Using Natural History Collections to Engage Young Learners in Science Practices

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Smithsonian’s National Museum of Natural History
Incorporating K-12 Outreach Into Digitized Collections Programs Workshop, December 5-6, 2016
Q?rius Collections Zone
Q?rius Collections Zone
Q?rius Collections-Based Learning

Learning Goals –

Use collections to:

- Inspire learners to explore the natural world
- Guide learners to explore the natural world as scientists do – through close observation, generating questions, drawing connections, constructing explanations, incorporating new information, refining ideas, etc.
- Invite learners to use these practices to investigate natural history concepts, particularly form and function, causal relationships, process and change over time

Our Target Audience

- Tweens and teens and the people who care for them (families, teachers, etc.)
Collections Challenge School Program
Train Your Expert Eye Activity
Train Your Expert Eye Activity
What Happened Here?
Digital Module

Use the field guide to determine what animals these fossils are from.

<table>
<thead>
<tr>
<th>NAME OF ANIMAL</th>
<th>TEETH</th>
<th>LIMBS</th>
<th>VERTEBRAE</th>
<th>SHELLS</th>
<th>DERMAL/SCALES</th>
<th>OTHER</th>
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<tbody>
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</table>

Vertebræ

- 1 mm
- Front
- Rear
- Left side
- Top
- Animal
- Description

Bowfin: carnivorous fish living in freshwater and in somewhat salty waters
Gan: carnivorous fish living in freshwater and in somewhat salty waters
Teleost: fish inhabiting fresh and salty waters
Salamanders: carnivorous amphibian (spends different parts of its life in freshwater and on land)
Teiid lizard: carnivorous reptile
Snake: carnivorous reptile
Champsosaurus: semi-aquatic, carnivorous reptile; body is crocodile-like, but lacks scutes; all champsosaurus are extinct
Crocodilians: semi-aquatic, carnivorous reptile; species include Brachydusuchus and Boreosuchus
Arranging fossils from oldest to youngest.

Drag the fossils onto the timeline from oldest to youngest. Use what you have learned to put these fossils in order.

OLDEST ------------------------------- YOUNGEST
What fossils show evidence for these traits?

The study of fossils is one of the ways scientists can track evolution through time.

Find the fossil that shows the earliest evidence for each of the traits and drag it to that space.

<table>
<thead>
<tr>
<th>4.5 BYA.</th>
<th>3 BYA</th>
<th>2 BYA</th>
<th>1 BYA</th>
<th>500 MYA</th>
<th>20 MYA</th>
<th>TODAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELLULAR</td>
<td>MULTI-CELLULAR</td>
<td>BILATERAL SYMMETRY</td>
<td>TETRAPOD</td>
<td>VERTEBRATE</td>
<td>OPPOSABLE THUMBS</td>
<td>BIPEDALISM</td>
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</tbody>
</table>

**Images of fossils**
## Scientist check-in

**How did you do? Do you want to try again?**

- **YES**
- **NO**

If you are confused, hover over answers for explanations.

<table>
<thead>
<tr>
<th>Trait</th>
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<tr>
<td><strong>Cellular</strong></td>
<td><strong>Multicellular</strong></td>
<td><strong>Bilateral Symmetry</strong></td>
<td><strong>Vertebrate</strong></td>
<td><strong>Tetrapod</strong></td>
<td><strong>Opposable Thumbs</strong></td>
<td><strong>Bipedalism</strong></td>
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<td>Bacteria <em>Escherichia coli</em></td>
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<td>Ring-tailed lemur <em>Lemur catta</em></td>
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<td>Rhino beetle <em>Oryctes nasicornis</em></td>
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<td>Swordfish <em>Xiphias gladius</em></td>
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<td>Moon jellyfish <em>Aurelia aurita</em></td>
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<td>Alligator <em>Alligator mississippiensis</em></td>
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WHAT WE’RE LEARNING

- Natural history collections objects on their own are highly motivating; they can fill a need to bring more science practices, especially inquiry, into science education.

- Balancing free choice, inquiry-based exploration with concrete learning outcomes is a challenge.

- Scaffolding and context are critical.

- Budget for content development: Writing, photography, illustrations, animations.

- In person experience does not match digital experience; there are trade-offs for each.

- Test frequently.

- Build strong relationships with teachers.

- Don’t try to do too much. Keep the learning goals achievable by target audience.
Deep Time Activities
Design Decisions

Roles of Collections for Learning
Tool to ignite interest
Proxy to illustrate a concept
Mnemonic for constructing knowledge
Source of information to explore form and function
Vessel for data used to investigate questions about cause and effect

Curation (choice)
Highly curated, restricted choice
Lightly curated, free choice

Format of the Objects
Touchable original or caste
Boxed original or caste
Touchable model
Visible behind glass
Digital - single view
Digital - multiple views, 3D
Digital - no image, just data

Learning Context
Formal
Informal