



pets in the  
classroom

# Hiss-terical Observations: Investigating Cockroaches Like Scientists!

<b>Adapted from</b>	<a href="#">Madagascar Hissing Cockroaches in the Classroom Entry: Small Animals 2016 Lesson Plan Contest S. Brown 7th grade science Student</a>	
<b>Pet:</b> Madagascar Hissing Cockroaches	<b>Class:</b> 6-9	

<b>Brief Overview:</b> Students will engage with live Madagascar hissing cockroaches to practice scientific observation skills and design and conduct a controlled experiment. They will explore the cockroaches' behavior and responses to different stimuli, culminating in a class-designed experiment to answer a question about their preferred environment.	<b>Lesson Breakdown</b> <b>Lesson 1:</b> Learn About Madagascar Hissing Cockroaches <b>Lesson 2:</b> Design Your Experiment <b>Lesson 3:</b> Testing Time
<b>Essential Question</b> How can we use careful observation and experimentation to learn about the behavior and preferences of living organisms?	

<b>Subjects</b> <ul style="list-style-type: none"><li><input checked="" type="checkbox"/> Science</li><li><input checked="" type="checkbox"/> ELA</li><li><input checked="" type="checkbox"/> Math</li><li><input checked="" type="checkbox"/> STEM</li><li><input type="checkbox"/> Art</li><li><input type="checkbox"/> Other</li></ul>	<b>Stem Connections</b> <p>Science: structures and processes, ecosystems Technology: stopwatches, 3D modeling (optional) Engineering: Creating the experiment - challenges, toys, etc. Math: measuring, graphing</p>
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## Performance Expectations/ Standards

### NGSS Standards:

- **MS-LS1-3:** Analyze and interpret data to provide evidence for the role of natural selection in shaping the traits of populations over time.
- **MS-LS3-3:** Construct an argument supported by evidence for how changes in factors in an ecosystem affect populations of organisms.
- **MS-ETS1-1:** Define the criteria and constraints for a design problem that involves the functioning of a system designed to solve a human problem
- **MS-ETS1-4:** Develop a model to generate data to evaluate potential solutions to a problem

### CCSS Math Standards:

- **6.SP.4:** Display data in plots and graphs. (e.g., bar graphs, line graphs)
- **7.SP.2:** Use random sampling to draw inferences about a population.
- **8.SP.A.1:** Describe data with summary statistics, including mean, median, interquartile range, and mode.

### CCSS ELA Standards:

- **6-8.SL.2:** Participate in collaborative discussions with diverse partners.

## I CAN statements

- make careful qualitative and quantitative observations about living things using all my senses.
- ask a question about something I observed and develop a hypothesis to answer it.
- design and conduct a controlled experiment to test my hypothesis.
- collect and analyze data to draw conclusions from my experiment.
- communicate my findings and interpretations clearly and concisely.

## Materials

- [Introduction to Vertebrates](#)
- Magnifying glasses, rulers, stopwatches
- Student experiments may require building materials
- [Investigating Cockroaches Like Scientists Student Worksheet](#)

## Teacher Background

Madagascar hissing cockroaches (*Gromphadorhina portentosa*) are not a household pest. Hailing from the island nation of Madagascar, they hold the title of the largest cockroach species, reaching an impressive 5-7.5 cm (2-3 inches) in adulthood. Unlike their smaller, scuttling cousins, these giants boast a surprisingly calm demeanor and are even kept as exotic pets. But beyond their size and docile nature, these insects harbor fascinating adaptations and behaviors worthy of scientific exploration.

One defining characteristic of the Madagascar hissing cockroach is its namesake sound. By expelling air through specialized spiracles, they can produce a loud hissing noise, reaching decibel levels comparable to a human whisper. This unique vocalization serves multiple purposes, from deterring predators to attracting mates during courtship. Interestingly, males possess larger horns on their heads, which play a role in aggressive encounters, similar to the battles seen in horned mammals.

Beyond their impressive "communication skills," Madagascar hissing cockroaches exhibit remarkable resilience and adaptability. Their omnivorous diet allows them to thrive on fallen fruit, leaves, and other organic matter found in their forest habitat. They boast a robust immune system, capable of resisting diseases that would prove fatal to other insects. Additionally, their long lifespan, spanning up to five years, further highlights their evolutionary success.

These gentle giants play a crucial role in their native ecosystem. By consuming decaying organic matter, they contribute significantly to the decomposition process, aiding in nutrient cycling and maintaining a healthy forest floor. In turn, they become food for larger animals, forming an important link in the food chain. Studying these fascinating creatures not only increases our understanding of insect diversity and behavior but also sheds light on the complex ecological web they inhabit.

## Lesson 1: Learn About Madagascar Hissing Cockroaches

Time	Materials	Activity
5 mins		Ask students what an invertebrate is and why anyone would study these animals/what kinds of information can be gained from studying an invertebrate? .
10 mins	<a href="#">Introduction to Vertebrates</a>	Share the presentation to get the students excited about learning about the Madagascar Hissing Cockroach.
10 mins		Review the differences between qualitative and quantitative observations. If these are new terms for the

		students, allow them time to practice using classroom items. Let them know they will be making both these types of observations with the Hissers
15 mins	Magnifying glasses, rulers, stopwatches	Review how to handle the Hissers safely.  Divide the students divided into small groups and have them make five qualitative and five quantitative observations about the Hissers.  Allow the students to choose what tools to use:magnifying glasses, stopwatches, rulers, etc. Students should record their data in their student workbooks.
5 mins		Have the students share their data with the class.

