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Sea Turtle CSI: A Graphing Activity Subjects: Life Science / Biology Environmental Science Marine / Ocean Science

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SEA TURTLE CSI: A GRAPHING ACTIVITY

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Grade Level
Middle School

Subject area
Life Science, Biology, or Environmental Science

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1. Activity Title: Sea Turtle CSI: A Graphing Activity

2. Focus: Sea turtle strandings and determining rate of decay over time

3. Grade Levels/Subject: Grade 7

4. Virginia Science Standards of Learning addressed:

LS.1: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- data are organized, communicated through graphical representation, interpreted, and used to make predictions;
- patterns are identified in data and are interpreted and evaluated;

LS.10: The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic, change over time, and respond to daily, seasonal, and long-term changes in their environment. Key concepts include
- factors that increase or decrease population size;

LS.11: The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include
- population disturbances and factors that threaten or enhance species survival; and
- environmental issues.

5. Learning objectives/outcomes:

a. Students will make observations and understand how qualitative data can be used in science
b. Students will graph data and interpret graphs to answer questions
c. Students will analyze threats that sea turtle populations face and discuss the ecological importance of animal species

6. Time Required: 60-80 minutes total; Advance preparation of lab materials – 10 minutes, Lab setup – 5 minutes, Introduction – 10 minutes, Activity – 30 to 45 minutes, Discussion – 15 minutes, Breakdown and clean-up – 5 minutes.

7. Vocabulary:

- **Stranded sea turtle**: any ocean turtle found dead, injured, sick, or otherwise abnormal found out of the water and along the coastline (http://www.pifsc.noaa.gov/marine_turtle/strandings.php)
- **Endangered species**: an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range (http://www.fws.gov/Midwest/endangered/glossary/index.html)
- **Threatened species**: any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (http://www.fws.gov/Midwest/endangered/glossary/index.html).
- **Qualitative data**: data are collected through observation; information that is not in numerical form; typically descriptive data (http://www.simplypsychology.org/qualitative-quantitative.html)
- **Quantitative data**: data are collected through measuring things; information in numerical form which can be put into categories or measured in units of measurement (http://www.simplypsychology.org/qualitative-quantitative.html)

8. Background information:

There are seven living species of sea turtles found around the world. Inhabiting nearly all oceans, sea turtles are found to occupy unique ecological niches and have been around since the time of the dinosaurs. Unfortunately, these animals face major threats that have been responsible for the rapid decline in sea turtle populations in recent years. According to the IUCN Red List of Threatened Species (www.iucnredlist.org), six of the seven marine turtle species are currently listed as either vulnerable (threatened) or endangered. The flatback sea turtle (*Natator depressus*) is the least studied of the sea turtles and has one of the smallest geographic ranges, living solely in the waters near Australia. Although flatbacks are regarded by the IUCN to be data deficient, they are considered vulnerable by the Australian government. Nonetheless, all sea turtle species face a variety of anthropogenic and environmental threats, including disease, marine debris, entanglement in fishing gear and bycatch. Sea turtles are important to ocean ecosystems, by maintaining marine habitats, helping cycle nutrients, and are a part of the balanced food web. As populations decline, it affects the health of the entire ecosystem.

Stranded sea turtles are any ocean turtle found floating on the ocean surface or washed up along the coastline, often deceased or severely injured. Live turtles are taken to rehabilitation centers to receive care, while the carcasses of dead turtles are often salvaged for necropsy and study. The Sea Turtle Stranding and Salvage Network (STSSN) was established by the National Oceanographic and Atmospheric Administration to collect information on and document standings through the country. Since nearly all species of sea turtles are threatened or endangered, identifying the sources of mortality and causes of these stranding events are crucial to the conservation and recovery of sea turtles populations.

