

A Cookie Catastrophe:
An Elementary Inquiry Learning Experience

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As a pre-service teacher, I am thrilled to witness and be a part of the historical changes within the field of education and excited by the research-based pedagogical approach and direction of the Ontario Ministry of Education. As traditional learning shifts to inquiry-based learning, educators are encouraged to develop and co-create learning experiences and opportunities that move beyond traditional literacies and are reflective of deeper learning competencies. Fullan (as cited in NPDL, 2019) refers to deeper learning competencies as the well-known twenty-first century skills, such as critical thinking, creativity, communication and collaboration, and has included citizenship and character development.

As educators, it is crucial that we spark student's natural curiosity and interests through our educational experiences. Having said that, offering students a real-life and relatable learning experience is an effective approach to gaining student interest. Science and technology classes can act as a vehicle for inquiry and enhance deeper learning competencies. The following article will shed light on a learning experience that I created for grade two students using the Smarter Science (2014) framework and the 5E instructional model in my science and technology education course. For context, the learning experience is based on a scenario that depicts an individual preparing to bake cookies and realizing they do not have the ingredients needed. In an effort to retrieve the ingredients, the individual leaves their house to go to the grocery store and when they return they realize they are locked out of their house. When they find their spare key, they notice it is frozen and will need to use their baking ingredients to speed up the melting process.

A Cookie Catastrophe

Grade: 2

Strand: Understanding Matter and Energy

Curriculum Area: Science

Unit: Properties of Liquids and Solids

By exploring various substances and their effects on ice, through a structured inquiry approach, students will begin to understand matter and energy, and more specifically that liquid and solids have specific properties and interact in different ways.

Ontario Ministry of Education Specific Expectations

2.3 “investigate, through experimentation, interactions that occur as a result of mixing and/or dissolving liquids and solids (e.g., salt and water, sand and water), liquids and liquids (e.g., oil and water), and solids and solids (e.g., salt and sand)

3.4 identify conditions in which the states of liquids and solids remain constant (e.g., solids remain solid when broken; liquids remain liquid when poured) and conditions that can cause their states to change (e.g., liquids may freeze when the temperature drops; solids may melt when heated)” (Ontario Ministry of Education, 2007, p. 59-60).

Materials

Please Note: The following list of materials is intended for one group of students. If you are planning to separate your class into various groups, please keep this in mind when collecting materials.

- 5 keys frozen in ice cubes
- Small amount of each substance: flour, salt, baking powder and sugar
- 4 small containers to hold each substances

- 4 spoons (1 for each material)
- A timer
- Science Journal to record predictions and information

Instructions

Please Note: This section is written in two sections, with the intent to first provide a brief overview of the process and then a more detailed description that outlines my implementation of the 5E instructional model.

Students will be introduced to the lesson with a real-life scenario. The scenario below was written in an effort to draw students' attention and curiosity and to invite them to be problem solvers. Below is the scenario drafted for this lesson and was written with a conversational manner in mind:

“Last night I was going to bake some delicious chocolate chip cookies when I realized I didn't have the ingredients I needed. I searched every cupboard and couldn't find a single ingredient. So, I made a list of all the ingredients I needed: flour, salt, baking powder and sugar, and off I went to the grocery store. When I got home, I realized I had locked the door and left my house keys on the kitchen table. When I went to grab my spare key, which is in a small flower pot in my backyard, I realized it was frozen!”

Teacher Instructions

1. Pour substances (salt, flour, baking powder and sugar) into little containers - four substances per table.
2. Divide students into groups of 4-5 students.
3. Place 5 ice cubes with frozen keys at each table.

Student Instructions

1. Make a Hypothesis: What substance do you think will melt the ice the fastest?
2. Select the substances you think will help Miss. Lemke melt ice the fastest.
3. Plan how you are going to use the substances and materials given.
4. Test out your hypothesis and observe the results.
5. Discuss your observations with your classmates

The following outlines the process of the 5E instructional model.

Engage: Initiating and Planning

Begin the lesson by reading the above noted scenario. Collaboratively, brainstorm with the students and initiate a discussion by asking the following questions:

- How can you retrieve the key from the frozen ice?
 - How will you get the key quickly so that they can get inside their house?
 - What do we know about each of these substances?
 - How will you know which substance melts the ice the fastest?
- Students will make a *hypothesis*, or educated guess, based on their previous knowledge of ice and the given substances

Explore: Performing, Recording and Investigating

- Students will test different substances on the ice and *observe* the reaction
- Students will *record* how fast each substance melts the ice
- Students will *plan* which substance they would like to try first and how they are going to use them

- Students will *experiment* with the different substances and decide which substance is the most effective at melting ice

Explain and Elaborate: Analyzing and Interpreting

- Students will *compare* and *contrast* the different substances to determine which one melts ice the fastest
- Students will *analyze* and *classify* the substances into groups that reflect their reaction with the ice

Explain and Extend: Communicating

- Students will *discuss* the results and their findings
- Students will *reflect* on and *report* their findings

Safety Considerations

- Be aware of student allergies and ensure that students do not have any allergies or documented skin sensitivities to the substances being used: flour, salt, baking powder and sugar.
- Ensure a first-aid kit is readily available if needed and locate the closest eye-wash station
- Provide safety gear, such as goggles or glasses and gloves.
- Ensure water/ice stays on the workspace to avoid slips

Inspiration and Extension

For this learning experience, I was inspired by an activity created by Coffee Cups and Crayons (2020). Coffee Cups and Crayons (2020) used frozen sea animals and experimented with different types of salt. I altered their experiment and opted to include a scenario that I believed students would be more interested in. In doing so, I modified the substances and materials used.

To further our learning, my students and I could extend our findings by experimenting with different types of salt next class.

References

Coffee Cups and Crayons. (2020). Ice and Salt Science Experiment. Retrieved from

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