



MACROINVERTEBRATES OUTDOOR LAB LESSON PLAN

Subject Area: Water quality & Macroinvertebrates

Grade Level: Middle School

Seasonal timing: Spring field trip

Instructional time: 45 minutes

A. Learning Goal: Learners will be able to use macroinvertebrate sampling data to evaluate water quality and ecosystem health.

B. Objectives:

- Use sampling equipment to collect aquatic macroinvertebrates.
- Identify macroinvertebrates by observing traits and using a key.
- Assess a macroinvertebrate sample as an indicator of water quality.
- Understand life cycles of selected macroinvertebrates.

C. State Standards:

- SCI.SEP3.m – Planning and conducting investigations.
- SCI.SEP4.m – Analyzing and interpreting data.
- SCI.SEP5.m – Using mathematics and computational data.
- SCI.LS1.B.m – Animals engage in behaviors that increase the odds of reproduction. An organism’s growth is affected by both genetic and environmental factors.
- SCI.LS2.A.m – Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared.
- SCI.LS2.D.m – Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on — for example, water purification and recycling.
- SCI.LS4.D.m – Changes in biodiversity can influence humans’ resources and ecosystem services they rely on.

D. Setting: Local lake, river, or stream.

E. Materials and Resources:

- LEEP outdoor macroinvertebrate lab manuals with writing utensil and clipboard.
- Identification key to macroinvertebrates.
- D-nets or dip nets and buckets.
- Ice cube trays.
- Forceps (tweezers), pipettes, and/or turkey basters.
- Vials and preservative for collecting new macroinvertebrate samples for display.

- Hand lenses, magnifying glasses.
- Life preservers (if near deep/dangerous water), hip boots, waders, rubber boots.
- First Aid kit.
- Calculators (optional).

F. General delivery, see teacher guide for detailed implementation suggestions:

Introduction of Lesson:

- Before going outdoors, have students conduct the indoor macroinvertebrate activity and relate the outdoor collection to the indoor lab sorting activity.
- Review safety aspects (below).
- Review equipment care and maintenance.
- Review life cycles of aquatic insects (complete/incomplete metamorphosis).
- Encourage students to collect macros in habitat areas near plants and debris.

Safety Considerations:

- Learners should not be in the water bare-footed. Old tennis shoes, hip boots, rubber boots, or waders should be used. Have life preservers on or available.
- Learners should stay with their groups at all times.
- First Aid kit should be available.

Large Group: Go over introductory materials and hand out equipment.

Small Group: Each small group goes to a designated area close to shore where it can be monitored. Learners will sweep the area for macroinvertebrates. Caught macroinvertebrates will be sorted in the ice cube trays according to macro groups, counted, and recorded. On shore the learners will complete the “**Tally Sheet Recording Form**” and determine the waters **index score**. After the tally and score is completed, the macroinvertebrates are released in the area they were found.

G. Extended Student Options:

- Learner adopts a safe water area near their home where they conduct a similar tally and complete an index score. Then write a summary of their findings.
- Learner writes an essay about one of the macroinvertebrates they find most interesting.
- Learner researches (computer, etc.) what might affect water quality.

H. Assessment:

- Have *each group* write a short paragraph about their findings.
- Have *each student* write a short essay on how these findings will affect their attitude towards using the surface water and shoreline development.
- Discuss and review what macros are and how they fit into the water environment.
- Have an informal class discussion (wrap-up) about the activity.

