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Fostering Students' Argumentation Skills with Game-Based Learning Method: A Systematic Review

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Abstract: This study maps instructional support and learning outcomes of game based learning on argumentation skills. This systematic review report positive effects of game based learning on learning outcomes and instructional supports on argumentation skills. However, the reviewed publications did not report specific instructional support and game elements associated to the learning outcomes. This study provide suggestions on how to design digital games for argumentation skills and learners' learning outcomes.

Keywords: game based learning, argumentation, learning outcomes, instructional support

Introduction

Learners need to learn how to generate valid arguments, reason soundly, and engage in argumentation especially in academic settings (Noroozi et al., 2012, 2016, 2018, 2020). Learning to engage in argumentation is challenging for students due to the complex, non-linear, and ill-defined nature of argumentation. This is striking since the ability to construct valid arguments and exchange them with others in reasoned debate is one of the critically important real-world skills required in the workplace and community life (Latifi et al., 2020; Noroozi, 2018). Liu, Liu, & Lin (2019) reported that most of the high school students had difficulties to engage in argumentation either in collaborative, or individual environment. Students may have difficulties in exploring relevant literatures, incorporating the data to make a generalisable claim, using evidence to back their claims, and rebut an argument in light of evidences. To cope with these challenges, educational technologists have focused on scaffolding students' argumentation. Designing Game-Based Learning (GBL) environments for fostering students' argumentation skills has recently become popular, especially with respect to scientific results for real-world applications. GBL promotes scientific argumentation (Bressler, Bodzin, & Tutwiler, 2019).

Given vast scientific support for the positive impacts of games on various aspects of the learning processes, many researchers from different disciplines are committed to developing GBL to promote students' argumentation skills. Despite various review studies in the field of GBL and their effects on various aspects of learning processes and outcomes in different disciplines such as business, marketing, math, statistics, environmental sciences, biology, and psychology (e.g., Boyle et al., 2014; Dehghanzadeh et al., 2019; Qian & Clark, 2016), no review study has yet been reported for the impacts of the GBL on promotion of students' argumentation skills. Therefore, the main aim of this review is to clarify what empirical evidence exists with regard to the effects of GBL on students' argumentation skills. Therefore, this review follows these questions:

1. Which instructional supports that influence argumentation have been investigated?
2. Which game elements that influence argumentation have been investigated?
3. Which learning outcomes that influence argumentation have been investigated?

Method

A keyword search strategy was used based on the most important concepts of the study, namely GBL, argumentation. First, we identified synonyms and related terms using Merriam-Webster's Online Thesaurus in combination with the reviews of Ke (2016) as well as Qian and Clark (2016). Then, we combined the related terms with the Boolean operators OR and the three concept areas with AND to arrive at the following search string: game* OR gamification OR GBL OR game-based learning OR serious game OR learning games OR educational game OR entertainment game OR video games OR mobile game OR digital game OR edutainment game AND argument. To identify relevant publications, a systematic search strategy was executed in the bibliographic databases such as Scopus, ERIC, and Web of Science. Various inclusion criteria were used to include the most relevant publications which resulted in 18 publications selected for this systematic review.

Results

The most commonly used instructional support for argumentation were modeling (8), interactivity (4), feedback (2), and reflection (2). The most commonly used elements for gamifying argumentation were feedback (18),

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challenge (9), collaboration (9). The most commonly used learning outcomes for argumentation were improving high level of argumentation skills (6), engagement (5), collaborative learning (3).

Conclusion, limitation and future research

This systematic review presents an overview of the current state of the art on the use of game based learning for argumentation in learning environments. This review intends to contribute to a growing body of knowledge on designing game based environments for argumentation skills learning. It provides interested scholars with information on how to take advantage of potential benefits of game based learning for argumentation and how to design digital environments to improve students' learning processes and their corresponding learning experiences and outcomes. These findings (Table 1) are useful to commercial game developers, because the engagement potential of a game is important for game development, with the goal of establishing a compulsion to play**.**

We did not report common affordances and hindrances that are inherent to game based learning for argumentation skills. Gamified environments typically provide learners with various affordances that can be used with the help of ICT tools. More research is needed to shed light on the possible affordances and hindrances that are inherent to the use of game based learning for argumentation.

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