Students who completed a case study on the influenza vaccine reported undergoing transformative experiences about evolution concepts

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Conclusions

90% of students scored positive for transformative experience surrounding evolution concepts (n = 171)
- 76% reported active use (AU)
- 92% reported expanded perception (EP)
- 93% reported experiential value (EV)

99.5% found the ideas in the case study interesting

70% of subsampled final student case reports demonstrated mastery of all 4 primary learning objectives

Methods

Case study structure: The case study “Lord of the Flus” asked students to analyze phylogenetic trees for 3 different flu subtypes, compare phenotypic variables, and predict which clades would be most successful next year. Each student wrote an individual final report where they designed a hypothetical flu vaccine and defended their choices.

Transformative Experience Survey (TES): A 10 question survey adapted from Pugh, 2010 was administered after the case. The TES used a six-point Likert scale where “Agree” responses were scored as plus 1 to 3 and “disagree” responses were scored as minus 1 to 3. A score above 0 was considered positive for transformative experience. A final open-ended question was included asking for any comments about the “Lord of the Flus” case study.

Results

Fig. 1: The majority of students met learning objectives in final case reports. 20 student case reports were subsampled evenly across all 9 sections. Reports were scored for each of the 4 primary learning objectives for the case and the percent of students who met each learning objective is presented. n = 20

Percent of students who met learning objectives

Case study structure

- Compare + 3 variables for 3 separate phylogenetic trees
- Explain public health impact of evolution
- Describe role of fitness in natural selection
- Define relationship between genetic mutation and...

Fig. 2: Students reported enjoyment, interest, and appreciation of concepts in the case study. Word cloud of 40 most commonly used words in comments from the final, open-ended question on the TES. 6 common words (a, an, the case, really, was, and) were excluded. Increased color intensity and word size correlates with increased use of that word. n = 67

Fig. 3: Student responses on the TES were skewed toward agree statements. Question stems are presented on the right and the corresponding transformative experience quality is provided on the left of each item. A dotted line is provided at 0 as the cutoff for positive responses. n = 171

Fig. 4: Students scored positive for overall transformative experience and each of the 3 TES qualities. Box and whiskers plot of student responses are represented with the exclusive mean. A dotted line is provided at 0 as the cutoff for positive responses. n = 171

Questions for Next Time

Which elements of the case study had the greatest impact on
- Transformative experience?
- Each of the three component qualities?
- Enjoyment?
- Achievement of learning outcomes?

How does undergoing transformative experience during case-based learning affect student performance?

Background

Course details: Intro Bio 152 is a course that focuses on evolution, plants, and ecology. Most students are sophomores in a biology major. The course is split into two types of sections, one that uses a traditional lecture format and one that employs case-based learning.

Case-based learning (CBL): CBL is a form of active learning where students collaborate to answer a story prompt, or “case,” that applies to real-world scenarios. CBL is associated with improved critical thinking skills, achievement on exams, positive attitudes about learning, and interpersonal skills.

Transformative Experience: Transformative experience is defined by three qualities: (1) active use (AU) of, (2) expansion of perception (EP) surrounding, and (3) experiential value (EV) for a concept. Instructional strategies that take transformative experience into account can promote conceptual change and help students overcome misconceptions about evolution.

Project Question

Do students who complete a case study on production of the influenza vaccine undergo transformative experiences about evolution concepts?