**If You Were A Fish**

**Alignment to Ohio Content Standards:**

[**Ohio Learning Standards for Science**](http://education.ohio.gov/Topics/Learning-in-Ohio/Science)**:**

**Grade 7 Life Sciences:** Pg. 84 7.LS.1: Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments.

**Environmental Science:** Pg. 107 ENV.ES.1: Biosphere-Biodiversity, Ecosystems (equilibrium, species interactions, stability)

**Environmental Science:** Pg. 107 ENV.ES.5: Movement of matter and energy through the hydrosphere, lithosphere, atmosphere and biosphere. Biogeochemical cycles, Ecosystems, Climate

**Environmental Science:** Pg. 108 ENV.ER.3 Water and Water Pollution. Hypoxia, eutrophication

**Environmental Science:** Pg. 108 ENV.ER.5: Wildlife and wilderness. Wildlife and wilderness management

**Environmental Science:** Pg. 108 ENV.GP.2: Potable water quality, use and availability

**Physical Geology:** Pg. 110 PG.IMS.4: Ocean. Streams (channels, streambeds, floodplains, cross-bedding, alluvial fans, deltas)

**Physical Geology:** Pg. 111 PG.ER.3: Water. Water quality, Hypoxia, eutrophication.

**Science Inquiry and Application**

* Identify questions and concepts that guide scientific investigations
* Design and conduct scientific investigations
* Formulate and revise explanations and models using logic and evidence (critical thinking)
* Recognize and analyze explanations and models
* Communicate and support a scientific argument

**Lesson Length:**

40-55 minutes

**Lesson Overview:**

Students will work with partners to examine the biology and habitats of streams using virtual reality goggles and microscopes. In each activity, students will evaluate specific characteristics of that aspect to compare healthy and impacted streams. Additionally, students will connect these concepts to explore how they are related.

**Lesson Objectives:**

The student will:

* Describe what physical stream features are important for animal habitat
* List characteristics of a healthy stream
* Identify a health stream based on observational and biological data

**Materials needed:**

* [PowerPoint slides](http://watersheddata.com/Education/Document/If%20You%20Were%20a%20Fish%20PowerPoint.pptx)
* [Student Handouts](http://watersheddata.com/Education/Document/If%20You%20were%20a%20Fish%20Student%20Handout.docx)
* [Example Student Answer Sheet](http://watersheddata.com/Education/Document/If%20You%20were%20a%20Fish%20Student%20Handout%20Answers.docx)
* 360 virtual reality stream photo for virtual reality googles
	+ Device used to view virtual reality 360 photos must have downloaded Google Street View app
		- Virtual Reality Photo A
			1. Search “Carbondale, Ohio” in Google Street View app
			2. Correct photo is DCIM\100GOPRO by Watershed Ohio
		- Virtual Reality Photo B
			1. Search “Waterloo Aquatic Education Center
			2. Correct photo is DCIM\100GOPRO by Watershed Ohio
	+ If no virtual reality googles 360 photos can be accessed on Watershed Education, [Virtual Field Trips](http://watersheddata.com/Education/Stream1.html)
		- Carbondale is Stream A
		- Waterloo is Stream B
* Indicator Species Information (Helpful link)
	+ [http://www.nswwaterwatch.org.au/files/19/Water%20Bug%20ID%20Charts%20&Posters/30/Water%20Bug%20Dectective%20Guide%20-%20Freshwater.pdf](http://www.nswwaterwatch.org.au/files/19/Water%20Bug%20ID%20Charts%20%26Posters/30/Water%20Bug%20Dectective%20Guide%20-%20Freshwater.pdf)

**Technology Needed:**

* Virtual reality goggles
* Microscopes

1. Engage the Learner

(10 to 15 minutes)

**Teacher (T):** Present students with the question: What would you need in your stream for survival if you were a fish? (Slide 2).

* Example Characteristics: Trees (shade), rocks (hide), bugs (food), algae (food), oxygen (respiration)

**Student (S):** Record at least 5 characteristics on a sheet of paper (Entrance Ticket).

**S:** Think-Pair-Share about their characteristics with the teacher recording different characteristics on the board.

**T:** Present the rest of the PowerPoint to students explaining various stream characteristics, leave up final slide with photo word bank.

