

Isle Royale in the Earth Science Classroom

Grade Level: 9th
Course: Earth Science

Justin Thomas

Clio High School
One Mustang Drive
Clio, MI 48420
jthomas@admin.clio.k12.mi.us

This Unit Plan is my original work completed specifically for the Isle Royale Institute at Michigan Technological University. All work that has been adapted/adopted for use in this Unit Plan has been properly cited.

Signature

Date

Personal Statement

Spending a week on Isle Royale backpacking was an experience that one must participate in to fully understand the effects it has on a person. Going into the trip I was full of many emotions; excitement, eagerness, enthusiastic, inspired and happy to name a few. I knew that the trip would be something that many people never get to experience. The peaceful setting, animal life, scenery and good company pointed towards a week of fun, learning and memories. Lying just below those feelings were those of concern and doubt. I had never been backpacking at the magnitude we were going to be packing, plus I knew that the terrain would be difficult and I was not in the best shape of my life. After arriving in Copper Harbor and talking with the other participants and the instructors my mind was at ease with what we would be doing. I had total confidence that I would be able to survive the experience and have fun at the same time. Once on the island the wonders of Isle Royale pushed any reservations I had about being on the island. Despite hard days of hiking I always ended the day with a feeling of pride, contentment and refreshment as I reflected on the days events and things I had experienced. At the end of the week I was sad to be leaving the beauty I had surrounded myself with.

Once back on land I reflected on the weeks activities. The first thing I noticed was how refreshed I felt. This was an odd feeling to me because I knew how much work I had pushed myself to accomplish. Being out in nature, away from the comforts that we have become accustomed to (T.V., cars, air conditioning, etc) I was able to think about what is important to me and how I need to change things in my own life to make my time here as enjoyable as possible. The best way for me to do this is to get back out into nature and continue backpacking. Everyday that has passed since getting off Isle Royale I have thought about where to get out and enjoy nature as well as how to do my part to preserve nature. I find myself more aware of how I dispose of garbage, how much electricity I use and what times of day I use gasoline powered machines (lawn mower, car, etc) to name a few. There are far to few areas on Earth that are as unspoiled and pristine as Isle Royale, and if we were to lose anymore of these places the world would be a much bleaker place to live.

After experiencing Isle Royale for myself I feel compelled and obligated to spread

the knowledge learned there to my classroom so that others may learn about the wonders that are there and hopefully become inspired themselves to visit there and/or do more to protect areas such as that. What worries me is that many people have no idea that Isle Royale exists. Since returning home I have shared my experiences and amazement of the island to everyone that would listen. The most commonly heard phrase from people when I talk to them is “where is Isle Royale?”. Many people think it is part of Canada. How can we attempt to preserve a place that no one knows exists, even when it is a part of their home state? By bringing up its wonders and source of knowledge in class my hope is that I can begin to get people involved in the preservation and interest of Isle Royale. This can be done in many ways; mention the island anytime there is a topic in class that occurs on it, give assignments that use it as an example, create a unit that is based on Isle Royale that covers the topic you want to teach, etc etc. IT will be different for every class, but if an attempt is made to incorporate the knowledge pulled from the island one can only hope that the students and Isle Royale will benefit from it.

Michigan Content Standards

Geosphere (EG) V.1

- Explain the surface features of the Great Lakes region using Ice Age theory.
- Explain how common objects are made from earth materials and why earth materials are conserved and recycled.

Atmosphere and Weather (EAW) V.3

- Explain how interactions of the atmosphere, hydrosphere and geosphere create climates and how climates change over time.
- Describe patterns of air movement in the atmosphere and how they affect weather conditions.

Unit Plan

Note - The series of lessons found below are supplements to existing lessons that are found in a freshmen Earth Science course.

Lesson 1

Goal statement

Many students have a hard time reading contour maps. Taking a 3-D object and making it 2-D throws many students for a loop. By the end of this lesson students should be able to read a topographic map as easily as if it were a road map. Students should also realize that topographic maps can be made for any area of the world, including national parks that are found right here in the state of Michigan.

Objectives

- Students should be able to identify high and low points on a topographic map by using the contour lines
- Students should be able to use a topographic map to determine the shortest route possible to a specific location using trail markers on a map
- Students should be able to use a topographic map to determine change in elevation and how this relates to actual work done on the ground while hiking using contour lines and contour intervals
- Students should be able to identify various points of interest on a topographic map using the maps legend
- Students should be able to determine the contour interval of a topographic map using the contour lines
- Students should be able to sketch a side view of a given point on the map using information given to them by the contour lines

Site Requirements

No specific site requirements for this lesson outside of space to open maps so that they lie flat.