SSTSN state coordinators and network participants document strandings in their respective areas and contribute these data to a national database. One of the pieces of information stranding teams collect when responding to a sea turtle stranding event is a condition code, which corresponds to the degree of decomposition of the body and are subjectively estimated from external examinations of the carcass. These standard condition codes are based on STSSN stranding report guidelines and range from code 0 (alive) to code 5 (clean bones). Scientific studies on sea turtle decomposition rates have recently been underway to associate a time component with the condition code continuum. This will help in determining how long ago mortality occurred for the stranded turtles that wash up on shore, which can be extremely useful when trying to pinpoint locations of at-sea mortality.

11. Student handouts:

- Images
- “Police report” document
- “Carcass evaluation” document
- “Condition code guide” document

10. Materials:

- Computer and projector for accompanying PowerPoint
- Dry erase board/easel
- Scrap paper and pencils

11. Classroom Setup: Desks/tables should be spilt up into six groups. The students should be spilt into these groups for the duration of the activity.

12. Procedure:

Prepare lesson activity by assembling “case files” in advance. A manila folder equipped with a cover page (attached) can be assembled for aesthetic purposes but is not required (papers grouped together will suffice). From the attached materials, print one copy of the following documents: “Photos”, “Condition code,” and “Police Report”. The first three pages of “Photos” should be cut horizontal in half to produce 6 copies of “Day 0 images.” Likewise, “Condition code” and “Police report” documents should also be cut where appropriate to produce multiple copies. The attached worksheet should be printed with enough copies for each student to receive their own.

Label each case file from A-F and assemble a stack of papers for each folder with:

- Its corresponding study images
- Day 0 images
- Carcass evaluation sheet
- Condition code guide
- Police report

The instructor may choose to laminate these items to ensure their longevity (excluding the police report, which will be filled out and handed in at the end of class) and/or place the condition code guide and day 0 images on a projector/poster to save paper. Set up the attached PowerPoint on the computer screen/projector.

Engage

Note: The instructor may wish to begin the class with a short presentation on basic sea turtle information, including population threats. The first six slides on the PowerPoint can be used as a guide, and this section can be expanded on if the instructor desires.

As the images of the decaying turtles can be graphic and bothersome to sensitive students, the instructor may wish to verbalize a warning or have a discussion about the nature of the images prior to the activity.

Show the students the image of the bananas on slide 8 of the PowerPoint.

Have them answer the following questions on a piece of paper or discuss among themselves:

1. Which banana(s) would you eat? Which banana(s) would you not eat?
2. Why? What is different about these bananas?
3. What are some ways you can distinguish a fresh banana from a rotten one?
4. How many days do you think it takes for a fresh banana to go rotten? How can you test that?

Discuss these questions as a class. Continue through the PowerPoint until slide 13. Refer to the notes portion of each slide for talking points.

Explore

Spilt classroom into 6 groups. Explain to the class that each group will receive a case file and will play the role of detective to determine the condition code of the turtle at that day of investigation. Go over the materials in each case file that they will receive:

- Unique, case-specific pictures for that day
- Day 0 pictures that depict what the initial carcass state for comparison *(Note: Reiterate to the students that this is a code 1 turtle, fresh dead)*
- Condition code guide that explains the criteria for each condition code
- Police report that the students are to fill out and hand in at the end of class, including a detailed description of the carcass state and their final condition code designation
- Carcass evaluation sheet that guides the students towards what type of observations they should make and well as basic sea turtle anatomy terms that should be used in their descriptions

Each group receives a case file and the students are responsible for comparing their case file pictures with the day 0 photos. They will write a detailed description of what their turtle carcass looks like, using sea turtle anatomy terms and the carcass evaluation sheet as a guide for what to look for. Then, they will use the condition code guide to assign the carcass a condition code based on their observations. Leave up slide 13 on the projector as guidelines for the group activity.

