



College of Education
UNIVERSITY of FLORIDA



FLORIDA
MUSEUM

Engaging K-12 Students in
Integrated STEM via
3D Digitization, 3D Printing
and Paleontology



AUTHOR (S)

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LESSON TITLE

Herbivores, Omnivores, and Carnivores

GRADE LEVEL

2nd

TIME FRAME

2 Days: 45-minute class period

DRIVING QUESTION

How do living things get energy?

What information can you gather from fossils that can help you determine if an animal was a carnivore, omnivore, or herbivore. ?

LEARNING GOALS

Students learning goals will consists of analyzing and interpreting data while looking at 3D printed tooth fossils. Students will understand what habitats and types of diets each animal attained. By analyzing the tooth fossil students will also be able to identify if the animal was a carnivore herbivore or omnivore.

ANCHORING EVENT

Carnivores tend to have long teeth called canines which are used to tear meat, Carnivores use both of their eyes for vision, so most species have their eyes at the front of the head.

Herbivores usually have flat teeth, often with sharp ridges on the tops. Because herbivores are often prey for other animals, they generally have their eyes on the side of their head.

Omnivores usually have a variety of all kinds of teeth because they eat both plants and animals. Generally omnivores have eyes on the front of their heads like carnivores, in order to best catch their prey.

Begin by asking students, what do teeth do for you and for other animals? Have students list all the verbs they can think of that describe what teeth are used for: For example: to bite and chew...

Begin by telling students that they will be observing and identifying different animal skulls today. Remind students that the skulls are models (but that they are very expensive). also remind students that all of the skulls are fragile and need to be treated very gently, otherwise they will break.

COLLABORATIONS

The second graders will be collaborating with the third grade class by observing a similar lesson about fossilized plant life using 3D printed models. This collaboration will inform students and give them a first look on how the third graders integrated 3D printing to understand life sciences on a more complex level.

STEM INTEGRATION

Science: Students will be looking at fossils of carnivores, herbivores, and omnivores.

Technology | Engineering: Student will be using 3D printed models, they will understand the printing process, and the meaning of “hands-on” and accessible.

Math: Students will use addition skills to find the sum of teeth in each fossil skull and recording it on their skull observation worksheet.

ASSESSMENT

Students will be assessed on what they have learned by taking a quiz with questions based on the content from this project based lesson.

PROCEDURE

DAY 1

ENGAGE:

Start off by displaying on the smartboard a variety of animals that eat different foods.

for example: Lion, antelope, crocodile, giraffe, bear

Display pictures of the food these animals eat and ask students to link the animals to their diet. Which animals only eat plants? Which only eat meat? Review the scientific names for animals that only eat plants, only eat meat or eat both (herbivore, carnivore, omnivore).

EXPLORE:

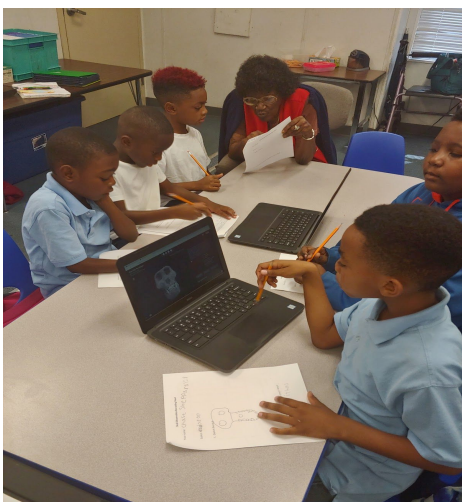
Show the students interactive video entitled "Learning about herbivores Herbivores, Carnivores, and Omnivores (<https://youtu.be/oCFU3tLdjRY>) to show students how animals use certain kinds of teeth to eat different foods. explain to students that animals who ate mostly meat will have sharp teeth for tearing and ripping flesh, animals who ate only plants will have flat teeth for grinding and chewing. and animals who ate both will have a variety of sharp and flat teeth. Ask students what kinds of teeth do herbivores, carnivores and omnivores need (flat, or sharp). Give children time to respond to partners. For day 2 tell the students that you are going to look at the skulls of different animals and try to work out which is which just by looking at them.

DAY 2

EXPLAIN:

Students will be handed their skull observation worksheet to use while observing the skulls. There will be five skulls one for each group. they will be observing 3D printed as well as computer scan models on a chromebook. students will rotate to each station every 15 minutes and write down their observations and ideas about each skull. Tell the students to observe the skull, sketch it and make notes. There will also be a list of observation questions for students to answer.

Students begin by making observations about the size of the skull and sketching. students will then fill out a chart answering, "Which type of teeth do they have?" and what is their function. Where are their eyes located? Based on this information, which type of animal do you think it is? A Herbivore, Omnivore, or Carnivore?