Materials needed

- Topographic map of Isle Royale National Park
- Large table space to lay maps on
- Topographic map worksheet (attached)
- Writing utensils

Risk Management

Unless you have enough topographic maps to give every student their own copy you will be working in groups. The biggest risk here is that some students will do all the work while others will just copy the answers down. Make certain that you are circulating around during the lesson, asking questions and making sure that students are writing down the answers in their own words on their own separate worksheet.

Content background

Detailed maps that show elevation change are called topographic maps (sometimes called contour maps). These maps also show features such as mountains, rivers, lakes, bridges, forests, etc. Topographic maps use lines and color to represent these different aspects of an area. A contour line connects areas of equal elevation. The elevation number will be printed inline with the contour line, but not all lines have to be printed with this index contour. Contour lines may not cross one another, if so that means the area has two different elevations, which we know cannot be true. The difference between two contour lines is called the contour interval. The contour interval is the same for all lines on a given map (they change between maps depending on the terrain). If the contour interval is very high then the terrain is steep. If it is small than the terrain has a gentle slope. To find the contour interval take one contour line and subtract it from the adjacent contour line that is higher in elevation. To aid the reader many topographic maps use depression contour lines if an area is lower than the surrounding land (such as a volcanic crater or mine). In this case you will see short lines at right angles coming out of the contour line. These lines point towards the lower elevation.

A legend explains what the symbols on a map mean. By using this you can easily determine that the thick red line running through the middle of your map represents a highway and the dotted red line represents a hiking trail. (Hess)

Methods

The basic method for this lesson is to first show students what parts there are on a topographic map, how to read them and then let them work on the assignment. This allows them to work through the assignment and apply the knowledge they were given to answer the worksheet questions instead of spitting out the information you just gave them.

Procedure

1. Have students break up into groups of 2 -3
2. Give each group a topographic map of Isle Royale and the accompanying worksheet (National Geographic)

3. Students should use the map to answer the questions on the worksheet
4. At the end of the hour, assuming everyone is done, go over the answers to the worksheet (after collecting it) to make sure that students have read the map correctly

Assessment

The main assessment on this lesson will be during the unit test. The test will include a small topographic map that asks students to determine one or many of the following items: contour interval, highest/lowest point, number of campfire sites, longest trail, drawing of a side view, etc. To assess as you move along with the lesson ask questions of the students on the spot to see if they can answer you as they work. If you have students keep a notebook or journal have them write down the big ideas at the end of the hour or as bell work have them explain how to read a topographic map.

Extension

As an extension to this activity have students prepare a trip on Isle Royale. Give them the following parameters that they must use:

- Trip length of roughly 30 miles (assume 6 - 8 miles a day)
- Must cross through a variety of land types (marsh, mountain, forest, rivers)
- Name the sites you will sleep at
- Describe each days hike according to its physical intensity and elevation change
- How long will each hike take

Once they have the parameters have them create a brochure that advertises their trips benefits and points of interest. If you are unfamiliar with Isle Royale then you may be interested in looking at the book by Dufresne or checking out the Isle Royale Natural History Association's website found in the bibliography.

Name: _____ Date: _____ Hour: _____

Topographic Map Worksheet

Directions: Use the topographic map of Isle Royale to answer the following questions.

1. What is the highest point on Isle Royale called?
2. Where is the lowest point on Isle Royale located?
3. What is the contour interval on this map?
4. How many campsites allows fires to be made?
5. Which trail is the longest on the island?
6. How long is the trail from Rock Harbor to Daisy Farm?
7. Where on the island is the steepest ascent?
8. How are portages represented on the map?
9. If I hiked from Washington Creek to Island Mine to Siskwit Bay back to Washington Creek, how far would I have hiked?
10. How far from shore does the boundary of Isle Royale National Park extend?
11. Describe the terrain you would pass through while hiking from Daisy farm to Mount Ojibway.

Lesson 2

Goal statement

From a young age students are taught that Michigan has been effected by glaciers in the past. We point to the Great Lakes as evidence but usually stop there. At the end of this lesson students should have an understanding of the effects glacial movement has on carving out a landscape and determining what kind of plant and animal life we see.

Objectives

- Students should be able to describe the differences seen in the north and south end of Isle Royale as it pertains to glacial movement
- Students should be able to explain how glaciers form and move
- Students should be able to describe the effects glaciers have on land and how their effects are seen today

Site Requirements

A projector or overhead will be needed to show pictures of the glacial effects on Isle Royale.

