

Topic:	Post Visit Lesson Plan for the Environmental Monitoring Interactive Stations: Ocean Conditions
Lesson Title:	Oh Buoy!
Grade Level:	4th – 5th Grades
Science Domain:	Physical Science
Purpose: The students will reflect on their field trip experience to the INFINITY Science Center and share information learned with others.	
Connecting to the Next Generation Science Standards	

Students who demonstrate understanding can:	
Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. (NGSS 4-PS4-1)	
4-PS4-1 Waves and Their Applications in Technologies for Information Transfer	
The materials/lessons/activities outlined below are intended to help students reach the Performance Expectations listed below.	
Performance Expectations:	Connections to Classroom Activity Students:
<i>Science and Engineering Practices</i>	
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle.	I can build a floating model of a buoy using various household materials to make sense of wave behavior including wave amplitude, wavelength and the motion of the object.
<i>Disciplinary Core Idea</i>	
PS-4: Wave Properties Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave	I can observe waves in a water demonstration and look for patterns in amplitude (height of the wave) and wavelength (spacing between wave peaks) and communicate the information to others.

<p>except when the water meets a beach.</p> <ul style="list-style-type: none"> • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). 	
<i>Crosscutting Concept</i>	
<p>Patterns</p> <ul style="list-style-type: none"> • Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. 	<p>I can look for similarities and differences in patterns in data collected on an ocean and river buoy.</p> <p>I can collect local weather data and look for patterns to make predictions for weather forecasting.</p>

Teacher Background Information

The Environmental Monitoring exhibit showcases live data feeds covering three topics: ocean conditions, air quality and river conditions. You and your students will explore the environment while learning about the role of data collection in scientific research.

There are six interactive computer stations located within the Environmental Monitoring exhibit, with signs clearly indicating the type of information available at each station. Each, touch-screen station, gives visitors a first-hand look at environmental data, the scientists who collect them, and the valuable insights that those data can yield.

The stations or kiosks include the following topics: **ocean conditions, air quality, and river conditions**. There are two identical kiosks for each topic located within the exhibit for a total of six kiosks. This lesson plan primarily focuses on ocean conditions and how buoys collect data such as water temperature and wave height.

When visitors visit the exhibit they will have the opportunity to interact with the live data from the different collection sites and with on-screen instructions can navigate the maps featured. Videos will be embedded within the screens with scientists explaining how they collect the data and why it is important they do so.

For additional information about the Next Generation Science Standards and in particular 4-PS4-1 Waves and Their Applications in Technologies for Information Transfer, click on the following PDF:

http://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-PS4-1%20Evidence%20Statements%20June%202015%20asterisks.pdf

Statement of Learning Objective:

I can communicate to others how scientists use technology to inform others about the weather.

Common Learner Misconceptions:

Please refer to the following website as a reference of Common Misconceptions about Oceans:

<http://beyondpenguins.ehe.osu.edu/issue/polar-oceans/common-misconceptions-about-oceans>

Climate Misconceptions: A Top 10 List

<http://beyondpenguins.ehe.osu.edu/issue/climate-change-and-the-polar-regions/climate-misconceptions-a-top-10-list>

Materials:

- Digital pictures from visit to the INFINITY Science Center
- Drawing paper and markers, colored pencils, or crayons
- Brochures to share as examples
- Various household materials that float that can be made into a model buoy: PVC pipe, water bottles with tops, plastic kitchen ware containers, plastic plates, etc.

Vocabulary:

- Model
- Buoy
- Forecast
- Brochure

Safety:

Students need to be careful when building their model buoy and only use materials that have been approved by you based on their design and material list. Caution students to choose materials that are “household” materials and deemed safe by you or an adult.

Safety Rules available for download from NSTA (National Science Teachers Association):

<https://www.nsta.org/docs/SafetyInTheScienceClassroomLabAndField.pdf>

Adaptations/Accommodations for Exceptional Students:

ELL students may need help with understanding the vocabulary and/or writing letters. Pair students with a partner to help with directions and label the materials with the English word and also the student’s native language when learning new material. Considering pairing students who may need additional help while researching the information in the computer lab or in the classroom.

Literacy Connections:

Media Sources:

<https://www.youtube.com/watch?v=6vgvTeuoDWY> NASA The Ocean: A driving Force

for Weather and Climate. This short video (6 minutes) explains how the ocean impacts people everywhere.

