Summer Workshop that my department taught biennially.

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.1, 4.3, 4.6

Using the knowledge that I have gained throughout this EE Workshop I am excited for this new development, and am feeling more equipped and ready to prepare my pre – service educators not only through the biennial EE Summer Workshop. Now I can incorporate more EE throughout my General Biology, Physics, Science and Discovery, and, Environmental Sciences courses that are also taken by the Education Majors/Minors.

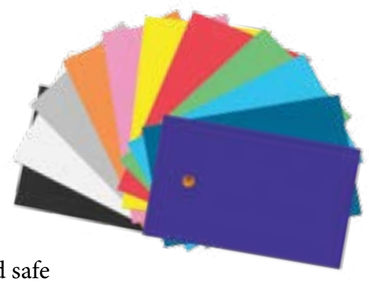
Materials

UW Madison EE Workshop materials, Previous SLC Academic Bulletins, mentor notes (Sr. Lorita Gaffney, Sr. Jan Villemure), summarization of similar colleges with these programs, on – boarding of the newly appointed Dean of the School of Education, current list of Education/Biology Majors/Minors (classification, remaining courses)

Step by step directions

The very first item on my list is to hold a meeting with the Education Department Chairs to discuss our current relationship and how close knit I see or two departments in the near future.

1. Schedule an initial meeting with Daniel Minter and Nancy Sim, Department of Education Chairs immediately upon my return. This will serve as an introduction to my Project Goal for my department.
2. Identify the future of 405 Integrated Natural Science Themes and 443 Science Methods Course. Previously Sr. Lorita Gaffney and Sr. Jan Villemure taught both of these courses, and since they are no longer associated within either department, I need to know if this will fall upon my or the Education Department to cover the required Major/Minor material.



   a. NSC 443 Curriculum and Methods Natural Science: Early Adolescence–Adolescence _____ 2
   Curriculum development based on standards, practices, and strategies in engaging students in learning science in a supportive and safe environment with measurement and evaluation of student performance. Prereq: EDU 271 or EDU 222
   b. NSC 405 Integrated Natural Science Themes _____ 2
   This exploratory course focusing on the philosophy and history of science is designed to address the contributing disciplines that create science as multifaceted and interdisciplinary. Using scientific inquiry and argumentation-based strategies the learners will view science as a dynamic part of a changing society leading to real truths behind natural phenomena that conform to the standards-based reform efforts to improve science education. Prereq: NSC 210.
3. Schedule to attend at least three Education Department Faculty Meetings. Because I am a department of one, I want to set realistic goals. By attending a meeting at the beginning, middle, and, end of the Semester, I will be able to gauge the impact of my "new" involvement with the Education Majors/Minors and Faculty. Through these pre – scheduled meetings, the relationship between the departments will grow and move forward together; with hopes that the Education Department will take notice and pre – invite me to any pertinent department meetings that are held.
4. Determine and keep my own separate account of the number of Education Majors that wish to hold a Biology Major or Minor. This will allow me to identify when to and how many Education Majors will be matriculating into my specific Science Classes. And as both Programs and the School grows, having a record of these numbers can aid in the assessment for adding class section specifically for our Education Majors

Assessments

1. Inclusion in the essential Education Department Meetings
   a. Maintain a collegial relationship with the Education Department throughout the Academic Year
   b. Follow – up and Follow through by both departments
2. Better understanding of the needs of the Education Department from my department
   a. Input on Science related courses Faculty hire
   b. Manage course accessibility through agreed upon rotation schedules
3. Better overall relationship between both departments
   a. Communication during Program/Course Revisions
   b. Involvement with Advisement
4. More involvement with the matriculation of the Education Majors
   a. Biology Majors
   b. Biology Minors
5. Education Major Course Content modifications/revisions based on the following criteria:
   a. Course Rubric
   b. Student Feedback
   c. Place – Base Education Standards
6. This new developmental phase will also be included within my Annual Self – Evaluation, thus ensuring that I continue to learn and improve my personal knowledge on Place – Based Education.

Introduction to Place-Based Learning

Melissa Nigh, Northland College

Context

This lesson was created for an Early Childhood course. Place-based learning is a great way to integrate environmental education into the course. This activity will show what place-based learning is and the steps a teacher needs to take in order to implement it into the curriculum. A lesson will be modeled and discussed. The culminating activity will be the place-based lessons students design. Encourage students to integrate a variety of subject areas into their lesson. If possible, visit Head Start or another EC setting in order to allow the students to teach their lessons.

Approximate activity time
Several class meetings

Licensure
Early Childhood

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.2, 4.3, 4.4, 4.6, 4.7

Theme 5
Guidelines: 5.1, 5.2, 5.3

Materials

Documents with steps to consider when creating a place-based lesson, four meters of string for each student, journal sheet, paper for map drawing, clipboards, reference materials on place-based learning, writing/drawing tools

Step by step directions

1. Discuss definition of place-based learning
2. Discussion of steps involved in creating a strong place-based learning lesson
3. Model a place-based learning lesson on campus or in a place within the city. For example, you could lead an activity, "Life in a Square." Go outside and have students make a square, using their string. Students will investigate the life in the square, drawing a map and taking notes in their journal. After the activity, discuss the components of the lesson plan and the value of learning about your local place.
4. Students will create a place-based education lesson plan.

Assessments

Informal: I will observe students throughout the lesson and question them on what they are observing.

Formal: Students will create a full lesson on the topic of their choice using place-based learning. Students will teach the lesson to a group of Early Childhood students off campus.

Green Roof Tour

Rachel Portinga, University of WI-Superior

Context

This activity was written to be used in biology courses that fulfill a 2-credit Environmental Science requirement for all students. One course (Bio 100) is a mix of majors from all across campus. They range from freshmen to seniors, and they have a range of emotions regarding this class. A second course is about environmental sciences, specifically for preservice teachers (Bio 170, "Biology for Teachers").

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2

Theme 4
Guideline: 4.3

The activity will include a tour of a green roof on campus, followed (and/or preceded) by work time on a small team project. The groups will be asked to design a project that would either propose a way to add value to the existing system, or share information regarding the green roof with community members and students. The details of the assignment are below.

This is appropriate to the setting because it is ON campus (place-based learning). Students see this feature every day on campus, but not many know the purpose, or benefits, of this building design. The roof is rarely used as a living lab for class or the community. This particular green roof has many species of sedum, meant to bloom at different times throughout the year, but no food plants. It is close enough to include a tour, and work time in groups, during the 50-minute class. With a class of 50 students, they will need to move up and down from the roof rather slowly. This experience should empower students to tell their friends, families, and roommates about the roof, so we can start building awareness about our own local environment and help others recognize benefits of sustainable building practices.

Materials

Green Roof (This could be amended to a feature of a LEED certified building, or Passive Haus building, or community garden.), access and tour of green roof, printed team assignments, phones or cameras, pens/pencils (students provide)

Step by step directions

1. Gain permission to access the roof.
2. Schedule the day in the semester to visit (ideally, include this date in the syllabus).
3. Divide students into groups of 3-4
4. The class period before the tour:
    a. Remind students that we are going on the field trip and they should:
        i. Wear appropriate shoes and clothing (solid base and closed-toe shoes, avoid short and/or flowy skirts, hair binders for long hair, etc.).
        ii. Watch the provided media on D2L (or other learning management system) about green roofs
        iii. Take quiz before arriving at the green roof
        iv. Meet the instructor AT the green roof meeting point next time – if they can come 10 min

early they can get started right away.

b. Provide an example of their associated group assignment.
    i. For example, you might assign students to work on improving the value of the green roof by making it ADA accessible.

