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Urban EcoLab

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Lesson Plan

Center for Urban Resilience

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LESSON #1: Hummingbird Ecology

OVERVIEW:

This Lesson 1, in a series of lessons on birds in the urban landscape, will focus on an aerobatic and amazing marvel of nature, the hummingbird! Students will gain an insight into the physiological and behavioral characteristics of this smallest of animals, as well as learn about supplemental feeding, installing feeders on their school campus, designing research investigations around feeders, and collecting and analyzing data using live hummingbird cameras available on the CUREs website via a YouTube Channel: CUREs Lab Bird Cams Project:

https://www.youtube.com/channel/UCvIFR2wRImRS5Cg2X8I4vqg?view_as=subscriber%2Flive.

The purpose of Lesson 1 is to provide opportunities for students to practice their powers of observation, ask questions, fine-tune their research and experimental design skills, and share with them this beautiful synanthrope, the hummingbird.

Option 1: If possible, it is recommended that teachers put up 1 or 2 (or more) hummingbird feeders at the school site, so students can do on-site research about the hummingbirds visiting their site. This should be done at least a few weeks before students will begin their exploration of hummingbirds and designing their research investigation, to give time for the birds to find the feeders and become habituated to using them as a source for supplemental food. See the “Care and Maintenance of Hummingbird Feeders” sheet in the Resources folder for directions on how to fill and care for the feeders.

Option 2: CUREs has LIVE Bird Cams on the CUREs website (see link above), where students can observe hummingbirds at sites around SoCal and elsewhere (see CUREs Lab Bird Cams Project).

SUB-QUESTION(S)/CONSIDERATIONS:

- What are the physiological and behavioral characteristics that set hummingbirds apart from other birds?
- What are the pros and cons to providing supplemental sugar-water solution in feeders for wild hummingbirds?

- What kinds of research investigations can be designed to learn more about intra and inter-species interactions at a feeder?
- How can technology be leveraged to provide opportunities for scientific investigation?
- How do hummingbird species differ geographically?

Teacher Background on Hummingbirds:

Hummingbirds are tiny, highly energetic birds that provide many ecosystem services such as pollination, insectivory, and biophilia. Hummingbirds utilize nectar from flowers and insects as their primary source of food. They get their name from the whirring sounds that their wings produce when they fly. Flapping up to 80 times per second, they are highly maneuverable, are able to hover in mid-air and can even fly backwards at speeds in excess of 30 mph. Hummingbirds are very small, only about five to seven inches long (some are less than three inches long), depending on the species. Found only in the Western Hemisphere, over 320 are distributed from Alaska to southern Chile, although most hummingbird species reside in the tropics. They are common here in Southern California, both as resident nesting birds and migrants passing through. Even the urban habitats of Southern California are rich with at least three species year-round: Anna's, Allen's, and Black-chinned. Other species, such as Rufous and Calliope can be seen migrating through during parts of the year. Hummingbirds can migrate great distances. A Rufous that was banded one winter in Florida appeared more than 3,500 miles away in southeast Alaska! Hummingbirds are often referred to as extremophiles, which means they can handle extreme conditions, such as extreme cold and heat, as well as being able to lower their body temperature and slow their metabolism at night during torpor, achieving an almost temporary state of hibernation. They can also fly upside down and go from 0 to 50 mph in about 10 feet, another example of how they can achieve many extremes that are not possible with other animals. Hummingbirds have extremely high metabolisms, and must feed every 5-7 mins during the

day, or they can die. Hummingbirds can live in the wild about ten years.

To learn more facts about hummingbirds, see the extensive lesson resources provided in, ***“Background Materials for Students & Teachers”*** and ***“Instructional- Lesson Plan & Lesson Support Materials”***, as well as all the links to great hummingbird resources embedded throughout curriculum.

WAYS OF KNOWING URBAN ECOLOGY:*Students will...*

Understand . Investigate the physical and behavioral characteristics of hummingbirds

Talk . Share knowledge of hummingbirds. Discuss new information with peers

Do . Design a research investigation involving hummingbird feeders (on-site or via live web cams)

Act . Conduct research. Gather & Analyze data. Draw conclusions. Share findings with peers

SAFETY GUIDELINES:

Review field guidelines when taking students outside to do any site visit.

