

Choices You Make Should Matter: Asynchronous Discovery Activities

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In a live undergraduate classroom, the instructor and other students can provide dynamic responses to anticipated and unanticipated student actions. This study investigates the need for theoretically-sound development of math activities where a computer might also provide dynamic responses to anticipated student actions. This poster addresses the following research question: How can sociocultural and cognitive points of conflict be used to develop asynchronous discovery-based activities?

Theoretical Framework – Activity Theory

Activity Theory is a sociocultural theory that attempts to describe the coupling of consciousness and activity, where consciousness is the product of an individual's interactions with people and artifacts in the context of everyday practical activity (Kaptelinin & Nardi, 2009). In Activity Theory, points of conflicts (referred to as *contradictions*) act as opportunities for development. They mark key actions a student would need to make similar to how introducing cognitive dissonance provides an opportunity for concept development (Cooper, 2019) in constructivist theories. By blending Activity Theory with a constructivist lens for a particular mathematical concept, a discovery-based activity can be theoretically-sound by constructing a series of anticipated actions and reactions. This is similar to how a “Choose Your Own Adventure” story has points where the reader chooses an action (go in the left door) and the book provides a reaction (turn to page 105). An overview of key actions for the developed and studied dynamic activity included in a College Algebra course is presented in Figure 1.

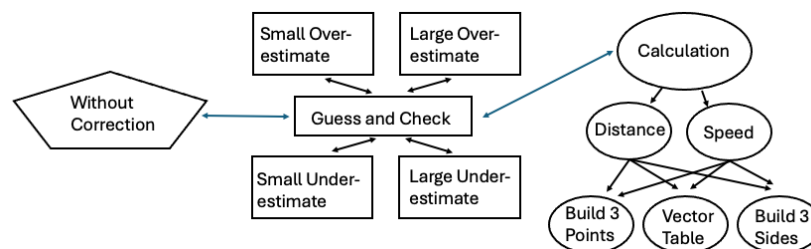


Figure 1: Graph flow of dynamic activity, with each shape representing a series of prompts and arrows between shapes represent reactions to students' key actions.

Methodology and Results

Undergraduate student responses to a static and dynamic version of this activity were coded for key actions they presented using either Activity Theory (sociocultural actions) or thematic analysis (cognitive actions). Three new sociocultural actions and one new series of cognitive actions were identified in student responses with the dynamic version of the activity.

Conclusions and Next Steps

Overall, the dynamic activity reflected common methods students used to solve the task. A future study will track every interaction students make with the task.

References

- Cooper, J. (2019). Cognitive dissonance: Where we've been and where we're going. *International Review of Social Psychology*.
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