5. Day of tour:
    a. Arrive at green roof 20 min early with team assignments in folders and meet tour guide.
    b. Send the first group of students up with tour guide (number determined by the roof itself), but instructor remains in meeting area for those coming on-time/late.
        - On the tour itself, have the tour guide highlight the different types of species on the roof, important design elements (such as facing south when in a northern climate), and note the view of campus from above. They should notice local features, "green spaces" that birds and bugs would be seeking from above, and identifying items that make life difficult for native species in the area.
    c. If there are a number of students "hanging out" with the instructor, waiting for their turn, then hand out their group folders so they can begin brainstorming their project ideas.
    d. As students return from the roof, send others up, and distribute all final folders.
    e. Once all students in a group are off of the roof, they can begin working on the team assignment around the meeting area.
    f. Instructor will walk among groups and help them generate and refine ideas.
    g. If students do not finish by the end of the class period, they can work with their groups outside of class to put in final touches.
6. Class period after the tour – collect team assignment
7. Within a week, during the announcements for the class, summarize the group's projects so everyone can be exposed to the ideas.

Assessments

Team assignment (see below)

Environmental Science - Team Assignment - 15 pts
Team Name: _____
Is anyone absent today - who? _____

References

Brueck, Hilary. What the heck is a "green roof"? Forbes website, May 31, 2017, video and article. https://www.forbes.com/sites/hilarybrueck/2017/05/31/what-the-heck-is-a-green-roof/#c17aad32eb22

Dowdey, Sarah. What is a green roof? How Stuff Works website, 2017. http://science.howstuffworks.com/environmental/green-science/green-rooftop.htm

Resources

Related Chapters in Book: Chapters 1, 2, 3, 5, 6, 9, 10, 11, 13, 15, 16. (Cunningham, W. P. and Cunningham, M. A. Principles of Environmental Science: Inquiry and Applications. 2017. 8th Edition)

1. Use the following guidelines to develop a project that would communicate information about the green roof to students, community members, or other campus visitors.
    a. Choose one of the following formats:
        - Design an activity (something people could DO) that could be used at Science Night to teach community members, mainly kids, about the green roof. Include a description of the activity itself, and information you would share with others (verbally and/or on a poster board).
        - Design an interactive display that would explain the green roof and be displayed in the student union. However, this display would not need a person there all the time. Include a sketch of the display (you do not actually need to physically make it) and the written information to be included with the display (description of how to interpret/use the display, and what it represents).
        - Develop a way to add value to the existing green roof. Include a well-written proposal of your idea that could be given to the facilities director, or provost, that would describe how the green roof could become more beneficial to the campus. This should also address any additional needs (financial or human) that would need to be implemented as a result of your proposal.
        - Design PowerPoint slides which could be on rotation in the student union to educate others on the green roof. Include the actual slides you would use and photos.
    b. All projects should include:
        - A description of the green roof layers and the benefits green roofs provide to humans and the ecosystem.
        - At least seven terms related to class.
        - At least three trivia questions you could ask people during, or after seeing/reading, your project.
        - Proper grammar, spelling, mechanics

Introduction of Social Costs of Environmental Problems to the Calculation of Gross Domestic Product (GDP)

Praopan Pratoomchat, University of Wisconsin-Superior

Context

The current calculation method of the Gross Domestic Product (GDP) does not include the cost of environmental problems created by the production activities. GDP is the most important economic indicator that the policy makers focus on and they use it as the decision making variable to launch economic policies. When the cost from the environmental degradation is ignored in the economic indicator, the law, regulations and policies are moving toward environmental destruction. This activity was created for a Principles of Macroeconomics course, a course required by students in every major in the School of Business and Economics. The traditional lesson for the GDP talks about the flaws of the calculation and how it could make it misleading, but never expanded the ideas to show what could be done. This activity expands this topic. Students should be able to calculate the environmental problem cost and include it into the GDP calculation.

Licensure

Secondary

NAAEE Guidelines for Excellence

Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Theme 5
Guidelines: 5.1, 5.2

Theme 6
Guideline: 6.2

Materials

Access to the internet, library access to academic journals

Step by step directions

1. Assign students to define and research current environmental problems in the local area. Pick one that the students think is the most critical (e.g., storm water, air pollution from transportation, recycling, waste management).
2. Students list all possible effects (positive/negative) that can be created by the problem and how it relates to the local and national economy.
3. Estimate the possible costs/benefits.
4. Subtract the cost from the local GDP (or add the benefits to the GDP), discuss the difference between the traditional method and the GDP after addressing the environmental problem. Discuss their own role related to GDP.

Assessments

I plan to grade using rubrics following the indicators from the EE standards.

How Much Plastic Debris are we Producing Every Day?

Lorena M Rios Mendoza, University of Wisconsin-Superior

Context

Our Chemical Environment (Chem 100) is a 2-credit course that falls under Universal Studies in Environmental Science in Chemistry. This is a general education course for all non-chemistry majors.
Students will collect all the plastic debris that they are producing for one week, but if some students prefer to write the kind of plastic items they used every day and keep the record in a journal, they will be free to do that instead. This activity will show students how much plastic debris is produced and how the awareness of seeing the plastic debris differs from the students that just kept the record in a journal to those who physically collected the plastic items.

Licensure

Middle Childhood

Secondary

NAAEE Guidelines for Excellence

Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Materials

Plastic debris items collected in a week or a day, journal to keep record of the plastic items produced in a week, container to recycle plastic

Step by step directions

1. Students will be required to collect each plastic item that they use every day for a week or just one day for those who would like to keep a journal instead. Set up a week for collection that will work for most of the students.
2. Journal to keep record of the plastic items used every day for the remaining six days
3. Set up a day to collect all the class-plastic debris. Students should bring the plastic debris in a container to class.
4. Count and classify
5. Extrapolate the data from class to the city, county, state, and planet. Discuss the impacts of plastic use and brainstorm ways to reduce the amount used.

Place-Based Design of Secondary Science Lessons

Amy Schiebel, Edgewood College
Aschiebel@edgewood.edu

Context

Secondary Science Methods II class (undergraduate and graduate)
Class time necessary is three two-hour class periods. Additional student time needed for reading and unit plan creation.

Goals: Preservice teachers gain experience designing a place-based activity as part of a science unit OR use place-based instruction as a basis for the design of the entire unit.

