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Building a Shared Tree of Life through Augmented Reality

BIOS4YOU
AR 2.0

BIO-INSPIRED STEM TOPICS FOR ENGAGING YOUNG GENERATIONS
THANKS TO THE USE OF AUGMENTED REALITY

Project Number: 2023-1-DE03-KA220-SCH-000126516

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General Information

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Name of the exercise:	Building a Shared Tree of Life through Augmented Reality
Description of the exercises:	In this exercise, students collaboratively construct a phylogenetic Tree of Life by combining individually (or groupy) created Augmented Reality (AR) organism models into a shared evolutionary structure. Each learner (or learners group) is responsible for researching, designing, and presenting one organism with its key derived traits. After scientific discussion and validation, the individual contributions are integrated by the teacher into a common AR-based phylogenetic tree, illustrating evolutionary relationships through shared ancestry.
Participants:	Students (individual or small-group work, integrated into a shared class project)
Participants' age range:	14–18 years
STEM subject and specific topic:	Biology – Evolutionary biology, phylogeny, biodiversity, and classification
Gamification process:	Students earn recognition through: • achievement badges (e.g. *Trait Identifier*, *Evolution Explainer*), • points for accurate trait identification and clear justification, • collaborative rewards for contributing to a coherent and evidence-based class Tree of Life. Gamification emphasizes participation and reasoning rather than competition.
Written or graphic description of Augmented info:	Each student (or in small groups) creates an AR-based organism module that includes: • a 3D model of the selected organism, • visual labels indicating key derived traits (e.g. vertebrae, limbs, amniote egg, feathers, mammary glands) and / or • short explanatory text describing the evolutionary significance of these traits. A central AR phylogenetic tree model visually represents branching relationships and common ancestors. Individual organism modules are linked to specific branches of this tree.

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External (or extra) tools required	• Augmented Reality platform (e.g. Delightex) • 3D model sources (optional, e.g. Sketchfab) • Digital devices (tablet, smartphone, or computer with camera) • Internet connection
Links (video, images, text online and so on).	• Educational resources on phylogeny and cladograms • Online references explaining derived traits and evolutionary relationships How to Make a 3D: ○ Fish: https://www.youtube.com/watch?v=u062zMj466E ○ Frog: https://www.youtube.com/watch?v=6OMaPPMmtJo ○ Bird: https://www.youtube.com/watch?v=U7kW6Vf4FTU • Optional 3D phylogenetic tree model imported by the teacher (https://sketchfab.com/3d-models/cladogram-phylogenetic-tree-animated-768b93780be342dfa8e61460560c363a, etc.)

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Pedagogical specifications

Here we will collect information on how to use the exercise in the learning session and the results and benefits of using it, from a pedagogical perspective.

How can this augmented information be used to address a STEAM topic in a more interesting way for students?

Augmented Reality enables students to interact with evolutionary concepts that are typically abstract and diagram-based. By creating and presenting AR organism models, learners actively engage in scientific reasoning, visualization, and communication. The shared Tree of Life demonstrates how individual biological data points combine into a coherent system, making evolution tangible, spatial, and meaningful.

Which pedagogical objectives are addressed through this scenario?

- inquiry-based learning through research and justification,
- development of critical thinking and argumentation skills,
- collaborative knowledge construction,
- understanding evolution as a branching and evidence-driven process,
- application of bio-inspired systems thinking.

Which results are expected to be reached with its use?

Students are expected to:

- accurately identify and explain derived traits,
- correctly position organisms within a phylogenetic context,
- demonstrate understanding of common ancestry and divergence,
- contribute constructively to a shared scientific model.

Which benefits are expected to be reached with its use?

- A deeper conceptual understanding of evolution and biodiversity,
- improved spatial and systems thinking skills,
- increased engagement through AR-supported learning,
- strengthened communication and collaboration abilities.

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Technical specifications

In this part it is necessary to specify whether the exercise was designed to be implemented with AR technology. This part is fundamental for the translation process. Please include text, audio text and all the necessary materials.

AR INFORMATION	
Technology	Augmented Reality platform (e.g. Delightex) https://edu.delightex.com/Studio/Spaces
If it's needed a marker, description of the marker	 https://edu.delightex.com/XAQ-HZF
Hardware and software needed:	Smartphone, tablet, or computer with camera, Internet connection, AR platform access
Type of Augmented data	Text; 3D models, Interactive hotspots

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Written description of the AR data	

Step 1 – Organism Selection and Research
Students individually or in pairs select one organism from the predefined Tree of Life structure (e.g.

```
Root (Vertebrae)
├── Fish
└── Tetrapods (Limbs)
    ├── Frog
    └── Amniotes (Amniote egg)
        ├── Lizard
        ├── Bird (Feathers)
        └── Human (Mammary glands)
```

). They research the organism's evolutionary traits, focusing on characteristics that distinguish it from earlier branches and justify its placement within the phylogenetic tree.

Step 2 – AR Model Creation
Using Delightex (or a similar AR platform), students create an AR model representing their organism. This model may include:

- a simple or imported 3D representation of the organism,
- visual labels highlighting derived traits (e.g. vertebrae, limbs, feathers, mammary glands),
- short explanatory text describing the evolutionary significance of these traits,
- optional animations or interactive elements to draw attention to key features.

The result of this step is an individual AR "organism module" that can be viewed independently.

Step 3 – Presentation and Scientific Justification
Before any integration takes place, students present their AR organism models to the class. During the presentation, they explain:

- which organism they selected,
- which derived traits they identified,
- why these traits justify the organism's position in the Tree

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	of Life. Classmates and the teacher may ask questions or suggest adjustments, ensuring that the final contributions are scientifically accurate and well-justified. **Step 4 – Integration into the Shared Tree of Life** After all presentations, the teacher integrates the validated AR organism modules into a central AR-based phylogenetic tree. The shared Tree of Life model is created by linking each organism module to the appropriate branch of a pre-imported cladogram structure using AR markers, hotspots, or embedded links. This step visually connects individual student contributions into a single, coherent evolutionary model. **Step 5 – Reflection and Discussion** The completed Tree of Life is explored as a class. Students reflect on how individual traits and organisms combine to form a branching evolutionary system. Discussion focuses on common ancestry, evolutionary divergence, and the role of evidence in building scientific models. Educational Value By following this process, students experience phylogeny as an **active and collaborative scientific practice**. The exercise highlights how complex biological systems emerge from simple rules and shared traits, reinforcing bio-inspired systems thinking and helping learners understand evolution as a dynamic and evidence-based process rather than a linear progression.
If Image	
If Text	
If video	-
If audio	-

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If 3D model	The formats needed are:.glb .obj,. stl. Cladogram / Phylogenetic Tree: https://sketchfab.com/3d-models/cladogram-phylogenetic-tree-animated-768b93780be342dfa8e61460560c363a Example: Articulated Lizard: https://www.tinkercad.com/things/3ZLXcO2KcEY Frog: https://www.tinkercad.com/things/hFUZWN7C4PO-frog Bird: https://www.tinkercad.com/search?q=Bird&staffPicks=0 Human Skelet: https://sketchfab.com/3d-models/skelet-rigged-203c3a4ab8544aa48beab0f31dc3b4d8

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