



Digital Preservation of Natural and Cultural Resources

ND EPSCoR Lesson Plan

Lesson Title: Digital Preservation of Natural and Cultural Resources

Lesson Overview:

The lesson will allow students to analyze their community and see how natural features have changed overtime and how cultures try and preserve them.

Topic(s): Digital imaging, culture, values, natural resources

Grade or Grade Band: 6-8

Lesson Objectives:

- Students will analyze aerial photos to see how both natural and cultural environments change a community and land around it.
- Students will learn to carry out a digital search for aerial photos of a selected area.
- Students will explore the culture behind features a place possesses.
- Students will understand how technology can be used to preserve disappearing cultural and natural resources.

National Next Gen Standards:

- **MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- **MS-ESS3-1 Earth and Human Activity:** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- **MS-ESS3-3 Earth and Human Activity:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

North Dakota Standards:

- **MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- **MS-ESS3-1 Earth and Human Activity:** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- **MS-ESS3-3 Earth and Human Activity:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Time Needed (estimate) Three 50-minute class periods

Lesson Author: Brittany Hagen

Dr. Brittany D. Hagen is an Associate Professor of Education and CAEP Accreditation Coordinator at Mayville State University in Mayville, ND. Dr. Hagen teaches courses related to foundations of education, educational technology, educational assessment, and elementary methods. Additionally, she has developed both online and classroom curriculums for a variety of age groups, including teach-the-teacher programs, assessment data modules, and high school aviation facilitator guides and interactive student activities. Dr. Hagen is also a proud Mayville State alumnus, dedicated to developing highly effective teachers who share a passion for educating young learners.

Scientist/K12 Collaborator & University: Stephanie Day, NDSU

Scientist Bio/Research: My research focuses on understanding how humans shape the environment. I specialize in using lidar and terrestrial laser scanning to understand how landscapes change. My research is highly interdisciplinary and I enjoy working with archaeologists, engineers, artists, architects, and natural resource scientists.

Preparation/Materials

Background knowledge students must have to be successful

Students will need a background of how the environment can change either by nature or human activity. They should also understand that changes occur in societies and identify what may cause the changes. Students will also need a background in chemical weather and erosion.

Differentiation and accommodation to support learning for all students:

When designing any lesson, it is important to address the needs of all learners. Please refer to the following resource for ideas on how to adjust your lesson to accommodate your students' particular learning needs:

<https://www.understood.org/en/learning-thinking-differences/treatments-approaches/educational-strategies/common-classroom-accommodations-and-modifications>

Essential Terminology

- Environment- the natural world, as a whole or in a particular geographical area, especially as affected by human activity
- Natural resources- materials or substances such as minerals, forests, water, and fertile land that occur in nature and can be used for economic gain.
- Culture- the customs, arts, social institutions, and achievements of a particular nation, people, or other social group.
- Value- holding something that is important, worthy, and useful in high regard
- Preservation- the action of protecting or maintaining something.

Resources

- Preserving African Heritage
- Preserving Global Sites
- Preserving the Smithsonian
- Fighting against the loss of cultural heritage
- Word Cloud

Websites:

- <https://www.ndepscor.ndus.edu/ndep/nature/sunday-academy/stem-module-topics/>
- <https://aerial.swc.nd.gov/>
- <http://www.zamaniproject.org/>
- <http://www.lib.usf.edu/dhhc/>
- <https://3d.si.edu/>
- <https://www.globalexplorer.org/>
- <https://www.wordclouds.com/>

Materials needed:

- Computer and project for teacher, computers for students
- Note cards (stack for each group)
- Structure from Motion (SfM) and Terrestrial Laser Scanning (TLS) from NDSU
- Optional: Legos, Model Magic, Play Dough, Lincoln Logs, popsicle sticks- anything for students to make a model
- PowerPoint – found as separate attachment

Lesson 1: Finding and Examining Historic Aerial Photographs (50 minutes)

Engage:

1. Display the aerial photography of Mayville, ND on PPT Slide 2. You may tailor this slide by doing a Google search for an aerial view of your specific town or region.
2. Ask students to turn and talk to a partner and come up with a list of 2-3 reasons why people would take or need aerial photographs. Allow time for students to share their responses, highlighting key concepts such as the topic of this lesson, digital preservation of natural and cultural resources.

Explore:

3. Use PPT Slides 3-4 to complete Activity 1 with students. In this activity, students will use the <https://aerial.swc.nd.gov/> website to locate their community and zoom into an area they are most interested in exploring.
4. Each student should have access to the website on their own personal computer. If not, the lesson will work with small groups of students using one computer.
5. Instruct students to follow the directions on PPT Slide 3-4 to download all air photos from the particular area they selected.
6. Students can also use the directions found in the Activity 1 Handout to download aerial photographs for their community from different times and examine them either in ArcGIS or simply as photographs on their computer.
7. Allow students time to examine the photographs on their own and encourage them to look for what has changed through time, what is new, what is missing, etc.

Explain:

8. Explain to students that aerial photography was used for military purposes by aviators in World War I and that it can be used to make maps, plan uses for land, study archaeological findings, environmental studies, etc.
9. Aerial photography uses a mounted or handheld camera to take pictures of land and water. The camera can be mounted to an aircraft, helicopter, balloon, rocket, etc. Taking aerial photos over time of the same place can help preserve history and show the building and destruction of communities.

