



TUSSLER - Digitally Tracing Student's Self-Regulated Learning

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Abstract

Learning analytics are a powerful tool for understanding what online learning behaviors are beneficial for achievement. However, little research in learning analytics has sought to validate the inferences researchers make from trace data to actual student behavior. This project situates self-regulated learning (SRL) theory with emerging methods to digitally trace student behaviors in STEM courses to better understand how students regulate their learning in online learning environments. To do this, we observed the behavior of fifty undergraduate students as they engaged with online learning materials and thought-aloud while they were learning. The goal of this research is to align student think-aloud data (i.e., verbal traces), with trace data and understand these behaviors within SRL theory.

Introduction

- SRL: sequential, temporal, goal-directed, adaptive process in which learners, define the features of a learning task, set a goal and plan, then enact strategies (Greene, 2021).
 - Forethought: preparation step - focused on goal setting, strategic planning, motivation
 - Performance: self-control & self-monitoring
 - Self-Reflection: reflecting on success or failure
- Trace Data
 - Learning analytics is the measurement and reporting of learners.
 - These analytics guide researchers inferences about student's online learning behaviors and have been found to be fairly accurate, but not fully validated (Bernacki et al., 2018)
 - In this study, we couple learning analytics with digital tracing to develop SRL theories.

Method

Data Stream	Task	
Sakai	<u>Watch:</u> Ellipses Theory Video	Pre-Class Phase 15 mins
MyMathLab	<u>Complete:</u> Pre-Class Preparation Assignment	
Sakai	<u>Watch:</u> Ellipses Lecture Video	In-Class Phase 50 mins
Learning Catalytics	<u>Complete:</u> Practice Problem	
Qualtrics, Sakai, Learning Catalytics (local file)	<u>Complete:</u> Review Problems from Fictitious Peer <u>Watch:</u> Ellipses Problem Review Video	
MyMathLab	<u>Complete:</u> After-Class Homework Assignment	Post-Class Phase 20 mins

Results

Verbal Traces	SRL Codes	Digital Traces
"I am a little overwhelmed."	Emotion Monitoring	Watching the video
"I clicked C. I'm going to click check answer."	Task Definition	Clicking answer choice C and check answer
"This is very confusing because we are basing everything off of the graph that she drew."	Negative Content Evaluation	Watching the instructor video and consulting notes
"I'm running low on time. So let me get on it."	Monitoring Time	Reading the task sheet

Discussion

- Aligning verbal with digital traces affords opportunity to corroborate inferences and establishing validity.
- Validated SRL codes of digital events afford scaling of observation to classroom using digital traces, testing complex hypotheses.
- The validated SRL codes of this digital study will be scaled to be relevant in classroom settings.

References

- Greene, J. A., Plumley, R. D., Urban, C. J., Bernacki, M. L., Gates, K. M., Hogan, K. A., ... Panter, A. T. (2021). Modeling temporal self-regulatory processing in a higher education biology course. *Learning and Instruction*, 72, 101201. <https://doi.org/10.1016/j.learninstruc.2019.04.002>
- Bernacki, M. L. (2018). Examining the cyclical, loosely sequenced, and contingent features of self-regulated learning: Trace data and their analysis.