Approximate activity time
3 class periods

Licensure
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 5
Guidelines: 5.1, 5.2

Theme 6
Guideline: 6.2

Step by step directions

1. Homework prior to day one of this lesson:
   a. Place-Based Education: Connecting Classrooms & Communities by David Sobel. 2006. The Orion Society.
   b. Selected readings from the place-based curriculum design literature
   c. Selected readings showing growth in student understanding in a variety of areas attributed to the use of place-based instruction.
   d. After all the reading assignments have been completed, the students will write what they believe to be the three points of most significance from the collection as a whole. Each point will be described and its significance described. Students will also comment on how this set of readings supports their goals for students. (You may want to create a collaborative list of student goals collaboratively early in the semester.)
2. Class period 1 (90 minutes).
   a. Discussion of the readings and their points of most significance.
   b. Examples of place-based curriculum will be shared. Some of these samples will be drawn from work done by the teachers at the Edgewood Campus School, a K-8 school that shares the Edgewood campus http://www.edgewoodcampus.org/ Other examples will be drawn from work done at the Wildlands School. http://www.wildlandschool.net/
   c. Examples of technology-enhanced place-based lesson and Situated Learning lessons will be shared. https://mediaspace.wisc.edu/media/2.5++Situated+Learning+and+Place-Based+Games+(David+Gagnon)/0_1baevws9
   d. Discussion of the use of place-based curriculum in the high school setting.
   e. Homework assignment: Additional readings on place-based education
3. Class period 2 (90 minutes).
   a. Go outside and engage in a sample of a Place-Based lesson used by the Edgewood Campus School.
   b. Walk around campus and create a list of science explorations that could be done here as part of a place-based approach to science education. Discussion about how these would be modified for use at various levels (grades 6-12) and within different science disciplines. Efficacy of integrated science also discussed.
   c. Brainstorm other skills that are developed and goals addressed through place-based work.
   d. Homework: More selected readings on place-based instruction in science. List at least 2 ways that you could apply the concept of place-based instruction to your individual unit plan
4. Class period 3 (90 minutes).
   a. Students share ideas about implementing PB in their unit plans. Group lesson critique and sharing of ideas for improvement.
   b. Work session devoted to working on the unit plan, particularly the PB design. In-class work sessions allow students to use the instructor and other students as sounding boards and resources while working on their unit designs.
   c. Work to make PB experiences as deep as possible and as interdisciplinary as possible.
   d. Answer the questions: How adaptable is this lesson to other "places"? What will you be most interested in assessing and how will you conduct that assessment?

Assessment

Assessment of these lessons will be done at the end of the semester when the entire unit plan is turned in. A rubric will be created for the assessment of this aspect of the unit plan.

Assessment Rubric Example

Place-Based Component of Curriculum Unit Plan Rubric

1. Place-based component plays a significant role in unit instruction?
   a. Place-based component is well integrated into the unit. An adequate amount of time is devoted to the place-based portion of the unit (10pts)
   b. Place-based component is associated with the unit but the connection is not clear and the integration is incomplete. Time allotted may minimize the usefulness of the learning activity. (5pts)
   c. Place-based component appears as an unrelated, or loosely related add-on to the unit. Minimal learning can be expected(1pt)
   d. No place-based component (0pts)
2. Place-based component allows for individual student interest and abilities. Is flexible and inclusive.
   a. Students can engage in the place-based component in a variety of ways. There is room to follow individual interests and results can be presented in a variety of ways (10pts)
   b. Students engagement in the place-based component is tightly structured and allows for minimal individualization. (5 pts)
   c. Student engagement options are severely limited and choice in engagement and reporting are highly structured (1pt).
   d. No variation is allowed for. (0pts)
3. The place-based component is relevant and compelling.
   a. Place-based component is based on a theme/problem/idea that is interesting and compelling to the target students. (10pts)
   b. Place-based component may be interesting so some but the ideas are not compelling and obviously engaging for the target students. (5pts)
   c. Place-based component likely artificial or insignificant in the view of the target student audience. (1pt)
   d. Lack of interest assured (0pts)
4. Assessment of the place-based component mirrors the work students do.
   a. Assessment flows smoothly from the work done by students. (10 pts)
   b. Assessment is authentic but is not a good fit with student work done. (5pts)
   c. Assessment not in line with the work students do. (1pt)
   d. No assessment provided (0pts)

Milwaukee River Study

Ray Scolavino, UW-Milwaukee
Rscali3@yahoo.com

Context

Purpose of the Activity

Many students/teachers in the Milwaukee area have the misconception regarding the Milwaukee River. They believe it is highly polluted, toxic, and in a very unhealthy condition for fish, plants, animals (including humans). This activity has a couple of purposes: 1. To address the misconception above, 2. Give preservice teachers a chance to collect authentic data (they may have science degrees but a number of them have never collect real time data outdoors), 3. Many of the teachers will teach in the Milwaukee Area so this gives them a lesson (or multiple lessons) that can be done in a "place-based" environment to a river system that is accessible to many schools. A different river could be used for this activity.

Middle/Secondary Science Preservice Teachers. This activity takes place during the fall semester. Majority of the students are post-bac, or if undergraduate, completed with their content coursework. Prior to this activity, they have taken the summer session, which included their first 3 credits of a total of 9 credits of Science Methods classes.

Approximate activity time
2-3 hours

Licensure
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Materials

Water testing chemicals, soil extraction equipment, various collection nets, collecting jars, equipment for gathering velocity of water (stop watch, rope, ping pong ball), flip chart paper, identification books, waders, microscopes/dissection scopes.

Step by step directions

Prior to the lesson, students are asked about their pre-conceptions regarding the health of the Milwaukee River (most have the misconception described above). Students are divided into different groups depending on how many different parts of the river will be tested. Within each group, the students are divided into the following groups: benthic soil, river speed, plants, chemical aspects, fish, insects, and micro-invertebrates, other animals (i.e. reptiles, birds, and amphibians).

Each group is dropped off at their appropriate site and do the following:

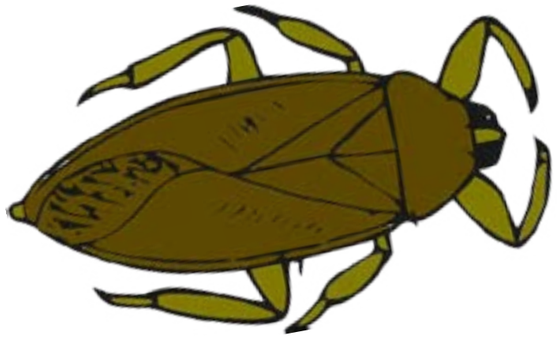
1. Collect information regarding your topic (benthic soil, river speed, plants, etc.)
2. Use various technology and guides to help identify findings
3. Use the Biotic Index of Water Quality to create a list of the plants, animals and chemicals found.
4. Return with data to main site

Once at the main site, each group prepares a presentation of what they found. Students share the information and use the abiotic /biotic index to determine the factors that indicate the health of the river. Usually, the health turns out to be in the Biotic Index Quality of Good; which shocks students. This data is then compared to data from past years (work on graph interpretation).

Have students look at the areas that need improvement and think of ways to advocate for that improvement. Divide students into groups and brainstorm practical ways their future students could advocate for the change. This may include determining the source point or activities along the river that may contribute to the problem. Have the students create an Advocate Action Plan that could potentially be used by students. This plan may not necessarily be the one they will use in the classroom but the key would be to teach high school students how to take action rather than just talk about it. An extension of this activity would be for one of the Milwaukee legislators to visit the methods class and evaluate the Advocacy Action Plans and provide suggestions on how to "teach" students to use their legislators as an instrument for action.

Assessments

1. Observation Assessment: the instructor observes how the students collect data, control variables, and present the data.
2. Presentation Assessment: the instructor observes how well the students present science data to other students. This includes proper use of terminology and data collecting techniques.
3. Advocate Action Plan: Within groups, students will create an Advocate Action Plan that will describe how students can advocate for the solution to the problem.



