

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 towards 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, being asked to reflect on where they noticed an ecological class concept outside of class, how noticing it changed the experience for them, and how they might value the experience differently now. Participants then took the post survey. Data from this pilot study were used to assess the suitability of this combination survey instrument for future use and to uncover predictive relationships between ecological identity and transformative learning experiences.

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:

After taking the pre-survey, half of the participants were asked over the next 3 weeks to describe, three times, course concepts that they noticed outside of class, how noticing that changed the experience for them, and how they now valued the experience differently (intervention). The other half were asked to describe a course concept they learned in their own words, each of three weeks (control). All participants then took the survey again.



Environmental Identity Survey
(Trinh, 2021)

Transformative Experiences Questionnaire
(Koskey et al., 2018)



Ecological Identity Scale (Walton & Jones 2018)

Transformative Outcomes (Cox, 2021)

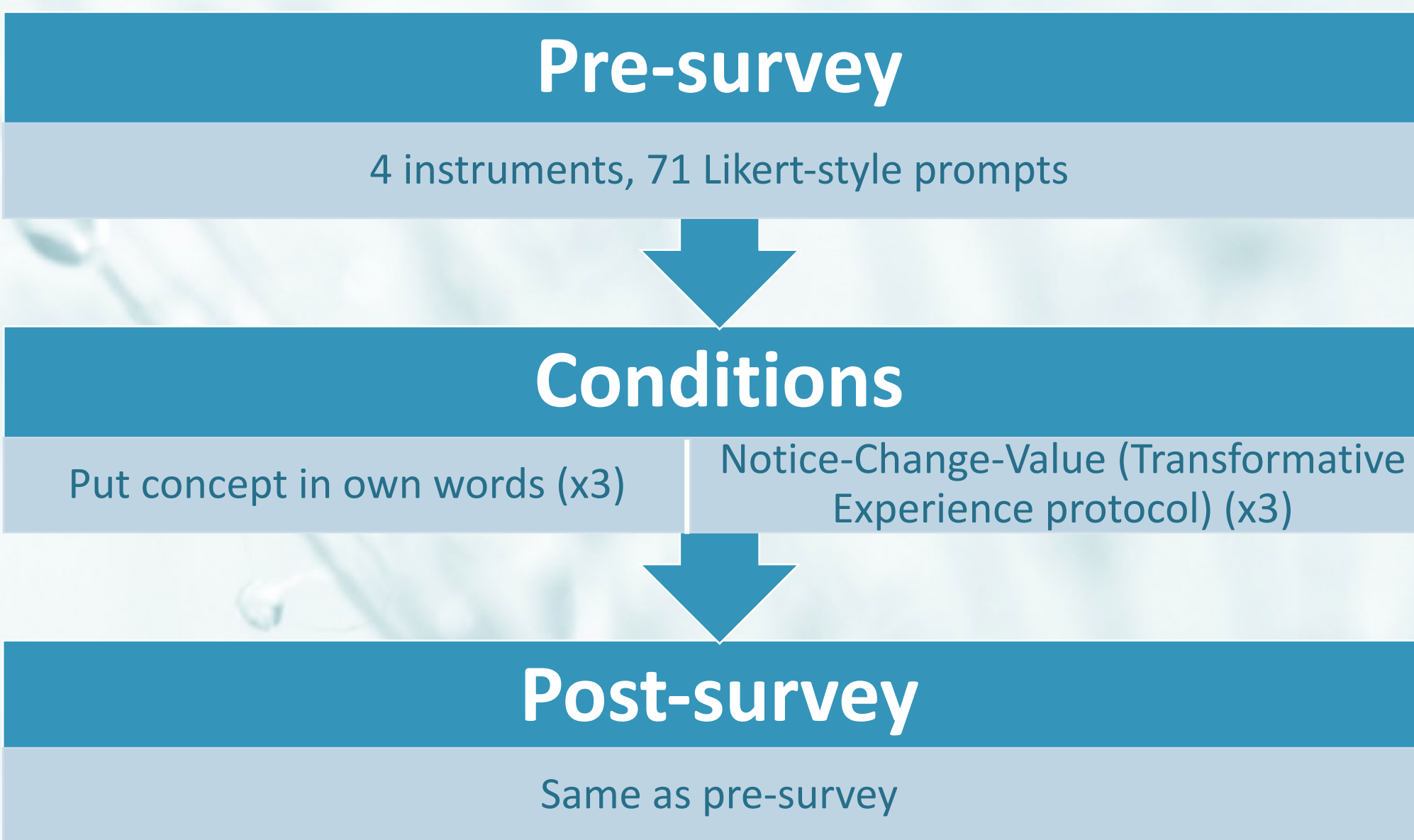
Data was analyzed to look for significant differences between pre- and post-survey scores and to look for differences in control and intervention groups. Survey items were subjected to descriptive statistics and confirmatory factor analysis.

