

Improving Engagement in an E-Learning Environment

Kevin Mulqueeny¹, Leigh A. Mingle¹, Victor Kostyuk¹, Ryan S. Baker²,
Jaclyn Ocumpaugh³

¹Reasoning Mind, Houston, TX

²Teachers College, Columbia University, New York, NY

³Worcester Polytechnic Institute, Worcester, MA

Kevin.Mulqueeny@reasoningmind.org

Abstract. Student engagement indicators, such as behavior and affective states, are known to impact learning. This study uses an established quantitative field observation method to evaluate engagement during students' use of a new version of an online learning system (Reasoning Mind's Genie 3). Improvements to Genie 3's design intended to increase engagement include: using virtual small-group tutoring environment, separating text and speech, and using indicators to focus students' attention. In this study, Genie 3 classrooms outperformed a traditional classroom on key indicators of engagement, including time on-task, engaged concentration, and boredom. These results have important implications for further improvements to Reasoning Mind, for the design of other online learning systems, and for general pedagogical practices.

Keywords: Blended Learning, Time-On-Task, Engaged Concentration

1 Introduction

Several prior studies have found a relationship between student learning and their affective state when using the system. Findings suggest that confusion and engaged concentration (or "flow") are positively associated with learning, while boredom leads to poor learning outcomes [1–3]. One blended learning program that has successfully increased engagement in elementary school mathematics is Reasoning Mind (RM).

Observations of RM's Genie 2 platform estimated that RM students experienced engaged concentration 71% of the time and boredom only 10% [4]. RM works with expert teachers to automate as many instructional experiences as possible [5]. Students study on computers during class time, freeing teachers to conduct targeted interventions.

adfa, p. 1, 2011.

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The latest RM platform, Genie 3, further refines earlier attempts to incorporate instructional design principles known to increase engagement in online instruction [6]. Reasoning Mind uses several principals to increase engagement: *Personalization* – simulating a small tutoring session, using conversational speech; *Multimedia* – lessons combine text, speech, and graphics; *Contiguity and Coherence* – illustrations are aligned to examples and unessential text is minimized; *Modality* – narrative, auditory instruction is prioritized over text; and *Segmenting* – lessons are segmented into manageable parts. The current study replicates observational methods used to study engagement with the Genie 2 platform [4].

2 Engagement in Genie 3 Compared to Traditional Instruction

We used the Baker-Rodrigo-Ocuppaugh Monitoring Protocol, or BROMP [7], to measure student engagement in two groups: one using the Genie 3 platform and one receiving traditional, teacher-driven classroom instruction.

2.1 Method

Design. Two BROMP coders [cf. 7] recorded student behavior and affect in a pre-determined order. Behavior codes included *On Task–Independent*, *On Task–Conversation*, *On Task–Pull Out*, and *Off Task*. Affective states included *Engaged Concentration*, *Boredom*, *Frustration*, *Confusion*, and *Delight*.

Participants. We observed twelve sixth-grade classrooms in a majority Latino, urban Texas school district. In the fall, 118 students used the Genie 3 curriculum and 95 students received traditional classroom instruction. In the spring 109 students used RM and 132 used the traditional curriculum.

2.2 Results

We used an arcsine transformation to normalize the distribution of proportional data [9]. An ANOVA showed a significant difference in the average proportions of all behavior categories between the Genie 3 and traditional groups (Figure 1). Genie 3 students spent more time in on task – independent ($p < 0.001$), more time in on task – pull out ($p < 0.001$), less time in on-task – conversation ($p < 0.001$), and less time off-task ($p < 0.001$).

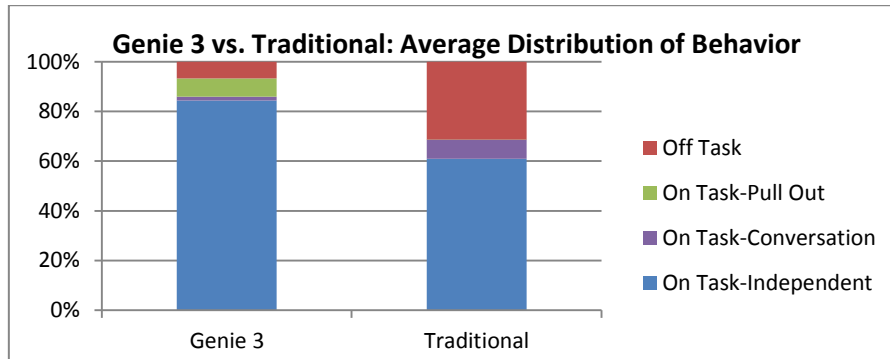


Fig. 1. Behavior distribution.

Similarly, we used an arcsine transformation for affective categories. The two groups differed significantly in all affective states except frustration (Figure 2). Genie 3 students showed higher levels of engaged concentration ($p < 0.001$), less boredom ($p < 0.001$), less confusion ($p < 0.001$) and less delight ($p < 0.01$) than students in the traditional classroom. There was not a significant difference in frustration between conditions ($p = 0.054$).

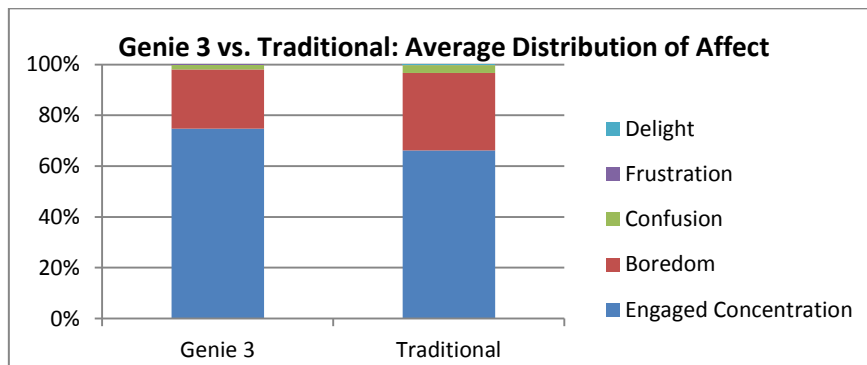


Fig. 2. Affect distribution.

3 Discussion

This study demonstrated that blended learning can offer impressive student engagement rates compared to traditional instruction. Students showed much higher levels of engaged concentration in Genie 3, and they were much less bored. This is likely due to the individualized nature of blended learning, in addition to the various e-learning principles embodied by the program. When each student is going at his or her own pace through a lesson, students have fewer opportunities to disengage.

One notable weakness of the Genie 3 system is a marked decrease in on-task conversation, meaning that the students were spending less time learning cooperatively. This is likely due to the use of headphones to provide audio content. This limits the possibility of peer interaction during lessons.

Students were not randomly assigned to groups and there were no baseline measures, so future studies are needed to uncover which e-learning principles, as embodied by RM, have an impact on student engagement.

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