CORAL
Partner Project

grade 8

Stream Study

Since the Coral partners (Peter and Kendal) had intermediate grade teaching experience and outdoor education in common, we decided to design a stream study for grade 8. A stream study offers a great opportunity to get outside — and to use technology, too! A stream study is also an excellent choice for the holistic classroom; students will definitely use their heads, hearts and hands (and feet, too). These lesson ideas fit into the Grade 8 Science and Technology curriculum primarily, but can be adapted easily for students as young as grade 4 (e.g., Habitats and Communities) or as old as grade 11 (e.g., SVN3M Human Health and the Environment).

Objective

Students will get their hands dirty and their feet wet investigating the health of a local stream. They will test water samples for a variety of chemical characteristics using technological devices. They will embark on a communications campaign about a water issue in their community. They will learn vocabulary such as *watershed*, *aquifer* and *water table*.

UNIT Outline

grade 8

Prep Activities

Why Monitor Water?
Learning Goal: Introduce environmental monitoring, key vocabulary terms and why water monitoring is particularly important.

Indicators of Water Health
Learning Goal: Consider methods of biological, chemical and physical monitoring and build familiarity with the necessary equipment and monitoring protocols.

Identifying Benthic Bugs
Learning Goal: Identify the unique characteristics of the 26 benthic bugs used to determine water quality.

Field Day

Stream Study
Learning Goal: Use technology and other scientific methods to assess the health of a local stream. Conduct a site survey and make outdoor observations.

Follow-up Activities

Stream Health Calculations
Learning Goal: Assess the health of your stream using the data collected.

Mapping and Comparing
Learning Goal: Upload health calculations using GPS coordinates and investigate factors that contribute to stream health by comparing results with those of other stream studies.

Planning for the Future
Learning Goal: Apply knowledge of stream health to a local situation.

Link

The Water Technology Advancement program is on the cutting edge of resources that can improve water quality for everyone. **http://www.watertapontario.com/**

PREP Activities

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Video

"Bay of Quinte Aquatic Bugs" (2:12) provides an overview of water quality in the Bay of Quinte and an example of a remedial action plan. **https://www.youtube.com/watch?v=-mX8ynRE5Us**

Day 1: Why Monitor Water?

Start your stream study with a lesson that introduces the concept of environmental monitoring. Help students understand why we monitor water and the crucial role that water plays in ecosystems. Introduce key terms such as *watershed*, *aquifer* and *water table*.

This ready-made Prezi by EcoSpark, **Why Monitor?**, will help you lead this lesson.
http://www.ecospark.ca/changingcurrents/whymonitor

Day 2: Indicators of Water Health

Now that we understand *why* we monitor water, introduce *how* we monitor water. We can monitor water by conducting biological (benthic bugs), chemical (pH, dissolved oxygen) and physical (temperature, turbidity) tests. Introduce all the equipment used in a biological stream study (e.g., nets, waders, seives, etc.). Model the use of technological equipment (e.g., dissolved oxygen sensor, pH probe and meter) if using; review safety principles of handling drops and/or pellets if using.

World Water Monitoring Day has prepared instructions for a **mock stream study**, which sees students practice collecting bugs using aquarium nets, beads and trays of water.
http://www.monitorwater.org/Guides_Lesson_Plans.aspx

Day 3: Identifying Benthic Bugs

Scientists use 26 benthic (bottom-dwelling) bugs when studying streams. Each bug has different characteristics and needs and a different tolerance to pollution. Using a computer period, assign each student in your class a benthic bug to research. Students should prepare a short presentation for their classmates that will help everyone learn to identify the bug in the stream!

These **descriptive identification guides** are a good place to start looking once online.
http://www.ecospark.ca/sites/default/files/currents/ID_guides.pdf

FIELD DAY Activities

grade 8

Day 4: Stream Study

Your field day is upon you! Students can be broken into small groups and can don hip waders to try their hand at netting bugs in the stream. Students who do not want to get wet can take charge of their groups' data sheets and participate in the chemical and physical tests, which can often be done from shore.