PREPARATION:

Time: 5 class periods

MATERIALS (enough for # groups @ 4 in each group):**Activity 1.1 (1 class period): Introduction, Picture-Walk K-W-L & Video Preview – Building Background**

- Picture-Walk:
 - Flip chart paper and markers
 - Hummingbird Pictures (see Resources folder)
- Video Preview:
 - Projector
 - Computer/laptop to show Video
 - Hummingbird Nature Series Video, “*Birds of the Sun God*” (see Resources folder)
 - White board/projector screen
 - Pens/pencils for note-taking
 - Two-column chart for note-taking

Activity 1.2 (1 class period): Read Materials; Review Sample Research Investigation; Formulate Potential Research Questions

- Reading materials (see Resource folder)
- Sample Research Investigation (see Resources folder)
- Research Investigation graphic organizer (see Resources folder)

Activity 1.3 (1 class period): Design Research Investigation; Select (or Design Own) Data Collection Sheet

- All materials from previous day (sample investigation, graphic organizer)
- Data Collection Sheet options (see Resources folder) – 3 choices, but students can design their own as well

Activity 1.4 (1 class period): Collect and Analyze Data; Draw Conclusions

- Data collection forms
- Clipboards
- Pencils/Pens
- Timing device
- Computers (if conducting observations using the live web cams)

Activity 1.5 (1 class period): Present Research Investigation & Findings to Class

- All materials from the in-class and field research

INSTRUCTIONAL SEQUENCE:

- **Activity 1.1 (1 class period): Introduction, Picture-Walk K-W-L & Video – Building Background**
- **Teacher Introduction:** *Introduce students to the topic of hummingbirds, advising them of the outline of activities throughout the next five days:*
 - Day 1: Picture walk (15 mins) & video with note-taking (30 mins).
 - Day 2: Read materials; review sample research investigation; begin to formulate potential research questions.
 - Day 3: Design investigation, select data collection method, etc.
 - Day 4: Collect and analyze data; draw conclusions.
 - Day 5: Present research investigation and findings to class.
- **Picture Walk:**
 - **Pre-Lesson:**
 - Before students arrive, have hummingbird pictures placed around the room either on the walls or at lab stations, depending on the space available.
 - *Note: There are more pictures than needed to choose from. The teacher can choose which ones and how many to make available to the students.*
 - Post flip-chart paper (Post-It stick-on works great!) under each picture.
 - Label each flip chart paper with three columns titled “Observations”, “K - What I Know”, and “Questions”.
 - **Step 1:** Count off students and have them go to each picture as you direct them (1s go to Pic1; 2s go to Pic 2, etc.)
 - **Step 2:** Advise the students they are to look at the picture and write down their observations in Column 1, what they know about hummingbirds in Column 2, questions they have

about hummingbirds in Column 3. Allow 5-10 mins for this portion.

- *Note:* Since a group of students will be at each picture, they can discuss the picture and one person can be the scribe for the group.
 - Step 3: When the 10 mins is up, go around the room and have a student from each group (someone other than the scribe) read the feedback from their group.
 - Step 4: Advise students that these flip chart papers will remain up during the next week, as students begin to formulate a research question for their hummingbird investigation.
 - Step 5: Also advise students that they will be working in these same groups to design a research investigation around hummingbirds at feeders.
- **Video:**
 - *This second portion of the class period will be spent on having students watch a 30 min video on hummingbirds, while they take notes from the video.*
 - Step 1: Have the video “*Birds of the Sun God*”, already queued and ready to go (see Resources folder).
 - Step 2: Distribute the two-column chart / graphic organizer to each student.
 - Step 3: Advise students during the video to take notes on the main topic & then details about that topic. *A sample has been provided in the Resources folder.*
 - Step 4: Show the video. Circulate occasionally to ensure students are watching the video and taking notes.
 - *Note: Optional – could give students a classwork grade for their notes.*

Activity 1.2 (1 class period): Read Materials; Review Sample Research Investigation; Formulate Potential Research Questions

- **Step 1:** Divide students into their groups from the previous day's picture walk activity.
- **Note:** *Advise students their research project will be a group project with one research question, not individual research questions. Have all students complete the forms, so each student can participate in the process. When it comes to the data collection process, one student will be recording data for the group.*
- **Step 2:** Distribute reading materials provided in the Resources folder.
- **Step 3:** Distribute Sample Research Investigation.
- **Step 4:** Distribute Research Investigation graphic organizer.
- **Step 5:** Advise the students that they will be doing the following:
 - Reading through the materials to learn about hummingbirds, and most importantly, to glean ideas on what they can research for their investigation (either using the on-site or live web cam feeders).
 - Reviewing the sample research investigation provided, to see how a good research project is designed, to gain ideas for how to design their group's research project.
 - Beginning the process of formulating their own research investigation.
- **Step 6:** Circulate throughout the room to assist students as needed.
- **Step 7:** At the end of the period, remind students to keep their work for the following class meeting, where they will be designing their investigation, deciding on their data collection method and then beginning to conduct their research.

