The Inquiry, Communication, Construction and Expression (ICCE) Framework for Understanding Learning Experiences in Games

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ABSTRACT

There is a paucity of research frameworks that focus on aiding game selection and use, analyzing the game as a holistic system, and studying learner experiences in games. There is a need for frameworks that provide a lens for understanding learning experiences afforded in digital games and facilitating knowledge construction and motivation to learn. Towards this goal, the purpose of this article is to introduce the inquiry, communication, construction, and expression (ICCE) framework. This qualitative study with interviews and observations examined the mathematics game Dimension M. It was analyzed using the ICCE framework. It reports the interpretive results of twenty 9th graders’ motivation and achievement in a game-based learning course to learn mathematics using Dimension M. The ICCE framework may be a valuable tool for aiding teachers to assess the efficacy of games for learning and for students to benefit from the possible designed experiences within games.

Keywords: Communication, Construction, Expression, Game Assessment, Game Design, Game Integration, Game-Based Learning, ICCE Framework, Inquiry

INTRODUCTION

Researchers have argued for a more nuanced approach to game-based learning in order to improve learning experiences and the efficacy of games for supporting students (Tobias & Fletcher, 2012; Foster & Mishra, 2009). Specifically, there is a paucity of empirical studies that are aimed at developing holistic frameworks for assessing games as educational technologies to support learning (Rice, 2007; Killi, 2005). According to Ferdig (2006), the assessment of
technologies is essential for supporting claims about how well they perform as educational innovations.

There is a need for frameworks that provide a lens for understanding learning experiences afforded in digital games and facilitating knowledge construction and motivation to learn within an academic domain. Building on the works of Dewey (1902) and Bruce and Levin (1997), we extend inquiry, communication, construction, and expression (ICCE) as a framework for examining immersive learning experiences afforded by games to support student learning and affect. The paper begins with a review of existing frameworks for evaluating games. This is followed by an operationalization of the ICCE framework. Next, we describe the research question and methodology. The results report the analysis of Dimension M, a mathematics game that was played by freshmen urban high school students as part of a game-based learning elective course. The concluding sections discuss the relevance of ICCE for supporting student learning and motivation using games, and the implications for including ICCE in designing games for education, teaching with games, and researching game-based learning.

FRAMEWORKS FOR EVALUATING GAMES

Few research frameworks exist that focus on aiding game selection and use, analyzing the game as a holistic system, and studying learner experiences in games. For instance, Rice (2007) created a tool for teachers to evaluate the inclination of video games towards encouraging higher order thinking in learners. This tool included components such as requiring users to assume a role, offering interaction through avatars and with non-player characters, presenting puzzles that require effort to derive solutions, and immersing players in systems that replicate real-life. Similarly, Killi (2005) designed the experiential gaming model to assist design and analysis of educational computer games for facilitating a flow experience. The model highlights the importance of providing the player with meaningful feedback, clear goals and challenges that adapt to his/her skill level, opportunities for creative solution generation, and reflection as factors contributing towards sustaining players’ engagement and as a means to maximize the impact of educational games.

The aforementioned frameworks are essential in that they target different audiences (teachers-Rice, 2007; learners-Killi, 2005) and focus on different teaching and learning dimensions (cognition-Rice, 2007; motivation-Killi, 2005) in the process of evaluating the merit of a game. We present the inquiry, communication, construction, and expression (ICCE) framework, which synthesizes the strengths of the frameworks discussed above to serve as a lens for analyzing learning opportunities in games and facilitating learners’ knowledge construction and motivational engagement.

ICCE is nested in a larger framework known as the Game Network Analysis (GaNA), which was conceptualized for facilitating teachers and researchers in introducing game-based learning in classrooms by guiding them in game analysis and game integration within an existing or a new curriculum (Foster, 2012). GaNA provides the adaptive structure teachers need within their classroom context to focus on the pedagogy and content of games and then employ games for supporting teaching and learning. Therefore, GaNA includes (a) game analysis for technology, pedagogy, and content using the Technological Pedagogical and Content Knowledge (TPACK) framework as a lens (Foster, Mishra & Koehler, 2011; Foster, 2012), and (b) the Play Curricular activity Reflection Discussion (PCaRD) model for integrating games in classrooms in a step-by-step approach to support teachers (Foster & Shah, 2012). The ICCE framework bridges game analysis and game integration by aiding teachers in the identification of learning experiences and design of opportunities that may be lacking in a game. We report on the role ICCE played as a method to identify learning experiences in games and briefly highlight the design of ICCE opportunities using PCaRD.
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