Materials needed

- Pictures of Isle Royale (internet or Gale, K and Gale, T)
- Glacial worksheet (attached)
- Power point of glaciers (or lecture notes, whichever you prefer)

Risk Management

Showing slides/pictures to students in a darkened room can cause students to fool around and not pay attention. Be sure to rotate around the room and call on people who are not paying attention. You may want to designate someone whom you know will talk to be your slide advancer should you use a power point layout for the pictures.

Content background

Glaciers are large moving masses of compacted snow and ice. They move extremely slowly and exert an enormous amount of force on the land below and next to where they lay. As they advance they carry material with them. This till is made up of rocks and dirt of all different sizes. When the glacier stops advancing it deposit's the till in a pile called a moraine. As the glacier retreats it will spread some of this till backwards. The end effect is that you can have vastly different landscapes in a small area due to glaciers. On Isle Royale you see this with the north and south side. When the glaciers advanced they pulled a lot of the soil from the north end of the island to the south end of the island. The result today is a boreal northern end (spruces, pines, shrubs) and a hardwoods southern end (maples, oaks). (Booth) When looking at Michigan as a whole one first notices the Great Lakes, followed by the many inland lakes and glacial deposits. This is seen in many other countries as well, including Sweden ,Canada and Switzerland to name a few.

Methods

In this lesson students will be presented with notes via power point. When the lecture is finished they will receive an assignment that asks them to apply the knowledge they learned (not just spitting back memorized facts).

Procedure

1. Hand students the power point slides
2. Go through slides at a pace that includes everyone's ability to take notes
3. Halfway through the lesson stop and ask three to four people to sum up the most important things that have been said so far in 30 seconds or less (this will help gauge comprehension as you go).
4. Once done with the lecture hand out the glacial worksheet and allow students to start working on it (assuming there is time).

Assessment

The assessment will be the very last question on the glacial worksheet. Along with that will be questions pertaining to the lecture on the unit test and any journal entries/bell work you have your students complete.

Extension

There are many places on Earth that show evidence of glacial disfiguration. Have students research an area of the world that has seen similar effects on its land due to glaciations as has Michigan and Isle Royale. They should be able to draw comparisons between Michigan and whatever area they are researching as well as how the effects are still felt today in terms of economy and daily life.

Name: _____ Date: _____ Hour: _____

Glacial Worksheet

Directions: Answer the following question using the knowledge you have gained in class. Be certain to write in complete sentences.

There are many places on Earth that exhibit glacial effects on its land just like Isle Royale and many places in Michigan. Research an area on Earth that has been affected by glaciations. Be sure to draw comparisons between Michigan/Isle Royale and your new area, specifically comparing the effects the glaciers had on land as well as how these effects are seen today with regards to the economy and daily life.

Lesson 3

Goal statement

Students know that mining has been important in the upper peninsula for years, but they fail to realize how long mining has been going on. By the end of this lesson, students should have an understanding of how copper is formed, why it has been mined and what the cultural aspects of copper mining are.

Objectives

- Students should be able to explain the different ways in which minerals form underground
- Students should be able to give reasons supporting the mining of copper and other minerals from an economic and cultural viewpoint

Site Requirements

You will need access to computers and the library.

Materials needed

1. Assignment sheet (attached)
2. Computers

Risk Management

Students will be using the internet and library to research information. You need to be aware of plagiarism from the internet as well as students wanting to play games rather than their actual assignment when on the computer.

Content background

A mineral is a naturally occurring, inorganic solid that has a specific chemical composition. They are formed in two major ways, from the cooling of magma and out of super-saturated solutions. Each and every mineral is slightly different from every other mineral, and some are more valuable than others while some hold higher cultural standings than others. Minerals such as diamond are culturally revered, being thought of as a symbol of beauty and prestige. It so happens that diamonds are also economically viable, costing a small fortune to buy. Hematite on the other hand is not culturally important. It is not prized for its beauty. What it is prized for is the iron one can get out of it, which we use in almost everything around us in some way.

The mineral copper is of particular importance to Michigan. As far back as 5,000 B.C. settlers were mining copper in the upper peninsula. The effects are seen in abandoned mines and tools from many cultures across the United States. Much of the copper was used to make tools such as knives and arrow heads. To get the copper these ancient peoples used hot and cold water to crack the rock, and then rock hammers to break the smaller pieces of copper out. It wasn't until the mid-1800's that large deposits of copper were found in enough quantity to make it profitable.