<b>Lesson 2: Design Your Experiment</b>		
<b>Time</b>	<b>Materials</b>	<b>Activity</b>
5 mins		Have students brainstorm the steps scientists consider when conducting scientific research. Help students conclude that research is used to answer a question, that research is planned, that details must be specified in advance, research is made up of a series of observations, observations are recorded and observations are used to draw conclusions about the original question.
10 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	In pairs, have students brainstorm a list of questions about the Hissers. Let students know that they will be handling the Hissers so it is crucial that students pair up with at least one partner that is comfortable handling the invertebrates.
15 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	Have students pick one of their ideas/experiments and let them know they will be designing their own experiment using the Hissers to learn more about them.  The only requirements are that (1) the experiment includes quantitative observations and (2) the Hissers come to no harm.
15 mins	<a href="#">Investigating</a>	Have the students identify their hypothesis and variables

	<a href="#">Cockroaches Like Scientists Student Worksheet</a>	<p>for the experiment.</p> <p>Have them list the materials they will need and the procedure they will follow. Remind them that the teacher <b>MUST</b> approve the procedure before they begin to test.</p> <p>If time permits, students may practice with Hissers and make adjustments as needed.</p>
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<b>Lesson 3: Testing Time</b>		
<b>Time</b>	<b>Materials</b>	<b>Activity</b>
5 mins		Safety First: Remind students about safety protocols when handling the cockroaches and emphasize the importance of following their approved experimental design.
15 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	Build and set up the experiment.
15 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	Experiment Time! Students conduct their experiments, collecting data as planned. Encourage them to document their observations throughout the process. Remind them that they should conduct their experiments more than once to eliminate bias.
5 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	Allow the students time to complete the questions on their worksheet.
5 mins	<a href="#">Investigating Cockroaches Like Scientists Student Worksheet</a>	Have the students share their results with the rest of the class.

## Differentiation

### For students who need additional support:

- Provide additional support to students who struggle with observation skills by offering prompts and guiding questions.
- Provide students with sentence starters or graphic organizers to support their observation and data recording.
- Offer manipulatives or visual aids to help students design their experiments.
- **Kinesthetic learners:** Provide opportunities for hands-on activities like creating models of the cockroach anatomy or building shelters for different environmental conditions.
- **Visual learners:** Utilize diagrams, videos, and infographics to represent data and concepts.
- **Auditory learners:** Encourage discussions, debates, and presentations to solidify understanding.

### For students who need additional challenges:

- Challenge advanced students to design more complex experiments or research additional information about Madagascar hissing cockroaches.
- Design a "roach hotel" with different compartments: Observe how roaches choose their preferred environment based on factors like temperature, humidity, and light.
- Create an obstacle course: Test the agility and problem-solving skills of roaches by designing a course with different challenges

## Assessment

Criteria	4 - Exemplary	3 - Proficient	2 - Developing	1 - Beginning
Data Table	All data is accurately recorded	Most data is accurately recorded	Some inaccuracies in data recording	Major inaccuracies or missing data in the data table
Graph	Graph is accurately constructed and	Graph is mostly accurate and well-constructed	Some inaccuracies in graph construction	Major inaccuracies or missing graph construction
Analysis Questions	Thorough and insightful responses demonstrating	Adequate analysis with some insightful points	Superficial analysis with limited insight	Minimal or no analysis; demonstrates lack of

	deep understanding of concepts and implications	Clear understanding of concepts and implications		understanding
<b>Overall Presentation</b>	Neat, well-organized with attention to detail	Mostly neat and organized with attention to detail	Somewhat neat and organized	Messy, unorganized, or incomplete presentation

### Extension

- Encourage students to create presentations or infographics to share their findings with a wider audience.
- Discuss the ethical considerations of using live animals in experiments and alternative methods of scientific investigation.
- Research other interesting behaviors of Madagascar hissing cockroaches.
- Investigate different stimuli: Once students have a basic understanding of cockroach behavior, they can design experiments to investigate their response to different stimuli. This could include light intensity, temperature, sound, or different food options.
- Explore behavior in groups: Observe and compare the behavior of individual cockroaches versus groups. Do they act differently? How do they interact with each other?
- Compare and contrast species: Extend the investigation to other cockroach species, available through pet stores or research institutions. How do their behaviors and adaptations differ from the Madagascar hissing cockroach?
- Research and present: Encourage students to delve deeper into specific aspects of Madagascar hissing cockroaches, such as their anatomy, reproduction, or role in the ecosystem. They can then present their findings to the class or through other creative mediums.
- Connect to conservation: Discuss the threats faced by Madagascar hissing cockroaches in their natural habitat and explore conservation efforts. Students can research and propose solutions to these challenges.