STUDENT ENGAGEMENT IN ONLINE DISCUSSIONS THROUGH A GAMIFIED APPROACH

by

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(Under the Direction of Michael A. Orey)

ABSTRACT

Asynchronous online discussion is important in online and blended courses by supporting various activities for students to interact with classmates and instructors. Benefits of asynchronous online discussion often include outcomes such as promoting thoughtful and reflective interaction among peers, engaging students in classes, and bolstering active learning. However, only when students engage in the discussions, can the aforementioned benefits occur. Low participation rate and shallow discourse are frequently reported by researchers. Being physically isolated from classmates and lacking an omnipresent instructor, student engagement in online discussions heavily leans on their motivation and self-regulated learning.

By taking the motivational benefits of the gamification approach, this dissertation presents the products of a program of inquiry on designing, developing, and evaluating the gamification approach for promoting student engagement in online discussions. Featuring six game elements, gEchoLu, was designed and developed for this dissertation that allows instructors to gamify online discussions.

This dissertation comprises an introductory chapter (Chapter 1) and a conclusion chapter (Chapter 6) that frame four journal style manuscripts. Chapter 2 presents five design principles

for gamifying online discussions, each of which consists of one or two implementations of gEchoLu. Chapter 3 reports findings from two trial studies of using gEchoLu in asynchronous online discussions. gEchoLu was tested in blended undergraduate and an online graduate courses. Student engagement in online discussions was examined and the effect of each specific game element was investigated. In Chapter 4, a control group was included, and mixed methods were used to investigate the effect of the gamification approach on student engagement in online discussions. The secondary MANOVA indicated that students who engaged in the gamification approach outperformed their counterparts in the control group. Chapter 5 prioritizes qualitative method to provide a comprehensive story of using the gamification approach in online discussions in an undergraduate level online course. How each of the game elements incorporated in gEchoLu affected student engagement, factors that encouraged or discouraged students to engage in the gamification approach, and instructor's perspective on the gamified online discussions were shared in this chapter.

INDEX WORDS: Engagement, Gamification, Online discussion, gEchoLu, Game elements, Online learning, Mixed Methods, Gamify

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DEDICATION

To everyone who believed I could do it, and who didn’t live to see this happened.

Life is beautiful!

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Enhancing student engagement is a fundamental goal in teaching and learning (Lester, 2013; Martin, 2012). A considerable number of studies have been done to construct student engagement (Finn & Zimmer, 2012; Fredricks, Blumenfeld, & Paris, 2004), which suggests the importance of its role in teaching and learning (Carini, Kuh, & Klein, 2006; Martin, 2008). Student engagement is a *meta-construct* and is generally defined as student behavioral involvement (Finn, 1993) and psychological investment (Newmann, Wehlage, & Lamborn, 1992) in learning activities. It consists of behavioral engagement, emotional engagement, and cognitive engagement (Fredricks et al., 2004). Behavioral engagement is related to student participation in learning activities—for example, how well a student follows the rules, or how much time a student spends on learning (Marks, 2000; Newmann et al., 1992). Emotional engagement focuses on such factors as a student's sense of belonging and attitude toward learning. According to Fredricks et al.'s (2004) definition, cognitive engagement involves student self-regulated learning and being strategic in learning. Although student engagement has long been held under the spotlight in teaching and learning, it is still a challenge for educators to engage students in learning (Steinberg, 1996).

Asynchronous online discussion is a learning activity often used in face-to-face, blended, and particularly online classes to encourage critical thinking as well as support collaborative learning (Aderson, Reder, & Simon, 1996). It has also been found that an effective online discussion can increase student academic achievement and knowledge creation (Yeh, 2010). The

aforementioned benefits only occur when students engage in online discussions. However, low student engagement in online discussions is a ubiquitous phenomenon in teaching and learning (Mason, 2011). For example, Guzdial (1997) found that only 2.2 messages were posted by each student per week in his study. Similar results were found in Wan and Johnson's (1994) study. An even lower participation rate was reported in Mason's (2011) study, in which 17.9% of total students participated in the online discussions and only one message was posted by each student. Xie, Debacker and Ferguson (2006) found that students' enjoyment decreased steadily as the online discussions progressed. Moreover, students' perceived relatedness in online discussions was reported as decreasing gradually overtime (Xie, Durrington, & Yen, 2011). After analyzing students' posts, Garrison, Anderson, and Archer (2001) found that most students showed shallow cognitive engagement in online discussions. Although Zhu (2006) suggested that students' cognitive engagement varies from low to high in her study, half of the students were at a low level of cognitive engagement.

This dissertation research applied a new approach—gamification—to design and develop an online discussion tool, gEchoLu, as well as to investigate its effects on student engagement. Gamification is the process of using game elements and design principles to make learning activities more fun, thus motivating and engaging learners. It has been proposed as a potential strategy to promote student engagement; however, it is still in its infancy in the teaching and learning arena (Dicheva, Dichev, Agre, & Angelova, 2015).

Gamification in Teaching and Learning

The gamification approach has increased in popularity in domains as diverse as education, business, and health (Bunchball, 2012). It is proposed as a potentially powerful vehicle for motivating and engaging users in activities that are not entertainment-focused.

Theoretical feasibilities of the gamification approach in promoting student learning have been proposed by many educators (Kapp, 2012). For example, Lee and Hammer (2011) suggested that the gamification approach can benefit learning in terms of cognitive, emotional, and social aspects. Based on Fogg's behavior model, Muntean (2011) proposed a list of game elements that could be implemented in online courses to increase student engagement (e.g., instructors divide a course into several chapters, and students accumulate points by completing each chapter's exercises). By drawing on the ideas of self-determination theory, Nicholson (2012) proposed a theoretical framework for meaningfully gamifying learning activities. Built upon the game elements proposed by Bunchball Inc. (2010), Simões, Redondo, and Vilas (2013) proposed a design framework for gamifying a social learning platform for K-6 students.

Although researchers have begun to notice the potential benefits of the gamification approach to learning, few empirical studies have been conducted to investigate its effectiveness and efficiency (Seaborn & Fels, 2014). Moreover, the results of those studies were inconsistent. For instance, Domínguez and colleagues (2013) conducted an experimental study with 211 undergraduate students, in which a gamification plugin was implemented in a typical e-learning system. The game elements included levels, badges, and leaderboards. While the experimental group performed better in overall scores and practical assignments, the control group scored better in written assignments and had a higher participation rate. In Goehle's (2013) study, a gamified homework program was used by 60 undergraduate students in a calculus course. The program included a badge system, a point system, and a level system. More than half of the students indicated that they engaged in the gamified homework system; however, the program had no influence on students' performance. Another study was conducted by Kopcha, Ding, Neumann, and Choi (2016) with 50 graduate students in an online technology integration

graduate-level course. The course materials were divided into four levels, and as students achieved a higher level, the difficulty level also increased. In addition, students were given badges if their assignments were of high quality. Students reported that the gamification approach had a positive influence on their learning and motivation. On the contrary, the results of a quasi-experimental study conducted with 80 undergraduate students enrolled in two communication courses suggested that the gamification approach (i.e., badges and leaderboards) used in the study failed in all scores, such as student motivation, course satisfaction, and student performance (Hanus & Fox, 2015).

Design Framework of gEchoLu

gEchoLu is a gamified online discussion tool designed based on self-determination theory and goal setting theory, as well as the empirical studies conducted in online discussions. The design framework of gEchoLu also borrowed from design principles in games for engaging players. The implementation of gEchoLu embraced five design principles: 1) Gamify goals and expectations to engage students in online discussions; 2) Allow autonomy-supportive gamified learning environments; 3) Gamify evaluation and feedback to promote students' sense of competence in online discussions; 4) Gamify to enrich social interactions among students in online discussions; 5) Gamify to create a safe learning environment for low profile students. In accordance, a series of the game elements were implemented to embody the design framework in order to promote student engagement in online discussions.

The badge system was designed allow instructors to create a set of various badges as rewards for high quality posts to the course discussion board. The corresponding experience points (XPs) of the badges were automatically assigned to the students. The instructor could decide on students' grades for online discussions based on the XPs that they gained in online

discussions. On one hand, participation in online discussions will not only be graded based on the quantity of a student's posts, but also the quality of the posts. On the other hand, students had a certain level of freedom to choose the badges that they wanted to earn, and the discussion topics that they were interested in participating in. Moreover, the requirements of each badge were designed to enable the badges to serve as guidelines for students before posting. When receiving badges, students actually were informed of why their messages were evaluated as high quality, thereby supporting their learning. In addition, students were given the option to display their gained badges in their profile and allow their achievements to be recognized by their peers. The level system was designed to allow instructors to create several levels of online discussion achievements. Students were required to earn XPs to achieve each level. After achieving the level, students could unlock some benefits of the level (e.g., achieving the capacity to use emoji in messages). The progress bars were designed to display students' current progress and the distance to the next level, thereby allowing students to monitor their progress and set goals. The gift system was designed to encourage social interactions with peers, in which students could give *thumbs-ups* to the discussion board posts that they liked and send *reactions* to peers to show their appreciation of peers work. Students had an option to post messages without revealing their identity by creating an avatar in gEchoLu.

Dissertation Overview

The dissertation followed a "compilation of research articles" format (Boote & Beile, 2005, p. 10), consisting of four discrete articles (i.e., chapters 2-5), as well as introduction and conclusion sections. Chapter 2, *Design guidelines to gamify asynchronous online discussions*, presents the design framework of a gamified online discussion tool, gEchoLu, and illustrates its implementation. First, after analyzing eight of the most popular definitions of "gamification," the

chapter proposes a comprehensive definition for this dissertation research. Second, it provides a review of empirical studies on using the gamification approach in teaching and learning, offering an overview of their designs and results. Third, the chapter presents a design framework for gamifying an online discussion tool, gEchoLu, to meet students' motivational needs, thereby promoting their engagement. The framework pulled the ideas from three bodies of literature: motivational theories (self-determination theory and goal setting theory), motivational needs behind video games, and studies in online discussions. Finally, the chapter showcases gamification examples (e.g., virtual gifts), in the form of five game elements.

Chapter 3, *Studies of student engagement in gamified online discussions*, reports on two implementation studies: one implementing gEchoLu in a graduate level course, and the other in an undergraduate level course. The purpose of the studies was twofold: testing the efficacy of gEchoLu and exploring the influence of the game elements on student engagement in online discussions. Both trials adopted a mixed methods research design: 1) self-report surveys were used to assess student engagement; 2) an informal meeting with the instructor provided feedback on his/her experience with implementing gEchoLu; and 3) surveys with open-ended questions served to assess how gEchoLu influenced student engagement.

Chapter 4, *Student engagement in online discussion through a gamified environment*. The study investigated if and how gEchoLu impacted students' behavioral, emotional, cognitive engagement, and performance in an undergraduate-level course. Mixed methods were used. MANOVAs and theme generation analysis were used to investigate differences between the gamification group and a control group. Data analysis results indicated that the gamification approach enhanced some students' performance in online discussions but there was no

significant improvement in behavioral, emotional, and cognitive engagement between the two groups.

Chapter 5, *An exploratory study of student engagement in gamified online discussions*, prioritizes qualitative method to explore how the gamification approach influenced student engagement in online discussions in an undergraduate level course for technology in the workforce. In the study, the gamification approach had positive impact on student engagement. The medium level performers were influenced by the gamification approach the most. The study also investigated the integration of the gamification approach into online discussions from the instructor's perspective.

Finally, Chapter 6 depicts a comprehensive picture of using a gamified online discussion tool and the major findings from this dissertation research are discussed. The chapter concludes with a discussion of the limitations of the current research and suggestions for future research.

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CHAPTER 2

DESIGN GUIDELINES TO GAMIFY ASYNCHRONOUS ONLINE DISCUSSIONS[1]

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Abstract

This paper proposes the gamification approach that can engage students in online discussions. Although some efforts have been proposed for using gamification for teaching and learning, insufficient attention has been paid to gamification that is designed upon *both* theories and evidence from empirical studies. This paper provides design guidelines for gamifying online discussions to promote student engagement. The design guidelines have been constructed based on goal-setting theory, self-determination theory, and theories of what makes games engaging, as well as on empirical studies of gamification in teaching and learning and on asynchronous online discussions. The paper also illustrates implementation of each design guideline through the use of specific game elements (e.g., badges). Implications for research and development are discussed.

