

ECOS Inquiry Template

1. CONTRIBUTOR'S NAME: KATIE HAILER

2. NAME OF INQUIRY: GROWING BORAX SNOWFLAKE CRYSTALS

3. GOALS AND OBJECTIVES:

- a. Inquiry Questions: What are crystals? How are crystals formed?
- b. Ecological Theme(s): geology/crystals
- c. General Goal: to grow borax crystals on pipe cleaners in the shape of snowflakes
- d. Specific Objectives: to teach the precise nature of the formation of a crystal
- e. Grade Level: k-5
- f. Duration/Time Required:
 - Prep time: 20 min.
 - Implementing Exercise During Class: 45min - 1 hour
 - Assessment: N/A

4. ECOLOGICAL AND SCIENCE CONTEXT:

a. Background (for Teachers): Teachers need to get the students in the class to each bring in a glass jar from home, preferably a quart glass jar. Hot water needs to be provided in the classroom. We accomplished this by filling up a large coffee pot with water. This provided us with about 70 cups of hot water to give to the students to fill up their jars. Borax also needs to be purchased. Borax can be found in the laundry detergent aisle of your local grocery. Teachers also need to be prepared for a hands-on activity with students talking and moving about the room. Time needs to be provided for clean-up as well, as the borax leaves a residue on the desks if spilled.

b. Background (to present to Students): Students need to be asked what they know about crystals. A crystal is a solid made up of a pure substance that forms slowly in a very specific repeating pattern. Not all pure substances form crystals because it is a delicate process. The atoms are arranged in a regular repeating pattern called a crystal lattice. A good example to give the students is carbon. A diamond is formed from carbon under pressure and with the arrangement in a perfect crystal lattice. Graphite (pencil lead) is also formed from carbon but in this case the crystal lattice arrangement is more random.

5. MOTIVATION AND INCENTIVE FOR LEARNING: This is a very hands-on project. Students will be able to design their own ornament from pipe cleaners and put this ornament into a borax water solution. Once the ornament is set up properly, the students only need to wait overnight to see their crystals grow. After a few days, the students can remove their ornament from the jar and hang it wherever they like. These crystal ornaments look nice in windows and on trees. The students can take the ornaments home and share them with their family.

6. VOCABULARY:

crystal: A solid made up of a pure substance that forms slowly in a delicate, repeating pattern

crystal lattice: a regular repeating pattern of atoms, a very exact organization of atoms that leads to the formation of a crystal.

7. SAFETY INFORMATION:

HOT WATER IS USED. PERCAUTIONS SHOULD BE TAKEN TO PREVENT ANY BURNS FROM THE HOT WATER. WE DID NOT ALLOW OUR STUDENTS TO POUR THEIR OWN WATER. WE DID THIS PART FOR THEM.

8. MATERIALS LIST (including any handouts or transparency masters):

COLORED PIPE CLEANERS

STRING

PENCIL

GLASS JAR (QUART OR SIMILAR)

BORAX (20 MULE BORAX) 3 TABLESPOONS OF BORAX/CUP OF HOT WATER

HOT WATER

SPOONS TO STIR WITH

9. METHODS/PROCEDURE FOR STUDENTS:

a. Pre-investigation work: Talk about the formation of crystals. Explain a crystal lattice. Give examples of crystals that naturally occur in the environment. Why are some crystals considered precious or semi-precious and valuable?

b. Investigation work:

1) What evidence (data, samples) do students collect? If the students do not set up their jar/ornament correctly (i.e. ornament touches the bottom or sides of jar), crystals will not grow on the ornament. The crystals end up growing on the sides of the jar.

2) How do students present the evidence (data)? They have ornaments with crystals growing on them.

3) What conclusions are drawn from the evidence students collect? Students will be able to observe the delicate way that crystals are formed. If students do not set up the system correctly or move the jar before the crystals form, they will have a diminished number of crystals. Growing the crystals will allow the students to observe the delicate and precise nature in which crystals form.

4) Include examples of data sheets.

10. ASSESSMENT: If you're doing this activity in conjunction with a larger geology unit, a worksheet could be provided asking them observation and crystal formation questions.

11. EXTENSION IDEAS: THIS UNIT COULD EASILY BE MADE MORE IN-DEPTH. THIS COULD BE A FUN PROJECT TO USE IN CONJUNGTION WITH A LARGER GEOLOGY UNIT.

12. SCALABILITY: 3-8

13. REFERENCES:

[HTTP://CHEMISTRY.ABOUT.COM/CS/HOWTOS/HT/BORAXSNOWFLAKE.HTM](http://chemistry.about.com/cs/howtos/ht/boraxsnowflake.htm)

14. LIST OF EXPERTS AND CONSULTANTS

15. EVALUATION/REFLECTION BY FELLOWS AND TEACHERS OF HOW IT WENT: