

SIMPLE Science Pedagogical Template (LessonAide)
as applied to *Hand It to the Animals*

NSES Standard: Life science, Grades 5-8, Content Standard C

- Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. (*Structure and Function in Living Organisms.*)
- Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment. (Diversity and Adaptations of Organisms).

*Unifying concept and process: **FORM AND FUNCTION** Form and function are complementary aspects of objects, organisms, and systems in the natural and designed world. The form or shape of an object or system is frequently related to use, operation, or function. Function frequently relies on form. Understanding of form and function applies to different levels of organization. Students should be able to explain function by referring to form and explain form by referring to function. (NSES)*

SWBATs:

Students will be able to

- identify various animal hands from their X-rays,
- predict the form of a fictional animal, given some information about its lifestyle,
- use WebImage to maneuver through stacks, and
- use WebImage to enhance the brightness/contrast of a digital image.

Page #	5E Phase(s)	Content/Task	Assessment	Answer(s)
1	<i>Engagement</i>	Photographs of animals using their “hands” engage the students.	None	None
2	<i>Exploration/ Explanation</i>	Students explore by scrolling through stack of images featuring X-rays of animal hands.	<i>How many images of animal hands are there?</i>	11

3	<i>Exploration/ Explanation</i>	The learners explore the data in greater depth searching for similarities and learn to enhance the images by adjusting the contrast.	<i>What do all the “hands” have in common?</i>	<ul style="list-style-type: none"> • Feathers (no) • Bones (yes) • Wrists (no) • Claws (no)
4	<i>Exploration/ Explanation</i>	Students continue to explore the variety of hands, looking for differences.	<i>How are the hands different?</i>	<ul style="list-style-type: none"> • Number of fingers (yes) • Thickness of bone (yes) • Shape of hand (yes) • Shape and length of fingers (yes)
5	<i>Exploration/ Explanation</i>	Students explore stack search for a relationship between form (shape of bones) and function (flying).	<i>Of the eleven images, which one shows a hand used for flying?</i>	<ul style="list-style-type: none"> • No. 2 (no) • No. 5 (no) • No. 7 (no) • No. 9 (yes)
6	<i>Exploration/ Explanation</i>	Students scroll, then enhance the image to see the relationship between the shape of a flipper and its function (swimming).	<i>Go back to the fifth image, and check which function you think this hand serves.</i>	<ul style="list-style-type: none"> • Swimming (yes) • Flying (no) • Grasping (no) • Bearing weight (no)
7	<i>Elaboration</i>	Students are asked to elaborate on what they’ve seen.	<i>How is the function of the sea lion’s hand helped by its form?</i>	<ul style="list-style-type: none"> • The claws help the animal swing from tree to tree. (no) • It's broad and flat, which makes it a more effective paddle. (yes) • The bones are flexible, slender, and spread out, which makes the flipper more maneuverable. (yes) • The bones are thick, which helps the animal move on land. (no)

8	Elaboration	Students are asked to apply the concept of <i>form vs. function</i> to a situation unrelated to what they've seen in the lesson.	<i>Of all the animal "hands" you've looked at, which one do these ancient Greek columns remind you of?</i>	<ul style="list-style-type: none"> • Number 8 (yes: zebra) • Number 9 (no: owl)
9	Elaboration	Students try to match the function of the hand to its function as part of trying to identify the animal itself.	<i>All three of these animals rely on their hands for running and walking. Look at the morphology of the hands on the left, and then drag them to their correct owners on the right.</i>	<ul style="list-style-type: none"> • This animal has large bones to support its weight and big claws. (Lion) • This animal has four fingers and pads to protect its hands while running. (Hyena) • This animal uses its front hands for digging. (Sun bear)
10	Elaboration	The student is asked questions that assess whether he or she understands the Big Idea being taught by the lesson.	<p><i>(a) In biology, function and form are often complementary.</i></p> <p><i>(b) If you planned to build a model airplane, an owl's wing would not be a good model to follow.</i></p>	<p>(a) True</p> <p>(b) False</p>
11	Further exploration	More animal hands... Suggested Web sites		