Building the Next Generation of Biologists by Increasing Representation.

Abstract:

In order to build the next generation of biologists, we must effectively communicate science in ways that are accurate, equitable, and meaningful to learners. During this presentation, Dr. Kristy Daniel will share insights about representation from her biology education research program through three lenses: representational competence, communicating science, and broadening participation.

It can be frustrating when what scientists say is not always what learners understand. Dr. Daniel has lead investigations that have identified challenging areas of cognitive conflict for learners, specifically concerning socioscientific issues, that create gaps in understanding. This research has lead to the development of new methods to build effective communication strategies that improve learning, motivate engagement, and broaden participation in science.

In this presentation we will follow how an initial exploration of college student tree-thinking (interpreting, comparing, and generating phylogenetic tree diagrams) has created the foundation of a much larger and impactful research program.

Outcomes from Dr. Daniel's research have supported the creation of novel assessments and instructional interventions aimed at helping learners overcome initial tree-thinking challenges. These contributions have impacted how phylogenetic trees are represented and taught in university biology courses on a global scale. This work also led to the development of a new theoretical framework, representational competence, that directs investigations about how learners come to understand, communicate, and generate knowledge using visual models of science. The high application potential from Dr. Daniel's research program has also grounded improvements regarding how science is represented and communicated in courses at Texas State University.

Dr. Daniel also explores learning beyond college classrooms, within informal environments. Drawing upon lessons learned from international partners, community organizations, and place-based, culturally responsive instruction centered around environmentally mindfulness, he has been able to design novel curricula that builds science practices and broadens participation in science.

Altogether, Dr. Daniel's research program is making progress toward understanding how to build and support the next generation of biologists by increasing representation.