**T/S:** Have students compare their answers to “What would you need in your stream for survival if you were a fish?” to the photo habitat word bank. Ask them if any of the new vocabulary could be applied to their characteristics. Was new vocabulary learned to describe different aspects of a stream?

**Habitat Photo Word Bank**

* **Run**-Main body of a stream that runs smoothly downstream
* **Pool**-Deep areas of slow-moving water
* **Riffle**-Rocky or shallow part of stream or river through rough water
* **Root Wad**-Exposed roots of a fallen tree
* **Eddy-**Circular current of water
* **Riparian zone-**Bank of a stream, typically filled with vegetation
* **Eroded banks-**Evidence of erosion on the outside bank of a stream
* **Substrate-**The sediment or material (ex. rocks) at the bottom of the stream
* **Thalweg-**Line following the lowest part of a valley or stream channel
* **Stream Channel-**Path of water and sediment flow between banks
* **Entrenchment**-Vertical containment of the stream, indicator of erosion

2. Explore the Concept

* 1. minutes)

**T:** Divide students into sets of partners. Students will work with their partner on each of the following activities.

* Half of the students will begin with activity 1 using the virtual reality goggles (virtual reality stream photo)
* Half the class will begin with activity 2 looking at stream macroinvertebrates (bugs).
* After 10-12 minutes, students will switch activities.

**T:** Before beginning the activity, explain each activity and ask if there are any questions. Remind students that they may ask for help at any time.

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| --- | --- |
| **Activity 1 Habitat (Google Box)** | **Activity 2 Biology (Microscopes)** |
| **Explore the Concept** **T:** Explain how to use Google Boxes. There will be two sets of pictures (one labeled “A” and one labeled “B”).**S:** Use virtual reality goggles to explore 360 photos of healthy and impacted streams. | **Explore the Concept** **T:** Explain how to use microscopes and indicator species sheets.**S:** Students will be given “A” and “B” samples each representing a different stream. Students will view the bugs under microscopes and identify the bugs found in each stream. |
| **Explore the Concept** **S:** Record findings on their handouts in the appropriate area. Remind students to use the vocabulary word from the photo word bank. | **Explore the Concept** **S:** Record observations in the corresponding box on the worksheet. Use indicator worksheet to determine what the presence of different organisms mean for the health of the stream. |

3. Explain the Concept and Define Terms.

(10 to 15 minutes)

**S:** Share out their observations of both activities

**T:** Lead a class discussion about the activities. Ask students what they can infer about the health of the streams observed and how they came to their conclusions.

* Discuss how the different features of a stream (riffles, root wads, substrates…etc…) improve the quality of streams.

4. Elaboration/Expansion of the Concept (remediation if needed)

(5 minutes)

**S:** On their handouts, students will write a paragraph summarizing the results of each activity.

* + Students should include specific details from the collected data and make a statement about the health of each stream.
	+ Students should connect how certain features in each stream affected its overall health.

5. Evaluate Students’ Understanding of the Concept

* Teacher should make observations of student understanding during their exploration of the material (Explore) and during class discussion (Explain).
* Teacher should collect Entrance Ticket (Engagement) and Handout (Explore/Extend) for additional proof of learning.

Additional Extension Ideas:

* After completing the activity, have students work together in small groups (2 to 5 students) to design their own ideal river. Have them explain why they would include each feature and how it would help the health of the river. Students can either draw their designs on a giant Post-It-Note or build a model of it.
* Have students research causes of unhealthy rivers (Farm runoff, missing riparian zones, illegal dumping, acid mine drainage…) and have them create a PSA (can be video, poster, radio announcement…etc…) about how those activities harm local waterways.
* Have them write letters to the local farms, community members, or government about ways they could help protect the waterways and why it is important to protect them.

Additional Resources:

**Contact Jen Bowman (****bowmanj2@ohio.edu****) to borrow a preserved macroinvertebrate sample set.**

*Special thanks to the Ohio University Voinovich School and to AEP Foundation for their support in the creation of this educational materials.*

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