How does light effect etiolation in Pomatogenon perfoliatus?

Angela Kelley and Laura Murray

I. Engagement: The activities capture the students' attention, stimulate their thinking, and help them access prior knowledge.

Activity

Materials

Article about the Chesapeake Bay: The one that I will use is from my local paper, The Opelika-Auburn News, "Dead Zone" by Lawrence Latane III a writer from the Richmond Times-Dispatch

I will follow up with another article about Mobile Bay to link the similarities. The Opelika-Auburn News, "Scientists: Low Oxygen Levels Led to Mobile County Fish Kills" October 28, 2003

Procedure

Background Knowledge:

Assess the students knowledge of estuarine ecosystems by a class discussion. Make a list from this discussion. You may want to divide the list into what we know for sure, what we aren't sure about, and what we would like to know.

The students will be given a copy of the article and asked to answer the following questions.

1. Describe the effect of a "dead zone" and explain how the zone occurs.

2. Describe how an algal bloom occurs and explain its effects.

3. Explain how fall turnover occurs and how it fixes the problem of a "dead zone".

4. List at least 5 ways that humans impact the bay.

5. List at least 5 ways you can reduce your impact on the bay.
Revise the class list made earlier.

Next hand out the article on Mobile Bay. Have the students compare the results of the Mobile Bay with the Chesapeake Bay.

**References**

Opelika-Auburn News, "Dead Zone" by Lawrence Latane III of the Richmond Times-Dispatch


**Core Learning Goals**

Goal 1- 1.1

**II. Exploration:** Students are given time to think, plan, investigate, and organize collected information.

**Activity**

**Materials**

6-8 20 gallon aquariums  
6-8 aquarium lights  
6-8 grow lights  
6-8 circulating pumps  
6-8 rulers  
6-8 thermometers  
6-8 heaters  
1 bag potting soil (40 lbs.)  
1 bag sand (40 lbs.)  
scissors  
nylon screening (gray)  
cardboard or poster board  
masking tape  
power strips  
P. perfoliatus cuttings*

**Procedure**

1. Mix the potting soil and sand.
2. Put about 12 cm of the mix into the aquariums.
3. Run water into the aquariums until full. I would put a tray on top of the dirt mixture so that it wouldn't suspend in the water column as much.
4. Let the tank sit for a couple of days to acclimate and put the heater which should be set at 72 degrees, thermometer, light, and pump in place.
5. Use cardboard half way up the sides to cut back on light from the room.
6. You need to put in three 15 cm cuttings per planting and evenly distribute throughout the tank. Be sure to keep the cuttings wet.
7. Before you plant each cutting, use you fingers to gently strip the bottom half of the stem of its leaves. Gently push the bare stem into the soil, until the cuttings are firmly in place.
8. Over the next few weeks measurements should be taken of total stem length, total number of leaves, and total number of shoots. This should be measure once a week. The water should be monitored for temperature, water, and algal growth.

References

*cuttings of P. perfoliatus (sources)
Chesapeake Bay Foundation
6 Herndon Avenue
Annapolis 21401
(410) 268-8816

Horn Point Lab
2020 Horns Point Road
Cambridge, MD 21613
(410) 221-8467

CBF "Bay Grasses for the Masses Project" or "Bay Grasses for Classes"

Core Learning Goals

Goal 1- 1.2, 1.3, 1.4, 1.5, 1.6

III. Explanation: Students are now involved in an analysis of their exploration. Their understanding is clarified and modified because of reflective activities.

Activity
Materials

Data from experiment
Graph paper
Composition Notebook

Procedure

At this point the students should be ready to do a formal lab write up to go in their composition notebook. The write up should include the purpose, list of materials used, procedure, results, and conclusion.

Before the students write the section for the results there is a brainstorming session in which they decide what type of graph would be most appropriate for their results. Also, they will need to calculate the internodal length by taking the total length and dividing by the total number of leaves. This will measure the etiolation.

The following analysis questions should be answered:
1. What role do plant hormones play in this process?
2. Identify other factors that effect plant growth and describe their effect on the growth.
3. Why does etiolation take place? Explain this process using your experiment and your knowledge of hormones.
4. Explain how human impact effects etiolation.

References

none

Core Learning Goals

Goal 1- 1.4, 1.5, 1.6

IV. Extension: Students are given the opportunity to expand and solidify their understanding of the concept and/or apply it to a real world situation.

Activity

Materials

Materials will vary depending on the type of project each group selects
Procedure

Students will work in groups of 4-5 to come up with a project to improve the watershed where they live. This may include but is not limited to the following: stream monitoring; mapping where and what type of SAV is found; growing SAV and planting it; interviewing local individuals to find out what was in the water and is not now such as grass types, crab, fish types, oysters/mussels, etc.; planting a bayscape; planting a riparian area.

Each group will present their idea to the class using a Power Point presentation. Then the class will vote on which one they would like to do as a class project.

References

http://www.chesapeakebay.net/info/involved_schools.cfm
http://www.chesapeakebay.net/helpbay.htm
http://www.cbf.org

Core Learning Goals

Goal 1- 1.7

V. Evaluation: Evaluation occurs throughout the lesson. Scoring tools developed by teachers and students target what students must know and do. Consistent use of scoring tools improves learning.

Activity

Materials

Formal Lab Report
Varies with your class project
Lab Report Rubric

Procedure

The students will be assessed by a rubric that I give them at the beginning of the year for all of their reports which are kept in a composition book.

They are assessed periodically as the lab progresses on their data
collection. Classroom participation is also a part of the lab grade. Participation is integral to the class project. They will write a report based on the class project that will include a description of what they did, the importance of the project to the Bay, ideas for future projects, and what they learned from the project about the Bay and their own personal impact on the Bay

References

none

Core Learning Goals

Goal 1- 1.5