Situational Interest and Informational Text Comprehension: A Game-Based Learning Perspective

Lucy R. Shores and John L. Nietfeld

Department of Curriculum & Instruction, North Carolina State University,
Raleigh, NC 27695
{lrshores,jlnietfe}@ncsu.edu

Abstract. Motivated by disturbing national educational statistics, the newly adopted Common Core State Standards [1] prioritize reading instruction across the content areas. This will significantly increase students' exposure to informational texts that are notorious for low comprehension rates and less than engaging content. Given the substantial literature supporting the positive relationship between situational interest and reading comprehension [2,3], this study will address whether game-based learning environments generate situational interest and, more importantly, whether the produced situational interest increases students' reading comprehension for informational texts. Using an explanatory sequential mixed methods design, eighth-grade students' situational interest and comprehension of texts embedded within a science game-based learning environment will be measured. Implications for this research include the design of intelligent game-based learning environments, the extent to which game elements generate situational interest, and techniques for capitalizing on this situational interest by intelligently and automatically integrating texts to challenge each reader.

Keywords: Game-Based Learning, Situational Interest, Reading Comprehension.

1 Introduction

The Common Core State Standards, now widely adopted across the nation, identify both a set of English Language Arts and Mathematics skills necessary for postsecondary and occupational success [1]. Within the English Language Arts framework, reading across the subject areas is emphasized, and higher-order skills associated with comprehending informational texts are prioritized [1].

While these standards are new to the field, reading comprehension research has been meticulously studied and provides a myriad of evidenced-based best practices. One well-researched area is how comprehension and learning from text is affected by student motivation, and more specifically, student interest [2-4]. Generally, when students are interested in the text, they experience heightened levels of cognitive and affective processing, which yields deeper understanding and greater levels of comprehension [2,3,5]. However, we cannot expect all students to be *personally* interested in all aspects of all subjects. Instead, *situational interest* encompasses

temporary interest elicited primarily through contextual attributes [2,5]. In other words, the actualization, intensity, and duration of situational interest are dependent upon the presence of aspects in the environment that, when interpreted by an individual, inherently produce a cognitive and affective response [2,3]; therefore, situational interest is "under the direct control of educators" and potentially instrumental for addressing the divergence between ideal and observed states of student motivation [2,5]. While the majority of situational interest and comprehension research has focused on text- and classroom-based manipulations, instructional technologies focused on deeper learning and engagement provide opportunities to investigate how these contexts affect comprehension.

Specifically, work focused on the development of digital, intelligent game-based learning environments, an instructional technique juxtaposing elements of games and educational content, is rapidly populating research agendas and classrooms. Rationale for this movement is provided through theoretical discussions and empirical findings supporting intelligent game-based learning as an effective method for encouraging sustained engagement and producing significant learning gains through adaptive, inquiry experiences [6,7]. Despite some apprehension for the current state of games for learning [8], the 2012 Horizon Report expects game-based learning to experience widespread adoption in the next two to three years [9].

Nonetheless, research investigating the effect of environmental contexts (e.g., hands-on activities, games) known to promote situational interest on reading comprehension is limited [10]. Furthermore, best-practices for designing such learning contexts should be better understood [8], as hastily integrating identified sources of situational interest can undermine the benefits of this state and even lead to a negative effect on learning. The proposed study has five main thrusts: 1) determine the efficacy of utilizing a game-based learning environment as a vehicle for evoking situational interest for informational texts, 2) investigate the influence situational interest has on reading comprehension within a game-based learning environment, 3) identify a set of generalizable game features and design principles that contribute to heightened states of situational interest, and 4) propose methods to optimize situational interest by intelligently integrating texts that challenge each reader.

2   Crystal Island: Lost Investigation

CRYSTAL ISLAND: LOST INVESTIGATION (Figure 1), a game-based learning environment for eighth-grade science and literacy, is derived from North Carolina's standard course of study for microbiology and revolves around a central problem solving narrative. Prior to playing CRYSTAL ISLAND: LOST INVESTIGATION students view a two-minute introductory video setting the stage for the underlying narrative where the student is cast as an investigator sent to Crystal Island to diagnose a mysterious illness plaguing researchers that have been stationed there to study the indigenous flora and fauna. Once game interaction begins, the student must interview sick team members, read relevant documents, test potentially contaminated objects, synthesize information, and accurately diagnosis the illness before it spreads. Several complex informational texts are embedded within the narrative and the generation of inferences and application of the texts' main ideas is imperative for game success.
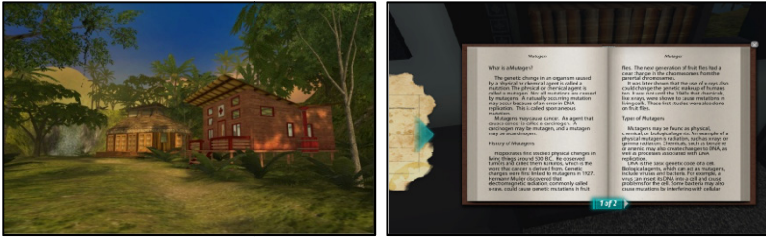
Fig. 1. Crystal ISLAND game world (left) and informational text (right)

3   Current Investigation

Eighth-grade students ($N \approx 325$) from a large, socioeconomically diverse middle school will be invited to participate in the study. Students will be randomly assigned to one of three conditions: game-based learning, classroom-based learning, reading only. Students in the game-based condition will interact with CRYSTAL ISLAND: LOST INVESTIGATION. Students in the classroom-based learning condition will complete a series of activities similar to those presented in the gaming environment separated by reading sessions. The purpose of this condition is to understand how the gaming environment affects situational interest and comprehension beyond more traditional classroom-based conditions. Finally, students in the reading only condition will simply read the passages provided in the other conditions without context. A select group of students will be asked to participate in follow-up, semi-structured interviews to expand upon and triangulate the quantitative data.

Specifically, this study will employ both quantitative and qualitative methods to answer the following research questions: 1) Do game-based learning environments trigger and sustain greater levels of situational interest than classroom-based conditions?, 2) Does situational interest generated through game-based learning affect and predict reading comprehension for texts embedded within the environment? 3) What components of game-based learning environments lead to greater levels of situational interest?

Reading comprehension will be assessed through multiple-choice questions written to measure both fact- and application-level understanding of the text. *Reading ability* will be measured using the Woodcock-Johnson and will be controlled for during analysis. *Situational interest* will be measured following each reading passage using methods similar to those used by [10]. *Reading motivation*, as measured by the Motivation for Reading Questionnaire [11], and *science interest*, as measured by the Science Interest Survey [12], will be used to control for prior and personal interests. *Prior knowledge* will be assessed through a researcher-constructed 20-item, multiple-choice test. The Perceived Interest Questionnaire [13] will be used to measure overall situational interest. ANCOVA and multiple regression procedures will be conducted to determine differences in comprehension and situational interest between conditions and reveal the predictive power of situational interest for comprehension. Moreover, multilevel modeling techniques will be used to understand how situational interest behaves during the interaction. Follow-up interviews will provide a qualitative perspective to expand upon and triangulate the quantitative data as suggested by [3].

With respect to the artificial intelligence and educational community, findings from this investigation could provide a foundation for intelligently adapting to students' individual differences in order to optimize situational interest. Furthermore, when interested, readers tend to demonstrate deeper comprehension [2,5]; therefore, informed by learner models, intelligent learning environments, such as game-based learning, could leverage situational interest and make intelligent, real-time decisions regarding the presentation texts appropriately challenging for each student.

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