Keywords: Gamification; Online discussion; Design; Engagement

Introduction

Asynchronous online discussions have been widely used in various educational settings, including distance education, face-to-face classes, and large classes (Gerosa, Filippo, Pimentel, Fuks, & Lucena, 2010; Kayler & Weller, 2007). Online discussions can help in promoting thoughtful and reflective interaction among peers (Collison, Elbaum, Haavind, & Tinker, 2000), encouraging critical thinking (Aderson, Reder, & Simon, 1996), engaging students in classes (Salter & Conneely, 2015), and bolstering active learning (Scardamalia & Bereiter, 1994). However, online discussions afford these possible benefits only when students are engaging in participation. Engaging students in online discussions is challenging (Hara, Bonk, & Angeli, 2000; Hew, Cheung, & Ng, 2010; Hewitt, 2005).

Efforts have been made on improving online discussion engagement, including the use of grades as well as peer facilitation and mediation (Dennen, 2005). However, such efforts have not led to sustained engagement even when they were effective in initiating engagement (Lee, 2013). In order to maintain students' engagement, uncommon lenses, such as playfulness, fantasy, and emotion may be needed (Ellis, Goodyear, Calvo, & Prosser, 2008; Gunawardena, Lowe, & Anderson, 1997; Shroff, Vogel, & Coombes, 2008; Vonderwell, 2003).

This paper applies the gamification approach to design online discussion environments to initiate and sustain student engagement in online discussions. Gamification can serve as a powerful vehicle for engaging users in activities that are not entertainment-focused (Bunchball, 2012; Deterding, Dixon, Khaled, & Nacke, 2011) due to its affordances for playfulness, fantasy, and positive emotional experiences. Gamification has increased in popularity in domains as diverse as education, business, and health (Bunchball, 2012). The gamification approach adds a game layer to a routine and non-entertainment activity to make the activity engaging. The

potential of using the gamification approach in teaching and learning has been recognized by researchers and educators (Kapp, 2012). Theories that explain or can be used to design gamified learning activities have been proposed (e.g., Muntean, 2011; Nicholson, 2012), and studies investigating the effectiveness of the gamification approach on learning have been conducted (e.g., Domínguez et al., 2013; Goehle, 2013). However, most of the empirical studies were reported without a description of theoretical foundations (Seaborn & Fels, 2014). Design should be built upon *both* learning theories and evidence from empirical studies to maximize the positive impact of the design (Hannafin, Hannafin, & Land, 1997). A lack of such design practice in gamification may have contributed to inconsistent findings in its impact. The positive influence of the gamification approach has been found on various aspects such as promoting student motivation (Landers & Epema, 2011), emotional engagement (Domínguez et al., 2013), cognitive engagement (Ibanez, Di Serio, & Delgado Kloos, 2014), participation (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014; Barata, Gama, Jorge, Gonçalves, & Fonseca, 2013; Iosup & Epema, 2014), interests in learning (Abramovich, Schunn, & Higashi, 2013; Denny, 2013; Leong & Luo, 2011), and the potential for improving student performance (De-Marcos, Domínguez, Saenz-de-Navarrete, & Pagés, 2014). However, negative impacts have been almost equally reported in empirical studies (Caponetto, Earp, & Ott, 2014; Dicheva, Dichev, Agre, & Angelova, 2015). For example, Hanus and Fox (2015) conducted a longitudinal study using the gamification approach in a face-to-face undergraduate course. The researchers found that experimental students rated lower in the gamified class in terms of motivation, satisfaction, and learner empowerment compared to the control students. Additionally, the gamification approach was not considered an efficient teaching and learning strategy in Berkling and Thomas' (2013)

study. These contradictory findings may have resulted from varying conceptions of gamification and missing out critical elements of gamification (O'Donovan, Gain, & Marais, 2013).

This paper inquires in what ways asynchronous online discussions can be gamified to promote student engagement. To address this research question, this paper begins with a conceptualization of the gamification approach. Then it proposes design guidelines for gamifying online discussions that are built upon theoretical foundations and empirical data from previous gamification studies.

Conceptualizing Gamification

Gamification originates from games but is different from games. The purpose of gamification is to encourage people to voluntarily participate in an activity that they might otherwise not. To be a gamified context, a game layer is added to make a non-entertaining context more engaging; however, it is not a full-fledged game (Deterding et al., 2011).

Table 2.1

Gamification Defined in the Literature

Definition	Source
"Using game techniques to make activities more engaging and fun"	Kim (2010, slide 10)
"The use of game design elements in non-game contexts"	Deterding et al. (2011, p. 10)
"The use of game mechanics, dynamics, and frameworks to promote desired behaviors"	Lee & Hammer (2011, p. 1)
"The process of game-thinking and game mechanics to engage users and solve problems"	Zichermann & Cunningham (2011, p. 16)
Application of "game mechanics to non-game activities to prompt specific behaviors"	Bunchball (2012, p. 2)
"A process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation"	Huotari (2012, p. 19)

"Using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems"	Kapp (2012, p. 10)
"The intentional use of game elements for a gameful experience of non-game tasks and contexts"	Seaborn & Fels (2014, p. 17)

Table 2.1 lists several commonly used gamification definitions in the literature. The definitions share commonalities at the macro level, while differing at the micro level. The first commonality is that almost all of them directly or indirectly indicate that gamification is a process. Unlike games, which are systems, gamification is a process of adding a game layer to a non-game activity in order to make it more fun. The second shared commonality is that a game layer consists of game techniques, game thinking, etc. Third, most of them suggested that the gamification approach intends to influence people, such as to promote intended actions, motivation, and engagement.

A major difference among these definitions reflects the use of the *game layer*. Some of the definitions, for example, directly use a broad term, such as game techniques and game (design) elements (Deterding et al., 2011; Kim, 2010), while the other definitions break *game elements* into different levels: game mechanics, game dynamics, game thinking, etc. Another difference reflects the intention of the gamification approach and the influences that are proposed in the definitions, including: to prompt specific (desired) behaviors, to make the non-game activities more fun, to provide users gameful experiences, and to engage users.

Keeping the commonalities, reconciling the differences of these definitions, and conceptualizing within learning contexts, the term *gamification* is defined in the current paper as *the process of using game elements purposefully to make learning activities fun, thus motivating and engaging learners*.

Game elements refers to the common elements that are found in most games, such as levels, earning badges, point systems, and time constraints. Game elements have been chosen instead of game mechanics and dynamics due to the inconsistent use of the latter terms in many studies. For example, earning badges, one of the most common game elements is categorized as a game mechanic in Kapp's (2012) work, while it is a game dynamic in Iosup and Epema's (2014) work. Levels, earning badges, points systems, guilds, challenges, developing avatars, etc. are all considered game elements in the current study. However, if each of the game elements is taken in isolation and without game design, none of them can make the learning activities more fun. Badges, for example, were used as a replacement of grades in Hanus and Fox's (2015) study, and were reported as ineffective. In contrast, collecting badges was reported as the most motivating activity among leaderboards, point system, and "Stock Market Questions" in Ibanez and colleagues' (2014) study. One solution to effectively allocate game elements is to treat them as a set of building blocks and to include design guidelines to use the blocks (Deterding et al., 2011).

Common Game Elements and Designs

Points, badges, levels, leaderboards, progress bars, and avatars are the most common game elements that have been used in extant empirical studies (Dicheva et al., 2015). The subjects, focus areas, offering formats, and grade levels differ from study to study. Most of the studies were conducted with undergraduate participants and focused on subjects, such as computer science and educational technology (Dicheva et al., 2015). Some studies gamified all aspects of the courses, while other studies gamified only part of the courses, such as assignments (e.g., Goehle, 2013), online discussions (e.g., Anderson et al., 2014), and laboratories (e.g., Burkey, Anastasio, & Suresh, 2013). The gamification approach was used in online, flipped, and

face-to-face courses. Game elements, implementation details, and findings (if provided) are summarized in table 2.2.

Points, also known as experience points (XPs) in some games, are cumulative scores that track the players' performance in games (Zichermann & Cunningham, 2011). Points were used in some studies as an alternative to grades (e.g., Barata et al., 2013; Goehle, 2013; Ibanez et al., 2014), which were assigned after students completed the requirements of the course, such as assignments, projects, and participation. In some studies, points were assigned not only for the completion of the requirements, but students also gained points by participating in extra activities. For example, students were able to earn points that they had lost on assignments by completing side quests (Leong & Luo, 2011). The goal was to provide more options to students to gain points, thereby diminishing the threats of failing in the courses. Without an opportunity to earn lost points from side quests, some students reported that they would cheat for the purpose of earning full scores for the assignments. Pirker and colleagues (2014) also indicated in their study that students enjoyed the feeling of a *hard to fail* environment by applying the XPs system.

Badges are one type of symbol that are assigned by game systems and can represent players' achievements or particular skills that they have earned in games (Bunchball, 2012; Zichermann & Cunningham, 2011). These badges can then be displayed by players to let the others recognize the players' achievements or the mastered skills. Some studies have proposed that badges can influence students' engagement by providing focused goals, challenging tasks, clear standards, affirmation of performance, novelty, and choice (Dickey, 2005). With regard to the use of badges, designs differ from study to study. The main badge types can be classified into participatory badges and skill-related badges (Abramovich et al., 2013). Participatory badges are awarded when students complete tasks, and skill-related badges are awarded when students

master relevant skills. For example, one type of badge was designed to reward students who efficiently managed their time (Haaranen, Ihantola, Hakulinen, & Korhonen, 2014). Some badges were designed to encourage students to invest extra effort in completing the tasks. For example, “Persistence is Not Futile” is one of the badges designed in Goehle's (2013) study, which can be assigned to students who tried more than 10 times to correct mistakes in their homework. Skill-related badges were found to help by providing students with a sense of competence in the learning process. Participatory badges were found to be related to the establishment of performance-oriented goals, which were suggested as having a negative effect on learning (Abramovich et al., 2013). For example, badges were given for completing the course assignments, and students were required to collect badges in Hanus and Fox's (2015) study. The authors reported that the gamification approach used in the course sabotaged student learning in terms of their intrinsic motivation and satisfaction. Students felt controlled by the badges, and the feeling of being controlled to do something can decrease students’ intrinsic motivation (Deci, Koestner, & Ryan, 2001). In contrast, collecting badges was reported as the most motivating activity in Ibanez and colleagues' study (2014). The reason can be that the badges designed in this study were related to the students’ skill development (mastery-oriented), while Hanus and Fox's (2015) study focused on student participation (performance-oriented).

The concept of levels corresponded to the increased difficulty of the tasks (e.g., Berkling & Thomas, 2013; Domínguez et al., 2013; Goehle, 2013; Li, Grossman, & Fitzmaurice, 2014). The researchers designed tasks of incremental difficulty for the purpose of reflecting the experience of increasing challenge that is common in video games. Domínguez and his colleagues' (2013) divided the course topics into four difficulty levels; the first level covered basic content, and each subsequent level showed a gradual increase in difficulty up through the

fourth level. However, since the gamification in teaching and learning is still in its infancy, very few studies show the effectiveness of levels in learning tasks.

Progress bars were set in most of the studies as an indicator of students' overall learning progress, and they allow students to track their points and achievements, or their proximity to the next level (De-Marcos et al., 2014; Domínguez et al., 2013; Goehle, 2013). For example, in O'Donovan and colleagues' (2013) study, the progress bar was embedded in a game development course, and its purpose was to set clear goals for students in order to motivate them to achieve the goals. The author reported that the progress bar was rated by students as the second most effective motivating gamification technique in the course.

Avatars are the characters that players create to represent themselves in gameplay environments (Dickey, 2006). Developing avatars is one element that can promote players' intrinsic motivation in the process of play in massively multiplayer online role-playing games (MMORPGs) (Dickey, 2006). Avatars allow players to experience identities in virtual worlds that differ from their everyday identities. In most empirical gamification studies, avatars were embodied as student profiles which consist of student names and pictures (Domínguez et al., 2013). The achievements that a student earned (e.g., points, badges) were displayed in association with his or her profile.

Leaderboards refer to "high-score tables" that display each player's progress and allow a player to compare his or her progress to others (Bunchball, 2012; Zichermann & Cunningham, 2011). Some researchers argued that the competition that the leaderboards creates can motivate the students, which is beneficial for learning (Kapp, 2012; Muntean, 2011). However, a great deal of empirical studies indicated that satisfaction scores of using the leaderboards in the courses ranked low by the students due to the dislike of too much competition (Domínguez et al.,

2013; Ibanez et al., 2014). In order to reduce the compulsion threat of competing with their peers, only the first top scores (e.g., top 5 scores) were displayed on leaderboards in some studies (Gordon, Brayshaw, & Grey, 2013; O'Donovan et al., 2013), and the leaderboard was reported as the most motivating game element in the course (O'Donovan et al., 2013). Another way of reducing the overwhelming sense of competition is that several leaderboards (i.e., leaderboards that correspond to skills and abilities) were introduced in the course, and positive competitiveness was observed because each student was able to have a greater chance to demonstrate his or her competence in specific domains (Todor & Pitică, 2013). In some studies, instead of displaying the achievements by each student, the achievements were displayed as groups (Mitchell, Danino, & May, 2013) and updated weekly (Burkey et al., 2013). Students indicated that they enjoyed competing between groups (Mitchell et al., 2013).

