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Preliminary analysis of a measure of students' ecological identities

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Abstract

News about our impacts on the environment abound – from loss of biodiversity to energy crises to overpopulation to climate change – and time is running out to course-correct. Information about, an understanding of, and even interventions that lead to attitudinal change about sustainability issues are insufficient to elicit behavioral changes. However, shifts in ecological identity have been tied to behavioral shifts. The coverage of ecological topics in biology courses provides a key context to shift students' ecological identities toward more sustainable actions. Many non-science majors take introductory biology, many science majors may be required to take biological science courses, and the biology laboratory provides the types of experiential learning that most impact student learning. This pilot project recruited 72 undergraduate, non-biology majors to take a pre-survey assessing their ecological identities and transformative experiences in ecology. Half of the students received a transformative experiences intervention. Participants then took the post survey. Data from this pilot study were used to assess the suitability of this survey instrument for future use and to uncover predictive relationships between ecological identity and transformative learning.

Keywords: Ecological identity, Transformative learning, Transformative experience, Non-majors, Environmental education

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METHODS

Students were recruited from nine sections of General Biology, a non-majors introductory course, at the University of Central Oklahoma. Seventy-two students consented to use of their data and completed the pre- and post-surveys (UCO IRB #2022-060). The 71-question survey was a compilation of four existing instruments: Environmental Identity Survey (Trinh 2021); Ecological Identity Scale (Walton and Jones 2018); Transformative Experiences Questionnaire (Koskey et al. 2018); and Transformative Outcomes (Cox 2021).

After taking the pre-survey, half of the participants were asked over the next three weeks to describe a course

concept they learned in their own words, each of three weeks (control). The other half were asked to describe course concepts that they noticed outside of class, how noticing that changed the experience for them, and how they now valued the experience differently (transformative experience intervention). All participants then took the survey again. Data was analyzed to look for significant differences between pre- and post-survey scores and to look for differences in control and intervention groups. Survey items were subjected to descriptive statistics and confirmatory factor analysis.

RESULTS

Data was collected from 72 participants averaging 20 years old (range 18-46). Their classifications were: 58% freshmen, 28% sophomores, 13% juniors, and 1% seniors. They were 64% female, 32% male, 3% other/3rd gender and their race/ethnicities were 64% White, 11% Latine, 8% Black, 8% Asian, 4% multiple ethnicities, 1% other, and 1% undeclared. Item analyses revealed that 56 of the 71 survey items had good discrimination indices though 68% of the poor discrimination items were on the **EnvID** scale. That instrument had high reliability (α=.821) but had some negative correlations between items. Exploratory Factor Analysis suggests 2-5 items may need to be deleted, and the groupings of the items across 2 factors are different than the subcategories of this published instrument (attitude and pro-environmental behaviors).

The **EcoID** scale also had high reliability (α=.867) though negative correlations between some items. Confirmatory Factor Analysis (CFA) revealed one item (a reverse-coded question about relating more to large corporations) that should be rewritten or removed. The **TE** instrument was reliable (α=.955), and the CFA supported keeping all its items. Similarly, the **TL** outcomes survey had high reliability (α=.906), though some high correlations between items. The CFA supported keeping all items from this instrument as well.

Repeated measures ANOVAs were run separately on each scale, with *Pre-Post scores (Time)* as the within-subjects factor and *Condition* as the between-subjects factor. These showed no significant interactions (pre-post*Condition). To further explore the results, I used Structural Equation Modeling (SEM) to find any significant predictors between subsets of data first using all data, regardless of condition, then comparing the models between conditions (Fig. 1).

Students' EcoIDs at time 1 were a significant, positive predictor of their EcoIDs at time 2 (total effect = .6293, p<.001) as mediated by their post-transformative experience (TE) score. That mediation held for the TE condition (p<.001), but not the Control condition (p=.121).

Students' post-transformative experience score was a positive and significant predictor of their change in EcoID (.2032, p=.005). When separated by condition, it was found this held for the TE condition (p=.001) not the Control condition (p=.820).

The total effect of EcoID pre on EcoID (direct and indirect through mediators) was positive and significant (.7226, p<.001). TE post was a significant mediator only for the TE condition (p<.001) not the Control condition (p=.121). TL post was insignificant for all groupings.

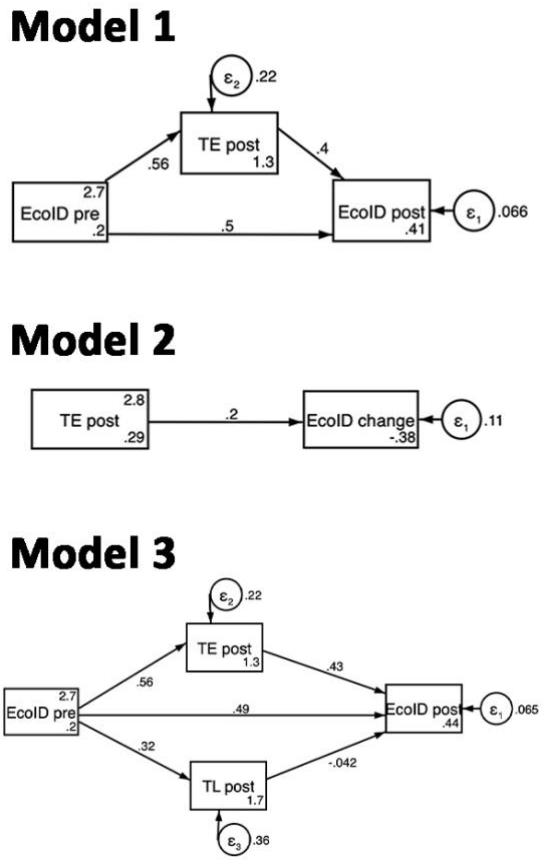

Figure 1. Three different structural equation models to discover significant predictors across variables. Unstandardized coefficients shown.

NOTES FOR THE INSTRUCTOR

The future of our biosphere depends on ecoliterate citizens with an ecological identity that drives them to make sustainable choices. Our biology courses have the potential to transform the ecological identities of our students to contribute to this dire need, so the challenge is to implement activities and assessments to reach this learning outcome. This study showed that *Teaching for Transformative Experiences in Science* (Sparks and Darner 2020) may help promote learner's ecological identities beyond any shifts from them merely learning information about ecology and sustainability. This study's setup of two Notice-Change-Value practice discussions and a third one about a sustainability topic, however, were not sufficient to induce transformative learning (a complete shift in perspective or worldview; Mezirow 2018). Testing of additional interventions (e.g., TE practice and discussions spread throughout the semester, activities that induce disruptive dilemmas, prompts for deeper reflection) is needed to reveal how to maximize our impact on students' ecological identities. This study also led to suggestions of a modified survey instrument that includes the constructs of ecological identity (but not environmental identity), transformative experiences, and transformative learning.

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