Examining the Characteristics of Digital Learning Games Designed by In-service Teachers

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Examining the Characteristics of Digital Learning Games Designed by In-service Teachers

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ABSTRACT

In order to better understand teachers' perspectives on the design and development of digital game-based learning environments, this study examined the characteristics of digital learning games designed by teachers. In addition, this study explored how game design and peer critique activities influenced their perceptions of digital game-based learning environments and learning through game design. Qualitative data were collected from fifty game design documents and participant responses to reflection questions. The analysis of game design documents showed that the majority of the participants designed immersive game-based learning environments where players are required to use higher order thinking and real-world skills as well as academic content to complete missions or solve problems. The results of this study provide important implications for teacher professional development as well as for educational game development.

KEYWORDS

Challenges, Digital Learning Games, Educational Game Design, Engagement, Game Design Strategies, Game-Based Learning, Scaffolding, Teacher Perceptions, Teachers as Game Designers

INTRODUCTION

Well-designed digital game-based learning environments have the potential to provide students with situated learning experiences and foster real world skills (An & Bonk, 2009; Gee, 2005; Shaffer et al., 2005). Despite the increasing number of teachers using digital games in the classroom, many teachers still do not seem to fully understand the educational potential of digital games (Gaudelli & Taylor, 2011; Schrader, Zheng, & Young, 2006). The national survey conducted by the Joan Ganz Cooney Center revealed that most game-using teachers were using shorter-form genres, such as drill-and-practice, trivia, and puzzle games. Few teachers reported using immersive games (e.g., adventure, role playing games) (Takeuchi & Vaala, 2014). However, it does not necessarily mean that teachers prefer shorter-form genres to immersive games. As noted in the report by Takeuchi and Vaala (2014), there is still a paucity of immersive games that are suitable for classroom use. Sancar Tokmak and Ozgelen (2013) also found that most games available to teachers today require students to have pre-knowledge to play and prevent teachers from developing game-based lessons based on a constructivist philosophy.

What types of digital learning games would teachers prefer to use if they had choices? It is critical to understand teachers' preferences, expectations, and needs in order to create games that can be effectively implemented in the classroom. Examining teachers' game design would help understand

their perspectives and needs related to game-based learning. In order to better understand teachers' perspectives on the design and development of digital game-based learning environments, this study examined the characteristics of digital learning games designed by teachers. In addition, this study explored how game design and peer critique activities influenced their perceptions of digital game-based learning environments and learning through game design.

Literature Review

While a number of studies have investigated how gameplay and other related activities influence teachers' attitudes toward and perceptions of games or game-based learning (Becker, 2007; Gaudelli & Taylor, 2011; Gerber & Price, 2013; Kenny & McDaniel, 2011; Ray & Coulter, 2010; Sardone & Devlin-Scherer, 2010), insufficient attention has been paid to how teachers design educational games. A small number of studies have explored preservice teachers' game design experiences. For example, Kafai and her colleagues (1998) examined how 16 preservice teachers designed fraction games, focusing on fraction integration, fraction representation, and consideration of user's thinking. The participants designed games on paper and did not use any game development software to develop the designed games. The results showed that the preservice teachers shifted from extrinsic game design where fraction content and game idea were unrelated to intrinsic game designs where game idea and fraction content were integrated. Their fraction representations grew more complex and diverse after they were introduced to two conceptual design tools, a blank page of empty computer screen frames and a question "Can you create a game without asking questions?". Also, the games designed after the introduction of the design tools showed improvement in consideration of the user's thinking (Kafai, Franke, Ching, & Shih, 1998).

After more than a decade, Li and her colleagues examined 21 preservice teachers' digital game development experience in a secondary mathematics methods course (Li, Lemieux, Vandermeiden, & Nathoo, 2013). Although Scratch (https://scratch.mit.edu) was introduced in a face-to-face class, the participants had the freedom to use any game development software. After developing their own games, about 40% of the participants mentioned problem solving as a benefit of learning through game design, while only two participants mentioned problem solving in the pre-survey. The interview results indicated that the game development process enabled the participants to use all the 21st century skills. At the same time, however, many participants experienced difficulty in translating their design ideas to a game. Some participants had to completely change their game designs to fit the program they used. The researchers evaluated the games created focusing on cognitive and pedagogical aspects. The analysis of the games revealed that although about half of the games required higher-order thinking skills, more than half of the games failed in the connections category, indicating that preservice teachers needed support in creating meaningful problems that connect to the real world.

Similarly, Theodosiou and Karasavvidis (2015) examined the quality of student teachers' game designs by analyzing their design documents in an undergraduate course on Serious Game Design. The participants were asked to design an educational game for preschoolers. The results revealed that student teachers experienced major difficulties in integrating learning content into the game context and using appropriate mechanics to support learning. They also experienced difficulties in connecting the critical game elements effectively. These findings suggest that pedagogical expertise does not directly translate into game design. The researchers called for more systematic efforts to scaffold teachers in the early steps in game design.

Only two studies so far have explored in-service teachers' experiences in educational game design (Li, 2012; An & Cao, 2017). In Li's (2012) study, fourteen teachers, enrolled in a graduate course, were asked to design and develop their own instructional games using Scratch or other game development software. The results showed that the game design and development experience improved teachers' understanding about game-based learning, helped them reconceptualize pedagogy, and transformed their teaching practice from passive content consumption to active knowledge generation. The major constraints or challenges faced by teachers during their game building process included

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