Museum Exhibit

Randa Suleiman, Alverno College

Context

Science and social studies integrated methods class. Aimed at elementary preservice teachers

Create a museum exhibit based on a theme in social studies or science. For example, you can use immigration as a theme. It is appropriate for elementary teachers because they can duplicate the idea in their own classroom based on what they are teaching. This approach allows integration of multiple content areas. For example, if your theme is immigration, you can choose to read books or articles related to the theme, do a math lesson with some of the data about immigrants, integrated social studies with history, etc.

Materials

Milwaukee Public Museum (or a local museum in your area), a second museum (if time permits), various material to create the museum exhibit, Creating a Classroom Exhibit websites

Additional information

Each candidate would choose any material that would they like to use to create their exhibit.

Creating a classroom exhibit websites

a. Smithsonian Center for Learning and Digital Access
   https://learninglab.si.edu/collections/creating-a-classroom-exhibit/DF4uHdinJkePcr1T
   http://www.smithsonianeducation.org/educators/lesson_plans/collect/crecla/crecla0a.htm
b. Kids Curator – focus on examples and readings
   http://kidcurators.com/
c. Using exhibits as assessment – Edutopia
   https://www.edutopia.org/practice/using-exhibits-assessment
d. For lesson plans/unit plans – Review
   http://www.readwritethink.org/classroom-resources/lesson-plans/designing-museum-exhibits-grapes-892.html
e. Read: https://www.desertmuseum.org/center/edu/docs/6-8_TIP_exhibit.pdf

Approximate activity time

6 hours

Licensure

Early Childhood

NAAEE Guidelines for Excellence

Theme 4
Guidelines: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7

Theme 6
Guidelines: 6.1, 6.2, 6.3

Step by step directions

1. Plan a visit to Milwaukee Public Museum (MPM) or a local museum. Ask teacher candidates (TC) to make observation as they walk around. Observations could be about the organization of the museum, location, signage, language. Then, ask TC to focus on an exhibit of their interest. Ask TC to make detailed observation regarding the different aspects of the exhibit and prepare questions to ask (if needed).
2. If time permits, plan a visit to a second museum.
3. Ask TC to compare the two museums. What is the same and what is different?
4. Complete class readings and explore the websites about creating a classroom museum exhibit.
5. Ask teacher candidates to select a theme for their museum exhibit. Encourage them to have interdisciplinary theme that includes at least two content areas.
6. Ask TC to brainstorm ideas of lessons or activities that align to the selected theme.
7. As a class, brainstorm what should be included in the museum exhibit based on the guidelines. (For example, display at least 3-4 artifacts based on at least two guidelines). Each teacher candidate will create a museum exhibit.
8. As the class generate the list of artifacts, divide the class into groups. Assign each group one artifact. Ask the groups to develop 2-3 success criteria.
9. As a class, work collaboratively to finalize the museum exhibit designed
10. Using the success criteria for each artifact, as a class, design (create) the rubric to assess the museum exhibit.

Assessments

The final museum exhibit for each candidate will be the assessment. The rubric created by the class will be used to evaluate the exhibit and provide feedback.

What Does the Box Say: Learning Through Letterboxing

Corey Thompson, Cardinal Stritch University

Context

Preservice teachers at the undergraduate level (would need at least 2 two hour class periods) and Graduate level (1 four-hour class session); candidates could be seeking any certification level. In this age of increased social media use and nature deficit disorder, students can learn a lot about their own and other's communities by engaging in the activity of letterboxing. There are many skills that can be developed and honed through letterboxing; skills that are easily transferable to the "regular" classroom environment.

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.3, 1.4

Theme 3
Guideline: 3.1

Theme 4
Guidelines: 4.2, 4.5

Materials

Physical material
Phone and/or camera, writing utensil, including colored pencils or crayons, paper or a letterboxing journal, a stamp, a Tupperware container, materials to camouflage/decorate your new letterbox, letterbox clue, computers, car or accessing sites by bike or foot. Optional: compass

Outdoor sites
Campus green space and anywhere where a letterbox can be found

Online resource
Letterboxing North America website: www.letterboxing.org

Human resources
Optional: those who have letterboxed before; employees of places where current letterboxes may be hidden.

Step by step directions

The objective of this lesson is to introduce students to a community of their choice by way of a geographical scavenger hunt, using various geographical skills, to determine the location and identify what the location is known for, its history, its value to the community and how they might go about supporting the space. (this will be completed in the form of an executive summary/letterboxing journal)

At the front of the room, have instructor's letterboxing kit unpacked as a visual aid: stamp, ink pad, family letterboxing journal, sample clues and pictures of the process. Spread the pictures throughout the room for students to view.

1. Have students put themselves into groups of 2 or 3. Explain that today they will be introduced to the concept of Letterboxing. Make sure each dyad or triad is seated near a computer.
2. Using the teacher's computer and class projection system, direct students to the letterboxing homepage and walk them through what a letterbox is. Ask anyone if they have heard of it or if they have ever been. If there are students who have letterboxed, allow them to share their experience and the class to ask them questions.
3. Using contents from the teacher's letterboxing kit, explain to students what a letterbox is and how one gets started. Talk about the skills needed in order to find letterboxes: reading, calculating math (depends on the clue), good communication, good collaboration skills, estimation skills
4. Explain to students that they will work as small teams and determine where they would like to go to letterbox. The territory covered depends on the age of the participants and the human and physical resources available. Students will keep a journal of their experience, connecting the activity to Wisconsin standards for EE and SS. They will reflect on their feelings about engaging in letterboxing and answer questions in regard to modifications and differentiation for their future class as well as lessons learned.
5. Using an example from the teacher's letterboxing kit, describe how groups will then research their location and provide an executive summary about the location to their classmates. These executive summaries will be distributed as handouts and will then be presented to their classmates and then displayed on a class bulletin board titled "Oh the places you'll go"

Example Letterbox:
Devil's Lake State Park**Demon's Dwelling LbNA # 16827**

Owner	Wisconsin Hiker
Placed Date	Jul 24 2005
County	Sauk
Location	Baraboo, WI
Boxes	1
Found By	smalltowngal
Last Found	Jul 19, 2015
Status	FFFFFFFFFFFFFFFFFFF
Hike Distance	?

Last found/checked: 15-NOV-09 Box in great shape. Added a second logbook.

Location: state park south of Baraboo
Time: 1 - 3 hours depending on how many boxes you do
Terrain: rocky bluffs & wooded trails; several steep sections
Note: You will need a vehicle sticker to park in this area. 2007 fees are: Daily: $7/$10 for non-resident or Annual: $25/$35. Ask for a copy of the park newspaper or trail maps if you'd like to see the almost 30 miles of trails in this park.

This hike starts on the North Shore. You can either start here or look for this box as a continuation of a loop after finding the Vertical Ascent and Snake Story boxes.

Start on the West Bluff trail; the trailhead is located in the northwest corner of the beach area.

The name of this lake is based on the Indian Ho-Chunk name Day-wa-kun-chunk, meaning "Sacred Lake" or "Spirit Lake". Still another name given by natives to this Lake, possibly of Sioux origin, is Minne-wau-ken, said by some to mean Bad Spirit Lake, while others claim it means Mystery Lake. Various names were given to this body of water over the years, but eventually the current name took hold and the lake bears it yet to this day.

Go up, up, up! Then up, up, up some more!

Many legends have attached themselves to this lake. Some say a phantom canoe can be seen gliding across the surface of the lake as the sun sets and just before the moon takes hold. Others have claimed to see a lake monster roiling the surface on many occasions.