Ecological Identity

"the extent and ways by which an individual views themself as being a part of an integrated social and biophysical (*i.e.*, ecological) system" (Walton & Jones, 2018). *Sameness with pro-nature others; Differentiation from anti-nature others; Centrality of the identity compared to role-based identities.*

Transformative Experience

When students articulate where they noticed (N) a course concept in their daily lives, how it changed their out-of-class experience, and how they value the concept differently results are higher transfer, conceptual understanding, and joy in learning (Heddy & Sinatra, 2013)



Results

Demographics

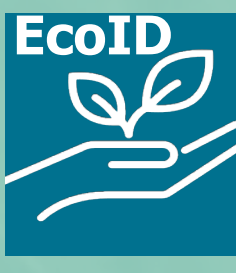
n = 72
20 years old (18-46)
58% freshmen, 28% sophomores, 13% juniors, 1% seniors
64% female, 32% male, 3% other/3rd gender
64% White, 11% Latine, 8% Black, 8% Asian, 4% multiple ethnicities

Item Analysis

56 of the 71 items had good discrimination indices. 68% of the poor discrimination items were on the EnvID scale.



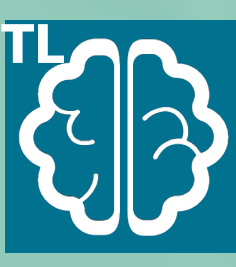
High reliability ($\alpha=.821$), though some negative correlations between items. Exploratory Factor Analysis reveals 2-5 items that may need to be deleted, and the groupings of items on 2 factors is different than groupings of this published instrument.



High reliability ($\alpha=.867$), though some negative correlations between items. Confirmatory Factor Analysis (CFA) reveals one item (the reverse-coded question 7) that should be rewritten or removed.



(too) High reliability ($\alpha=.955$). The CFA supports keeping all items from this instrument.



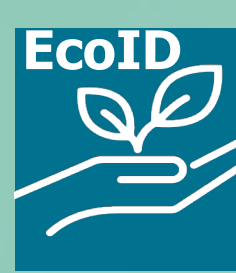
(too) High reliability ($\alpha=.906$), though some high correlations between items. The CFA supports keeping all items from this instrument.

Correlations & Predictors

Repeated measures ANOVAs were run separately on each scale, with *Pre-Post scores* as the within-subjects factor and *Condition* as the between-subjects factor. These showed no significant interactions.