Other than the commonly used game elements, most empirical studies suggested that it is important to seek other game elements, such as cooperation and social mechanisms in teaching and learning (e.g., De-Marcos et al., 2014; Domínguez et al., 2013; Li et al., 2014). Virtual gifts might be a potential game element that can be used to achieve this goal. Virtual gifts are non-physical, intangible objects that are purchased by virtual coins or earned in games and can be sent to other players (Bunchball, 2012). Virtual gifts can be used for showing appreciation for other players' help (Zichermann & Cunningham, 2011) or for simply fostering relationships in the virtual community (Bunchball, 2012).

Table 2.2

Game Elements, Implementation Methods, and Findings Reported in Empirical Gamification Studies

Game elements	Implementation methods	Findings
Points	• Alternative to grades (Barata, Gama, Jorge, & Goncalves, 2013; Goehle, 2013; Ibanez et al., 2014)	• N/A
	• Assigned for all students' activates, including required and extra (Leong & Luo, 2011; Pirker et al., 2014)	• Students enjoyed the feeling of a "hard to fail" environment (Leong & Luo, 2011; Pirker et al., 2014)
Badges	• Assigned when students complete the tasks (Abramovich et al., 2013; Hanus & Fox, 2015)	• Students felt controlled by the badges (Hanus & Fox, 2015) • Participatory badges supported students' establishment of performance-oriented goals (Abramovich et al., 2013)
	• Assigned when students master a skill or exert extra effort on a task (Abramovich et al., 2013; Goehle, 2013; Haaranen et al., 2014; Ibanez et al., 2014)	• Collection of badges motivated students to learn (Goehle, 2013; Ibanez et al., 2014)
Levels	• The tasks are divided into several levels, and the difficulty increases from the first level to more advanced levels (Berkling & Thomas, 2013; Domínguez et al., 2013; Goehle, 2013; Li et al., 2014)	• N/A
Progress bars	• A visual indicator which allows students to monitor their learning progresses (De-Marcos et al., 2014; Domínguez et al., 2013; Goehle, 2013; O'Donovan et al., 2013)	• Students reported that the progress bars were motivating (O'Donovan et al., 2013)
Avatars	• Students' online profiles which consist of students' names or unique pseudonyms and pictures (Domínguez et al., 2013)	• N/A
Leaderboards	• A table displays all students achievements (Domínguez et al., 2013; Ibanez et al., 2014)	• Students did not enjoy the competition created by the leaderboards (Domínguez et al., 2013; Ibanez et al., 2014)
	• A table displays first top scores of students (O'Donovan et al., 2013)	• Students reported that the leaderboards were very motivating (O'Donovan et al., 2013)

	• Multiple leaderboards focused on different achievements (Todor & Pitică, 2013) • Leaderboards display group achievements (Mitchell et al., 2013) • A leaderboard displays top ranked groups' achievements and update weekly (Burkey et al., 2013)	• Positive competition was observed (Todor & Pitică, 2013) • Students enjoyed competing between groups (Mitchell et al., 2013) • N/A
Virtual gifts[1]	• Social mechanisms which are used in social games (De-Marcos et al., 2014; Domínguez et al., 2013; Li et al., 2014)	• N/A

[1] Implementation methods were only recommended without actual implementation reported in the listed studies

Design Guidelines for Gamifying Online Discussions

As discussed earlier, the contradictory findings in empirical studies on gamification suggest that design guidelines are essential to a gamifying process for engagement and learning (O'Donovan et al., 2013). In the remainder of this paper, design guidelines for gamifying online discussion environments are discussed. For each guideline, one or two implementation examples of game elements are provided. These guidelines and implementation examples are built upon theoretical foundations and empirical gamification studies in teaching and learning.

Design Guideline 1: Gamify goals and expectations to engage students in online discussions

- ***Implementation 1.1: Use badges to illustrate expectations in online discussions.***
- ***Implementation 1.2: Use progress bars to allow students to set personal learning goals.***

Problems. The most successful online discussions are purposeful and task-oriented (Ronteltap & Eurelings, 2002). Students are unable or unmotivated to participate in discussions when no clear expectations are communicated (Dennen, 2005). For example, in a study conducted by Xie and his colleagues (2006), explicit statements of the instructor's expectations significantly contributed to the students' increased motivation in online discussions over time. Clear expectations helped students set their goals in discussions, which resulted in higher engagement (Ng, Cheung, & Hew, 2009).

Theoretical foundations. Clear goals can promote improved performance and enhanced engagement by motivating individuals to expend necessary effort and persistence on the task (Schunk & Mullen, 2012). Goal setting theory explains individuals' motivation from the expectation perspective and postulates that important relations exist between specific goals with a higher difficulty level and the level of task performance (Locke & Latham, 2002; Locke, 1996). Individuals are better motivated by clearly and highly set goals compared to vague and

low goals; therefore, goals that are both specific and set at a high level of difficulty may lead to a higher level of task performance (Locke & Latham, 2006). A goal system is deemed to be one of the foundations of games (McGonigal, 2011). The goal is the specific object or result that a player needs to work to achieve; clear goals provide the player with a sense of purpose. Clear, specific, and achievable but difficult goals are seen as crucial in triggering players' attention and motivation (Garris, Ahlers, & Driskell, 2002).

Implementations. Badges can speak to students about the expectations of the instructor and guide them in preparing their discussion entries. Such guidance is crucial, particularly in promoting the participation of disengaged students who are do not understand expectations and do not know how to participate. For example, an instructor badge called *inquisitive* (to a comment that contains a thoughtful question) can inform students that they have made a helpful contribution to a discussion topic. Then, students with further questions rather than a complete answer can still engage in discussions while pursuing the objectives that are set by the instructor. Thus, the badge system can serve as a guiding mechanism for students during discussions and help them to make meaningful contributions that meet the instructor's expectations. Moreover, because participatory badges (focused on participation regardless of performance quality) are likely to foster performance-oriented goals, which may negatively influence learning in the long-term (Abramovich et al., 2013), caution is warranted when designing participatory badges.

Progress bars in an online discussion system can be designed to display students' XPs, showing current level, and how many XPs that they need to gain to achieve the next level (an example of a progress bar is shown in Figure 2.1). In this way, students can track their progress when they log on to systems, which allows them to set a clear goal to achieve and adjust their actions in accordance with their goals in future online discussions.

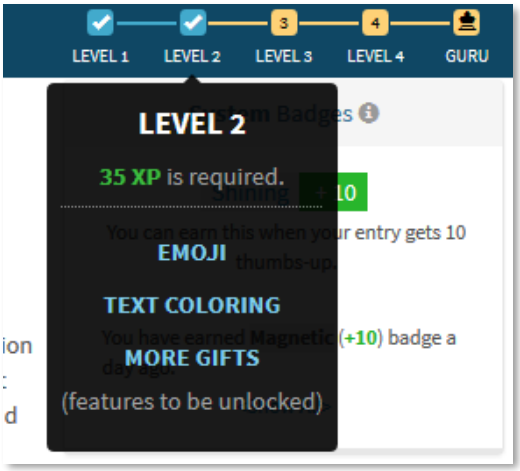

Figure 2.1. An example of a progress bar

Design Guideline 2: Allow autonomy-supportive gamified learning environments

- ***Implementation 2.1: Use an experience points (XP) system to embrace flexibility in participations.***
- ***Implementation 2.2: Provide options to students when gaining badges.***

Problems. Autonomy refers to the desire to perform one's behaviors as volitional and self-endorsed (Ryan & Deci, 2000b, 2002) and is the feeling of freedom to choose and have control over one's actions, and when students feel more control over their learning, they will likely feel more self-determined. Autonomy has been documented as significantly related to student non-posting behaviors (Xie, 2013), information sharing behaviors (Xie & Ke, 2011), and intrinsic motivation (Shroff et al., 2008).

Theoretical foundations. According to self-determination theory, autonomy can be achieved by providing choices, which help individuals to formulate a sense of control (Deci & Ryan, 1985; Ryan & Deci, 2000a, 2000b). The essence of gameplay design is choice (Dickey, 2005). For example, choices are presented to players in MMORPGs in the forms of having avatars, choices of small quests, and the option to drop or delete the selected quest. Instead of

being controlled by the game design, players are allowed to experience gameplay, which promotes mastery-based play (Dickey, 2006). Similarly, research in teaching and learning that has compared the effects of program control versus learner control on students' reactions and motivation has yielded consistently positive results that favor learner control. For example, Morrison, Ross and Baldwin (1992) found that students who were allowed to choose the amount and context of their learning activities reported more positive attitudes toward the course than students in the control group. Similarly, Cordova and Lepper (1996) reported that providing student control led to increased motivation and greater learning. If a student is provided with options in learning, and he/she can choose the activity that is aligned with his/her own goals, intrinsic motivation is likely to occur.

Implementations. Because each badge can be assigned a certain amount of XPs, students' can receive XPs based on the badges they gain in the system. Therefore, unlike traditional online discussions that require students to make a certain number of posts or comments before the deadline, the XP system enables students to achieve their goals through multiple routes. No minimum number of posts is required for each topic, so students can gain points by participating in the topics that they are interested in and earn the related badges. If students are not interested in or do not have enough knowledge to contribute to the current topics, they can observe others' conversations. In later online discussions which they are interested in, they can participate more and earning the points that they lost in the current discussions. The autonomy that the XP system provides can create a "hard to fail" learning environment for students (Leong & Luo, 2011; Pirker et al., 2014). Moreover, it may also prevent students from posting superficial comments, such as "I agree" in order to meet the traditional quantity-based requirements.

"Mandatory fun" is detrimental to students' motivation (Mollick & Rothbard, 2013). If a controlled sense is established by collecting badges, the badges will likely discourage rather than promote students' motivation (Hanus & Fox, 2015). Therefore, it is fundamental to include various badges when designing a gamified online discussion. Badges can be designed by recognizing different aspects of students' actions in online discussions. For example, 40 badges that focused on positive reinforcement, students' particularly diligent work ethic, and extra effort were used in a mathematics online assignment system (Goehle, 2013).

Design Guideline 3: Gamify evaluation and feedback to promote students' sense of competence in online discussions

- ***Implementation 3.1: Use badges to value and inform quality in students' participations.***
- ***Implementation 3.2: Use "thumbs-ups" to encourage peer recognition.***

Problems. Perceived competence is defined as the extent to which an individual believes that she or he is capable of performing an activity well (Ryan & Deci, 2000b). That is, when students' skills develop, and they believe that they are becoming more competent, they perceive a sense of control and self-determination over their learning. Individuals tend to be more engaged in a certain task when the task is structured in contexts that lead them toward feelings of competence (Ryan & Deci, 2002). Students who have a higher level of perceived competence showed significantly more active posting behaviors than those who had not (Shroff et al., 2008; Xie, Durrington, & Yen, 2011; Xie, 2013). In a peer-moderated online discussions study, with higher perceived competence, students were more willing to interact with their peers and had better performance in facilitating online discussions (Xie & Ke, 2011). Moreover, students' perceived competence in online discussions was found to be positively related with their attitudes toward the course (Xie et al., 2011).

Theoretical foundations. In video games, competence is considered the most important need of all, because competence in games represents a sense of accomplishment and control (Ryan, Rigby, & Przybylski, 2006). Positive feedback (Ryan & Deci, 2000b), and being recognized for the work (Harter, 1978) were proposed to promote individuals' sense of competence.

Good games provide "on demand" and "just in time" information throughout play, and this information teaches players how to play (Gee, 2004). Based on the feedback that players receive after their actions, they adjust their actions or decisions to gradually achieve their goals. In video games, the feedback system, in such formats as titles, adornments, equipment of players' characters, and players' levels, tells players how well they did in the game (Holt & Kleiber, 2009). Accurate and encouraging feedback from instructors helps students to develop reasonable self-efficacies and motivation (Schunk & Mullen, 2012). Furthermore, feedback which simply indicates to the student whether the answer is right or wrong is not very helpful for learning (Shute, 2008). Optimal feedback with information that relates to students' work influences students' decisions to pursue mastery goals (Elliott & Dweck, 1988). Mastery goals lead to positive outcomes, such as deep processing and intrinsic motivation (Hulleman, Schrager, Bodmann, & Harackiewicz, 2010) as well as persistence (Miller, Behrens, Greene, & Newman, 1993).

