TEACHER GUIDE

Science Standards for Skulls: Everybody's Got One

KINDERGARTEN:

- LS1-K-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
- **In exhibit:** "You Are What You Eat," labels on many of the skulls provide great insights into how these animals obtained food. Students will also be able to observe different tooth types and can infer basics like herbivory or carnivory based on the tooth shapes.

1ST GRADE:

- No standards at the this grade level

2ND GRADE:

- LS2-2-1. Make observations of plants and animals to compare the diversity of life in different habitats.
- **In exhibit:** The various skulls in the exhibit showcase the diversity of animals with skulls across many environments. The easiest ones to compare/contrast between are those found in Idaho (with the state image) and those found in the oceans, but comparisons between deserts and forests are also easy to do within the exhibit.

3RD GRADE:

- LS2-3-2. Use evidence to support the explanation that traits can be influenced by the environment.
- **In exhibit:** The "Headgear," labels talk about some of the uses of horns, beaks, etc. that help the animals survive in their environments. The skulls of whales and dolphins have blowholes on top, an easy-to-spot trait influenced by their aquatic environment. The mata mata and Diplocalus displays also talk about how they are camouflaged, and Tiktaalik is a great example of environmental influence with the development of legs.

TEACHER GUIDE

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4TH GRADE:

- LS1-4-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- **In exhibit:** Virtually the entire exhibit can be related to this standard, as the exhibit is all about internal structures that help support survival, growth, behavior, and reproduction. The signs around the exhibit will highlight how the various skulls support those functions.
- LS1-4-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- **In exhibit:** Students can see eye and nose shapes among the various skulls, which can allow them to make inferences about their use (forward-facing big eyes and side-facing small eyes tell different stories about how those animals gather their visual information).
- ESS1-4-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.
- **In exhibit:** The exhibit has camel, bison, and sloth fossils from Idaho, an easy way to highlight that the Idaho that students know now is not the same as it was in the past.

5TH GRADE:

- LS2-5-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
- **In exhibit:** Fossil organisms are found throughout the exhibit. Students can see that some lived in environments like today, such as those from the Ice Age, while others were in vastly different environments, such as the dinosaurs.

MIDDLE SCHOOL:

- LS4-MS-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

TEACHER GUIDE

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- **In exhibit:** Students can build from the 5th grade standards with the diverse fossils and extinct animals present in the exhibit, specifically around the Ice Age fossils, but now start asking what those patterns mean. Why are some animals, like the giant ground sloth and mammoth, extinct, while others survived?
- LS4-MS-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer relationships.
- **In exhibit:** The exhibit has a mastodon and a mammoth jaw next to one another, making it easy to see their differences but also their similarities through shared relationships. The large mammoth skull is also located next to an Asian Elephant skull, which provides another way for students to explore similarities in related animals. The wall of bird skulls is perhaps one of the best examples, and it also ties in with the following standard as well.
- LS4-MS-3. Analyze displays of pictorial data to compare patterns of similarities in the anatomical structures across multiple species of similar classification levels to identify relationships.
- **In exhibit:** The bird skull portion of the exhibit has a phylogenetic tree painted on the wall behind the skulls, showing how all the birds are related. This allows students to use concepts from the prior standard along with the visual representation in order to see how their ideas of relationships tie in with what scientists have figured out using DNA.

HIGH SCHOOL:

- LS4-HS- 1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- **In exhibit:** The bird phylogeny on the wall, the primate exhibit, and the camel skulls all provide great ways to lead into the multiple lines of evidence supporting biological evolution.
- LS4-HS-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- **In exhibit:** "Headgear," signs in the exhibit talk about many amazing display structures in animals. These structures have been selected for because of their elaborateness, and the variation between them offers a great insight into how this form of natural selection drives variation.