InSPECT Curricula Landing Page

Introduction to InSPECT Curricula

Our two NGSS aligned curricula engage students in several Science and Engineering Practices: developing and using models, planning and carrying out investigations, constructing explanations and designing solutions, using mathematics and computational thinking, and engaging in argument from evidence.

The first, Curricula: CO2 & Systems, is a seven lesson unit arc where students develop and run their own investigations using sensors and software. Students will build conceptual models about how photosynthesis and cellular respiration contribute to atmospheric changes in CO_2 levels.

The second, Curricula MBER + CT, is a three lesson unit arc where students learn about photosynthesis and cellular respiration as chemical processes that plants and animals use to create energy. During this unit, students will learn that sensors and software can be used to produce data and respond to changing environmental conditions.

Core Ideas and Design Rationale

- *Promoting Computational Thinking*. Computational Thinking is one of the NGSS scientific practices-- and also an increasingly important skill in the modern workforce. Computational thinking involves understanding computational concepts, knowing how to use computational tools, and-- in the science classroom-- being able to use these tools and understandings as part of scientific inquiry. Throughout our curriculum, students write programs to collect, process and store data for their experiments. In the process, they learn both how that data was created, and how these same computational tools can be used to sense and respond to the changes in the environment.

- *Supporting Student Agency*. One of the main goals of science education reform is to shift away from transmitting facts to students, toward students actively constructing their own knowledge. This means that students should lead the direction of inquiry, and confront the same sorts of uncertainties that scientists do. But typical “cookbook” lab

work is usually very procedural, with very little room for students to encounter authentic sources of uncertainty, or to take their own approaches to resolving them. In our curriculum, we build in opportunities for students to come up with their own methods-- and discuss their benefits and limitations.

- *Telling Data Stories and Discussing Data.* When students develop their own methods for conducting an investigation, their datasets can each look quite different-- and it will often have interesting and important features. After each lab, before jumping directly into data analysis, we ask students to tell one another their "Data Stories"-- stories of how their data got to be how it is. This gives students time to notice and discuss features of data-- such as spikes, gaps, noise, or unexpected rises-- and to reason about what might cause them. This in turn allows them to see data as something created-- by people, technologies, and the material world-- rather than simply as "the answer."

- *Biology Content and Alignment with NGSS.* Even as students approach an investigation using their own methods, it is important that they still construct a deep understanding of the target phenomena. Students in InSPECT classrooms take up the following NGSS Science and Engineering practices: 1) developing models, asking questions, 2) planning and carrying out investigations, 3) constructing explanations and designing solutions, 4) using mathematics and computational thinking, and 5) forming arguments from evidence.

Introduction to InSPECT Hardware

We've partnered with Manylabs to create Dataflow, a novel learning technology that can lead to the enhancement of science learning through authentic hands-on investigations, dataflow programming, and laboratories to improve science and engineering practices.

By using flexible low-cost technologies InSPECT is able to address many of the barriers that prevent students from practicing authentic science in the classroom. Students will use programmable scientific and engineering tools (light sensors, fan motors, digital thermometers, etc.) to design experiments to investigate phenomena, formulate and refine their own theories, and propose causal explanations of their observations. As they collect data, they can tinker and add complexity to their experiment with additional sensors and compare models with peers while refining their own theories and conceptual understanding based on primary experiences.

Extra Resources

To supplement both of our curricula, we have prepared a suite of extra resources:

-Science Snacks: Short 20-45 minute activities designed to deepen students understanding of main lesson content, or provide a challenge for students or class periods that get ahead of schedule

-FAQs & Tip Sheets: Reference sheets, how-to's, and additional information about science content, software, and hardware

-Standalone Sensor-Enhanced Lessons: Full 60+ minute lessons that make sense even without the rest of the curriculum

-InSPECT Hardware: Introduction and setup instructions for InSPECT hardware