Recognition of individuals' contributions to a community can promote their competence (Harter, 1978). When one's work or capability is valued by significant others, this recognition is closely related to a person's self-worth (Seifert, 2004), and the worth of an individual is inherently connected with his/her performance (Covington, 1984). Providing opportunities that can promote the recognition of an individual's work or capability by others in a community can

help the individual to build self-identity in the community, which meets both intrapersonal and interpersonal needs. Good video games allow players' achievements to be recognized by others in multiple ways, such as leaderboards, badges, and status. However, most of these strategies are built on competition among players (Kapp, 2012). Several studies indicated that competition has a negative influence on learning (Belland, Kim, & Hannafin, 2013; Ke & Grabowski, 2007). For example, competition is likely to lead students to build performance goals. Students who hold performance goals will likely tend to avoid putting effort into learning. Therefore, the gamified online discussion environment should incorporate a non-competitive recognition design.

Implementations. Badges can be considered as a type of optimal informational feedback that keeps students informed of their performance and achievements during the discussion activity and function as a type of recognition. The "inquisitive" badge, for example, shows a student that the post is considered to be high quality because it contains a thoughtful question. Moreover, when students receive badges, they are also informed by instructors that their investment in composing the posts are recognized.

Other than instructors, peers are also significant others. Opportunities for students' posts to be valued by peers should not be ignored. A rating system was implemented in Xie's (2013) study which allowed students to value peer's posts. The results indicated that students' motivation, posting behaviors, and the length of posts were substantially influenced by the rating system. The author further argued that more highly rated students post longer messages and read more. Thumbs ups (i.e., likes), for example, is a social technique that can be used for peer recognition. Different form Xie's (2013) rating system, thumb up only allows students to appraise peers' posts, which may prevent negative influence from low ratings.

Design Guideline 4: Gamify to enrich social interactions among students in online discussions

- ***Implementation 4.1: Use social mechanisms to encourage social interactions.***

Problems. Students need social interactions in online discussions. For example, Thompson and Savenye (2007) reported that students were more willing to participate in online discussions after a closer rapport had been established. Hew and collegues (2010) reported that when a student's contributions are acknowledged and appreciated by others, the student's posts increased both quantitatively and qualitatively. In peer-owned and facilitated online discussions, a sense of relatedness and familiarity among students was also reported as the most common motivator of student contributions to discussions (Cheung, Hew, & Ng, 2008; Xie & Ke, 2011; Xie, 2013).

Theoretical foundations. The need for social interaction in online discussions echoes a sense of relatedness, which has been noted as a vital facilitator of student motivation (Deci & Ryan, 2000; Ryan & Deci, 2000a, 2002). Relatedness refers to the need for belonging and attachment to other people and to one's community (Deci & Ryan, 2000; Ryan & Deci, 2000a, 2002). It is the feeling of being supported by significant others (Ryan & Grolnick, 1986). The sense of relatedness has been noticed as an important contributor to students' motivation and engagement in online discussions. Video games provide great platforms for players that allow them to perceive co-presence of and behaviorally involve themselves with other players (de Kort, IJsselsteijn, & Poels, 2007). Web forums, guild chat channels, and voiceover are common techniques that allow game players to connect (Przybylski, Rigby, & Ryan, 2010). Social video games have even placed social interactions in a crucial role in gameplay (Silva, 2012). Socializing, such as sending virtual gifts or extra lives to other players, is one example of a

strategy that social video games use to encourage social interactions among players (Bunchball, 2012; Zichermann & Cunningham, 2011).

Implementations. A socialization system allows students show their acknowledgements and appreciations to the peers who contribute valuable replies to their posts can be implemented in gamified online discussions. “Thumbs up,” which also known as “likes” in common social networking websites can be used to promote students social interactions. Moreover, virtual gifts can be preprogrammed in a gamified online discussion system and allows students appreciation for peers by sending virtual gifts. For example, Figure 2.2 illustrates a virtual gift system that can be designed in a gamified online discussion system. A gift icon displays at the bottom of the replies, so the students who post the original post can see the icon. By clicking on the icon, the gift store pops up, and the students can choose one virtual gift and send a thank you note.

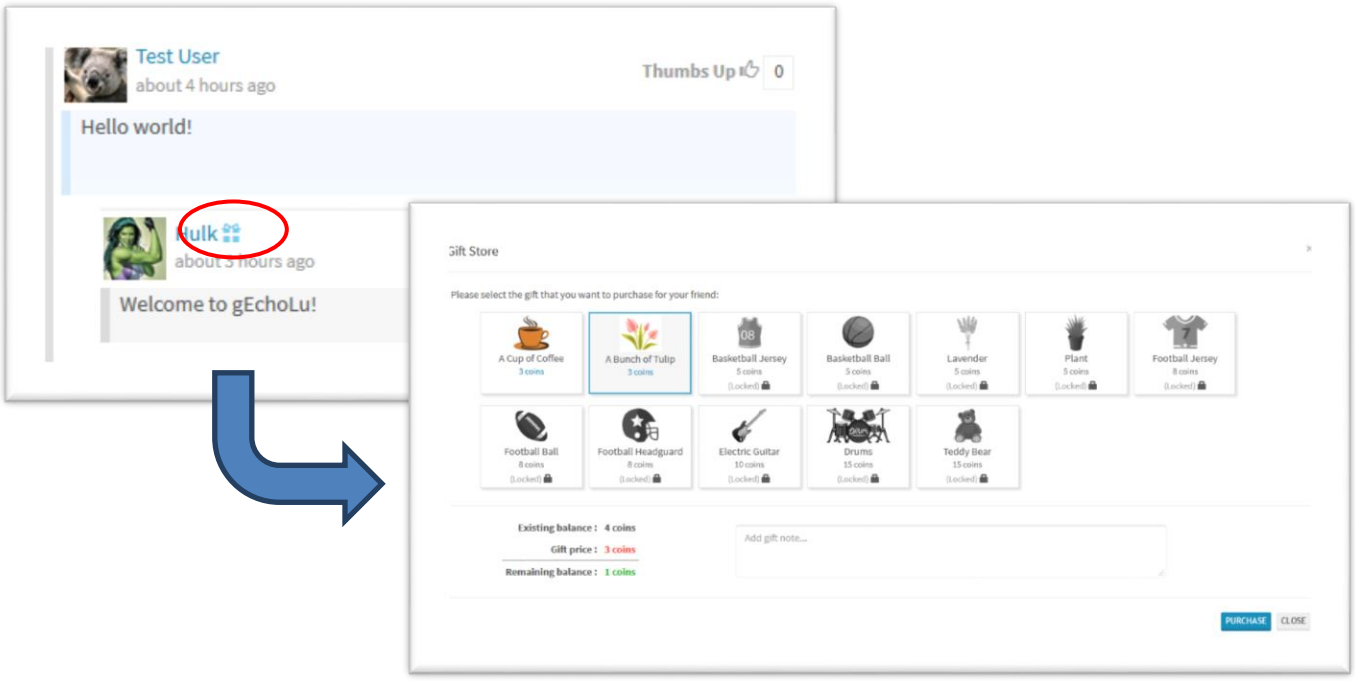

Figure 2.2. A screenshot of virtual gift system in a gamified online discussion system

Design Guideline 5: Gamify to create a safe learning environment for low profile students

- ***Implementation 5.1: Provide students with an option of posting with unique pseudonyms.***

Problems. Establishing a "safe space" in which the sharing of knowledge is encouraged and validated is deemed to be the first necessary step in building a knowledge sharing community (Pilkington & Walker, 2003). Chen and Caropreso (2004) conducted a study among 70 undergraduate students who majored in educational technology and reported that low-profile students (i.e., socially retiring, reserved, and less prone to interest in social interaction) tended to post one-way rather than two-way messages, and the messages were either unrelated or only marginally related to the discussion topics. One reason for resistance could be that students are more likely to protect themselves from external judgments of their abilities (Husted & Michailova, 2002).

Theoretical foundations. Unlike personality expression in the physical world, video games allow and even encourage players to experience identities that may deviate with their everyday ones (Yee & Ducheneaut, 2011). Avatars are one of the formats that can represent players with identities that differ from their everyday identities in video games. A study conducted with 68 World of Warcraft players revealed that due to the anonymity and fantasy in the game, the avatars were rated by the players as being more conscientious, extraverted, and less neurotic than the players actually were. This phenomenon was more salient with those players who held low self-esteem or were introverted in their real lives (Bessière, Seay, & Kiesler, 2007).

Implementations. Allowing students to create and use unique pseudonyms as their second identities for posting may create a safe environment for discussions in which students can participate without concerning external judgement on their capabilities. In this way, students may

feel more freedom to convey their ideas, thereby encouraging low profile students' to engage in online discussions. Each student has an option to determine a unique name for his/her online profile and choose a graphic to represent himself/herself when they log on to an online discussion system for the first time. Later, students can choose to use this profile for their discussion posts when needed. Figure 2.3 illustrates a post with a pseudonym.

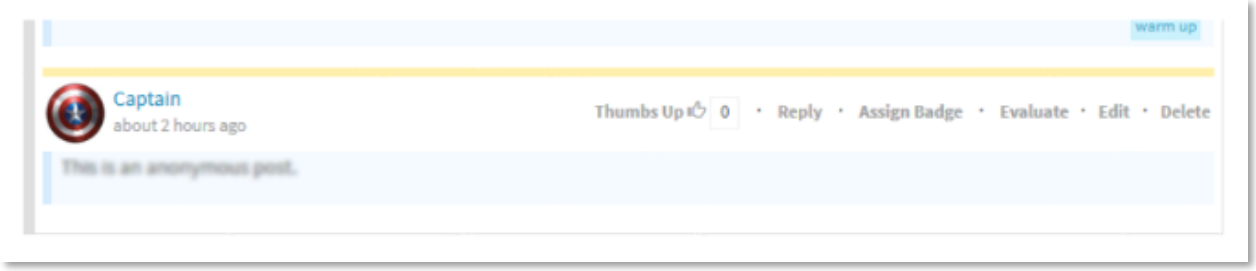

Figure 2.3. A post with the Captain pseudonym

Discussion

Summary

A broad range of gamification definitions, the limited number of empirical studies, and inconsistent findings together keep the use of gamification for teaching and learning still in its infancy (Dicheva et al., 2015; Seaborn & Fels, 2014). The goal of this paper was to (a) conceptualize the gamification approach in teaching and learning and (b) provide theory-driven, evidence-based design guidelines for applying the gamification approach in online discussions. In particular, we reviewed the empirical studies on gamification in teaching and learning to identify the effective ways of using different game elements. Five guidelines for promoting student engagement in online discussions were proposed, and each comprised one or two gamifying implementation examples. The guidelines aimed to use the gamification approach 1) to assist students to set goals and to be acknowledged of instructors' expectations, 2) to support a certain level of autonomy, 3) to promote student sense of competence, 4) to increase social

interactions among peers, and 5) to create a safe learning environment. The guide was constructed using a theoretically-informed, evidence-based approach, which has been rarely done in the gamification literature (Seaborn & Fels, 2014). The associated implementation examples exercised badges, progress bars, experience points, thumbs ups, social mechanisms, and unique pseudonyms to realize each guideline. Although theories have been suggested to gamify learning activities (e.g., Nicholson, 2012), no explicit explanations have been provided to guide the design of a gamified learning activity. These implementations proposed in the current paper illustrate how to use game elements to realize each guideline.

Limitation and Future Research Directions

Studies to validate the design guidelines proposed in this paper are needed in the future. A further consideration worthy of note regards evaluation of studies approach in investigating effectiveness of the guidelines. A proper evaluation approach is missing in most of the empirical studies on gamification in teaching and learning (Dicheva et al., 2015; Hamari, Koivisto, & Sarsa, 2014). One of the major concerns is that most of the studies were short length and/or one time studies (Hamari et al., 2014; Seaborn & Fels, 2014). However, technological interventions are complex in nature, which requires cycles of designing, revising, and evaluating the employment (Walker, 2006), especially when innovative intervention, such as the gamification approach is involved (Caponetto et al., 2014). Therefore, robust approaches (e.g., design-based research) are needed to examine the real potential of the gamification approach in promoting student engagement in learning. Several iterations are needed to test and revise the proposed guidelines in order to generate an effective version.

Furthermore, future research should test the proposed guidelines in different contexts. Prevalent gamification studies were conducted with university level students (Caponetto et al.,

2014), and in technology related courses, such as computer science and engineering (Dicheva et al., 2015). Therefore, a substantial amount of the potential of the gamification approach in learning remains unknown. Since an intervention "enacts through the interactions between materials, teachers, and learners" (The Design-Based Researcher Collective, 2003, p. 5), students with distinct backgrounds may react differently when applying the proposed guidelines to their learning contexts.