Along the trail you'll be looking at the scenery and great views of the lake, but also looking for a series of benches along the trail. This will give you a good excuse to sit down and rest on the benches!

Record the second year on the 1st bench: _____ (A)
Pass the 2nd bench.
Record the first year on the 3rd bench: _____ (B)
Pass the 4th and 5th benches.

Eventually you will come to a pair of benches at a nice overlook. On the bench with 4 dates, record the first year: _____ (C) and the last year: _____ (D)

From the middle of these benches, take [(A) – (B) / 2] paces in a westerly direction. Then take [(D) – (C) / 5] steps in a northerly direction. The namesake of the lake awaits you in the base of a fallen tree. Please re-hide it well after stamping in.

You can now either retrace your steps or continue on the West Bluff trail to the south shore of the lake to make a loop around the lake. You can then search for two boxes on the east side of the lake (Vertical Ascent and Snake Story).

We hope you enjoyed your hunt and since we don't live in the area we would really appreciate an update on the status of the box if you find it. We won't be able to check on it very often…

6. Upon finding the letterbox and taking pictures, small groups should begin research on the site, primarily using the human resources on site if applicable and brochures and interviews. (Electronic media can be used, but it is preferred that students connect with hard copy printed word and "live" resources if at all possible).

   What? (Is Devil's Lake history?)
   So What? (Why is it an important place in our community?)
   Now what? (Now that you have been here, how can you be an ambassador for and a steward of this place?)

Assessments

Informal: Students will keep a journal of their experience, connecting the activity to Wisconsin standards for EE and SS. They will reflect on their feelings about engaging in letterboxing and answer questions in regard to modifications and differentiation for their future class as well as lessons learned.

Formal: Students will write an executive summary of the letterboxing experience and create an informational handout that explains how to letterbox (see attachment).

Teacher Candidate:_____ Score:_____
Instructor:_____Date: _____
InTASC Standard 1: Learner Development
InTASC Standard 2: Learning Differences
InTASC Standard 3: Learning Environments
InTASC Standard 9: Professional Learning and Ethical Practice
InTASC Standard 10: Leadership and Collaboration

Scoring (Each performance indicator is worth 4 pts.)		**4 (A) Requirements Met**	**3 (B) Requirements Mostly Met**	**2 (C) Requirements Somewhat Met**	**1 – 0 (D-F) Most Requirements Not Met**
What?		Clearly describes the social studies resource	Mostly describes the social studies resource	Somewhat describes social studies resource	Social studies resource is not described.
So What?		Clearly describes how this resource is important to the community	Mostly describes how this resource is important to the community	Somewhat describes how this resource is important to the community	Does not describe how this resource is important to the community
Now What?		Clearly describes how teacher candidate will use resource	Mostly describes how teacher candidate will use resource	Somewhat describes how teacher candidate will use resource	Does not describe how teacher candidate will make use of the resource
Picture Attached		Picture Provided			Picture Not Provided
Handout		Handout is a creative and useful reference.	Handout is mostly creative and useful.	Handout is somewhat creative and useful.	Handout is not creative or useful.
Total Points: _____ _ Average: _____ Grade: _____		**Comments:**			

Interdependence of Life Within an Ecosystem (Stability vs Instability)

John Whitsett, University of Wisconsin-Oshkosh

Context

This project is intended to provide disciplinary content enhancement pertaining to ecosystem stability for those enrolled in an elementary science methods course. Additionally, the students should be able to modify the activities to be incorporated into their future classrooms.

The goal of this project is for the prospective teachers to gain an understanding of the structure of an ecosystem and the effects upon stability as a result of the removal of a member of the system or the interjection of an organism which has no natural predators.

Licensure
Early Childhood

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.2, 1.3, 1.4

Theme 4
Guideline: 4.1

The activity is intended to allow prospective teachers of grades K-5 to develop an inventory of organisms (plant and animal) in a local ecosystem. Depending upon conditions, this inventory will be developed by direct observation of a local environment. If this is not possible, a profile will be provided. The students will then determine what resources are needed for each organism to survive and reproduce. This information can be organized in a number of ways, potentially including food webs as well as others. The interdependence of the members of the system can then be explored with an ecological Jenga game in which pressures on the system are demonstrated by removing or adding Jenga blocks, ultimately resulting in the collapse of the system.
A potential extension of the project is to interject the idea of an invasive species. For example, the round goby in the Great Lakes or zebra mussels and the resulting competition for resources, which can also result in the collapse of a system.

Ecosystems consist of many components including producers, primary consumers, and secondary consumers. It is important to understand that all of the components of the ecosystem hold an important place in the system. Removal of any component of the system will affect the stability. Students who have a good knowledge of these relationships and are able to critically analyze the system are able to make good decisions.
Systems: Systems help make sense of a large and complex world. A system is made up of parts. Each part can be understood separately. The whole, however, is understood only by understanding the relationships and interactions among the parts.
Organizations, individual cells, communities of animals and plants, and families can all be understood as systems. And systems can be nested within other systems.
Interdependence: Human well-being is inextricably bound with environmental quality. Humans are a part of the natural order. We and the systems we create—our societies, political systems, economies, religions, cultures, technologies—impact the total environment. Since we are a part of nature rather than outside it, we are challenged to recognize the ramifications of our interdependence.

Sustainability: Learning is future oriented where environmental and social responsibility drive individual and institutional choices.

Materials

Set of plant and animal cards (representing a range of producers, primary consumers, and secondary consumers), text or internet ability to describe the characteristics of each organism to determining the requirements for that organism to survive and reproduce, set of dice or a spinner to select each type of organism, set of Jenga blocks, Eco-llapse game https://www.extension.purdue.edu/extmedia/fnr/fnr-431-w.pdf (Purdue University)

Step by step directions

This activity will consist of three distinct components:

1. Identification and characterization of the ecosystem.
2. Modelling of the result of stress placed upon the ecosystem.
3. Debriefing following the stress simulation to include developing predictions of the effect of introducing an invasive species.

Procedure:

1. If an outdoor education area is available, a survey of the area will be conducted in which an inventory of the species (both animal and plant) will be compiled. If obtaining the data directly is not feasible due to weather, time of year, or location, an alternative is to provide a set of cards depicting a suitable variety of organisms.
2. Each plant species or animal should be depicted on a card.
3. Each student will select one (or more) card(s) and conduct a search using either text or internet to determine what the organism needs to thrive.
4. Each organism will be determined to be a “producer”, “primary consumer” or “secondary consumer”.
5. A Jenga set will be color coded to reflect the population distribution of the system. Producers are represented by 32 brown blocks. Primary consumers are represented by 16 white blocks and the secondary consumers will be 6 tan colored blocks. The colors will match the dice or spinner indicated in #7.
6. Students will then conduct the Jenga game. (There are several iterations of an environmental Jenga game as described in the literature)
7. Students, in turn, remove a Jenga block as determined by either a dice or a spinner which is color coded. The blocks can be removed to the side or as an alternative, added to the top of the Jenga tower.
8. With each block removed, the tower becomes less stable. It is important to maintain a discussion through this process in which the removal of a block represents the removal of a component of the ecosystem. The result of the process is that the system becomes less stable and when enough stress is applied to the system, the system will eventually collapse.
9. The Eco-llapse version of the Jenga game, which is from Purdue University, has an added component of eco-cards which provide an added component of unusual events. In this version, a spinner is used to select the removal of a producer, primary consumer, or secondary consumer but also has the possibility of an eco-card. The eco-cards have unusual events. For instance, a big box store is built so you need to remove 3 blocks, or a stream bed reclamation is implemented and you need to put back 2 blocks.
10. Another dimension can be to add a block that is a different size than the Jenga blocks in the set. This block is not compatible with the rest and adds additional stress. With this alternative, the simulation can involve a discussion around invasive species which are those organisms that do not fit the system and make it less stable.

