Zooming in Time—Exploring Students’ Interpretations of a Dynamic Tree of Life

# Details

## Year

2020

## DOI

10.1007/s10956-020-09893-x

## Issued

2020

## Language

English

## Volume

30

## Issue

1

## Start Page

## End Page

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## Type

Journal article

## Journal

Journal of Science Education and Technology

## Publisher

Springer Science and Business Media LLC

## Topics

## Sample

Ten upper secondary school students (8 females and 2 males) aged 16–18 years (mean 17.3 years) in Sweden voluntarily participated in the study. All students previously studied the national elementary school curriculum and were all enrolled in the same school in the same national social science program.

## Implications For Educators About

* STEM Education
* School innovation
* Professional development

## Implications For Stakeholders About

# Abstract

Central to evolution is the concept of a common ancestry from which all life has emerged over immense time scales, but learning and teaching temporal aspects of evolution remain challenging. This study investigated students’ interpretation of evolutionary time when engaging with a multi-touch tabletop application called DeepTree, a dynamic visualization of a phylogenetic tree. Specifically, we explored how interactive finger-based zooming (zooming “in” and “out”) influenced students’ interpretation of evolutionary time, and how temporal information and relationships were conceptualized during interaction. Transcript analysis of videotaped interview data from ten secondary school students while they interacted with DeepTree revealed that zooming was interpreted in two ways: as spatially orientated (movement within the tree itself), or as time-orientated (movement in time). Identified misinterpretations included perceiving an implicit coherent timeline along the y-axis of the tree, that the zooming time duration in the virtual tree was linearly correlated to real time, and that more branch nodes correspond to a longer time. Sources for erroneous interpretations may lie in transferring everyday sensory experiences (e.g., physical movements and observing tree growth) to understanding abstract evolution concepts. Apart from estimating the occurrence of dinosaurs, DeepTree was associated with an improvement in interpretation of relative order of evolutionary events. Although highly promising, zooming interaction in DeepTree does not facilitate an intuitive understanding of evolutionary time. However, the opportunity to combine visual and bodily action in emerging technologies such as Deep Tree suggests a high pedagogical potential of further development of zooming features for optimal scientific understanding.

# Outcome

"The immersive experiences offered by combined visual and bodily interaction with DeepTree and other recent touch table applications (e.g., Schuman et al. 2020) yield potential for further development of zooming features with knowledge acquisition. Although highly promising, in its current form, DeepTree does not facilitate an understanding of the represented temporal scales. In this regard, conceptual and representational competence is required for an accurate understanding of abstract science concepts (Matuk and Uttal 2018). The ideas of common origin and most recent common ancestor are fundamental to conceptualizing evolutionary relatedness. Communicating these ideas are challenging for many designers of tree of life representations and additional features such as zooming require an even more enhanced representational knowledge in comparison with “static” phylogenetic representations." (Authors, 132)