Lesson 2 Michigan Glacial History

**Sub-Driving Question**: How did glaciers form in my Backyard?

**Objective(s)**: LWBAT describe how glaciers flow (Mastery).

 LWBAT demonstrate how glacial flow formed the Great Lakes (Mastery).

**Grade(s)**: 3

**Standards** from the Michigan Department of Education:

**E.SE.E.2** Surface Changes- The surface of Earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

**E.SE.03.22** Identify and describe natural causes of change in the Earth’s surface (erosion, **glaciers**, volcanoes, landslides, and earthquakes).

Materials: \*note some need to be prepared before class
------Activity 3-----------------------------------------------------
Borax Laundry Booster
Measuring Cup
2 Quart Mixing Bowl
1 Cup of Glue per student or group (1 gal. jug is ideal)
Toothpicks
Wax Paper
Spoons for Mixing
Warm Water (warm water from any tap will work)
Laminated Map of North America
Laminated Phases of the Great Lakes

**\*\*Bold portions of the Lesson are representations of the teacher talking.**

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| 3-3:03 | Background**Do you remember how ice can shape landforms?****Can you list a few of the glacial features we talked about yesterday?**-kettle lakes, moraines, outwash, striations on rocks and U-shaped valleys. **How many of you knew that Michigan’s great lakes were completely formed by glaciers?**-just receive a hand-poll of yes or no And were they kettle lakes the result of big chunks of ice that were left behind –or something else?-Something elseWho can describe for me how that happened?-glaciers eroded the weaker rocks that formed the surface of the Earth in those areas, giving us deep depressions that would become the Great Lakes. **Name the Great lake**s: HOMES acronym: Huron, Ontario, Michigan, Erie, Superior |
| 3:03-3:10 | Geological history: \* You can inform students that these are values made by scientists that have been able to date the different sections of glacial deposits.\*\* You may choose to ask these questions or skip this portions entirely:**When was Michigan covered with the Ice that would help to shape the Great lakes?** -Around 15,000 years ago**How many times do you think that the glaciers accumulated enough snow and ice to cover Michigan to then retreat again? How many times did this Cycle happen**?-Around 4 timesReference the Major Stages in the Evolution of the Great Lakes to gather more background information. |
| 3:10-3:15 | Questioning to Motivate the Activity: **What do you think the glaciers could have done to form the Great lakes? Let’s reflect on what we know about glaciers…**  (priority to evidence)-They Erode!-glacial weight and force can carve out deep channels or valleys-rivers carrying away sediment**“They carry sediment in both large chunks and small pieces of sand.”** **But once the glaciers pick up the sediment, how does it get moved away from it original location.** **Take for example the rock that laid where the Great Lakes are now… where did it go?*** **During this next activity we will learn how the glaciers moved…**
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|  | Students Begin Experiment: This is to simulate a glaciers movement!Half of the fun is actually making the flubber, so I would suggest letting the kids have a small part in mixing the substances together. You must determine how your class can handle making such a messy substance. A word of caution is that the flubber can get stuck in the carpet and never come out so be very careful.  Also the flubber should not be ingested. If this occurs, call poison control immediately. (SAFTEY) |
| 3:15-3:30 | Flubber Recipe from Dr. McKenzie, The Ohio State University\*\*(for a class set, you may wish to double or triple the large batch size)

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| **Large Recipe** | **Preferable for a class of 10 or less** |
| In a large container (like a pail) combine  |
| 1 1/2 C | warm water |
|  2 C | white glue  |
| In a smaller container combine |
| 1 1/3 C | Warm water |
| 3tsp | Borax |

* Mix ingredients in each container thoroughly.
* Pour contents of smaller container into larger container.
* Gently lift and turn the mixture until only about a tablespoon of the liquid is left. FLUBBER will be sticky for a moment or two. Let the excess liquid drop off, then FLUBBER will be ready.
* Store in an airtight container for up to three weeks.

Use FLUBBER to simulate glaciers* In tubes or slanted pans like paint roller pans.
* with small pebbles, to show carrying ability of glaciers and how glacial scratchings and grooves are formed.
* with toothpicks, to show flow of glaciers.

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| **Small Recipe** | **Preferable for a class of about 20** |
| In a large container (like a pail) combine  |
| 0.75C  | warm water |
| 1C | white glue  |
| In a smaller container combine |
| 0.67 C | Warm water |
| 1.5 tsp | Borax |

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| 3:30-3:45 | To begin the questioning phase sit students back down after making flubber and allow them each to have a moment to play with the material. Enforce play rules: you can play with the flubber at your seat as long as you keep it over your desk and not near your neighbors. After play ask students to **remind you why we made flubber during our glaciers lesson**-to show how the sediment moved**Let’s set the flubber on the table and allow it to sit for a few moments and observe what happens.** (formulate explanations) -it expands outwards as its height gets smaller -It Moves! It isn’t a stagnate piece of ice, it actually FLOWS!On a sheet of paper have students draw a picture of their observations of the flubber.  |
| 3:45-3:55 | Collect all the students’ flubber but leave papers. Pull out the laminated Map(s) of North America.Ask:**Given what you know now, do you think that enough snow and ice could have gathered (accumulated) in Hudson Bay (point to it on the map) to cover all of Michigan? Lets see…****Activity:**Put Large “globs” of the flubber on the location of Hudson Bay until enough of the flattened Flubber has reached the southern border of Michigan.Note: Keep saying that ‘**it snowed’** when you add another glob of flubber to the map. You may have to add/ ‘make is snow', more than once or twice.Ask: Explain how the enough snow could have accumulated to cover all of Michigan and most of Canada on the same sheet of paper from before. (evaluate their explanations) **On the picture below:** Indicate the different lobes to the students. On a new sheet of paper have each student write the name of each of the lobs and take a guess to why they are named the way they are. Lets students use a large map of Michigan to help them if you have one.  |
| 3:55-4 | Pass out the Laminated Phase Cards: Have students discuss with a partner what order they think the cards go in. Students should be able to use some new knowledge to express why they ordered the cards the way they did. (communicate and justify)\*\*You may want to help your students along as they contemplate what to do with figure 10. It may seem to be counterintuitive to the other phases seeing as there is a lot of sediment laid down. An important thing to remember is as glaciers melt they deposit all of the sediment that they once had within them; leaving the area in front of the glacier very messy, dirty, and full of random sediment. It isn’t until the glaciers melts in a large enough quantity that the meltwater will then move the sediment away from the front of the glacier. The sediment carried away will then clean up the area and make it look much like the Michigan we see today: thus the point of figure 11. Another helpful hint is to encourage the students to look at the names of lakes. Try to group the names that are unfamiliar to the beginning phases and the names of lakes that look more familiar to the later phases. Many of the current lake names are indicated by “Early [lake name]” to show how much of the sediment was carved out of that lake bed and is much like how we see it today.  |
| Evaluation: I will know that the LWBAT describe how glaciers flow they indicate movement on their observation sheet.  I will know that the LWBAT demonstrate how glacial flow formed the Great Lakes they correctly align the phase cards while also communicating why that placed them in the order they did. Important to keep in mind that the cards indicate the amount of sediment moved as the glacier advanced and retreated.  |

 **KEY For PHASES Activity**

**Order Figure 8, 9, 10, 11 in decreasing age. Explanations are included in each of the figure descriptions (Farrand, 1988).**

