

Play Your Way Into Math: Supporting Prevocational Students in a Computer Game-based Learning Environment

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Project Goal

The overall research focus in this project concerns the affordances of computer game-based learning (CGBL) for prevocational students, in the domain of mathematics. The effects of different forms of elicited reflection on both students' acquired knowledge and motivation during game-play are examined. The goal is to identify concrete conditions under which CGBL establishes positive learning effects.

Theoretical Background

Overall, expectations of CGBL for education are high. Games have the potential to influence learning in two ways; First, games have *motivational* properties that are likely to generate more motivated and engaged learners, what results in higher time on task and better learning. Second, games influence the *cognitive learning processes*. Meaning that in games learners learn through manipulation and observation, which generates an intuitive way of learning (de Jong, 2006). A side-effect of this intuitive learning is that the acquired knowledge is implicit (students learn to solve a problem, but remain unaware of the underlying processes and their effects). As a result, even though students learn from CGBL, transfer of knowledge to other contexts (e.g. domain knowledge tests, real-life situations) often fails. Support can optimize knowledge acquisition from CGBL environments (ter Vrugte & de Jong, 2012). Reflection is an essential element of the learning process and is known to support the development of meaningful understanding. However, it is not a standard element of educational games. Adding support that elicits reflection is likely to foster students' development of more explicit knowledge.

Methodology and Design

To conduct the research a CGBL environment was designed. Within this environment the students take on a role as hotel employee. During their virtual career the students encounter problems and fulfill tasks that help them to understand, practice, and master the math domain of proportional reasoning. In a series of studies the effects of different forms of reflection on students' acquired knowledge and motivation will be investigated. Data-collection encompasses: domain knowledge tests, motivational measures, ability measures, and logfile recordings.

The first study utilized a 2x2 design to examine the effects of elicited reflection with or without specific information. As the students showed the tendency to explain material to each other, and explanation in collaborative settings is known to aid knowledge acquisition (Gijlers, Saab, van Joolingen, de Jong, & van Hout-Wolters, 2009), collaboration was opted as alternative approach to induce reflection. Hence, a second study used a 2x2 design to examine the effects of collaboration and competition. Subsequently, an exploratory study addressed the effects of a combination of collaboration and in-game reflection prompts.

Results

Results of both studies indicate that the educational game improves prevocational students' performance on proportional reasoning assignments. However, the in-game reflection prompts did not yield positive effects on knowledge acquisition or gameplay. Even when guided through the reflection process, reflection did not come natural to these students, and even when the students reflected, this did not lead to deeper understanding of the material. The data-collection of the second and exploratory study has recently been completed and results are expected to be presented at the ICLS 2014.

References

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