

## Soil Biology and Respiration

**Introductory Activity:** FBI Metaphors / Soil FBI Identification and Scale

**Field Activity:** Tools Explanation / Soil Productivity Exploration, Outdoor Field Study

**Description:** Using quantification and observation skills, students learn about soil microbes, their function, and why they are important for ecosystem regulation. Using Vernier LabQuest scientific handhelds and O<sub>2</sub> and CO<sub>2</sub> sensors, students explore soil biological activity by calculating changes in microbial respiration over time. By measuring soil temperature, moisture, pH, soil texture and infiltration rates, students will be able to investigate other soil properties that have an impact on microbial activity. Collected data is analyzed and conclusions are drawn about the overall productivity of the soil at their school site.

**Objectives:** By the end of the program, the students will be able to:

- Define and describe different types of soil organisms (fungus, bacteria, and macroinvertebrates)
- Explain the processes of respiration
- Describe what role soil microbes play in the environment
- Explain why microbial function is important for the environment
- Apply scientific investigation tools, the scientific method, and experiments to answer questions
- Collect accurate experimental data

### Indiana Academic Standards for Science:

**Fourth:** 1.1, 1.2, 1.3, 1.5, 1.6, 2.1, 2.3, 2.4, 2.5, 2.7, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.6, 4.7, 5.1, 5.2, 6.1, 6.2

**Fifth:** 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.4, 2.7, 2.8, 4.2, 4.4, 4.5, 4.6, 5.1, 5.7, 5.8, 5.10, 6.1

**Sixth:** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.1, 2.2, 2.3, 3.15, 3.16, 3.20, 4.1, 4.2, 4.3, 4.9, 5.2, 7.3

**Seventh:** 1.1, 1.2, 1.3, 1.4, 1.7, 1.8, 2.3, 2.4, 2.6, 3.7, 4.2, 4.5, 4.6, 4.7, 4.8, 4.9, 4.12, 4.14, 5.4, 7.1

**Eighth:** 1.1, 1.2, 1.3, 1.4, 1.8, 2.1, 2.2, 2.4, 2.5, 2.7, 2.8, 2.9, 3.6, 4.4, 4.5, 5.1, 5.6, 5.7, 5.9, 7.2, 7.3, 7.7

**High School:** Env.1.4, Env.1.7, Env.1.9, Env.1.14, Env.1.15, Env.1.18, Env.1.34, Env.1.35, ES.1.10, ES.1.22, ES.1.26, B.1.16, B.1.17, B.1.19, B.1.37, B.1.41, B.1.44, B.1.45

### Indiana Academic Standards for Mathematics:

**Fourth:** 1.1, 1.2, 1.3, 1.9, 7.1, 7.3, 7.4, 7.5, 7.8, 7.9

**Fifth:** 1.2, 2.1, 2.5, 3.7, 5.5, 5.6, 6.2, 7.1, 7.3, 7.4, 7.5, 7.7, 7.8

**Sixth:** 1.1, 2.1, 2.2, 2.3, 5.1, 5.6, 6.3, 7.1, 7.4, 7.5, 7.6, 7.9, 7.10

**Seventh:** 2.1, 5.1, 5.3, 6.3, 7.1, 7.4, 7.6, 7.7, 7.10, 7.11

**Eighth:** 2.1, 2.3, 5.3, 6.3, 7.1, 7.4, 7.6, 7.7, 7.10, 7.11

### Excellence in Environmental Education – Guidelines for Learning (Pre K – 12):

Fourth Grade	Fifth – Eighth Grade	Ninth Grade
Strand 1 A, C, D, G Strand 2.1 A, B Strand 2.2 A, D Strand 2.4 A, D	Strand 1 C, D, G Strand 2.1 A, C Strand 2.2 A, C, D Strand 2.4 D	Strand 1 C, G Strand 2.1 B, C, D

Please note specific learning objectives and academic standards will vary based on timeframe, location, availability of resources, and tailored content of programming.