

GRADE LEVEL: This lesson is designed for a grade 6 science classroom.

SCIENCE CONCEPT: This lesson is aimed at helping students understand that the behavior and survival rate of a group of organisms is dependent on environmental conditions, such as quantities of light. This lesson also provides opportunities for students to practice making observations and formulating and testing hypotheses.

RELATIONSHIP TO CALIFORNIA SCIENCE CONTENT STANDARDS:

5. e *Students know* the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

LEARNING OBJECTIVE:

1. Students will form two hypotheses to address the effects of dark conditions on the nocturnal and locomotive behaviors of Madagascar Hissing Cockroaches (MHC).

EVALUATION IDEAS:

1. formative:
 - a. I will grade the first page of student's MHC Log. I will place a red check mark on the right-hand corner of the MHC log to indicate student's proficiency in documenting the effects of light on the nocturnal and locomotive behaviors of MHC.
 - b. I will ask students to orally describe how MHC behaved in the natural classroom light.
2. summative:
 - a. I will grade student's entire two-page MHC Log after they have investigated the effects of two different environmental conditions on the nocturnal and locomotive behaviors of MHC. I will place a red star on the right-hand corner of the first page of the MHC log to indicate student's proficiency on both days of documentation.
 - b. During a two-minute presentation, students will share their two hypotheses regarding the effects of dark conditions on the nocturnal and locomotive behaviors of MHC.

CONCEPTUAL BACKGROUND:

The behavior and survival rate of MHC depends significantly on environmental conditions, such as quantities of light. In order to teach this lesson well, the teacher must understand how and why MHC's nocturnal and locomotive behaviors vary depending on the quantity of light in their habitat or ecosystem. The MHC prefers a dark, moist, and secluded environment. MHC hiss when disturbed or alarmed, and they have pads and hooks on their feet that allow them to climb smooth surfaces. When a male intrudes on a neighboring male's territory, a fight will ensue. Mating behavior is elaborate and involves posturing and hissing by the males to attract females. The MHC moves away from light and, therefore, is nocturnal in activity. In the dark, they become more active and scavenge for meals.

LESSON IMPLEMENTATION PLAN: This lesson is designed as a structured inquiry. There is a cage with MHC inside a well-lit classroom. Students will take turns observing and documenting in their MHC Logs the effects of light on the nocturnal and locomotive behaviors of MHC. Groups of three students will rotate after five minutes. Based on their classroom observations, each student will form two hypotheses to address the effects of dark conditions on the locomotive and dietary behaviors of MHC. Students will document their two hypotheses in their MHC Log.

ENGAGE – I will pose two questions to the class: “Do you prefer the nighttime or daytime? How does the light and darkness affect your energy, mood, and behavior?” After a brief discussion, I will pose two more questions to the class: “Do you think that different environmental conditions, such as darkness or light, affect the energy, mood, and behavior of MHC? How so?”

EXPLORE – Using their MHC Logs, students will begin to observe the MHC in the well-lit classroom. The MHC log is one page long and provides students with the opportunity to document their observations and two hypotheses in an organized fashion. Students will document the effects of light on the nocturnal and locomotive behaviors of MHC on the top half of their MHC Log. Afterwards, on the bottom half of their MHC Log, each student will form and document two hypotheses to address the effects of dark conditions on the nocturnal and locomotive behaviors of MHC. *Each of student’s two documented observations and hypotheses must consist of one complete sentence* (four complete sentences in total).

EXPLAIN – Once all students have had a chance to observe the MHC, I will facilitate a class discussion on why the behavior of MHC will vary depending on the amount of light they are exposed to. I will add comments and undertake direct teaching if necessary, until the class as a whole can articulate an understanding that the behavior of MHC varies depending on the amount of light they are exposed to because they are nocturnal creatures.

ELABORATE – I will elaborate on the learning of the same concepts in different contexts by having students watch an informational video that explains and depicts the effects of dark conditions on the nocturnal and locomotive behaviors of MHC.

EVALUATE -

- a) formative: Based on their documentations regarding how the MHC behaved in light, I will ask students to describe *how* and *why* they formed their two hypotheses regarding the effects of dark conditions on the nocturnal and locomotive behaviors of MHC.
- b) summative: I will assess student’s knowledge by assigning to them a one-paragraph essay. In the essay, students will write five sentences in which they describe how the informational video validated or invalidated their two hypotheses regarding the effects of dark conditions on the nocturnal and locomotive behaviors of MHC.

DIFFERENTIATION PLANS:

Behavioral for Student A – Provide hyperactive students with additional supervision during the classroom observations of the MHC to ensure that they are participating adequately throughout the lesson.

Cognitive for Student B – Provide inattentive students with additional explicit instruction about how the survival of all organisms depends significantly on the environmental conditions of their habitat or ecosystem.

Cognitive for Student C – Assist unorganized students with documenting classroom observations in their MHC Log.

Affective for Student D – Provide temperamental students with an appropriate level of praise to motivate them to participate in classroom activities.

Language Demands for Students E – I will use body language to accompany speech in order to assist ELL students in comprehending information. In order to represent the word *nocturnal*, I will pretend to be sleeping. In order to represent the word *locomotive*, I will pretend that I am running around.

F – I will simplify vocabulary to promote ELL students' comprehension of course concepts. For example, I will explain that the word *sleep* is similar to the word *nocturnal*, and that the word *energy* is similar to the word *locomotive*.

G – In lieu of completing the MHC Log, ELL students may draw a picture in which they address the effects of light on the nocturnal and locomotive behaviors of MHC.

LIST OF MATERIALS (FOR STUDENTS):

- MHC Log, MHC Essay, writing utensil

SAFETY CONCERNS/SPECIAL INSTRUCTIONS:

- To ensure the safety of all, students and teachers are prohibited from touching the MHC or their cage.
- Due to SJSU Animal Welfare Committee (IACUC) policies, the MHC checked out through the SJSU Wildlife Ambassador Program are not allowed to be fed while out for a short classroom visit by teachers or students. Also, their environment may not be manipulated for experimental purposes, which would include turning the lights on and off to observe a change in their behavior.