Finally, building a gamified learning environment does not necessarily mean that students will be automatically motivated and engaged in learning activities. The assumption "if we built it, they will come" has been proven wrong for e-learning (Zemsky & Massy, 2004). An effective online discussion consists of two inseparable and essential components: design and facilitation (Rovai, 2007). If either of these components is ignored, the online discussions likely will not be engaging. Efforts for facilitation need to be taken by practitioners who are interested in using the gamification approach in teaching. Therefore, future research is needed to investigate the role of practitioners in gamified online discussions, and guidelines for supporting practitioners to facilitate effective gamified online discussions need to be constructed.

Implications for Research and Practice

Education has been undergoing a transformative era in which the popularity of online learning is increasing (Dennen, 2005; Pethokoukis, 2002). By being freed from temporal or physical constraints, online environments enable more students to engage in learning. Asynchronous online discussions are essential components of online courses. The design guidelines proposed in this paper may benefit researchers and practitioners by introducing an innovative way, gamification for increasing student engagement in online discussions, and providing an explicit guidance for implementing the gamified approach. This paper is a starting

point that can inspire more studies with particular focus on theory-driven, evidence-based design when gamifying educational contexts.

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CHAPTER 3

STUDIES OF STUDENT ENGAGEMENT IN GAMIFIED ONLINE DISCUSSIONS[2]

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Abstract

This article presents two trial studies using the gamification approach in online discussions to increase student engagement. A gamified online discussion tool, gEchoLu, was designed and implemented. The first trial focused on examining student engagement in online discussions. The results indicated that gEchoLu had positive influences on student behavioral engagement, emotional engagement, and cognitive engagement. The second trial aimed to investigate the effect of specific game elements implemented in gEchoLu on student motivation and engagement in online discussions. Findings from the second trial suggested that the badges, the like feature, the progress bars, and the feature of posting with avatars promoted student engagement in online discussions. The limitations and implications are discussed.

Keywords: Gamification; Student engagement; Online discussion; gEchoLu

Introduction

Asynchronous online discussions have been commonly used in distance education, face-to-face classes, and large-sized classes (Gerosa, Filippo, Pimentel, Fuks, & Lucena, 2010; Kayler & Weller, 2007). They stimulate student reflection by taking advantage of asynchronism. Being asynchronous frees students from time and space constraints and provides more time for reflection (Hawkes, 2006). Asynchronous online discussions support students' higher-order thinking (Aderson, Reder, & Simon, 1996; Collison, Elbaum, Haavind, & Tinker, 2000), active learning (Scardamalia & Bereiter, 1994) and social presence outside the classroom (Rovai, 2007). However, the benefits of synchronous online discussions only occur when students actually engage in discussions. The lack of engagement in online asynchronous discussions has been observed as a ubiquitous phenomenon (Hara, Bonk, & Angeli, 2000; Hew, Cheung, & Ng, 2010). Low participation rate (M. J. W. Thomas, 2002b), lack of interest in online discussions (Xie, Durrington, & Yen, 2011), and shallow discussions (Hew et al., 2010) are commonly associated with low student engagement in online discussions. While engaged students tend to have higher academic achievement (Carini, Kuh, & Klein, 2006; Finn & Zimmer, 2012; Martin, 2012), the disengagement is closely related to withdrawal (Connell, Spencer, & Aber, 1994).

A promising solution to student disengagement in online discussions is gamification. Gamification is defined as a process of using game elements and game design to make non-game activities more engaging (Deterding, Dixon, Khaled, & Nacke, 2011). Thus far, it has been implemented in a variety of domains, such as business, health care, and government (Lee & Hammer, 2011). Gamification has been proposed as a potential strategy to boost students' motivation and engagement in school activities (Kapp, 2012; Kopcha, Ding, Neumann, & Choi, 2016). However, limited studies have been conducted to examine the effectiveness of the

gamification approach in teaching and learning, and the existing empirical studies present contradictory outcomes on the effects of gamification on student motivation and engagement (Caponetto, Earp, & Ott, 2014; Dicheva, Dichev, Agre, & Angelova, 2015). Given this gap, this study investigated the effects of the gamification approach on student motivation and engagement in online discussions. A gamified online discussion tool, gEchoLu, has been developed and used in two trial studies. The following research questions were addressed in the studies.

1. How does gEchoLu influence student engagement in online discussions?
2. How does gEchoLu influence student motivation in online discussions?

Gamification in Teaching and Learning

The use of the gamification approach in teaching and learning differs from study to study. For example, Domínguez and colleagues (2013) implemented a gamification system in a university-level online technology introduction course. The game elements in the gamified learning system included rewards such as badges, points, leaderboard, and leveling-up (i.e., a hierarchical tree following the course topics and optional exercises structure). The results indicated that the gamification approach had a positive influence on students' academic achievement, emotions, and social interactions. However, students reported their satisfaction with the gamified exercise to be low compared to other exercises in the course and there was no significant influence on cognitive engagement between traditional and gamified exercises.

A case study conducted in an undergraduate level programing course reported that the gamification approach has a significant positive influence on student emotional and cognitive engagement (Ibanez, Di Serio, & Delgado Kloos, 2014). Game elements, such as badges (as a rewarding mechanism), points (earned from badges), leaderboard (displaying student

achievements), and altruism (in which students help peers gain points) were implemented in this study. Collecting badges was reported as the most effective motivator for participating in learning activities. However, the researchers noted that students' intrinsic motivation for learning programming, rather than the gamified approach, may have influenced increased cognitive engagement.

Another study (Goehle, 2013) in which a gamified online assignment platform was used in an undergraduate mathematics course reported increased student engagement. However, there was little influence on student performance (Goehle, 2013). Levels, progress bar, and achievement badges were used in the platform. Unlike the aforementioned studies, the badges in this study were not only associated with mandatory course activities (e.g., turning in assignments on time) but also associated with students' additional efforts (e.g., diligence, persistence, turning in assignments prior to the deadline). Other uncommon elements, such as a list of earned and unearned badges and the capability of sharing earned badges on Facebook, were also used in the platform.

In another study, two game elements—badges and leaderboard—were implemented in a face-to-face university level class and no or negative impact was found on student motivation, satisfaction, and empowerment (Hanus & Fox, 2015). The possible reason was that the badges were given when students completed a required assignment, which meant earning badges was required. This use of badges was attributed to the game element's negative influence on student motivation (Abramovich, Schunn, & Higashi, 2013). When a gamified activity is mandatory, student motivation is more likely to decrease (Mollick & Rothbard, 2013).

Negative impacts of gamified interventions can be attributed to the gamification design and technical issues. First, competition elements such as a leaderboard may have created

pressure and anxiety in students as a result of being compared to peers (Law, Sandnes, Jian, & Huang, 2009). Another reason could be that badges were used to reward task completions without informational feedback (Elliott & Dweck, 1988). Such external rewards may have diminished students' intrinsic motivation toward completing learning tasks, hence, leading to shallow learning. In addition, some of the studies (e.g., Domínguez et al., 2013; Rosario & Widmeyer, 2009) also reported usability issues of the system that may jeopardize the learning experiences.

Student Motivation and Engagement in Online Discussions

Engagement is affected by context and malleable by instructional interventions (Finn & Zimmer, 2012; Fredricks, Blumenfeld, & Paris, 2004). Despite the inconsistency among its definitions in the literature, it can be defined as students' psychological investment and behavioral involvement in the learning activities (Appleton, Christenson, & Furlong, 2008). The multifaceted nature of engagement is typically described as having three or four components. Researchers espousing a three-component model often include behavioral engagement, cognitive engagement, and emotional or affective engagement (Fredricks et al., 2004; Jimerson, Campos, & Greif, 2003). Researchers have proposed an engagement taxonomy with four subtypes that bifurcate behavioral engagement into two components: academic engagement (e.g., time on task) and behavioral engagement (e.g., participation) (S. L Christenson et al., 2008). Although the four-component model is supported by some researchers, the three-component model has been widely accepted. This article adapts the three dimensions model.

The majority of studies in student engagement relate behavioral engagement with students' participation (Jimerson et al., 2003), such as following the rules in classrooms (Finn, 1993), homework completion (Reschly & Christenson, 2012), and involvement in learning

activities (Fredricks et al., 2004). Behavioral engagement in online discussions can be in the form of a new discussion entry or a reply to a peer's discussion entry. The number of discussion entries was regarded as an indicator of behavior engagement (Xing & Goggins, 2015). A substantial relationship has been observed between students' discussion posts and achievement (Ramos & Yudko, 2008). However, such a relationship tends to exist only when discussion posts are required. For example, when online discussions were voluntary, only 4 posts were created by 32 undergraduates for each discussion topic throughout of the course (Deng & Tavares, 2013). Similar findings were reported in Cheng, Paré, Collimore, and Joordens (2011).

Emotional engagement is defined as students' psychological reaction to academic environments, such as the feeling of boredom or enjoyment of learning activities (Finn & Zimmer, 2012), and the relationship with teachers and peers (Fredricks et al., 2004). Emotional engagement in online discussions refers to students' interests/enjoyment in online discussions and their social interactions with teachers and peers. Xie and his colleagues (2006) found that students' perceived enjoyment in online discussions dropped steadily throughout the semester. Moreover, the establishment of a strong rapport assists in building students' sense of community, and the acceptance level of community closely relates with students' interactions (Garrison, Anderson, & Archer, 2001). Even the desire of exchanging social cues could be a motivator of participating in online discussions (Walther, 1996). On the contrary, online learning environments are more likely to isolate students from others.

Cognitive engagement draws on the idea of expending extra effort to comprehend complex concepts and master higher-order thinking skills (Finn & Zimmer, 2012; Fredricks et al., 2004). The importance of cognitive engagement in online discussions has been noted in a considerable number of studies (e.g., Garrison, Anderson, & Archer, 2000; Putman, Ford, &

Tancock, 2012; Zhu, 2006). Cognitive engagement in online discussions is defined in terms of the attention and effort that students expend on reading and writing the discussion entries. It involves the use of higher-order thinking skills, such as analyzing, critiquing, and reasoning, in reading and composing posts in online discussions.

Motivation is a driving source for engagement (Skinner, Kindermann, Connell, & Wellborn, 2009). Motivation answers the "why" of student behavior or action (Appleton et al., 2008). The more a student is motivated to learn, the more likely the student engage in learning activities, and the more likely learning actually happens (Beachboard, Beachboard, Li, & Adkison, 2011; Kim, Park, Cozart, & Lee, 2015). Motivation is conceptualized as a continuum between controlled and autonomous motivation (Ryan & Deci, 2000a, 2000b). Controlled motivation enacts performance to respond to an external demand, such as commenting on peers' discussion board post to earn a participation grade (Deci & Ryan, 2000; Ryan & Deci, 2000b). On the contrary, with autonomous motivation, one's behaviors are consistent with his or her other values and needs (Ryan & Deci, 2000b). For example, a student comments peers' discussion board post with enthusiasm and great interests because of the peers' post is about environmental education for recycling that he or she cares about.

Design of gEchoLu

gEchoLu is a gamified online discussion tool, which incorporates several game elements: a badge system, an experience points (XPs) system, a progress bar system, a leaderboard system, a posting with avatar system, and a likes (i.e., thumbs ups) system. The badge system allows instructors to create and design badges and assign them to students as a type of reward or recognition in accordance with students' performance in the discussions. Two types of badges can be created in gEchoLu: system badges and instructor badges. System badges can be created

mainly for the purpose of encouraging students to start engaging in gEchoLu, and are assigned automatically. For example, students can earn a “photographer” badge by uploading their profile pictures. Instructor badges focus on different quality aspects of student posts and need to be assigned by the instructor manually. For example, the badge “linker” was one badge that the instructor created to reward students whose posts were well aligned with learning theories. Figure 3.1 presents the Linker badge created in gEchoLu.

Figure 3.1. An example of an instructor badge

Moreover, the instructors can determine the value of badges with experience points (XP). In this way, when students gain badges, they also gain some XPs as well, and they can advance to the next level when sufficient XPs are gained. Furthermore, each student’s XPs are displayed via a progress bar for the purpose of providing the student with a visual demonstration of current progress and achievement. Figure 3.2 is a screenshot of a student’s progress bar.