This digital **field manual** by EcoSpark will guide you through planning, executing and analyzing your stream study as it relates to benthic macroinvertebrates (bugs!). It includes tips for selecting a site, important safety considerations, a materials checklist, blackline masters (data sheets) and analysis instructions.
http://www.ecospark.ca/sites/default/files/currents/2013_CC_Manual.pdf

Extensions

There are many ways to take advantage of the valuable outdoor time provided by your field day. Here are a few extension ideas:

- Create simple field journals (sheet protector; recycled cereal box cardboard; blank, lined or graphed paper) before heading outside. Have students record thoughts, questions and observations in their field journals throughout the day
- Map your stream study site using GPS and other mapping technologies
- Survey your stream study site for interesting geologic and geographic features
- Sketch a bird's eye view of your site on your data sheet or invite students to sketch a site feature of their choice (e.g., vegetation) in their field journals
- Survey your stream study site for possible sources of pollution (runoff, construction, storm water drains)
- Look for invasive and native species around the stream study site
- Conduct a "bio blitz" to see how many different plant and animal species you can identify
- Invite someone from your regional conservation authority to attend your stream study. They can serve as a community connection and may be able to answer questions you cannot

FOLLOW-UP Activities

grade 8

Day 5: Stream Health Calculations

Once data has been collected from your stream, it is time to assess the health of your stream. Students can be broken into expert groups based on the biological, chemical and physical data collected. They will make use of online resources to determine how their data fits with the parameters for healthy, impaired or potentially impaired streams. Expert groups can be reconfigured into teams of 3 (with one expert from each group) to make a final assessment of the stream using justification from data and research.

EcoSpark provides an online **Data Analysis Calculator** for analyzing the biological data.
http://www.ecospark.ca/changingcurrents/step4

The **Mud Creek case study** provides a good starting point for determining how chemical and physical data can be used to indicate stream health. **http://www.learnnc.org/lp/editions/mudcreek/6589**

Day 6: Mapping and Comparing

After analyzing and discussing the data, students will post this information online in a **mapping program**.
http://ecospark.ca/changing-currents-site-sample-results

Using this program, students will also be able to compare their stream with other streams in the area and begin to speculate on some of the local factors contributing to their stream's health status.

This is an excellent time to provide further and perhaps differentiated information to students depending on the direction of their inquiry and speculation. Students can seek out connections with specialists in the field and videos can be used to reinforce insights regarding factors that contribute to a stream's health.

Day 7: Planning for the Future

As a culminating task, students could develop an action plan or awareness project that will help improve the health of the stream. Working individually or in teams, students will identify resources (specialists, community leaders, equipment, etc.), write an action plan that will have a direct or indirect impact (awareness) on the health of the stream and then take steps to implement this action plan. This can be used as a meaningful way of assessing both student engagement in the stream study process and student understanding of the principles of water monitoring.

Grants are available for many environmental initiatives and students may wish to apply for funding.
https://fef.td.com/funding/

CONCLUSION
Chat Link, Questions grade 8

Conclusion

From online videos to technological devices for the field and from collaborative mapping programs to ready-made presentations on environmental monitoring, the Coral partners gathered some excellent new ideas for ways of incorporating technology into hands-on, outdoor activities in a meaningful way. Even some materials that do not appear to be "technological" (e.g., the hip waders that keep your feet dry in the stream) are a kind of technology! Outdoor education, an important piece of Earth Connections in the holistic curriculum, can certainly be taught with a technological bent!

Partner Chat

1. What are the advantages and the drawbacks of implementing constructivist principles in a course? What are some foreseeable problems if you were to follow the same principles in your course?

There are many advantages to using constructivism to plan a course or unit of study. Some of the most important involve student buy-in, long-term meaningful learning, a sense of autonomy and a motivation to follow personal interest and build on what they know and are interested in. On the other hand, some disadvantages include the time commitment and the amount of planning required. From an instructor perspective, it can feel as though not as much is getting accomplished.

2. What are the benefits and challenges in integrating technology into a conventional course? How can you ensure that students have a valuable learning experience?

Some students may have an aversion to technology or be resistant to changing their previous conceptions on learning when technology is used in a dominant way. Access and equity are two additional challenges that need to be considered when choosing a technological route. Technology is most beneficial when it leads to active participation in a community or in the world around us. Transparency and clear instructions are essential to ensure that students have a valuable learning experience when technology is used heavily.

For more details on our responses to these questions and how the reading contributed to our development of this stream study unit please refer to our chat transcript posted on **Blackboard**.
http://c2c.oise.utoronto.ca/chattie/chatSession.php?chatsession=2915&contextid=243734#