Lesson Plans

MOSS

McCALL OUTDOOR SCIENCE SCHOOL

University of Idaho

College of Natural Resources

Title: Dissolved Oxygen
Grade Level: 5th-8th

Topic:	**Water Quality: Dissolved Oxygen**
Background:	Dissolved oxygen is the amount of oxygen dissolved into a body of water; it is an indicator of water quality. Dissolved oxygen (D.O.) is incorporated into the water by waves, rapids, waterfalls, and photosynthesis. Temperature affects dissolved oxygen; warm water decreases D.O. and cold water increases D.O. Higher atmospheric pressure also holds in more dissolved oxygen into a body of water than lower pressure. D.O. is measured in milligrams per liter or parts per million.
Next Generation Standards:	LS2, LS2.A
Goals:	Students will learn how to measure dissolved oxygen using an YSI DO 200 meter, as well as create a mini inquiry project as to what will add more D.O. to a body of water. Essential questions: • What is dissolved oxygen? • How does dissolved oxygen affect what lives in a body of water? • What factors affect dissolved oxygen? • How would dissolved oxygen differ between a lake and a fast moving river?
Objectives:	• Students will understand that D.O. is added from the atmosphere and from plants and that it is the measurement of how much oxygen is dissolved into a body of water. • Students will be able to understand that D.O. is as important to aquatic life as oxygen in the air is to humans. Students will also understand that water with higher D.O. concentrations supports more diverse and abundant aquatic life. • Students will recognize that some factors that raise D.O. levels are: waterfalls, rapids, and waves. Factors that lower D.O. levels: number of aquatic organisms (animals and plants), higher water temperatures and lower atmospheric pressure. • Students will hypothesize that a fast moving river would have a higher D.O. concentration than a lake, because it is churning, running

	water, and tree cover lowers or keeps the water cooler.
Materials:	• Three large mason jars per group • Three pitchers • Enough straws for every student • Dissolved oxygen meter per group (ex: YSI DO 200 meters) • Turkey baster one or two per group • Scrap paper and pencil • Water: ice water, room temperature water, hot water (enough to fill each mason jar half way)
Set up:	Have a pitcher of water sitting out so that it has time to become room temperature. Have iced water and heated water readily accessible. Make sure the D.O. probes are calibrated and measuring similar concentrations.
Classroom Time:	45 minutes
Introduction (Engage):	Ask students what humans need to breathe to gauge their understanding of oxygen's importance. Shift the discussion to what aquatic organisms, such as fish, need to breathe. Explain that dissolved oxygen is oxygen from the air being incorporated into a body of water. This happens when water goes over a waterfall, when an aquatic plant releases oxygen through photosynthesis, etc. The temperature and air pressure also affects how much D.O. stays in the water.
Activity (Explore):	Put your students into groups depending on how many D.O. meters are available for use, minimum 3 children per group. Explain that they are going to be measuring the D.O. of cold, room temperature, and hot water using the probes. Students will be measuring D.O. before and after blowing bubbles through a straw into the jars of water. Give students the opportunity to write a hypothesis about which jar will have the highest D.O. concentrations before and after blowing bubbles into the jar. While students are writing their hypothesis, fill the jars halfway with water with each temperature of water. Students should then begin their experiment by measuring the D.O. in each jar and recording the results. After measuring all three temperatures

	without bubbles, students should begin the bubble blowing section of their experiment. They should blow through their straws continuously for 30 seconds, recording the highest D.O. reading in the 30 second increment. Express caution that excessive bubble blowing could result in water splashing their face; with the hot water this is the biggest concern.
Explanation:	Gather all results and discuss common trends within their results. You should expect to find that the cold water has a higher standing D.O. concentration, followed by the room temperature water and the hot water should be the lowest. After blowing bubbles, the trend should stay the same; however each concentration should be higher. A good way to show this data is by creating a graph in Excel. While creating a graph for the class, have the groups hypothesize as to whether a fast moving river or a lake would have higher D.O. concentrations.
Elaboration:	Have the students explain why they think they got the results that they did. Be sure to fill in if necessary that D.O. concentrations are generally higher the colder the water gets. In addition, bubbles from the straw are representative of how oxygen would be incorporated into water from natural processes, such as waves, rapids, waterfalls, or aquatic plants. Ask the students how they think D.O. affects what lives in a body of water. The more D.O. that is in a body of water allows greater biodiversity, or more types of organisms in larger numbers. Explain that some aquatic organisms have gills (i.e. fish) while others still have lungs (i.e. lunged snail). Ask whether they would expect to see more fish or lunged snails in a body of water with really low D.O. Some students may question why the D.O. increased in the jars even though humans breathe out carbon dioxide. Explain that even though humans do breathe out more carbon dioxide than when we breathe in air, we are also breathing out about 75% of the oxygen that we initially breathe in. This is what makes CPR a lifesaving technique.

Evaluation:	You can evaluate your student's comprehension of the subject matter by their hypothesis of which body of water would have a higher concentration of D.O.: a fast moving stream or a lake. They should use their new knowledge from the activity measuring D.O. to hypothesize that the fast moving stream would have a higher concentration of D.O. Allow time at the conclusion of the lesson to recap on the major information covered to ensure comprehension is achieved.

Additional resources:
The following AL@ website has good additional information about dissolved oxygen.
http://adventurelearningat.com/wp-content/uploads/2012/08/DO-and-BOD_description.pdf