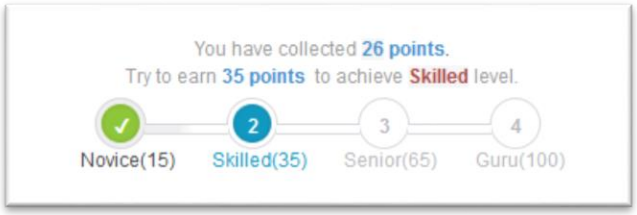

Figure 3.2. A screenshot of a student’s progress bar

The Leaderboard feature in gEchoLu shows the top five students based on the XPs earned in a specific discussion, and the leaderboards change in every discussion based on students’ XP scores (see Figure 3.3). The inclusion of a leaderboard aims to allow students’ achievements to

be recognized by their classmates. In order to decease the anxiety that could be caused by comparing oneself to peers, the leaderboard only displayed the top five students' XPs, and it changed based on students' weekly XPs.

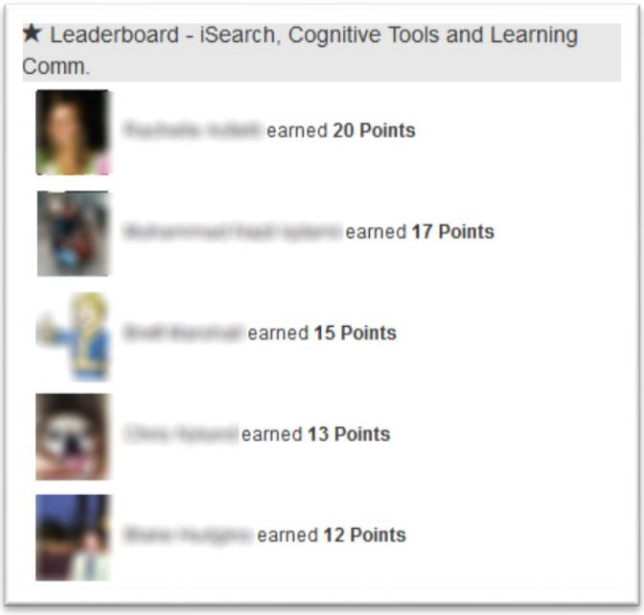

Figure 3.3. A screenshot of a leaderboard in Trial I

The posting with an avatar feature allows students to create unique online discussion pseudonyms, which can be used instead of their real identities when posting messages without revealing their true identities. Moreover, in order to promote students' interactions, gEchoLu allows students to like their peers' posts by giving the posts thumbs-ups.

Trial I: Gamification for Graduate Students

Research Design

A concurrent mixed methods design was used. Mixed methods research takes advantages of both qualitative and quantitative approaches to understand a phenomenon (Greene, 2007; Johnson, Onwuegbuzie, & Turner, 2007). A concurrent design features both data sets that were collected within the same time frame. The present study used Likert-scaled questions and the

number of students' posts as quantitative data to measure student engagement change throughout the discussions; open-ended questions as qualitative data were used to explore the insights of how gEchoLu influenced student engagement.

Participants and Study Site

Participants were enrolled in an online graduate-level course on theories in using technology in teaching and learning at a large southeastern public university in the United States. In total, 22 students participated in the study; 13 of them were female (59.1%), and nine were male (40.9%). The majority of participants (77.3%) were Caucasian (n=17), with 13.6% African American (n=3), and 9.1% others (n=2). By the end of the data collection, participants' reported an average age of 32.7 (*SD* = 7.68), and they were from a variety of fields, such as education, librarianship, information technology, and kinesiology.

Procedures

The gamified online discussions lasted for 8 weeks. Three or four participants were assigned to a group (seven groups in total). Each week the discussions focused on one topic. Participants needed to post one lesson plan for each topic as a group and provide at least one individual response to the chosen lesson plan. The student engagement survey was administered twice throughout the 8-week study (i.e., in the middle as Time 1, and at the end as Time 2). Twenty participants completed all two surveys.

Data Collection

Participants' engagement was measured by three subcomponents: behavioral engagement, emotional engagement, and cognitive engagement. Behavioral engagement was measured by both a self-reported survey and the number of participants' posts. The frequency of participant posts was obtained from the gEchoLu database. Three self-reported items measuring

participants' behavioral engagement (e.g., I pay attention in online discussions) were adapted from the School Engagement Measure (SEM; Fredricks, Blumenfeld, Friedel, & Paris, 2005) to meet the context of the current study. SEM is a Likert scale self-reported questionnaire; all the items in the questionnaire were rated from 1 to 5 (1 = never, 5 = all of the time; or 1 = not at all true, 5 = very true). The developers reported Cronbach's alpha values of .72 and .77 for behavioral engagement and the construct validity has been reported by the developers (Fredricks et al., 2005). However, in Trial I, Cronbach's alpha was not at an acceptable level for both time points. Therefore, confirmatory factor analyses were carried out to test the factor loadings, and one item was excluded for later analyses due to the low loading. Eisinga, Grotenhuis, and Pelzer (2013) suggested that the Spearman-Brown coefficient should be reported for two-item scales. The Spearman-Brown coefficients were .419 and .648 for the two time points, respectively, which was within the range of a low to acceptable level. However, the low number of items can account for the low reliability (Eisinga et al., 2013).

Emotional engagement was measured by two self-reported subscales: participants' enjoyment and perceived relatedness in online discussions. The subscale of enjoyment was adopted and modified from SEM (Fredricks, Blumenfeld, Friedel, & Paris, 2005), and the subscale of perceived relatedness was adopted from the Basic Psychological Needs Scales (BPNS; Baard, Deci, & Ryan, 2004). The modified questionnaire consists of 6 items for measuring enjoyment (e.g., I like participating in online discussion), each of which is rated from 1 to 5; and 8 items for examining relatedness (e.g., I like the people I interact with in the online discussion), each of which is rated from 1 to 7. The developers of the instruments reported Cronbach's alphas of .83 to .86 and .89 for these two scales, respectively. In addition, the developers provided evidence for construct validities for SEM (Fredricks et al., 2005), and

evidence of construct validity was provided by previous research for BPNS (Sørebø, Halvari, Gulli, & Kristiansen, 2009). The Cronbach's alphas for the enjoyment scale were .940 and .867 in Trial I.

The scale of cognitive engagement was adopted from the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991). Eleven items measuring participants' cognitive strategy use and self-regulation were chosen and modified to examine participants' cognitive engagement in online discussions for this study. Each item is rated from 1 to 7. One example item is "I use what I have learned from old assignments and the textbook to participate in online discussions." Developers of the instrument reported Cronbach's alphas of .83 to.88 for the cognitive strategy use scale and .63 to .74 for the self-regulation scale (Pintrich & de Groot, 1990). Developers and colleagues reported construct validity from correlational studies showing that self-efficacy, interest, and task value correlate positively with cognitive strategy use and self-regulation (Pintrich, 1999). The Cronbach's alphas were .843 and .745 in the current study. Appendix A displays all the survey items for the current study.

Moreover, in order to obtain further insights into the effects of the gamification approach, two open-ended questions regarding participants' experiences in the gamified online discussions were administered at the end of the semester: 1) In what ways do you think the gamification approach influenced your participation and learning in the online discussions? 2) Provide any ideas about how to improve the gaming elements used in the course.

Data Analysis

Student engagement was analyzed within one group at Time 1 and Time 2 to examine any change. A paired *t-test* is used to compare means from the groups that are correlated (Field, 2009). Descriptive statistics were used to report participants' number of posts. Descriptive

statistics are used in a study to describe and interpret what the data is (Best & Kahn, 2006; Johnson & Christensen, 2014) especially when concerned with conditions or relationships and the development of trends (Best & Kahn, 2006). The open-ended questions data were analyzed using constant-comparative analysis (Glaser, 1965). That is, the data was first analyzed without predetermined codes, and any concepts that emerged from the data were then merged into smaller categories after constant comparison of the initial codes. Table 3.1 lists the alignment of research questions (RQs) with data collection methods and data analyses in Trial I.

Table 3.1

Alignment of RQs with Data Collection Methods and Data Analyses in Trial I

Research questions	Data collection methods	Data analyses
RQ1 How does gEchoLu influence student behavioral engagement in online discussions?	Self-reported survey: SEM Number of participants' posts Open-ended questions	Paired *t-test* Descriptive statistics Constant-comparative analysis
RQ1 How does gEchoLu influence student emotional engagement in online discussions?	Self-reported survey: SEM and BPNS Open-ended questions	Paired *t-test* Constant-comparative analysis
RQ1 How does gEchoLu influence student cognitive engagement in online discussions?	Self-reported survey: MSLQ Open-ended questions	Paired *t-test* Constant-comparative analysis

Results

Assumptions of the paired *t-test* were tested beforehand, and the normality assumption of student enjoyment score was violated. Therefore, three paired *t-tests* were performed for behavioral engagement, perceived relatedness, and cognitive engagement, as well as a non-parametric test (Wilcoxon signed-rank test) for student enjoyment (see Table 3.2). The results indicated that there was a significant change in participants' perceived relatedness from Time 1 (M = 4.64, SD = .91) to Time 2 (M = 4.88, SD = .84); t (19) = -2.14, $p < .05$, d = .48. However, it was not significant at the Bonferroni-adjusted α (.05/4) level. Scores of student behavioral

engagement, enjoyment, and cognitive engagement showed no significant changes. The means of behavioral engagement, perceived relatedness, enjoyment, and cognitive engagement increased.

Table 3.2

Mean Scores for Student Engagement in Online Discussions from the Survey

	Time 1		Time 2			
	M	*SD*	*M*	*SD*	*t*	*p*
Behavioral engagement [a]	4.13	.63	4.35	.59	-2.02	.058
Emotional Engagement: Enjoyment [a]	3.00	.93	3.22	.68	-1.53	.144
Emotional Engagement: Perceived relatedness [b]	4.64	.91	4.88	.84	-2.14	.045
Cognitive engagement [b]	5.18	.77	5.37	.61	-1.34	.197

[a], The full score of behavioral engagement and enjoyment is 5
[b] The full score of perceived relatedness and cognitive engagement is 7

Because the lesson plans could be posted only by groups, and each group was required to post only one plan for each topic, there was no variance in the number of the posts. Therefore, only the number of participants' comments on the lesson plans was exported from gEchoLu database. Moreover, the average number of comments for each topic was calculated. As reported in Table 3.3, the number of participants' comments on the topics in the middle of the discussions period dropped slightly and was followed by an increased trend. Except for Topic 7 (participants were required to post at least two comments for Topic 7), the overall average number of comments for each topic was higher than 1.30.

Table 3.3

The Frequencies of Participants' Comments in Trial I

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7
# of comments	26	31	27	27	28	21	99
# of participants	20	21	21	22	20	19	20
Avg. # of comments	1.30	1.48	1.29	1.23	1.40	1.11	4.95

A total of 21 participants responded to the open-ended questions. The results showed that thirteen participants indicated positive attitudes and five participants indicated either negative attitudes or indifferent attitudes toward the gamification approach; the rest of the participants did

not state their attitude in the responses. A majority of the 13 participants with positive attitudes stated that the gamification approach made the online discussions more fun, more casual, and less intimidating. As one participant responded, “It made it a bit more fun and did not seem as serious and academic…” Some participants indicated that the gamification approach motivated them to participate more (e.g., “I probably made more comments than I would have otherwise”). Moreover, participants commented that it provided them with a sense of competence; for example, “I liked leveling up and earning badges. It felt like accomplishing something.” The reasons provided by the participants who did not enjoy the gamification approach very much included the beliefs that the badges were not suitable for graduate participants and that the gamification approach had no impact because they were more concerned about grades and learning materials. For example, one participant stated, “I am in the class for the grade, the experience, and to learn the material. Achieving levels such as this means nothing to me.” Another participant commented, “I either want to post because it is inherently valuable to me or I don’t.”

Discussion

Trial I examined graduate students’ engagement in a gamified asynchronous online discussion over time. Overall, it seems that the gamification approach had a positive influence on students’ engagement in online discussions. Most students indicated positive attitudes toward the gamified online discussions in their responses to the open-ended questions. Means of engagements increased from Time 1 to time 2. More specifically, student perceived relatedness was found to have significantly increased (see Table 3.2), and according to Cohen (1988), the effect size (d = .48) indicates that there was a fairly substantive increase from Time 1 to Time 2. Moreover, although statistical analysis suggests no difference in student enjoyment, the means

increased over time. Compared to the previous studies in which student perceived relatedness and enjoyment significantly decreased (Xie et al., 2011), the findings in the current study suggest that the gamification approach had a positive impact on student emotional engagement. Although the survey results indicted no statistically significant difference in behavioral engagement, the means increased from Time 1 to Time 2. As an indicator of *behavioral engagement* (Xing & Goggins, 2015), the increased number of student posts for each topic over time also corroborates students' self-reported behavioral engagement on the survey.