11. The debriefing, should include a discussion of the factors which contribute to destabilization of the ecosystem, eventually leading to the issues around the introduction of invasive species.
12. Discussion among the students should consider the factors which tend to stabilize an ecosystem and what factors tend to destabilize it, leading to a lack of sustainability.
13. The concluding discussion might address the question "Are humans an invasive species in the ecosystem?" This question would be appropriate for students in a science methods class, but would likely not be used with younger children.

Assessments

Informal: Informal assessment of students can be accomplished by direct observation and noting the discussion and arguments used by students. Students should be able to demonstrate the understanding of ecosystem stability and interdependence by:
-Describing patterns of what plants and animals (including humans) need to survive.
-Constructing an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs
-Using a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
-Communicating solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment

Formative Assessment Probe: No More Plants Uncovering Students' Ideas About Interdependency and Change; Keeley, Page; Science & Children; April/May 2015

This is a short formative assessment from the National Science Teachers Association which is in a multiple choice format. The correct choice indicates appropriate reasoning while each of the incorrect choices demonstrates a specific misconception. This could be used at the conclusion of the activity to document understanding of the interdependence and the effect on the system stability when an element is removed.

Resources

Wisconsin Department of Natural Resources: Invasive species for elementary http://dnr.wi.gov/topic/invasives/edresources.html

Food Web Ecology: Playing Jenga and Beyond. Peter C.de Ruiter, Volkmar Wolters, John C. Moore, Kirk O. Winemiller, SCIENCE, VOL 309, July 1, 2005

A Constant of Change: Brkich, Katie and Lamb, Tamra; Science & Children; April/May 2015.

Recognizing Stability and Change; Ashbrook, Peggy; Science & Children; April/May 2015.

Of Jenga Towers and Environmental Offsets; Vijay Kolinjivadi Wednesday, 17 September 2014 09:52 (/author/itemlist/user/49182), Truthout | Op-Ed

Cycle of Life: Food Chain; AAAS; http://sciencenetlinks.com/lessons/cycle-of-life-1-food-chain/

Recycle Bin Dive: Quantitative Analysis for Statistics Class

Georjeanna Wilson-Doenges, UW-Green Bay

Context

This activity has been developed for Social Science Statistics, an undergraduate introduction to statistics for the social sciences including education, nursing, and social work as well as the traditional social sciences such as psychology, political science, public administration, sociology, etc.

On the second day of class, when teaching about frequency distributions and graphs, prepare an in-class "dumpster dive" on one recycle bin. Bring the recycle and trash bin from outside our classroom into our room. Briefly teach the students about what could be recycled in your home county and hand out a one-page recycling guide. Pick through the recycle bin in front of the class and have the students tally up the number of correctly and incorrectly recycled items in the bin. Put the incorrectly recycled material into the trash bin and put the correctly recycled material back in the recycle bin and return the bins to the hall after the exercise.

Talk to students briefly about the job of a custodian and how some feel personally responsible for proper recycling and trying to sort through the trash as much as the job allows. Talk about how the university/college values sustainability and about the mission's focus on the environment.

Licensure
Early Childhood
Middle Childhood
Secondary

NAAEE Guidelines for Excellence
Theme 1
Guidelines: 1.1, 1.3, 1.4

Theme 5
Guidelines: 5.1, 5.2

Theme 6
Guideline: 6.2

Then, have the students make a frequency table and graph of the findings as a way to teach about representing and communicating quantitative data correctly.

Extend this project to a homework assignment where each student will go home and record the frequency of correctly and incorrectly recycled materials at home for one week and present those data in tables and graphs. Compile the whole class' data as well as whether they live on or off campus. Calculate means and standard deviations for these data and then, later in the semester, revisit this data to see if there is a significant difference in average correctly recycled items between households on or off campus.

This activity is a great way to introduce an environmental topic in a class that doesn't normally include environmental education. In this way they are collecting data from their own authentic place and then understanding how their results fit into the larger context of our classroom. There is also an opportunity to change behavior by increasing students' knowledge about proper recycling that could extend beyond this project.

This is also an activity that would be easy to apply at any level for preservice teachers.

Materials

Recycle and Trash Bin brought into the classroom (usually by a custodian), Gloves to wear to dig through trash,

materials to record data and graph, Copy of Recycling Guide (specific to your county) for each student

Step by step directions

Overall pedagogical approach: In-class demonstration with at-home application

1. In-class demonstration of "dumpster dive" with proper recycling guide
2. Homework Assignment Sheet:
   *On the day before your recycling is collected or before you take your recycling to the curb, look through the recycle bin and count the number of correctly and incorrectly recycled items for your household for one week. Use the county's Recycling Guide to know what is correct or incorrect.
   *Record that data and then represent the data in a Frequency Table that includes frequency, relative proportion and relative percent.
   *Choose an appropriate graphing technique for this qualitative data and graph the frequency or percent of correctly and incorrectly recycled items in your household for one week.
3. In-class compilation of data and further analysis. In class, record all percent incorrectly recycled items and calculate the mean and standard deviation for the whole class.
4. Later in the semester, use these data again to compare the mean incorrectly recycled items between students living on-campus versus off-campus.

Assessments

1. Homework Assignment Grade for correct frequency table and graph
2. Exam 1 Part A (Frequency Table and Graphing) Section Grade
3. Survey questions about attitudes toward recycling.

Exploring Squash

Lenore Wineberg, Becky Hitchcock, and Jordan Thorton, University of Wisconsin-Oshkosh
wineberg@uwosh.edu

Context

Required science lesson for early childhood undergraduates in their 10 week 60 hour practicum in a an early childhood classroom. The students had to follow the Wisconsin Model Early Learning Standards.

Materials

Four spaghetti squash, individual trays for each of the three students, cooked squash with bowls and spoons

Step by step directions

1. Precut 3 squash
2. Ask students do they know what this is? The first squash was not cut.
3. What does it feel like,what does it smell like?
4. What do you think is inside?
5. Do you remember when we cut open the pumpkin?
6. Let them explore their own precut squash and ask same questions as above.
7. Allow the children to generate the questions.
8. Teacher encourages children to explore their squash.
9. Teacher asks would they like to taste cooked squash.

Assessments

Teacher asks what did you like about the squash? Did you like eating the squash?

Approximate activity time

Over a semester

Licensure

Early Childhood

NAAEE Guidelines for Excellence

Theme 1
Guideline: 1.1

Theme 4
Guidelines: 4.1, 4.2, 4.3, 4.4, 4.6

Theme 5
Guidelines: 5.1, 5.3

Theme 6
Guideline: 6.2

Integrating EE into Math Methods Using K-12 Math Standards

Kevin Zak, Northland College

Context

This activity occurred in a Math Methods course for undergraduate elementary education majors (licensed in grades 1-8). Over the course of the semester course, we mapped out the possible K-8 math topics and concepts that they will be required to teach to their future students from the Common Core State Standards for Math. We analyzed how these topics and concepts are developmentally arranged into a progression for learners across the grades and how they build upon one another. An activity that focused on teaching children about developing number concepts and number sense using the outdoors were modeled in class. For this activity, preservice teachers went outside to gather a variety of objects that were used as manipulatives to help develop number sense. Following the experience, preservice teachers then selected one of the other math topics and concepts to research and develop a lesson plan that incorporates the use of the environment and outdoors as way to help K-8 students learn those topics/ concepts.

