

Exploring the KU Natural History Museum

Evolutionary Relationships in the Museum and Beyond

Target Audience: Middle school and above

Differentiated Instruction Summary

Strategy	Levels	Content/Process/Product	Grouping(s)*
Learning Contracts	Readiness (two versions)	Content Process Product	Individual Pairs

* Students could work as individuals or possibly pairs, depending on student needs and chaperone ability.

Objective: Students explore evolutionary relatedness (phylogeny) among organisms in a natural history museum setting and then extend those ideas to another setting on campus.

Pre-assessment/Prior Knowledge: Prior to their visit, students should be familiar with the idea of evolutionary relatedness, shared characters (synapomorphies), and tree diagrams.

Activity Description: *Contract/Agreement.* Small groups are free to explore the main University of Kansas campus, but are expected to complete the tasks outlined in Version 1 or 2 of the learning contract as part of their visit. Group composition and which version students will use is determined and agreed upon by the teacher in collaboration with students prior to their visit. Groups are required to check in with, and report their progress to, the lead teacher at predetermined points during visit.

Version 1

Students select three vertebrate animals on display in the Panorama exhibit at the Natural History Museum and describe or diagram how they are related to each other and their reasoning (Section A). Students then need to find an animal depicted in artwork at the Spencer Museum of Art and integrate this organism into the relationship framework they created in the first section (Section B).

This version requires students to perform only a few steps (fewer facets), and narrows their choice somewhat by limiting them to vertebrates that are more likely to be familiar (more structured).

Version 2

Students select three organisms on display at the Natural History Museum and describe or diagram how they are related to each other including specific shared characters (Section A). Students then need to find an animal depicted in artwork at the Spencer Museum of Art or outside by Potter Lake and integrate that organism into the relationship framework they created in the first section (Section B).

This version requires student to observe and integrate more information through additional steps (multiple facets), and provides greater choice in selecting the organisms they focus on and the space they explore (more open).

Materials Needed:

- Student
 - Copies of learning contracts (see attached)
 - Pencils or pens
- Teacher
 - Content Outline

Content: See Activity VII (Interpreting Evolutionary Tree Graphics)

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Evolutionary Ideas in Museums – Learning Contract 1 (sign and date bottom of page 2)

Goal: To explore and discuss the evolutionary relationships among organisms in a natural history museum setting and then to extend those ideas to another setting on campus.

SECTION A – NATURAL HISTORY MUSEUM

What to do: Choose ONE of the tasks below

Timeline: Complete during campus visit

1. Select any three vertebrate animals on exhibit in the Panorama (4th Floor) and describe how and why you think they are related to each other.

OR

2. Select any three vertebrate animals on exhibit in the Panorama (4th Floor) and draw a tree diagram to show how they are related to each other.

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SECTION B – SPENCER MUSEUM OF ART

What do to: Complete the full task below

Timeline: Complete during campus visit

1. Go to the Spencer Museum of Art (behind the Natural History Museum) and find an example of artwork that realistically depicts a different non-human vertebrate animal.

AND

2. How do you think this animal is related to the three vertebrate animals you selected for Section A?

If you selected option 1 in Section A, be sure to explain in the space below what kind of information you used to determine these relationships.

If you selected option 2 in Section A, add this organism to your tree diagram above.

Agreement: I/We agree to be responsible for the completion this activity within the time allotted and understand that we will be evaluated on the accuracy, detail and presentation of content.

Student(s) Signature: _____

Visit Date: _____

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Evolutionary Ideas in Museums – Learning Contract 2 (sign and date bottom of page 2)

Goal: To explore and discuss the evolutionary relationships among organisms in a natural history museum setting and then to extend those ideas to another setting on campus.

SECTION A – NATURAL HISTORY MUSEUM

What to do: Choose ONE of the two tasks below

Timeline: Complete during museum visit

1. Select any three organisms on exhibit in the museum and describe how you think they are related to each other, and what specific shared character(s) you used to determine this.

OR

2. Select any three organisms on exhibit and draw a tree diagram to show how they are related, and then mark at least two shared characters at the appropriate points on the tree.

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SECTION B – SPENCER MUSEUM OF ART

What do to: Complete the full tasks below

Timeline: Complete during museum visit

1. Go to the Spencer Museum of Art (behind the Natural History Museum) and find an example of artwork that realistically depicts a non-human animal, OR go to the green space near Potter Lake (behind the Natural History Museum, past the Spencer Museum of Art) and find a non-human animal in the area (do not approach or handle this animal).

AND

2. How do you think this animal is related to the organisms you selected for Section A?

If you selected option 1 in Section A, explain in the space below how this animal fits into the relationships you described for the other organisms, and the specific shared character(s) you used to determine this.

If you selected option 2 in Section A, add this organism to your tree diagram above and mark a shared character on the tree that supports this relationship.

Agreement: I/We agree to be responsible for the completion of this activity within the time allotted and understand that we will be evaluated on the accuracy, detail and presentation of content.

Student(s) Signature: _____

Visit Date: _____

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Rubric: Descriptions and Tree Diagrams

Item	Needs further support	Meets Expectations	Exceeds Expectations
LC 1 Section A Option 1	Identifies relationships, but are incorrect or explanation is limited (e.g. head shape)	Identifies relationships correctly, descriptive explanation provided (e.g. elongated snout), and is biologically meaningful	Identifies relationships correctly and extended explanation (e.g. elongated snout shared by canids)
LC 1 Section A Option 2	Diagrams shows incorrect relationships (e.g. polytomy or incorrect nesting)	Diagram shows correct relationships between organisms	Diagram shows correct relationships, attention to diagrammatic detail or additional information (e.g. time arrow, group labels)
LC 1 Section B	<p>Description: Relationship described of new organism to others is incorrect, explanation is limited or did not select a non-human vertebrate</p> <p>Diagram: New organisms incorrectly added to tree or did not select vertebrate</p>	<p>Description: Correctly describes relationship of new organism to others, explanation is more descriptive, and is biologically meaningful</p> <p>Diagram: Correctly added new organism to tree</p>	<p>Description: Correctly describes relationship of new organisms to others, and extended explanation provided</p> <p>Diagram: Correct relationships shown, and attention to diagrammatic details or additional information included</p>
LC 2 Section A Option 1	Identifies relationships, but are incorrect or did not use appropriate shared characters	Identifies relationships correctly and appropriate shared characters are referenced	Identifies relationships correctly, and extended explanation of shared characters provided
LC 2 Section A Option 2	Tree shows incorrect relationships or includes incorrect shared characters	Tree shows correct relationship and marks two appropriate shared characters	Tree shows correct relationships, and attention to diagrammatic detail or additional information (e.g. multiple characters at nodes)
LC 2 Section B	<p>Description: Incorrectly describes relationship of new organism, incorrect character(s) referenced</p> <p>Diagram: Incorrectly adds organism to tree, shared characters not appropriate</p>	<p>Description: Correctly describes relationship of new organism and appropriate character(s) selected</p> <p>Diagram: Correctly adds organism and appropriate characters to tree</p>	<p>Description: Correctly describes relationship of new organism and detailed explanation of character(s) provided</p> <p>Diagram: Correctly adds organism and characters to tree, and attention to diagrammatic detail or additional information (e.g. multiple characters at nodes)</p>