Students were observing scanned 3D models on chromebooks as well as 3D printed models.



ELABORATE:

After student groups have all had a chance to share their observations, groups will go back and discuss possible reasons and explanations. What differences were common? Why do you think there were differences? What similarities were reported? What might explain these similarities

EVALUATE:

Check students understanding by asking questions. When students have finished, discuss the data by having students share out their findings on each skull. Students can compare and contrast with other groups by asking others who examined the same skulls to also share their data. Students will also take a quiz on what they have learned about 3d printing and information that was covered in the project based learning.

STANDARDS

NEXT GENERATION SCIENCE STANDARDS (NGSS)

Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Performance Expectation	Connection to Lesson
2-LS4-1 Biological Evolution: Unity and Diversity	
Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	Students will analyze and interpret data by observing the teeth of mammals from 3D fossils. Students will be able to determine mammals identifying the teeth of the animal selection..
Science & Engineering Practices	Connection to Lesson

Analyze and interpret data to make sense of phenomena using logical reasoning

Students will be using data they collected from observing the 3D printed skulls to record similarities and differences. by doing this they will also be able to compare and contrast different pieces that have the same diet.

Disciplinary Core Ideas

Connection to Lesson

LS4.A: Evidence of Common Ancestry and Diversity

Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (3-LS4-1)

Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)

After students complete this activity, they should be able to classify a skull as a Herbivore, omnivore, or carnivore

Cross Cutting Concepts

Connection to Lesson

Scale, Proportion, and Quantity

Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

Students can compare modern skulls and see that the same observations made from modern mammals and can be made of those that lived long ago.

(3-LS4-1)Connections to Nature of
Science

Scientific Knowledge Assumes an Order
and Consistency in Natural Systems
Science assumes consistent patterns in
natural systems. (3-LS4-1)

Common Core State Standards Connections

ELA/Literacy

- **SL.2.5** - Create audio recordings of stories or poems; and drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)
- **W.2.7** - Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1), (2-LS4-1)
- **W.2.8** - Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1), (2-LS4-1)

Mathematics

- **2.MD.D.10** - Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-LS2-2), (2-LS4-1)
- **MP.2** - Reason abstractly and quantitatively. (2-LS2-1), (2-LS4-1)
- **MP4** - Model with mathematics. (2-LS2-1), (2-LS2-2), (2-LS4-1)
- **MP5** - Use appropriate tools strategically. (2-LS2-1)

ISTE: Creative Communicator

Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

Knowledge Constructor

Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

RESOURCES & MATERIALS

Resources:

Brainpopjr.com videos:

- *classifying animals*
- *fossils*
- *mammals*

3D scanned models

<https://africanfossils.org/>

This virtual lab showcases a spectacular collection of fossils and artifacts found mostly at Lake Turkana in East Africa

Spotted hyena: <https://africanfossils.org/fauna/spotted-hyena?o=1>

Giraffe: <https://africanfossils.org/fauna/giraffa-camelopardalis?o=1>

Mountain Gorilla: <https://africanfossils.org/fauna/mountain-gorilla?o=1>



(Wolf lower jaw)



(T-rex skull)

Youtube video on Learning about herbivores Herbivores, Carnivores, and Omnivores

<https://youtu.be/oCFU3tLdjRY>

Materials:

- Paper, notepads, pencils
- Skull Observation Sheet

https://docs.google.com/document/d/1JdysZFMC6J0i2pUH27RDRIYGXuQs2iLgBjIB_P3p1DE/edit

- 3D printed models
- Smartboard
- Chromebooks
- Quiz Sheet

https://docs.google.com/document/d/1WWHzMHVYTW5dldPURD5iEoqVQZ_IUaQzJP_A7Vw8Ee0/edit

KEY ACADEMIC AND/OR SCIENTIFIC LANGUAGE

Herbivore: an animal that feeds on plants.

Omnivore: an animal or person that eats food of both plant and animal origin.

Carnivore: an animal that feeds on flesh.

Predator: an animal that naturally preys on others.

Prey: an animal that is hunted and killed by another for food.

Fossil: the remains or impression of a prehistoric organism preserved in petrified form or as a mold or cast in rock.

Mammal: a warm-blooded vertebrate animal of a class that is distinguished by the possession of hair or fur, the secretion of milk by females for the nourishment of the young, and (typically) the birth of live young.

Canine: a pointed tooth between the incisors and premolars of a mammal, often greatly enlarged in carnivores.

Molar: a tooth situated between the canine and the molar teeth.

Incisors: a narrow-edged tooth at the front of the mouth, adapted for cutting.

PRIOR KNOWLEDGE

Students should have prior knowledge on what is classified as a mammal and Understanding life cycles of different animals.