Approximate activity time
60 minute - student
Lesson plans - multiple days

Licensure
Early Childhood
Middle Childhood

NAAEE Guidelines for Excellence
Theme 4
Guidelines: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7

Theme 5
Guidelines: 5.1, 5.2, 5.3

Materials

Color paint swatches, buckets, outdoor school yard

Step by step directions

Math activity using the outdoors to help young children develop number sense:
Teacher candidates are placed in pairs. These pairs are provided a bucket and several color paint swatches. Their task is to find and collect objects that match as many of the different colors on these swatches as possible. They will place these objects in their buckets. After a set amount of time and depending upon progress, the class will be gathered together to share some of the items that were found. These gathered objects will then be used in the following activities (see text reference and list below) and serve as the natural manipulatives for them instead of the ones listed. The instructor will lead preservice teachers in the modified activities designed for kindergartners listed below using their collected objects. Following each activity, the instructor will facilitate a discussion about how they can be used to help students develop early number sense and concepts.

Van de Walle, Karp & Bay Williams (2016) Elementary & Middle School Mathematics: Teaching Developmentally (9th edition). Boston, MA: Pearson.

8.1 – Learning Patterns (p.145)
Students have ten objects they have gathered from outside. Hold up a dot plate for about five seconds and have students use their gathered objects to make the pattern represented on the plate. Do this with several different dot plates and patterns. Discuss what patterns the made and how many objects make up each.

8.6 – Line them up! (p.148)
Students use objects they have gathered from outside to create a number line. Read the sequence forward and backward, and discuss the need for even spacing and what a number line represents.

8.15 – Five frame tell-about (p.154)
Students use objects they have gathered from outside. Explain that only one object is permitted in each square of the five frame. Have students show three on their five frame and ask them to share what they can tell us about 3 from looking at their five frame. Try other numbers (1-5) on their five frame using their collected objects. Discuss what students notice and help them focus on how many objects are needed to make five (four and one, two and three, three and two, etc.). This can be done with the numbers 5-10 using a ten frame or two five frames.

8.19 – Favorite fruit graph (p.165)
Students sort objects they have gathered from outside to create a picture bar graph (instead of their favorite fruit). Discuss with students how the bar graph is made and what information it can provide.

Following these sample activities, preservice teachers select one of the following topics/concepts to research and develop a lesson plan that incorporates the use of the environment and outdoors as way to help K-8 students learn those topics/concepts. In addition to CCSS-Math standards, these lesson plans must include and be aligned with WI Model Academic Standards for Environmental Education.

Preservice teachers select from the following K-8 Math Topics/Concepts:

- 9 – Developing meanings for the operations
- 10 – Developing basic fact fluency
- 11 – Developing whole-number place-value concepts
- 12 – Developing strategies for addition and subtraction computation
- 13 – Developing strategies for multiplication and division computation
- 14 – Algebraic thinking, equations, and functions
- 15 – Developing fraction concepts
- 16 – Developing fraction operations
- 17 – Developing concepts of decimals and percent
- 18 – Ratios, proportions, and proportional reasoning
- 20 – Geometric thinking and geometric concepts
- 21 – Developing concepts of data analysis
- 22 – Exploring concepts of probability
- 23 – Developing concepts of exponents, integers, and real numbers

Assessments

Preservice teachers will develop and teach a lesson plan that uses the environment or the outdoors to teach a chosen math topic or concept to their peers. Following teaching the lesson, teacher candidates will reflect upon their lesson using provided question prompts. These lesson plans will be reviewed by the instructor using a provided rubric and given written feedback.

Appendices

Appendix A: Material by Discipline

Page	Title	Outside experience	Math Methods	Science Methods	Science Content Course	Social Content Course	Social Studies Methods	Literacy Methods	Multidis-ciplinary Methods
1	Outdoor Education Review Report	x		x					x
6	Introducing Place-based Education in Social Studies						x		
8	Trees as Storytellers	x		x	x		x		
10	Time Well Spent	x			x				x
15	Mapping Historical Land Sessions						x		
20	EPA history, impact and the present			x	x				
22	Integrating EE Practices	x		x	x				x
24	"Let's see what's out there."	x		x	x		x		x
27	Introductions in General Botany	x			x				
29	A Walk in the Park	x							x
31	Awareness of Risk: Inside, Outside, and Beyond	x							x
36	Conflict Resolution with Bioenergy				x		x		x
38	Sorting Trash with Static Electricity: A Case Study				x				
40	Winter Inquiry Project	x		x	x				
45	Meeting Nature in New Ways	x							x

Page	Title	Outside Experience	Math Methods	Science Methods	Science Content Course	Social Content Course	Social Studies Methods	Literacy Methods	Multidis-ciplinary Methods
49	Facilitating Pre-Service Teachers	x							x
52	Treasuring the Great Lakes	x		x	x		x		
54	Central Sands High Capacity Well Controversy	x			x				
57	Environmental Issue Investigation, Action, and Instruction			x	x		x		
59	Place Based Science – Lake Wingra	x		x	x		x		
61	What is in Our Local Soil?	x		x	x				x
64	Model for Course Evaluation and Infusing Place			x	x				
66	Introduction to Place-Based Learning	x					x		
67	Green Roof Tour	x			x				
70	Introduction of Social Cost of Environmental Problems					x			
71	How Much Plastic Debris				x				
72	Place-Based design of Secondary Science Lessons	x		x	x				
74	Milwaukee River Study	x		x	x				

Page	Title	Outside Experience	Math Methods	Science Methods	Science Content Course	Social Content Course	Social Studies Methods	Literacy Methods	Multidis-ciplinary Methods
76	Museum Exhibit						x		x
78	What Does the Box Say?	x					x		
82	Interdependence of Life Within an Ecosystem	x		x	x				
85	Recycle Bin Dive Quantitative Analysis for Statistics Class	x	x	x					x
87	Exploring Squash			x					
88	Integrating EE into Math Methods	x	x						

Appendix B: Material by Licensure

Page	Title	Early Childhood EC/MC	Middle Childhood MC/EA	Secondary MC/EA
1	Outdoor education review report	x	x	
6	Introducing Place-based Education in Social Studies			x
8	Trees as Storytellers	x	x	
10	Time Well Spent: a facilitated solo experience to ignite environmental literacy.	x	x	x
15	Mapping historical land sessions of current WI tribal nations as context for treaty rights and sovereignty	x	x	x
20	EPA history, impact and the present		x	x
22	Integrating Environmental Education Practices into Science Education	x	x	x
24	"Let's see what's out there." Jean-Luc Picard	x	x	x
27	Introductions in General Botany	x	x	x
29	A Walk in the Park	x	x	
31	Awareness of Risk: Inside, Outside, and Beyond	x		
36	Conflict Resolution with Bioenergy			x
38	Sorting Trash with Static Electricity: A Case Study		x	x
40	Winter Inquiry Project	x	x	
45	Meeting Nature in New Ways	x	x	x
49	Facilitating pre-service teachers to create an engaging place-based activity for elementary school students	x	x	
52	Treasuring the Great Lakes	x		x
54	Central Sands High Capacity Well Controversy	x		x
57	Environmental Issue Investigation, Action, and Instruction	x	x	x
59	Place Based Science – A Closer Look at Lake Wingra	x		
61	What is in our local soil?	x	x	
64	Model for Course Evaluation and Infusing Place – Based Education into the Curriculum			
66	Introduction to Place-Based Learning	x		
67	Green Roof Tour	x	x	x
70	Introduction of Social Cost of Environmental Problems to the Calculation of Gross Domestic Product (GDP)		x	x
71	How much plastic debris are we producing every day?		x	x
72	Place-Based design of Secondary Science Lessons		x	x
74	Milwaukee River Study		x	x
76	Museum Exhibit	x		
78	What Does the Box Say?: Learning Through Letter-boxing	x	x	x
82	Interdependence of Life Within an Ecosystem (Stability vs Instability)	x		
85	Recycle Bin Dive Quantitative Analysis for Statistics Class	x	x	x
87	Exploring Squash	x		
88	Integrating EE into Math Methods using K-12 Math Standards	x	x	

