Increasing the Use of Formative Feedback: Utilizing Game-Based Principles

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Abstract: Formative feedback has been identified as an important mechanism to help students enhance their areas of weaknesses (Shute, 2008). This study investigated a game-based formative feedback report system to delivery simple, real-time, and skill-based feedback to students. Preliminary results indicate many students (33.9%) who received the game-based feedback used it 3-4 times each week and select groups of these students showed statistically significant improvements in their final unit grades ($F(1,53)=4.621$, $p<0.05$).

Keywords: formative feedback; gamification; game-based formative feedback

Introduction

Formative feedback is crucial to the process of knowledge and skills acquisition (Leighton, Chu, & Seitz, 2013; Shute, 2008). The use of formative feedback during learning is complex because it is not only a cognitive process but also requires the considerations of affective dispositions (Immordino-Yang & Damasio, 2007). To facilitate successful and positive experiences of learning, educators need to consider how human emotions enhance or hinder students' use of formative feedback (Lajoie, 2008; Sawyer, 2006). In meeting the goal of developing a learning environment that is sensitive to students' emotions, game-based environments are a powerful ally (Shute & Ventura, 2013). Feedback provided to students during a digital game environment (e.g., earning in-game money or jewels) are often reflected upon by students, and used to enhance their future in-game performance (Gee, 2007; Shute & Ventura, 2013). As such, the principles behind these digital game feedback systems are useful in an educational environment to help provide formative feedback that is used in a meaningful way.

Theoretical framework

Learning error and formative feedback (LEAFF) model

The LEAFF model outlines that a learning environment deemed emotionally safe by students allows them to feel at ease revealing their learning errors which is hypothesized to develop more meaningful feedback for students to use during their learning (Leighton et al., 2013). When students feel at ease revealing what they do not understand and thus share their misunderstandings, educators can help correct these misconceptions by providing relevant formative feedback that is specifically targeted to the errors revealed. Formative feedback that is deemed meaningful and relevant to students' performances are expected to be accepted and used by students than they would otherwise (Smith, diSessa, & Roschelle, 1993). Most players deem the game environment as emotionally safe, which leads to positive evaluations of the feedback and increased motivation to use it. Hence, there is a need to investigate this type of game-based feedback so that students may be receptive of and use their formative feedback to improve their performance in an educational environment.

Research Questions

The main objective of this study was to investigate whether a game-based formative feedback reporting system using classroom-based formative assessments may enhance students' use of formative feedback in the classroom as well as knowledge and skill acquisition during the unit. Specifically, the research questions that guided this study was:

1. Do students use game-based formative feedback provided in their classroom?
2. How do students use the game-based formative feedback they receive in the classroom?
3. Does the use of game-based formative feedback improve students' achievement during the unit?

Methods

This study was designed to work with the same two teachers while they were teaching the same two concurrent units over a two-year period. Students in the first year of the study completed all their formative and summative

assessments without an enhanced formative feedback report while students in the second year of the study completed the same formative assessments, but had their feedback provided using a game-based formative feedback report system.

Participants

A total of 126 Grade 9 students and their English and Mathematics teachers (n=2) participated in this study over a two-year period. During the first (n=69) and second (n=57) years of this study, students' data was collected during the specified units.

Measures used and data collected

During the first year of the study, students' achievement records (e.g., students' performance on the formative and summative assessments during the poetry and circle geometry units) were collected. During the second year of the study, students' achievement records during the same two units as well as surveys and open-ended responses investigating student usage of game-based formative feedback were collected.

Analyses

Initial analyses of the survey data, which targeted the first research question, indicated that most students (33.9%) who received the game-based formative feedback used the feedback at least 3-4 times a week for each of the two units. The qualitative data, which investigated the second research question, is currently being analyzed using thematic analysis. Students' achievement data, which focused on the third research question, was split into strong, medium, and weak achievers as identified by their course grades before the poetry and circle geometry units. Statistical comparison of students' achievement data revealed statistically significant differences ($F(1,53)=4.621$, $p<0.05$) for students who were considered medium achievers. Specifically, students in the medium achiever group who received the game-based formative feedback scored higher (80.22%) when compared to their peers who did not receive the enhanced feedback (74.66%).

Significance of study

There is a need to develop and use game-based formative feedback reports in the classroom because they encourage students to use the feedback in a meaningful way Considering the large amount of effort and resources placed on formative assessment and its feedback, it is important to develop proper feedback reports so that students may understand the feedback and use it to enhance their areas of weakness (Black & Wiliam, 1998). This game-based formative feedback system indicates the need to consider digital game design principles when developing formative feedback report systems for educational environments (O'Connor, 2011).

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