

Activity Title: Hypoxia, Dead Zones in the Gulf of Mexico?

Subject (Focus/Topic): This lab is about Water Chemistry.

Grade Level: 7

Average Learning Time: 1 class period

Lesson Summary (Overview/Purpose): The students will use data from the SEAMAP program to gain understanding of the oxygen levels in the Gulf of Mexico.

Overall Concept (Big Idea/Essential Question): The students will understand how the amount of oxygen controls the amount of life in the Gulf of Mexico.

Specific Concepts (Key Concepts): N/A

Focus Questions (Specific Questions):

1. Where does hypoxia exist in the Gulf of Mexico?
2. How have these areas changed over the years?
3. How are the number of creatures connected to the amount of oxygen?

Objectives/Learning Goals: Students will compare and contrast the oxygen levels found in the Gulf of Mexico between years and draw connections to the amount of life found in that location.

Background Information: Students just need to be familiar with the Gulf of Mexico geography.

Common Misconceptions/Preconceptions: N/A

Materials: copies of lab, computers

Technical Requirements: computers

Teacher Preparation: The teacher should take the time to investigate hypoxia through the web site listed in the additional resources section.

Keywords: hypoxia

Pre-assessment Strategy/Anticipatory Set (Optional): N/A

Lesson Procedure:

1. Pre-lesson questions

I have students answer the questions at the beginning of class while I take attendance. I project the questions on to the screen and have the kids answer on their own paper.

- a. How do fish get oxygen?
- b. How do whales get oxygen?
- c. How do humans get oxygen?

2. Class discussion

Go over the answers to the questions but be sure to elaborate and include the organs each creature uses to get its oxygen. Make sure the students understand the importance of oxygen to ocean creatures.

3. Hypoxia lab

4. Class discussion

At the end of class or perhaps the beginning of class the next day I discuss the following questions with the students.

- a. Did you see any evidence of hypoxia in the data collected while I was at sea?
- b. Did you see evidence of hypoxia in the years past?
- c. Which animal's habitat shifted due to the lack of oxygen?

Assessment and Evaluation: Standards:

- **National Science Education Standard(s) Addressed:**
Properties and changes of properties in matter
- **Ocean Literacy Principles Addressed:**
Principle 4 concept a
- **State Science Standard(s) Addressed: Indiana 7th grade 3.7**
- **Other National or State Standards Addressed (Optional)**
N/a

Additional Resources:

Gulf of Mexico ecosystem viewer

http://www.ncddc.noaa.gov/website/GOM_Portal/viewer.htm

hypoxia watch

<http://www.ncddc.noaa.gov/hypoxia/>

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Hypoxia Lab

What is hypoxia?

Hypoxia in aquatic systems refers to waters where the dissolved oxygen concentration is below 2 mg/L, a level which is deadly to many organisms. Most organisms avoid, or become physiologically stressed, in waters with oxygen below a concentration of 5 mg/L. Also known as a *dead zone*, hypoxia can also kill marine organisms which cannot escape the low-oxygen water, affecting commercial harvests and the health of impacted ecosystems.

Procedure:

Today you will be a real scientist and analyze data which has been collected from the Gulf of Mexico.

1. Go to my blackboard site and click on files. Select hypoxia 2012 to bring up a picture of the oxygen levels this past summer. With your partner carefully examine the picture to answer the following questions:
 - a. Where is the oxygen level the lowest?
 - b. Are there any hypoxia areas in the picture?
 - c. Are there any areas where the oxygen is low and the creatures are stressed?
 - d. If so are these areas close to shore or close to the center of the Gulf of Mexico?
2. Next we are going to compare this years data to that collected in years past. Minimize the explorer screen you were using and open a new screen then follow the link on my blackboard site to the Gulf of Mexico ecosystem viewer.
3. In the first box choose ocean chemistry
4. In the second box choose dissolved oxygen.
5. In the third box choose hypoxia studies.
6. In the fourth box choose 2011 summer.
7. Then down below click on add to list then on draw map.
8. Zoom in on the section of the map that was present in 2012 data.
 - a. Where is the oxygen level the lowest?
 - b. Are there any hypoxia areas in the picture?
 - c. Are there any areas where the oxygen is low and the creatures are stressed?
 - d. If so are these areas close to shore or close to the center of the Gulf of Mexico?
 - e. Overall is the amount of oxygen greater or less than in the picture of the 2012 data?
 - f. What would you predict for 2013?
9. Clear the map and choose 2004 summer. Follow the same directions as above and create a map.
 - a. Where is the oxygen level the lowest?
 - b. Are there any hypoxia areas in the picture?
 - c. Are there any areas where the oxygen is low and the creatures are stressed?
 - d. If so are these areas close to shore or close to the center of the Gulf of Mexico?

- e. Overall is the amount of oxygen greater or less than in the picture of the 2012 data?

10. Clear the map and choose 2002 summer. Follow the same directions as above and create a map.
 - a. Where is the oxygen level the lowest?
 - b. Are there any hypoxia areas in the picture?
 - c. Are there any areas where the oxygen is low and the creatures are stressed?
 - d. If so are these areas close to shore or close to the center of the Gulf of Mexico?
 - e. Overall is the amount of oxygen greater or less than in the picture of the 2012 data?

11. Clear the map and change the information in the first box to Aquatic Sciences.
12. Choose Bottom trawl analysis – SEAMAP in the second box.
13. Choose the species of your choice in box three.
14. Choose summer in box four.
15. Finally choose 2004 – number per hour in the fifth box then create the map as before.
16. Study the distribution of the species then change the year to 2002, being sure to clear the map of the 2004 data.
 - a. What species did you choose?
 - b. Did the number distribution of the species change from 2002 to 2004?
 - c. If so did the numbers increase or decrease?

Discussion

1. Compare the change in creature numbers to the oxygen available during those years. Can you see a connection between the amount of oxygen and the number of creatures?
2. What will happen to the species you choose if the oxygen falls to hypoxia levels in the middle of the Gulf? Would this change affect the species you choose to investigate?
3. What if the coastal waters falls to levels of hypoxia? Would this change affect the species you choose?