pre-post * Condition, $F=.209$, $p=.649$, not significant



pre-post * Condition, $F=2.26$, $p=.138$, not significant

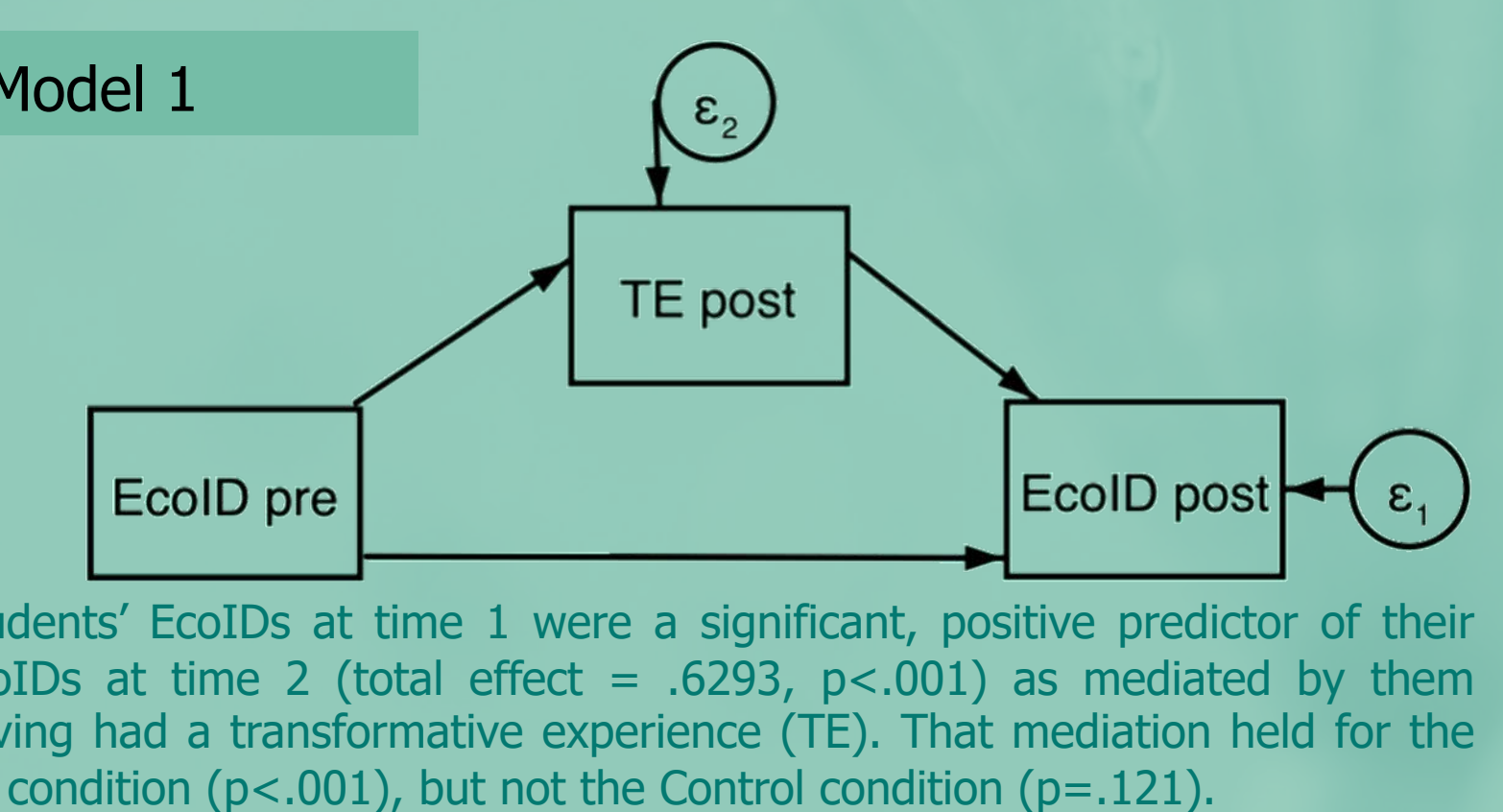


pre-post * Condition, $F=.598$, $p=.442$, not significant

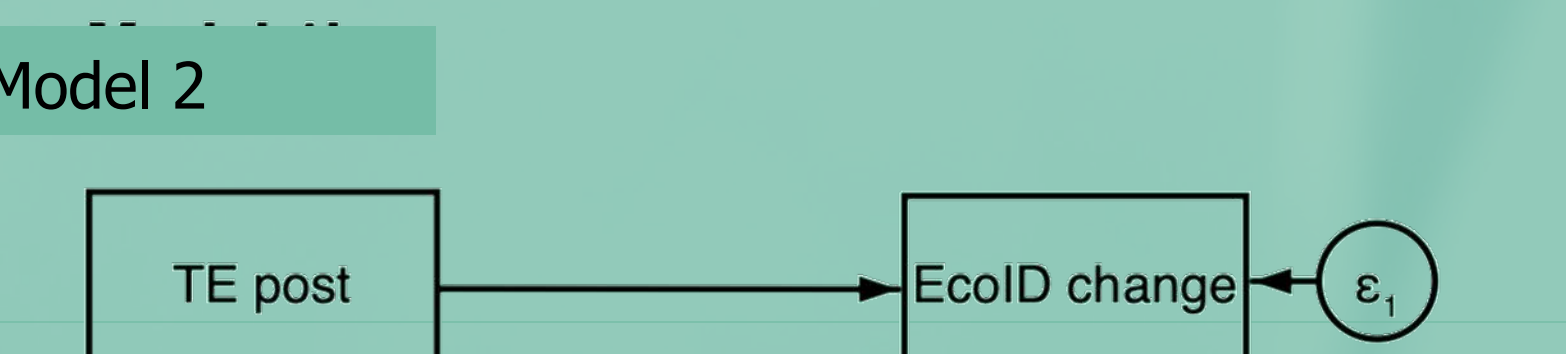


pre-post * Condition, $F=.0$, $p=.998$, not significant

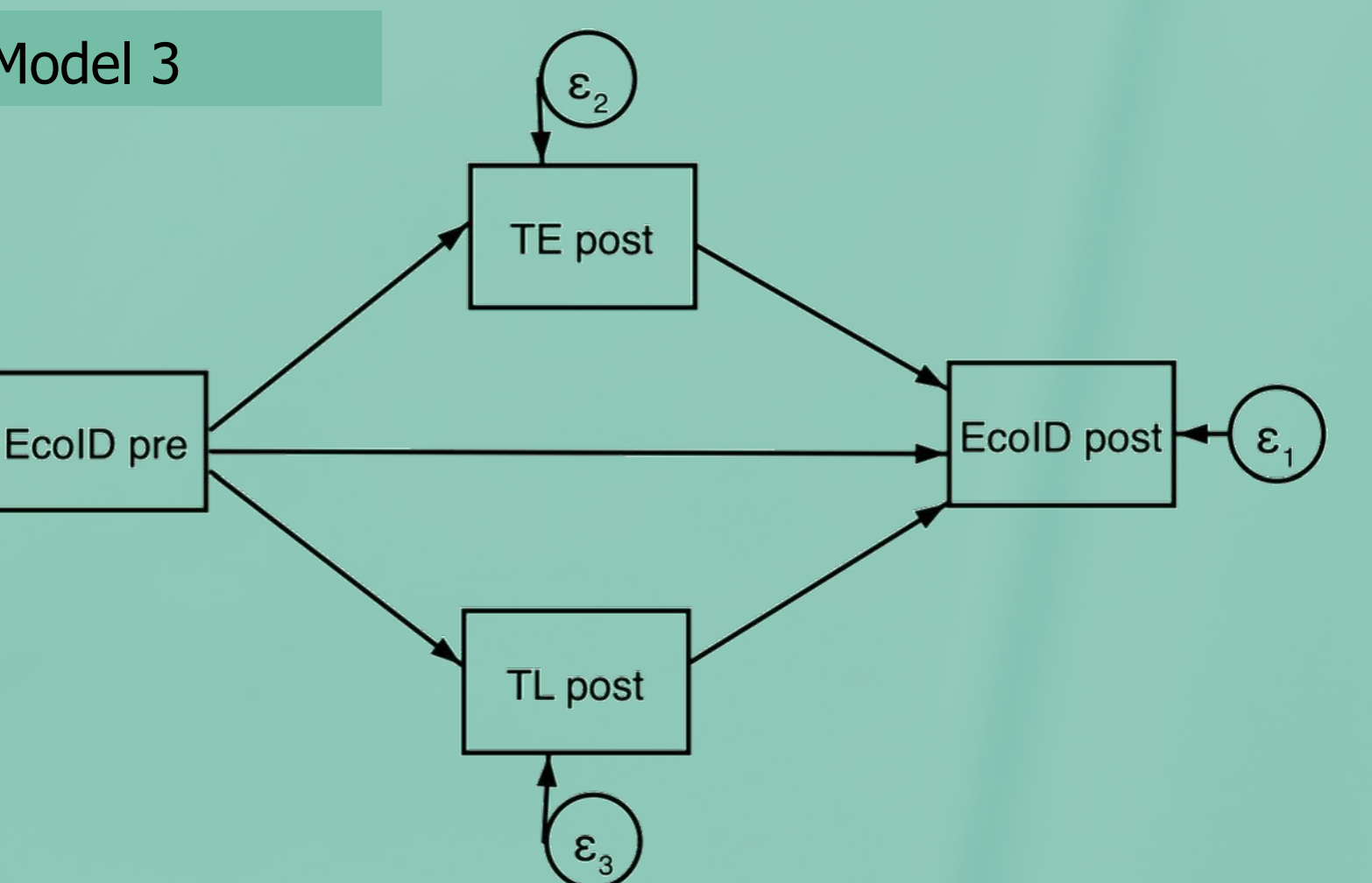
To further explore the results, I used Structural Equation Modeling (SEM) to find any significant predictors between subsets of data first using all data, regardless of condition, then comparing the models between conditions.



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



Students having had a transformative experience was a positive and significant predictor of their change in EcoID (.7226, $p=.005$). 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.

Conclusions

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 & 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, 2009). 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.

References

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