Methods

If you lecture to students about everything they will become detached and bored with class. To change things up students will be teaching themselves and making a presentation to the class. This will allow students to feel as if they are directing their learning and not the teacher, yet through careful preparation you will be able to lead them in the direction you want.

Procedure

1. Handout assignment details
2. Allow the class period to finish the paper
3. Randomly pick 3 - 5 students to explain their paper

Assessment

The assessment will be the final paper. Specifications for the paper are found on the paper assignment sheet.

Extension

Every culture in the world has minerals they prize for one reason or another. Have students look at different cultures and compare the reasoning behind their reverence for their mineral to that of ours and copper.

Name: _____ Date: _____ Hour: _____

Mining in Michigan Paper

You are to write a short research paper on mining in Michigan. It should contain the following information/answer any questions posed:

- Explain what a mineral is and how they form
- Why are minerals prized in human culture?
- How do we obtain copper from the ground?
- Describe the evidence that has been seen that supports copper mining by ancient cultures in Michigan
- What cultural, economic and environmental impacts has copper mining had on the Upper Peninsula?

Make sure your paper follows the guidelines below:

1. Typed, 12-point font, New Times Roman
2. Proper grammar, spelling, formatting
3. Addresses all of the points above
4. No more than two pages long, no shorter than one page long

Lesson 4

Goal statement

Students are always looking for ways to take class topics and relate them to the real world. With this lesson you can relate weather to what they see everyday. By the end of the lesson, students should be able to explain why we see different types of weather, how the atmosphere and hydrosphere work together to create weather, and how wind patterns affect the weather you see.

Objectives

- Students should be able to explain why weather on Isle Royale is so unpredictable
- Students should be able to explain the relationship between the atmosphere and hydrosphere pertaining to weather formation
- Students should be able to determine what an advancing weather system will do when it encounters different land/water masses

Site Requirements

You will need some large roll paper for students to create posters on as well as markers or crayons so that the posters have some color.

Materials needed

1. Large sheets of paper (from a roll)
2. Weather assignment sheet (attached)

Risk Management

The students will be working in groups to create a poster. As with previous lessons it is important to walk around and observe the students working to ensure that one student is not doing all of the work.

Previous Knowledge

Students should have basic knowledge of the following topics in meteorology:

- Cloud formation
- Types of clouds
- Water cycle
- Difference between weather and climate
- What an air mass is and where they come from
- Global wind systems
- Fronts
- Pressure systems

Content Background

Climate is the long-term variations of weather in a particular area. Climate is determined by a number of factors. The major players in this complex equation are how wind patterns move in the atmosphere and the relationship between the atmosphere, hydrosphere and the geosphere.

As the wind blows it carries with it the characteristics of whatever land/sea mass it start in. As it travels its characteristics begin to change depending on what it is moving

over. For example, if a cold air mass from Canada begins to move towards the southern United States (Texas, Alabama, etc) the resulting change will be a gradual warming of the air. As it moves through the country it will bring cooler temperatures until it warms up to the same temperature as the land it is over. If an air mass originates over the Gulf of Mexico it will bring warm, moist air to wherever it travels until it begins to dry out.

The relationship between the atmosphere, geosphere and hydrosphere also plays an important role. If a warm air mass travels over warm water it will pull the water into the atmosphere, causing condensation and rain to follow. If it were to travel over a cold body of water the air would gradually begin to cool, pulling moisture from the atmosphere, causing it to dry out and clear up. A similar thing occurs when air masses travel over land. The temperature of the land, amount of moisture in the ground and the amount of space being covered all affect the weather that you will see. If there are a lot of lakes then you will experience lake effect weather (such as in western and central Michigan and northern Ohio). It is important to note that the triple relationship described here is very complex. There are many things that effect what the weather is. The situations described above are general examples and do not occur that way every time.

Methods

The “real” world is one that works within collaboration and communication. By putting students into groups we allow them to practice communication and collaboration in a setting that is easier to regulate and control. This also gives the students a chance to give the work their own personal touch instead of only writing the answers down on paper when we ask them.

Procedure

1. Divide the class into groups of 4 - 5
2. Hand out the poster assignments (there are 5 different topics)
3. Give students time to work on the posters
4. Have students present their posters

Assessment

The main assessment on this lesson will be during the unit test. Being that there are presentations involved a quiz the next day is advised to make certain students are paying attention while their peers are talking. Participation is also assessed during this lesson, more specifically in that each student has played a role in the creating and presenting of the poster.