Give the students 5-10 minutes to complete this task. Upon completion, hand out a few small pieces and one large piece of scrap paper to each group. Have each group write the condition code they have decided

on in the center of the large sheet of paper. Explain to the students that they will now have a chance to walk around to other groups to look at all the other images and provide feedback on the condition code the group decided (gallery walk style). Feedback will be given on a small piece of scrap paper left at each station and turned upside down. As a group, students are to write a check mark if they agree with the designated condition code or an X if they disagree. If the disagree, the students should also provide feedback on why they do not agree and what condition code they would give. Have the students leave out all of the papers on the desks, minus the police report, which should be hidden in the case file (so other groups cannot see their rationale). Assemble these papers in the middle of the group of desks. As a group, have the students rotate around the room. Provide 3-5 minutes at each station before rotating.

Note: it may be useful to reiterate to the students that the purpose of the experiment was to see how long it took a turtle to decompose from code 1 to code 5. Once the turtle reached code 5, the experiment stopped. Therefore, there is only one code 5 case file, but there may be multiple code 1-4s.

Explain

After all the groups have rotated to all the station, have them return to their original case file. Give the students a few minutes to read the feedback from their peers, revise their condition code designation if needed, and place last minute details on the police report. Inform the students that in a few minute they will be sharing their results to the class. Have them decide on a presenter of the group who will share their final condition code decision and rationale. During this time, write the chart below on a board/poster at the front of the room:

Case File	Condition Code
--	1
A	
B	
C	
D	
E	
F	

Note: The teacher may choose to collect the police report at this point as groups finish them if they wish to check/grade it for details, use of terminology, etc.

After 3-5 minutes of individual group discussion, explain to the class that we will now share results with the class and fill in the chart. Explain to the class that first entry represents the day 0 images, which have a condition code of 1. Starting on slide 15 of the PowerPoint, click through the animations one at a time to reveal each case study photo. One at a time, have the presenter of the corresponding group explain their group's condition code decision as well as their rationale. The instructor should fill in their code on the chart as each class presents.

After all groups have presented, the instructor should lead a brief discussion about the difference between qualitative and quantitative data. Explain how in the beginning of the lesson, when the students were looking at pictures and making observations, they were using qualitative data. Then, we turned this qualitative data into quantitative data using the condition code scale. Discuss how during the gallery walk part of the lesson, students may have disagreed on condition code designations because qualitative data is subjective. Explain that for purposes of the graphing assignment, you will now share the "right" answers to this lesson. Go through the board and correct any of the codes as needed (refer to the attached teachers answer key).

Elaborate

Next, explain to the students that we need to associate a time component with the condition codes. Discuss as a class why this is important and add a "Day" column to the chart on the board (refer to image below). Tell the students that sampling took place each day for 6 days, so each case file represents a different day of sampling. Starting with the case file that represents condition code 2, proceed through the case files one by one and determine the chorological order of the case files as a class (noting that two of the case files have the same condition code and students will need to decide which came first in time chronologically based on the images). Refer to the teacher answer key for answers.

Case File	Condition Code	Day
--	1	0
A		
B		
C		
D		
E		
F		

Evaluate

Pass out the graphing assignment worksheet and have the student fill in the datasheet by copying the answers from the chart on the board. The students should graph the data and answer the questions on the worksheet.

Note: The teacher may choose to have the students work in-class on the graphing assignment worksheet, either individually or with their neighbor, or have them take it home to complete for homework. If the worksheet is homework, make sure the students copy down the data before leaving the classroom.

Wrap-up:

- What are stranded turtles?
- What are some threats sea turtles face?
- How is qualitative data different than quantitative data? Why was it useful to turn qualitative data into quantitative data in this activity?
- Why are we studying the decomposition rate of sea turtles? Why is this study important?
- Why do we care about turtles dying? *(Note: the instructor may choose to spend more or less time on the impact of species extinction on the ecosystem. Additional PowerPoint slides can be added to further explore conservation biology if desired)*

13. Assessment

Students will be assessed based on their performance on the worksheet, and their ability to complete the

police report including their evaluation of the carcass state and supply justification.