Extension of learning more about this topic:

10. To extend the lesson, consider asking students to explore other regions or communities that interest them. With a partner, have students discuss different things they notice, changes they see, and potential reasons for the changes.

Evaluation

11. To evaluate students' learning: ask them the following questions, also found on PPT Slide 5:
 - a. What are the main differences you are finding among the pictures?
 - b. What could be the reasons behind these changes?

Lesson 2: Identifying Cultural Resources (50 minutes)

Engage:

1. Pose the following question to students to start the lesson: What resources in our community do you value? Use PPT Slide 7 to guide the discussion. Give students a stack of note cards and encourage them to think about what they value most in their community, and what makes their community special. Students will be encouraged to think of specific places or items that they value.
2. To initiate their thinking on this, remind them to think 2 about what places they looked for in the aerial photographs, we are likely to look at those places we value most first. Students will be given 2 minutes to complete this task.
3. Further information for how to complete Activity 2 can be found on the Activity 2 Worksheet. Questions and vocabulary on the worksheet will follow the rest of the lesson.

Explore:

4. Then, ask students to organize their cards by the places they mentioned. This will ensure that a place is not miscounted simply because it is not described with the same language. Students will be given 2 minutes for this activity.
5. Consider entering all the places generated by students into a word cloud creator to generate a word cloud showing the places and things that are valued ([Word Cloud Generators list](#)). You can enter them as a class or ask a student to do it for you. Those places mentioned many times will be shown as larger. Because a word cloud generator works by mentions of a given word each place will need to be entered into the text as many times as it is mentioned in the card, this can be done simply with copy and paste.

Explain:

6. As the places are being entered into the word cloud generator, discuss with the class the difference between community and personal values and how culture varies in time and space. More information and prompts can be found on PPT Slides 8-10 and the Activity 2 Worksheet.
7. Highlight key vocabulary words for students by writing them on the board and having students copy the term and definition on their Activity 2 Worksheet. The vocabulary terms for this section are as follows:
 - a. **Culture**- the customs, arts, social institutions, and achievements of a particular nation, people, or other social group.
 - b. **Value**- holding something that is important, worthy, and useful in high regard.

Extension of learning more about this topic:

8. Allow students to view the completed word cloud. Encourage students to reflect on what places or things were mentioned most and why some places were only important to one or very few people while others are widely viewed as a valuable community resource. Students will then be asked to consider what resources their parents or grandparents might value most or consider community resources. Discuss how these are similar or different from their own values. Emphasize that personal values and culture do not

always align, yet both are important and both should be considered worth protecting.

9. If time allows, review the loss of cultural sites research found on PPT Slides 11-12. These slides share information about the loss of cultural resources in ND, North America, and around the world due to natural and anthropogenic effects.

Evaluation

10. To evaluate learning, ask students to compare their responses to another group or whole class. Highlight the key concepts and clear up misconceptions as necessary.

Lesson 3: Digital Preservation (50 minutes)

Engage:

1. Write the terms “Structure from Motion (SfM)” and “Terrestrial Laser Scanning (TLS)” on the board. Ask students to discuss with a partner or small group what these terms might mean. Ask them to identify how these terms relate to digital preservation. Break the terms into parts if students need assistance with discussing what the terms may mean.
2. Explain to students that SfM and TLS are more modern methods that capture elements of culture and photographs that can help preserve a place at a specific moment in time. Share PPT Slide 14 with students for more information and visuals.

Explore:

3. Allow students time to research SfM and TLS online or do so as a class to find out how the methods work and also the benefits and limitations of each method.
4. Ask students to share a few highlights of their research with the class. Highlight key concepts and clear up misconceptions if applicable. You will use these technologies for the remainder of the lesson if you have them available to you.

Explain:

5. Share PPT Slide 15 with students to provide an overview of how cultural resources can be preserved and highlight groups and places that are doing so.
6. Allow time for students to explore the websites listed on PPT Slide 15 and share the most interesting information they found.

Extension of learning more about this topic:

7. To extend their learning about digital preservation, allow students to work in their group to make a model of one of the objects in the room, or something culturally important to them, or a past historical monument. Items to build the model could include: Legos, Model Magic, Play Dough, Lincoln Logs, popsicle sticks- anything for students to make a model of something culturally important to them
8. More information and step-by-step directions on this activity can be found in the Activity 3 Worksheet and PPT Slide 16.
9. Be sure to explain to students the importance of taking photographs from a variety of angles. Students should understand how shows impact their model, and the need to create reference points in each photograph.

Evaluation

10. To wrap up the lesson and evaluate students’ learning, review the wrap-up questions found on PPT Slide 17 with students. Provide time for students to think independently about the answers to the questions and provide time to share in small groups and with the whole class. Be sure to highlight key concepts and clear up misconceptions as necessary.

Additional Lesson Resources / Materials

References:

Day, S. "Digital Preservation of Natural and Cultural Resources". Web. 6 July 2020.
<https://www.ndepscor.ndus.edu/ndep/nature/sunday-academy/stem-module-topics/>

Websites for purchasing materials

For general supplies:

- Nasco: <https://www.enasco.com/c/Education-Supplies/Science>
- Flinn: <https://www.flinnsci.com/>
- Carolina: <https://www.carolina.com/lab-supplies-and-equipment/science-lab-supplies/science-lab-classroom-supplies/10300.ct>
- School Specialty: <https://www.schoolspecialty.com/science-supplies-and-products>
- Amazon: www.amazon.com