Appendix C: Professional Development of Environmental Educators: Guidelines for Excellence

NAAEE Guidelines for Excellence: Professional Development for Environmental Educators

Pg	Title	Theme 1				Theme 2			Theme 3			Theme 4							Theme 5			Theme 6			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.2	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	6.1	6.2	6.3	6.4
1	Outdoor Education Review Report											X	X	X			X					X	X		
6	Introducing Place-based Education								X					X				X							
8	Trees as Storytellers	X	X										X												
10	Time Well Spent	X	X		X																				
15	Mapping Historical Land Sessions	X	X																						
20	EPA history, impact and the present	X		X	X																				
22	Integrating Environmental Education Practices								X				X				X								
24	"Let's see what's out there." Jean-Luc Picard						X		X	X			X		X		X		X	X	X		X		

Pg	Title	Theme 1				Theme 2			Theme 3			Theme 4							Theme 5			Theme 6			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.2	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	6.1	6.2	6.3	6.4
27	Introductions in General Botany	X	X				X					X				X	X								
29	A Walk in the Park													X			X		X	X					
31	Awareness of Risk: Inside, Outside, and Beyond											X					X								
36	Conflict Resolution with Bioenergy	X	X	X																					
38	Sorting Trash with Static Electricity: A Case Study	X	X	X																					
40	Winter Inquiry Project	X	X																						
45	Meeting Nature in New Ways	X																	X						
49	Facilitating Pre-Service Teachers		X							X			X	X			X								

Pg	Title	Theme 1				Theme 2			Theme 3			Theme 4							Theme 5			Theme 6			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.2	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	6.1	6.2	6.3	6.4
52	Treasuring the Great Lakes	X	X																						
54	Central Sands High Capacity Well Controversy	X	X	X	X																				
57	Environmental Issue Investigation, Action, and Instruction			X	X		X		X									X							
59	Place Based Science – Lake Wingra	X	X	X	X								X						X						
61	What is in our local soil?	X							X			X	X	X			X		X	X		X	X		
64	Model for Course Evaluation and Infusing Place – Based Education											X		X			X								
66	Introduction to Place-Based Learning												X	X	X		X	X	X	X	X				

Pg	Title	Theme 1				Theme 2			Theme 3			Theme 4							Theme 5			Theme 6			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.2	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	6.1	6.2	6.3	6.4
67	Green Roof Tour	X	X											X											
70	Introduction of Social Cost of Environmental Problems	X	X	X	X														X	X			X		
71	How much plastic debris are we producing every day?	X	X	X	X																				
72	Place-Based Design																		X	X			X		
74	Milwaukee River Study	X	X	X	X																				
76	Museum Exhibit											X	X	X	X	X	X	X				X	X	X	
78	What Does the Box Say?			X	X				X				X			X									
82	Interdependence of Life Within an Ecosystem	X	X	X	X							X													

Pg	Title	Theme 1				Theme 2			Theme 3			Theme 4							Theme 5			Theme 6			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.2	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	6.1	6.2	6.3	6.4
85	Recycle Bin Dive	X		X	X														X	X			X		
87	Exploring Squash	X										X	X	X	X		X		X		X		X		
88	Integrating EE into Math Methods using K-12 Math Standards											X	X	X	X	X	X	X	X	X	X				

Appendix D: Guidelines for Professional Development crossed with Teaching Standards

Teacher Standards, Wisconsin	Guidelines for the Preparation and Professional Development of Environmental Educators	
1. Teachers know the subjects they are teaching.	**Theme One: Environmental Literacy**	
The teacher understands the central concepts, tools of inquiry, and structures of the disciplines she or he teaches and can create learning experiences that make these aspects of subject matter meaningful for pupils.	Educators must be competent in the skills and understandings outlined in Excellence in Environmental Education—Guidelines for Learning (K–12).	
2. Teachers know how children grow.	**Theme Four: Planning and Implementing EE Programs**	
The teacher understands how children with broad ranges of ability learn and provides instruction that supports their intellectual, social, and personal development.	Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.	
3. Teachers understand that children learn differently.	**Theme Four: Planning and Implementing EE Programs**	
The teacher understands how pupils differ in their approaches to learning and the barriers that impede learning and can adapt instruction to meet the diverse needs of pupils, including those with disabilities and exceptionalities.	Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.	
4. Teachers know how to teach.	**Theme Four: Planning and Implementing EE Programs**	
The teacher understands and uses a variety of instructional strategies, including the use of technology, to encourage children's development of critical thinking, problem solving, and performance skills.	Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.	
5. Teachers know how to manage a classroom.	**Theme Five: Fostering Learning**	
The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	Educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require students to seriously reflect on their own and others' perspectives.	
6. Teachers communicate well.	**Theme Four: Planning and Implementing EE Programs**	**Theme Five: Fostering Learning**
The teacher uses effective verbal and nonverbal communication techniques as well as instructional media and technology to foster active inquiry, collaboration, and supportive interaction in the classroom.	Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.	Educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require students to seriously reflect on their own and others' perspectives.
7. Teachers are able to plan different kinds of lessons.	**Theme Four: Planning and Implementing EE Programs**	**Theme Five: Fostering Learning**
The teacher organizes and plans systematic instruction based upon knowledge of subject matter, pupils, the community, and curriculum goals.	Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.	Educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require students to seriously reflect on their own and others' perspectives.
8. Teachers know how to test for student progress.	**Theme Six: Assessment and Evaluation of EE**	
The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the pupil.	Environmental educators must possess the knowledge, abilities, and commitment to make assessment and evaluation integral to instruction and programs.	
9. Teachers are able to evaluate themselves.	**Theme Three: Professional Responsibilities of the Environmental Educator**	
The teacher is a reflective practitioner who continually evaluates the effects of his or her choices and actions on pupils, parents, professionals in the learning community and others and who actively seeks out opportunities to grow professionally.	Educators must understand and accept the responsibilities associated with practicing environmental education.	
10. Teachers are connected with other teachers and the community.	**Theme Three: Professional Responsibilities of the Environmental Educator**	
The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support pupil learning and well-being and acts with integrity, fairness and in an ethical manner.	Educators must understand and accept the responsibilities associated with practicing environmental education.	
	Theme Two: Foundations of EE	
	Educators must have a basic understanding of the goals, theory, practice, and history of the field of environmental education.