

Introduction to Scientific Inquiry: Hexbug Traces

Overview

This activity will introduce the scientific process to students, from observation through hypothesis testing. This activity uses Hexbug robots, so that students do not have any prior knowledge or biases, which will allow them to focus on the scientific process itself.

Time allotted: 1 class period

Grade level: 7-12

Keystone Assessment Anchors

Scientific inquiry is included in a number of different anchors across the sciences, such as BIO.B.2.4 and BIO.B.3.3

Objectives/Learning Goals:

- Identify basic steps of the scientific process
- Practice making appropriate detailed observations
- Develop testable hypotheses
- Evaluate hypotheses
- Analyze structures for similarities and differences
- Work successfully in teams
- Practice keeping detailed notes

Student Materials (per student):

- Notebook and writing utensils

Other Materials (per student group):

- Dry sand
- Sifter for the sand (colander or strainer works well)
- Paper to put sand on (black is recommended)
- Assorted Hexbugs (www.hexbugs.com)
- Extra batteries for the teacher to have on hand (www.hexbugs.com)

Procedure

- Before class begins:
 - Place paper on each table.

- Sprinkle dry sand using the sifter, no more than 1 cm deep
- Use Hexbugs to make traces in the sand such that each table has tracks from 1 or 2 different Hexbugs.
- Put Hexbugs away so that the students cannot see what made the traces.



- As students enter the classroom, ask them not to touch the sand on any of the tables.
- At the beginning of class, teacher should introduce a scenario that sets up the lab. For example, students can pretend that they are castaways on an island and have noticed these tracks on the beach.
- Students are asked to make detailed observations in their lab notebooks describing the traces. They should then work with their groups to hypothesize what kind of organism made the traces, including how many limbs the organism has, how they organism walks, etc. Students should also make a possible sketch of the organism.
- At this point, the class comes together to discuss the scientific process, linking their activities to observation and making hypotheses.
- The teacher then brings out the different Hexbugs and asks the students group to refine their hypotheses and come up with experiments to identify which Hexbug made their trace.
- Students then execute their experiment and compare their results to the tracks on their tables.
- The class comes together again to report their results and discuss the scientific process again.

Notes

- Students should keep lab notebooks for this entire process, from observation to interpreting results of experiment.
- This lab can be modified to keep one of the Hexbugs hidden so that at least one trace cannot be immediately linked to one of the Hexbug choices. This demonstrates that scientists don't always get the answer right away.
- Hexbugs can also be modified to be missing limbs to demonstrate variation.
- This lab can also be modified for guided inquiry, where students can vary substrate (wet versus dry sand, fine versus coarse sediment, etc.).
- Hexbugs and extra batteries can be found at Kmart, Walmart, Amazon, Target, etc., as well as www.hexbugs.com . Hexbugs vary in price from \$10-30. Batteries are usually sold in 2-packs at stores and cost approximately \$4 per pack.
- The Hexbug Nano is not recommended for this activity.