Extension

You can relate the idea of relationships and wind patterns to anywhere in the world. Ask students to use the concepts to explain why Grand Rapids and Lansing get more snow and rain than the east side of the state, or why Cleveland can get 4 -5 feet of snow from a storm that only left us 6 inches.

Name: _____ Date: _____ Hour: _____

Isle Royale Worksheet

The weather on Isle Royale can be very unpredictable and very different than what is seen on the mainland. These differences are seen in amounts of precipitation, cloud cover, temperatures, severity of storms and many other conditions. Using what you know about weather and the atmosphere create a poster that explains one of the relationships below and how it effects Isle Royale. You will be told which topic to answer once your group is formed. Circle your topic so that you do not forget!!

Group 1

- Explain how air masses can affect the weather on Isle Royale.

Group 2

- Explain how the relationship between the atmosphere and geosphere can affect the weather on Isle Royale.

Group 3

- Explain how the relationship between the atmosphere and hydrosphere can affect the weather on Isle Royale.

Group 4

- Explain how the relationship between the geosphere and hydrosphere can affect the weather on Isle Royale.

Group 5

- Explain how the relationships between the atmosphere, hydrosphere and geosphere, along with air masses, affect the weather on Isle Royale (basically you are combining groups 1 - 4 and showing the relationship that they all have on the weather)

Make sure your poster has the follow:

1. Legible writing
2. Pictures showing what happens
3. Writing explaining what happens
4. Creativity
5. Accurate information

Make sure everyone in your group has a role to play. The same person should not be doing all the work. You have research to do, a presentation to plan and do, drawings to be done and writing to be placed on the poster. Simply put, there is plenty for everyone to do and your time restrictions require you to work as a team.

Bibliography

- 1) Booth, G. (2003). *The Moosewood Project*.
<http://www.cbc.yale.edu/courseware/moosewood.html>
 - Provides useful information on the ecology of Isle Royale. Useful for lesson 2.
- 2) Dufresne, J. (1991). *Isle Royale National Park: Foot trails and water routes*. Seattle, WA: The Mountaineers.
 - Great information on the trails on Isle Royale, their difficulty, how long they are and what one can expect to encounter while on that trail. Useful for lesson 1.
- 3) Gale, K & Gale, T. (1995). *Isle Royale: A photographic history*. Houghton, MI: Isle Royale Natural History Association.
 - Contains pictures of Isle Royale. Useful anytime you want to show geologic features, flora/fauna on the island, trail conditions, etc. Useful for lesson 2
- 4) Hess, Frances Scelsi, et al. (2005). *Earth Science: Geology, Environment and the Universe*. New York, NY: Glencoe.
 - The classroom text I use. Much of the background content can be found here.
- 5) Holden, T. (1985). *Above and below: A history of lighthouses and shipwrecks of Isle Royale*. Houghton, MI: Isle Royale Natural History Association.
 - Provides a glimpse into the near disasters that are the shipwrecks of Isle Royale as well as the steps taken to prevent them in the future.
- 6) Huber, N.K. (1983). *The geologic story of Isle Royale National Park*. Houghton, MI: Isle Royale Natural History Association.
 - This book is useful if you want to put a geologic spin onto the formation of Isle Royale and how volcanic activities led to much of the formation of Lake Superior before the glaciers came through.
- 7) Louv, R. (2005). *Last child in the woods: Saving our children from nature deficit disorder*. Chapel Hill, NC: Algonquin Books.
 - Gives great ideas on taking nature education (such as Isle Royale ideas) and incorporating them into classrooms so that students do not forget about the woods and nature.
- 8) Manninen, C. (2006). Web site: <http://www.irnha.org/>
 - Contains general information and links about Isle Royale itself.
- 9) Martin, S. (1999). *Wonderful power: The story of ancient copper working in the Lake Superior basin*. Detroit, MI: Wayne State University Press.
 - Copper mining history is rich in the Upper Peninsula and on Isle Royale. This book will help back that up. Useful for lesson 3.
- 10) National Geographic, (2004). *Trails Illustrated Map: Isle Royale*. Evergreen, CO:

National Geographic.

- Full color topographic map of Isle Royale. Useful for lesson 1.

11) Shelton, N. (1997). *Superior wilderness*. Houghton, MI: Isle Royale Natural History Association.

- This book has a lot of general knowledge of Isle Royale, including copper mining, geology and human activities on and around the island.