In regard to student cognitive engagement, no significant difference was found; however, the means were high and increased from Time 1 to Time2. Discussions were required assignments and made up 57% of final grades. Thus, to earn desirable grades, students needed to expend extra cognitive effort on composing posts. That may explain why the cognitive engagement remained high over time.

The lower engagement at Time 1 compared to Time 2 may be because of the weeks of Topic 4 and 6 when there were two other projects due. The overwhelming workload from other projects may have compromised the time that students could use to participate in the gamified online discussions, thereby resulting in lower engagement. This finding is consistent with previous studies reporting that the lack of time can impede students' contribution to online discussions (Cheung, Hew, & Ng, 2008; Xie et al., 2006). Moreover, the synchronous online class meeting held during the week for the last discussion may have played a critical role in student engagement in the gamified online discussions.

Trial II: Gamification for College Students

In order to examine the effect of the gamification approach on undergraduate level students' engagement in online discussions, Trial II was conducted. The purposes of Trial II

were to test the revised gamification approach on student engagement and to focus on investigating how each of the game elements incorporated in the gEchoLu affected students' engagement. Different from Trial I, five changes were made for the gamification approach. First, more badges were created. Moreover, the points that students gained from the badges were associated with their final grades for the online discussion activity. Second, because the points of the badges that students gained were also their final grades, and considering the privacy of students' grades, the leaderboard feature was disabled. Third, unlocking new features was associated with the levels. That is, when students achieved a new level, certain new functions of gEchoLu were enabled. For example, at the initial level, students could not use emojis when composing their posts, but the emoji function was unlocked after they achieved level 2. Fourth, in order to further promote students' social interactions, a virtual gift system was implemented. By clicking the gift button beside the comments to the posts, the students can send virtual gifts to the peers who write the comments. Figure 3.4 illustrates the virtual gift system implemented in gEchoLu. Fifth, a monetary system was implemented in gEchoLu in which the points that students gained could be converted into virtual coins, which students used to give "thumbs-ups" or send virtual gifts to their classmates. The monetary system had no bearing on their grades. Thus, the game elements used in Trial II were a badge system, a like system, a gift system, a progress bar system, an unlocking new features system, and a monetary system.

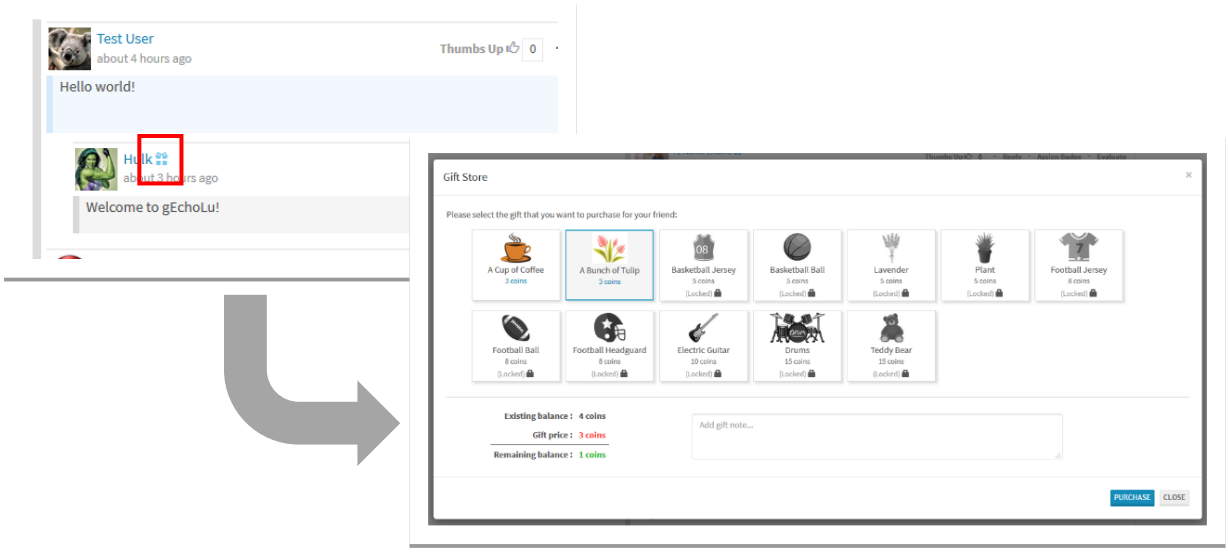

Figure 3.4. The virtual gift system included in Trial II in gEchoLu

Research Design

Trial II continued a concurrent mixed methods design (Greene, 2007). Quantitative data was collected from self-reported survey and logs from the gEchoLu database. Qualitative data was obtained from open-ended questions. Similar to Trial I, the purpose of mixing in Trial II was complementarity.

Research Context and Participants

The participants were recruited in an upper-level undergraduate psychology course at a large southeastern public university. All of the classes were delivered in a face-to-face format. A total of 41 students participated in the gamified online discussions. Thirty-three participants returned the survey; however, among those 33 participants, one participant failed to complete it. Thus, the total number of participants included in the analysis was 32. The average age of the participants was 21.33 (*SD* = 1.05). Of the 32 participants, 62.5% were female (n = 20), 31.3 % were male (n = 10), and the rest of the participants did not indicate their gender. The majority (75 %, n = 24) of the participants were Caucasian, with three Hispanic (9.4 %), one Africa American

(3.1 %), one Asian (3.1 %), and three (9.4 %) other. Participants were majoring in various programs; 25 % (n = 8) were from the psychology program, 9.4 % (n = 3) were majoring in advertising, 9.4 % (n = 3) were from the social justice program, and 6.3 % (n = 2) were from communication and journalism. There were four participants from middle school education, history, computer science, and statistics, and the rest of the participants either listed themselves as undecided regarding their majors or did not respond to the question.

Procedure

The course took place during a summer semester and lasted for one month. The online discussions were designed as an out of class activity and formed 15% of the final grade. A total of three discussion topics were designed, and each of the discussions lasted for one week. The first discussion started during the second week of the course and was followed by the other two discussions. After participants completed all three discussions, the survey with open-ended questions was distributed face-to-face.

Data Collection

The same student engagement survey was administered. Cronbach's alphas were .937, .807, and .605 for enjoyment, perceived relatedness, and cognitive engagement, respectively, in Trial II. However, Cronbach's alpha was.274 for behavioral engagement. Moreover, in order to investigate participants' motivation, six items measuring student autonomous motivation and controlled motivation were added (see Appendix B). The items were modified from the Learning Self-Regulation Questionnaire (SRQ-L; Black & Deci, 2000). Each question provides a reason why a particular behavior happens, and respondents are asked to rate the reasons on a scale from 1 (not at all true) to 7 (very true). An example of a modified question for the autonomous motivation scale is "I participated actively in online discussion because I feel like it's a good way

to improve my understanding of the course material." An example of a modified question for the controlled motivation scale is "I actively participated in the online discussion because I would get a good grade if I did what my instructor suggested." Previous studies reported high alpha reliability with .75 and .80 for the autonomous scale, and .67 and .75 for the controlled scale (Black & Deci, 2000; Williams & Deci, 1996). Cronbach's alpha was .946 for autonomous motivation and .727 for controlled motivation in Trial II.

Open-ended questions were added for the purpose of understanding participants' perceptions of the game elements implemented in gEchoLu (see Appendix C). An example of the questions was "*please name the features of gEchoLu that you liked the most and why.*" Furthermore, the number of posts, number of participants who participated in the online discussions, number of system and instructor badges earned by participants, number of gifts sent, the highest level that participants achieved, and the points that participants earned were exported from the database of gEchoLu.

Data Analysis

To understand the relationships between participants' achievements from the gamification approach in gEchoLu (e.g., number of badges earned) and their motivation as well as engagement in online discussions, a series of correlations were performed. It helps to answer two questions: Is there a relationship between each of the game elements embraced in gEchoLu and student motivation as well as engagement? If there is, how strong or weak is it? (Huck, 2012). Moreover, similar to Trial I, descriptive statistics were reported for student motivation and engagement as well as number of posts; a paired *t-test* was performed to further test if participants' autonomous motivation significantly differed from controlled motivation. Participants' responses to the open-ended questions were analyzed by constant-comparative

technique. Table 3.4 lists the alignment of RQs with data collection methods and data analyses in Trial II.

Table 3.4

Alignment of RQs with Data Collection Methods and Data Analyses in Trial II

Research questions	Data collection methods	Data analyses
RQ1 How does gEchoLu influence student behavioral engagement in online discussions?	Self-reported survey: SEM	Descriptive statistics Correlations
	Number of participants' posts	Descriptive statistics Correlations
	Open-ended questions	Constant-comparative analysis
RQ1 How does gEchoLu influence student emotional engagement in online discussions?	Self-reported survey: SEM and BPNS	Descriptive statistics Correlations
	Open-ended questions	Constant-comparative analysis
RQ1 How does gEchoLu influence student cognitive engagement in online discussions?	Self-reported survey: MSLQ	Descriptive statistics Correlations
	Open-ended questions	Constant-comparative analysis
RQ2 How does gEchoLu influence student motivation in online discussions?	Self-reported survey: SRQ-L	Descriptive statistics Paired *t-test* Correlations

Results

Table 3.5 presents descriptive statistics of student motivation and engagement at the end of the online discussions. The means of the surveys indicated a moderate to high degree of autonomous motivation, controlled motivation, behavioral engagement, perceived relatedness, and cognitive engagement. However, the score for participants' enjoyment of online discussions was relatively lower than the other subcomponents of engagement and was only slightly higher than the half of the full score. Although the means showed that the participants' autonomous motivation was lower than controlled motivation, the paired t-test revealed no significant difference ($t(31) = -.617$, $p = .54$).

Table 3.5

Descriptive Statistics for Student Engagement Scores in Trial II

	M	*SD*	*Skew*	*Kurt*
Autonomous Motivation[a]	4.14	1.56	.001	.060
Controlled Motivation[a]	4.31	1.35	-.103	-.504
Behavioral Engagement[b]	3.55	.59	.335	.104
Emotional Engagement: Enjoyment[b]	2.88	1.01	.011	-.634
Emotional Engagement: Perceived Relatedness[a]	4.52	.82	-1.151	1.596
Cognitive Engagement[a]	5.36	.54	-.234	-.424

[a] The range of scores for behavioral engagement and enjoyment is 1-5
[b] The range of scores of autonomous motivation, controlled motivation, perceived relatedness and cognitive engagement is 1-7

Participants' contributions to online discussions for each week are shown in Table 3.6. The total number of participant posts and comments increased during the second discussion period and decreased during the third discussion period. The average number of participant posts also showed a similar pattern. However, the average number of participants' comments and the average number of messages (average considering all posts and comments) actually increased throughout the three discussions (n = 4.82 for Discussion 1, n = 5.19 for Discussion 2, n = 5.46 for Discussion 3). That is, although Discussion 2 represents a peak in the total number of messages (both posts and comments), the numbers of messages of participants who actually participated in the discussions increased over time.

Table 3.6

The Frequencies of Participants' Contributions in Trial II

		Discussion 1	Discussion 2	Discussion 3
Original posts	The number of posts	92	99	87
	The number of participants	41	41	38
	Avg. number of posts per participant	2.24	2.41	2.29
Commenting on original posts	The number of comments	98	100	95
	The number of participants	38	36	30
	Avg. number of comments per participant	2.58	2.78	3.17

Total avg. numbers	4.82	5.19	5.46

As shown in Table 3.7, the number of the instructor-assigned badges that participants gained from Discussion 1 (n= 72) was lower than the number from Discussion 2 (n = 112), and the number of instructor badges that participants gained from Discussion 2 was higher than the number from Discussion 3 (n = 95). The number of system badges that participants gained and the likes that participants sent increased from Discussion 1 to Discussion 3. In particular, the likes increased a considerable amount from Discussion 1 to Discussion 2. However, the number of virtual gifts that participants sent remained low; no gifts were sent in Discussion 1, and only 2 virtual gifts were sent in Discussion 2 and Discussion 3. Most of the participants (n = 38) achieved level 4 (i.e., the final level) at the end of the online discussions.

Table 3.7

Participants' Gains in gEchoLu

	Discussion 1	Discussion 2	Discussion 3
Instructor badges	72	112	95
System badges	45	75	78
Likes	57	543	606
Gifts	0	2	2

The results of the correlations indicated that system badges were positively correlated with the number of messages that participants posted (r = .476, p = .006). In addition, the number of posted messages was significantly correlated with the number of likes that participants received (r = .535, p = .002) and sent (r = .473, p = .006). Moreover, the number of instructor badges that participants gained from gEchoLu was significantly associated with participants' autonomous motivation (r = .443, p = .011) and their cognitive engagement (r = .372, p = .036). The results of the correlation analysis showed that the relationships between participants' gains

from gEchoLu and the other subcomponents of student engagement (i.e., behavioral engagement, enjoyment and perceived relatedness) as well as controlled motivation were not significant.