Activity 1.3 (1 class period): Design Research Investigation; Select (or Design Own) Data Collection Sheet

- **Step 1:** Today should be devoted to designing a robust research investigation. Students should have all their materials from the previous day to accomplish this (sample research investigation, graphic organizer).
- **Note:** *If students are struggling with coming up with a research question, utilize the “Sample Research Questions and Hypotheses” document in Lesson Resources provided.*
- **Step 2:** Distribute to each group samples of each of the data collection sheets. The group will decide on one data collection method to match the question they have come up with. If they need to design their own, to match their question, they can do so.
- **Step 3:** Advise students to begin their work, designing a research investigation with all of the components listed on the graphic organizer.
- **Step 4:** The team should also decide who will be doing each part of the research. Roles could be: time keeper; data collector; observers (to observe humm coming to/from the feeders); identifier (to help identify species, if a species composition is being conducted)

Activity 1.4 (1 class period): Collect and Analyze Data; Draw Conclusions

- Today is the day to conduct the research.
- **Step 1:** Divide the students into their groups.
- **Step 2:** Make sure each group has a timing device. The timekeeper will need to be sure to keep track of time for the observations (20 mins), to allow time for analysis, discussion, and drawing conclusions.
- **Step 3:** Be sure each group has their data collection sheet and something to write with, as well as a clipboard.

- Step 4: If conducting outside observations, review the Field Safety Guidelines in the Resources folder.
- Step 5: If students are observing using the live webcams, they will need access to computers to make their observations and space to gather.
- Step 6: Have students begin their observations.
- Step 7: After 20 mins have the class gather back in the classroom to discuss and analyze their data and draw some conclusions. Tomorrow they will present their research question, hypothesis, methodology (experimental design), results/findings challenges they encountered, something(s) that surprised them, and potential future questions that could be explored.

Activity 1.5 (1 class period): Present Research Investigation & Findings to Class

- Today's activity will be to communicate findings to peers.
- Step 1: Have students sit in their research groups.
- Step 2: Have each member of each group share one thing about their research investigation, including:
 - Research Question
 - Hypothesis
 - Methodology (experimental design)
 - Results/Findings
 - Challenges they encountered
 - Something that surprised them
 - Potential future questions that could be explored
- Step 3: A "nice-to-do" would be to invite members of the school administration to come and hear the research findings and give them the opportunity to ask the students questions.
- Step 4: Exit Ticket: Have students share one thing they learned about hummingbirds that they had not previously known. Can be a verbal or written response, teacher choice!

- *Note: It is recommended that this project be assessed as a research / project grade using a simple rubric. One has been created as a sample (see Lesson Resources).*

Summary Notes – By the end of the Lesson, Students will be able to (SWBAT):

- Understand the physiological and behavioral characteristics of hummingbirds
- Install hummingbird feeders at a site and Know how to maintain them
- Work with peers to design a research investigation
- Conduct research involving hummingbird feeders on-site or via live web cams
- Utilize technology by integrating it into the experimental design process
- Make observations of live hummingbirds at feeder sites
- Collect and Analyze data
- Share findings with peers
- Work cooperatively to reach desired goals

Lesson Standards Alignment (CA-NGSS) – See Chart in Module 13 Curriculum Support Materials.

Lesson Adaptations and Extensions – See Chart in Module 13 Curriculum Support Materials.

Potential Extension Lesson Activities:

- Show additional videos on hummingbirds or assign them for homework. A great one is a National Geographic video documentary titled:
 - “Wild Hummingbirds Jewelled Messengers”. See link below.
 - <https://www.youtube.com/watch?v=bbuuX1q4vUU>
- Have students create a Research Poster on the research they conducted; see sample Student Posters provided in the Resources folder.
- Have students create their own hummingbird pamphlet (see sample provided in the Resources folder).
- Invite a hummingbird expert to give a talk to the class (hummingbird rehabbers or hummingbird vet would be good options).
- Have a hummingbird art contest where students draw/paint their own unique pictures of hummingbirds.
- Have a hummingbird poetry contest where students write a poem about hummingbirds; could also have a poetry reading and invite families and the community.
- Plant a pollinator garden at the school site, with plants that will attract hummingbirds.
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