<http://www.weatherwizkids.com/weather-forecasting.htm>

Weather forecasting website

<http://www.learner.org/interactives/weather/forecasting2.html>

A Meteorologist's Toolbox: Gathering Weather Data

5E Instructional Process:

Engage:

Activity

1. Gather students to discuss the recent field trip to the INFINITY Science Center. Lead a discussion on the Environmental Monitoring Station: *Ocean Conditions*. Remind the students that prior to the field trip, we spent time learning about buoys and how scientist collect data to help citizens and/or other scientists make informed decisions about the environment. Share pictures, if available, of the exhibits downloaded from student cameras and/or phones.
2. Example questions to guide the discussion:
 - What did you observe at the Environmental Monitoring Stations? Take the time to briefly discuss each station, but spend a greater amount of time on the Ocean Conditions Station.
 - What did you observe at the River Conditions Station that was similar to the Ocean Conditions Station? What was different?
 - What wave patterns are similar and what wave patterns are different?

Guiding Questions

1. What did you observe at the Environmental Monitoring Stations?
2. What did you observe at the River Conditions Station that was similar to the Ocean Conditions Station? What was different?
3. What wave patterns are similar and/or different?

Explore:

Activity

1. After the class discussion, explain to the students they are to design and build a model of a buoy using various household materials. The model buoy must float and carry a payload of their choosing.
2. Students will need to first create a plan, draw it, and include a list of materials needed to build their model buoy. What kind of materials will they need in order for the model buoy to float? How or will it collect data?
3. Decide whether or not this will be an "in school project" or a home project. Some students may have access to materials and some may not.
4. As an alternative, you may choose to use the following "Build-a-Buoy" idea with the NOAA Chesapeake Bay Office, <http://www.cosee->

west.org/Jul_Aug2012/For%20the%20Web/Activities%20and%20Lesson/Building%20ROVs%20and%20AUVs/build_a_buoy.pdf or click on the following link as an additional alternative http://secoora.org/webfm_send/515

5. Allow time for students to construct, test, and share their model buoys and compare and contrast the model with the real buoys we learned about at the National Data Buoy Center and at the INFINITY Science Center. In order for students to make sense of wave behavior including wave amplitude, wavelength and the motion of an object they will need to refer back to the National Data Buoy Center and view the data from a real buoy.

Guiding Questions:

1. What kind of materials will you need in order for the model buoy to float?
2. How or will it collect data?
3. How is the model buoy like a real ocean or river buoy?
4. How is the model buoy different from an ocean or river buoy?

Explain:

Activity

1. As a final culminating activity students can design a Prezi, PowerPoint, or create an iPad movie of students “interviewing” a student scientist on their data collecting from the previous lesson. Students must write and submit a script based on what they have learned as a result of this lesson and/or at the INFINITY Science Center Environmental Monitoring Exhibit.
2. What types of tools do scientists use to collect data? Discuss the examples we saw at the INFINITY Science Center and create a list. Are there tools that we could use to collect data at our local school? (Thermometer, anemometer, barometer, rain gauge, wind sock, etc.) If possible, collect high and low temperature at your school for a 30 day cycle, graph the data and look for patterns. Assign groups a particular month for your area and to use a website such as www.wunderground to collect data, and look for patterns.
3. Continue to collect the local weather data for a whole school year to make weather predictions.

Guiding Questions

1. What kinds of questions should you include in your script to interview a student scientist?
2. What types of tools do scientists use to collect data?
3. Are there tools that we can use to collect data at our local school?

Elaborate:

Activity

1. During Language Arts, ask your students to compose and send thank you letters to the chaperones, school administration, and staff at the INFINITY Science Center and to include any special information learned as a result of the field trip.
2. Display the brochures on a bulletin board in the hallway along with pictures to share information with other grade levels or school visitors.

Guiding Questions:

1. What is the format of a thank you letter? How should you begin your first paragraph? Ask another student to read your thank you letter to offer suggestions on how to make your writing stronger and clearer.

Evaluate:**Activity**

1. As a final evaluation, ask students to write a persuasive letter to their parents and/or guardians discussing the one or more of the following points:
 - Why do scientists collect data on ocean conditions?
 - Why do you think or do not think that scientists need additional funding to continue with research projects?
 - Why should our family visit the INFINITY Science Center in the future?
 - What do you expect to learn as a result of your visit at the INFINITY Science Center?
 - Free choice

Guiding Questions:

- See above for guiding questions for the persuasive letters.