# Aliens: We Come in Peace

## Experimental Design & Claim, Evidence, and Reasoning

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| **Grade Level** | 9th – 12th Grade | **Time Frame** | 2-3 class period(s) |
| **Subject** | Science | **Duration** | 150 minutes |
| **Course** | Biology | | |

## Essential Question

How do scientists obtain evidence to back their claim and reasoning?

## Summary

Students will participate in a set of observational experiments, designed to help them come up with "good" evidence to back a claim they present. Students will learn about how to overcome flawed predictions with evidence and design good reasonable explanations.

## Snapshot

**Engage**

Students begin by observing different aliens around the room.

**Explore**

Students collaboratively hypothesize a possible explanation of the aliens' behavior.

**Explain**

Students design a list of good ways to collect evidence to support claim and reasoning.

**Extend**

Students investigate Roly Poly's behavior making a claim backed by evidence and reasoning.

**Evaluate**

Students prepare a poster with their claim, evidence, and reasoning and participate in a Gallery Walk.

## Standards

*ACT College and Career Readiness Standards - Science (6-12)*

**IOD202:** Identify basic features of a table, graph, or diagram (e.g., units of measurement)
**IOD304:** Determine how the values of variables change as the value of another variable changes in a simple data presentation
**SIN201:** Find basic information in text that describes a simple experiment
**SIN301:** Understand the methods used in a simple experiment
**SIN401:** Understand a simple experimental design
**SIN404:** Identify similarities and differences between experiments
**SIN502:** Predict the results of an additional trial or measurement in an experiment
**SIN503:** Determine the experimental conditions that would produce specified results
**EMI401:** Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text
**EMI502:** Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why
**EMI505:** Determine which experimental results or models support or contradict a hypothesis, prediction, or conclusion

*Next Generation Science Standards (Grades 9, 10, 11, 12)*

**:** Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
**:** Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

## Attachments

- Alien Invasion—Aliens, We Come in Peace.docx
- Alien Invasion—Aliens, We Come in Peace.pdf
- Aliens—Aliens, We Come in Peace.docx
- Aliens—Aliens, We Come in Peace.pdf
- Observation Sheet—Aliens, We Come in Peace.docx
- Observation Sheet—Aliens, We Come in Peace.pdf
- Roly Poly Lab—Aliens, We Come in Peace.docx
- Roly Poly Lab—Aliens, We Come in Peace.pdf

## Materials

- A dozen variations of four different types of aliens (48 aliens in total)
- "Alien Invasion" script
- Alien Observation Sheet
- Roly Poly Lab handout
- Choice Chambers (or petri dishes cut and pieced together)
- Material of choice for roly poly
- Poster paper

# Engage

Begin by using the "Alien" and the "Alien Invasion" documents to set the aliens up around the room. Once the aliens are ready, students will enter the room. Make sure to tell them not to disturb the aliens. Students will need to take a sheet of paper to record observations they make.

**Keep It Quick**

Allow only about 5 minutes for this activity and make sure students are doing their own observations. They will likely congregate and talk amongst themselves while observing, so you will need to remind them that they'll get time a bit later to discuss.

# Explore

Once they have finished observing, have students go back to their desks and do an I Think, We Think individually. Using their observation notes, ask students to write down any patterns/trends they believe the aliens are showing and why.

**When "I Think" Happens**

Have students fill out the individual claims while they're collecting evidence. However, the color and evidence is what is written during the Engage, and the individual claim is written at their seats, which requires them to use their documented evidence to draw conclusions.

Then pair them up and have them discuss and come up with a group trend for each alien, writing their group claim on the observation sheet.

# Explain

As a class, reveal the groupings to the students and see how many got them right and how many got them wrong.

Then, do a modified 4-2-1, where each pair of students comes up with two things they did "well" and two things they did not do as well on. Have the pairs then join with another pair, forming groups of four, and have them come up with the thing they all did mostly well and the thing many of them got wrong. Once finished, have students individually write on what makes a good observation and what makes a bad observation. Once finished, have them share with the class their thoughts.

### Looking For Breadcrumbs

If the conversation goes there, you may also address observational bias and drawing incorrect conclusions because of bias. Try not to force it on them, though, if they didn't catch it. There will be other opportunities to address bias, and if they don't "see" it to begin with, it's a difficult concept to internalize.

# Extend

Give students individual copies of the "Roly Poly Lab." Ask them to observe normal Roly Poly behavior and make a claim, which they then will have to design an experiment to research. Have them gather new evidence and decide whether their observations/evidence support their claim or not and, if not, instruct them to make a new claim.

**Supplies**

You can have the students collect Roly Polies over the weekend before doing this experiment and house them in a breathable container (this way you won't have to purchase Roly Polies). Roly Polies like to eat cabbage and for water, just leave a damp paper towel in the container. However, if you can't or don't want to have students collect them, the following link will lead you to one location from which you can purchase them: https://www.carolina.com/isopods/terrestrial-isopods-pill-bugs-sow-bugs/FAM_143060.pr

# Evaluate

Give each group of students a sheet of posterboard or oversized paper. Ask students to prepare a Research Poster about their Roly Poly experiment. Stress that they need to include information about their claim/hypothesis on their Roly Polies using their evidence and reasoning. When they are done, have them hang the posters around the room.

After the posters have been hung, ask students to participate in a Gallery Walk where, as they look over their classmates' posters, they put sticky notes on the posters that say whether they agree with their classmates' claims based on the evidence or disagree and why. Once they have completed the circuit and have returned to their own posters, have students read the feedback that was left for them on the sticky notes.

## Resources


- Carolina Science Online. (n.d.). Terrestrial Isopods. [Web page.] https://www.carolina.com/isopods/terrestrial-isopods-pill-bugs-sow-bugs/FAM_143060.pr
- K20 Center. (n.d.). 4-2-1. Strategies. https://learn.k20center.ou.edu/strategy/142
- K20 Center. (n.d.). Gallery walk / carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). I think / We think. Strategies. https://learn.k20center.ou.edu/strategy/141
- K20 Center. (n.d.). Research poster. Strategies. https://learn.k20center.ou.edu/strategy/49
- McCormic. (n.d.) Alien invasion. Miss McCormic's Website. [Web log]. Rhttps://missmccormic.weebly.com/uploads/1/0/1/2/10125307/alien_invasion.pdf