

Public Abstract

First Name:Kristy

Middle Name:Lynn

Last Name:Halverson

Adviser's First Name:Sandra

Adviser's Last Name:Abell

Co-Adviser's First Name:Patricia

Co-Adviser's Last Name:Friedrichsen

Graduation Term:SS 2009

Department:Curriculum & Instruction

Degree:PhD

Title:Investigating the development and use of phylogenetic representations by college undergraduates in a plant systematics course

Representations, such as visual diagrams, are critical tools for visualizing complex scientific knowledge. However, there is limited research investigating how students gain competence with using representations in biology, specifically in evolution. In evolutionary biology, phylogenetic trees diagrams are built to represent evolutionary relationships among taxa. Unfortunately, these trees are not well understood by students. In this study, I used open-ended student responses from pre/posttests, interviews, reflective journal entries, field notes, and course assessments to learn how 27 upper-level undergraduate students enrolled in a plant systematics course used phylogenetic trees and developed tree thinking skills. I identified a) 10 approaches students used to interpret phylogenetic trees and 5 criteria used to compare representations; b) 8 alternative student generated representations and that some students were not able to generate any representation to illustrate a given phylogenetic scenario; and c) improvements in students' overall tree thinking, with greater improvement in tree reading than tree building. During the course, students were exposed to 3 instructional interventions to improve their tree thinking skills. I identified 16 core skills necessary for students to develop competence in tree reading and tree building. I proposed 7 levels of representational competence (Levels 0-6) based on these core skills. This framework for representational competence in tree thinking that is grounded in research will inform the design of evolution curriculum and maximize the instructional potential of using phylogenetic representations.