Little Shrimpers: A Brine Shrimp Activity

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Grade Level:
Elementary-Middle School

Little Shrimpers

Purpose:
To test the responses of brine shrimp to environmental stimuli

Objectives:
Students will be able to:

- define stimulus and response.
- list possible stimuli to which brine shrimp may respond.
- design an experiment to test responses of brine shrimp to external stimuli.
- collect and analyze data.
- identify manipulated and responding variables.
- work cooperatively in small groups.

Materials:
To hatch and maintain brine shrimp:

- brine shrimp eggs (available from a pet store or biological supply company)
- two 2-liter soda bottles
- marine salt
- air pump
- airline tubing
- dechlorinating liquid
- hydrometer (for checking salinity)
- brewer's yeast
- dried spirulina (from pet store)
- turkey baster
- two check valves for air pump
- glass eye dropper (without bulb)

For experimental groups: (have materials available for students)

- paper towels
- pH paper
- eye dropper (one per group)
- Petri dish with lid (one per group)
- aluminum foil
- air pump with tubing
- vinegar
- ammonia
- flashlight
- ice
- heating pad
- sea salt solutions of different salinities
- artificial plants

Grouping:

- younger students: four/group
- older students: two/group

Preparation and Procedure:

Hatching and maintenance of brine shrimp:

There are many ways to hatch brine shrimp. A jar with some salt water is the easiest way, but they will not live very long like this. To keep the colony going, a little more care is needed. I prefer to keep the colony going as long as possible and refer to it throughout the year, but that is optional. Brine shrimp prefer a temperature between 77-86^{o} F, salinity of 30-35 ppt, a pH of 8-9, and strong aeration. To mix saltwater, add 30-35 g of marine salt to one liter of water. Be sure chlorine has been removed from water. Many set-ups are feasible, but an inexpensive hatchery can be made with two-liter soda bottles, airline tubing, and a pump. (See illustration)

Add about one teaspoon of eggs to your hatchery and wait two-three days. You will soon have more brine shrimp than you will know what to do with! Keep remaining eggs in refrigerator. They will keep for a year or more. Feed your brine shrimp **sparingly**; in nature they eat microalgae, but will survive in captivity on brewer's yeast or dried Spirulina algae (available in fish stores). **Do not overfeed**. Keep your colony in dim light. They will not grow well if kept in bright light; they will expend too much energy swimming toward the light. Don't use air stones; the bubbles are too small and can actually kill the little guys. To change the water, shine a light at the surface and drain water from the bottom. Keep the water **clean** if you want them to survive for any length of time. Once the eggs have hatched and had a chance to grow a bit, it is time to experiment!

Carrying out experiments:

1) Use the turkey baster to remove some water and brine shrimp. Place some in a Petri dish for each group of students. Allow students time to observe their creatures. Do not give any information or answer questions at this time. Groups should construct a list of their observations and questions that have come up. Allow sufficient time for discussion among group members. If dissecting scopes are available, the kids will enjoy looking at the critters at this time. Once all groups are finished, make a master list on the chalkboard.
2) Explain that the creatures are brine shrimp, sometimes called "sea monkeys." Go over the master list and correct any misconceptions. Add as much information about brine shrimp as is appropriate for your students. They should be very interested at this point. #1 and #2 should take about 45 minutes.
3) Introduce experimental phase of activity at this time. Explain to students that they are to design an experiment to see what brine shrimp will do if faced with a "stimulus." Do not define stimulus at this time. Let the kids figure it out as they go along. Have materials available for students to look at for ideas. All experiments must be approved before students are allowed to proceed.

4) When experiments are completed, student groups must present findings to the class via poster presentations. Following the completion of all presentations, ask the groups to make a list of stimuli and responses. Make a master list on chalkboard. #3 and #4 may take up to a week.

Safety:
Follow the usual guidelines for laboratory safety involving chemicals and animal care.

Sample questions:
1. How will you measure the brine shrimps' responses?
2. What do you expect to happen? Why?
3. Will you collect qualitative or quantitative data?
4. How many shrimp will you use? Why did you choose that number?
5. What are your manipulated, responding, and controlled variables?
6. What materials will you use?
7. How would this (response) help a brine shrimp to survive?
8. Can you think of another organism that might respond similarly to this stimulus? How could you test it?
9. Predict how a brine shrimp predator would respond to the same stimulus.
10. Describe a brine shrimp's ideal habitat.
11. What were some possible sources of instrument error? of human error?
12. If you were to repeat this experiment, what changes would you make?
13. What grade would you give yourself for the work you did with your group? What grade would your group members give you?

Where to go from here:
The advantage of maintaining brine shrimp throughout the school year is that it is an ideal stepping stone for discussing cycling of nutrients (carbon, oxygen, nitrogen, etc.), food webs (what do brine shrimp eat and what eats them?), predator/prey relationships, taxonomy (brine shrimp aren't really shrimp), anatomy, marine biology, adaptations, etc. The possibilities are endless. By tying new topics into something familiar, the teacher makes it easy for students to grasp unfamiliar content.

References and Resources:
There are many great web sites with lots of brine shrimp information. The ones that I have found to be most useful are:
1. http://ng.netgate.net/~jlatham/Hatch.html
2. http://www.tain.com/public/artemi~1.htm
3. http://www.killi.net/foodarts/brine.html
4. http://www.nwf.org/nwf/atracks/habitat/wetlands/wet10009.html
5. Other sources of information are right at your local pet shop. Most employees are knowledgeable about the culture of brine shrimp, and can answer questions as they pop up.

Suggestions for assessment:
Groups can be assessed on the visual and oral presentation of their results. Individual lab reports can be graded. Written quizzes requiring students to match the stimulus with the response is also an option.

Little Shrimpers Student Activity Sheet

Name:_____
Group Members:_____
_____

Experimental Design

1. **Problem:** We want to see what effect _____ has on _____.

a) Our **manipulated variable** is _____.

b) Our **responding variable** is _____.

2. To carry out our experiment, we need the following **materials:**

_____ _____

_____ _____

_____ _____

3. **Hypothesis:** If we _____, the brine shrimp will _____.

4. How many brine shrimp will you use?_____

Explain why you picked this number. _____

_____

_____

5. Our **procedure** for doing this experiment is: (use complete sentences.)

a:

b:

c:

d:

e:

f:

g:

h:

i:

j:

Teacher approval:_____

B) Data
Quantitative Data (draw table using ruler)

Qualitative Data:
Interesting observations:_____

_____

_____

_____

Results: Our hypothesis was correct /incorrect (circle one).

Possible sources of **human error** were:

_____

_____

Possible sources of **instrument error** were:

_____

_____

This experiment was important because:

_____

_____

Construction of brine shrimp hatchery