The open-ended questions results indicated that the badge system was the most motivating game element (16 out of 32) implemented in gEchoLu. The main reason was that the badge system was directly associated with participants' final grades in online discussions. Participants also mentioned that the badge system motivated them to participate and learn more. For example, one participant indicated that they found the badge system motivating "…because it added to me going the extra step and to learn a little more." In addition, the badge system provided participants with a sense of competence. A participant commented that "I liked it better than other discussion tools I've used, because it was 'rewarding' in the sense you earn rewards for participation." Moreover, participants also suggested that they enjoyed the fact that the badges were designed based on the quality of their posts. The progress bar feature was rated as the second favorite game element by participants; nine participants reported that the progress bars helped them to monitor their progresses, informed them how to proceed, and provided them with a sense of achieving something. For instance, one participant stated that "I felt that whenever I accessed the system, I was most concerned with the progress bar and seeing improvement in that." Other than progress bars, the thumbs-up function was the third welcomed feature in gEchoLu (7 out of 32). Getting thumbs-ups from peers made the participants feel supported; as one participant stated "Encouragement for giving thumbs up was a good way to get people to read and support others' posts." The function of being able to post with their avatars was also indicated as a preferable design in gEchoLu, because this function allowed participants to freely express their ideas.

Virtual gifts (n = 9), badges (n = 8), technical issues (n = 5), unlocking new features (n = 4), and monetary system (n = 3) were reported as the least liked game elements or the issues that hindered them from engaging in online discussions. The majority of participants who suggested the virtual gift system as the least favored game element stated that there was no value of sending gifts. One participant said, “I did not like the virtual gifts because I thought they were pointless and it would have been weird for me to actually send one to a fellow student.” Another participant provided the reason that he or she did not like the gift system was “I did not send or receive any gifts, and they did not count on XP points.” Moreover, participants also noted that it took too long for them to learn how to use the gift system. Interestingly, the badge system was listed as the second least favorite game element in gEchoLu (n = 8). Most of the participants who did not like the badge system indicated that the worth of each badge was too low, therefore it was hard for them to gain sufficient points for descent grades. In addition, participants stated in their responses that there was not enough variety in badges and some of the system badges were designed in a way that can be assigned only once. Third, technical issues that participants encountered while posting messages to gEchoLu were reported as another factor that prevented participants from engaging in online discussions. The fourth least liked function was unlocking new features; the main reason was that the participants saw no purpose of unlocking new features. For example, a participant responded that “I didn't care [about] unlocking features ... I feel they are unnecessary for my grade and what I had to do.” The monetary system was mentioned as the fifth least liked game element, because it cost virtual coins to give thumbs-ups to their classmates’ posts. On the contrary, participants suggested that they would prefer giving thumbs-ups to their classmates without any constraints.

Discussions

Overall, gEchoLu had some positive impact on student engagement. First, not only the survey results but also the increase in the number of discussion board posts corroborate such a positive impact. The increases in the numbers of system badges and "likes" for each discussion topic suggest that students became more active in using gEchoLu over time. However, it should be noted that although no statistical significance was found, the means of students' controlled motivation (4.21) was slightly higher than student autonomous motivation (4.14) suggesting that students may have been more concerned about extrinsic motivators such as the instructor's opinion toward them and their grades, rather than being intrinsically motivated to learn. This finding also reflected on the students' responses to the open-ended questions, which indicated that the badge system was the most welcomed game element because the badges were directly associated with students' online discussion grades. In addition, some of the game elements (e.g., virtual gifts) were not related to grades, therefore students considered them to have no value. In addition, student enjoyment for participating in online discussions was low, which can be explained by the responses from open-ended questions. Students reported that it was hard for them to obtain enough points from badges to achieve decent grades, and the worth of each badge was very low. Consequently, the frustration associated with gaining points from badges may have hindered students from enjoying the gamified online discussions. It is consistent with the self-determination theory that the learning tasks should be designed with optimal challenge (Schunk, 2001). Tasks that are too easy or too difficult may decrease students' sense of efficacy, thereby resulting in low enjoyment.

With regard to the influence of game elements on student engagement, the badges, the like feature, the progress bars, and the system of posting with avatars may have played positive

roles in promoting students' engagement in online discussions in Trial II. According to the results of the correlation analysis and the open-ended questions, it is interesting to note that the badge system played a double-edged sword role in promoting student engagement. On the one hand, the system badges were significantly correlated with the numbers of students' posts and the instructor badges were significantly correlated with students' autonomous motivation. This result is also supported by students' responses to the open-ended questions that the badges motivated them to participate more. Moreover, the positive correlation between the instructor badges earned and cognitive engagement suggests that the instructor badges were designed based on the quality of posts, and they encouraged students to expend cognitive effort to gain the instructor badges (Abramovich et al., 2013). On the other hand, the badge system was one of the least favorite game elements implemented in gEchoLu. The main reasons provided by students mainly focused on the worth of each badge and how it was too small, which frustrated them.

Moreover, the statistical analysis revealed that the like system was significantly correlated with number of student posts. The results of the open-ended questions suggested that the like system also had positive effects on student emotional engagement as they indicated that they felt support from peers when they received likes. Furthermore, progress bars may have positively affected students' cognitive engagement. Students indicated that the progress bars helped them to monitor their progress, and they proceeded in accordance with that progress. The definition of cognitive engagement includes self-regulation (Appleton et al., 2008) which is demonstrated in this study as students directed their actions based on the achievements displayed in progress bars. In addition, several students indicated that being able to post with avatars allowed students to feel free to post the messages that they otherwise would not. This implies that being able to post with avatars had some effects on students' behavioral engagement. If there

was no function of posting with avatars (i.e., posts using pseudonyms), the number of messages could be less.

Virtual gifts, unlocking new features, and the monetary system were listed as the least favorite game elements by students probably because the students saw no value for those game elements. These results suggest that the outcome of an engaging task should yield meaning to an individuals' goals (Martin, 2012), as does the outcome of the gamification approach (Domínguez et al., 2013; Nicholson, 2012).

Finally, regarding the overall user experience, students reported that technical issues impeded them from engaging in online discussions. Similarly, Domínguez and his colleagues' (2013) found that technical issues were the second most important cause of low participation in the gamified activities in their study. Many studies on online discussions have found that technical issues limit students' contributions in online discussions (e.g., Hummel et al., 2005; Murphy & Coleman, 2004). Another phenomenon observed in Trial II that was similar to a traditional online discussion tool is that students needed a period of time to learn how to use gEchoLu. As noted earlier, the number of likes students used in Discussion 2 increased dramatically compared to Discussion 1, and it later increased a smaller number in Discussion 3. This drastic increase may be due to fact that the students needed time to become familiar with gEchoLu, and once they learned how to use it, the activity level increased a considerable amount. This is similar to the finding in Thomas' (2002a) study where students needed time during initial discussions to familiarize themselves with the discussion tools.

General Discussions and Implications

This study reported two trials of applying the gamification approach in the field of teaching and learning. The overarching goal was to investigate the effect of a gamified online

discussion tool, gEchoLu, on student engagement. The first trial was conducted with graduate students and the main purpose was centered on the change in student engagement throughout the semester. The second trial took place with undergraduate students and the goal was to investigate the effects of game elements implemented in revised gEchoLu on student engagement in online discussions.

Overall, gEchoLu had positive effects on student engagement in both trials. Student engagement remained moderate to high, and it increased throughout the discussions in Trial I. Compared to the previous studies conducted in traditional discussion boards which reported that student engagement decreasing overtime, the increase found in Trial I suggests that the gamification approach can have potential in promoting student engagement in online discussions (Xie et al., 2006, 2011). However, study findings also suggest that student autonomy needs special attention when the gamification approach is applied. For example, the major reason that the badges were rated as the least liked game element in Trial II may be because students needed to work too hard to earn badges, thus to gain desirable grades. Individuals are more likely to hold aversive attitudes toward "mandatory fun" (Mollick & Rothbard, 2013). Providing a certain amount of autonomy when implementing the gamification approach in teaching and learning is necessary. For example, instead of requiring students to earn badges to gain credits, rewarding students with bonus points when they earn badges may decrease the frustration level.

Moreover, students reported that the worth of each badge was too small and it was frustrating to have to collect too many points for a good grade. When a task difficulty is beyond an individual's capability, anxiety may emerge (Abuhamdeh & Csikszentmihalyi, 2012), which can impede student engagement (Sarason & Sarason, 1990). When challenges were set too high,

the gamification approach had already lost its fun. Thus, instructors need to monitor and adjust the value of badges around students' needs to balance the challenge level.

In addition, the results of the trials showed that every game element of gamification should be meaningful to students so that they will use these elements. In the second trial, the virtual gifts designed to promote social interactions was barely used by students, because they did not see the value of sending virtual gifts as Cole, Bergin, and Whittaker's (2008) findings suggested. People tend to engage in the tasks directly related to their goals (Wigfield & Eccles, 2000). When goals of online discussions are not related to students' learning goals, socialization can also be relevant to students' goals, which helps to build close rapport (Dennen, 2005). Establishment of close rapport can increase interactions among students (Thompson & Savenye, 2007). Providing an explanatory rationale can help students establish the value of the activity (Belland, Kim, & Hannafin, 2013), like sending virtual gifts to peers and increasing interactions among students. For example, instructors can encourage students to use the virtual gifts system by explaining to students the importance of acknowledging each other's work. Healthy and active interactions among students can benefit student learning.

Gamification is still in its infancy in teaching and learning (Caponetto et al., 2014; Dicheva et al., 2015); students may have very limited knowledge about what gamification is and how it works. This study found that after students became familiar with the gamification system, gEchoLu, their engagement with the system increased dramatically. Therefore, an explanation of the gamified learning systems is necessary. Gray (2004) concluded in her study of a traditional online discussion system that it was important for students to receive technology orientation before the actual online discussions take place. An orientation session to familiarize students with the gamification approach seems more critical in a gamified online discussion than a

traditional one. Moreover, building a gamified learning environment does not necessarily mean that students will be automatically motivated and engaged in learning activities. The assumption "if we built it, they will come" has been observed wrongly in e-learning contexts (Zemsky & Massy, 2004). An effective online discussion consists of two inseparable and essential components: design and facilitation (Rovai, 2007). By ignoring either, it is less likely the online discussions will be engaging. In order to maximize the effects of the gamification approach on student engagement, during online discussions instructors should keep facilitating students' use of the gamification approach.

Limitations and Future Research

There are several limitations of the current study. Both trials were conducted with a small number of participants, which may have impacted the power of the statistical analyses. Moreover, no control group in both trials decreases the strength of the arguments about the effectiveness of gEchoLu on student engagement. Therefore, future studies should be conducted with a larger sample size, and a control group should be included to test the effectiveness of gEchoLu in a more solid way. The reliability of the behavioral engagement scale was low in both trials. The possible reasons might be the low number of observations and the number of items in the scale. In addition, the behavioral engagement scale was originally developed for in class activities, thus the scale may not be suitable for the context of the current study. It is necessary to find other indicators for measuring student engagement in online discussions. Furthermore, a critical indicator of learning in online discussions— "lurking" behaviors, which are defined as non-posting behaviors, such as observation (Dennen, 2008)—should be examined. Since gEchoLu is still in development, data on "lurking" behaviors could not be obtained in the trials. However, these types of behaviors should be investigated in future studies. Another limitation of

the current study concerns the measurement of student cognitive engagement. Both trials only used a student self-reported survey to investigate cognitive engagement; however, the content of students' discussion entries could be used for investigating student cognitive engagement (Zhu, 1996). Thus, in future research, content analysis techniques should be also used to better understand the influence of gEchoLu on students' cognitive engagement. Last, only open-ended questions were used in both trials to investigate students' experiences with gEchoLu and their opinions of the game elements. The longest response to the open-ended questions in the trials was 55 words; therefore, open-ended questions may not be able to capture a detailed picture of students' experiences. Hence, other qualitative methods, such as interviews, need to be conducted in future studies to obtain in-depth information about students' experiences with gEchoLu.

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CHAPTER 4

AN EXPLORATORY STUDY OF STUDENT ENGAGEMENT IN GAMIFIED ONLINE DISCUSSIONS[3]

[3] Ding, L., & Orey, M. To be submitted to *Instructional Science*.

Abstract

This is an exploratory study that examines the influence of the gamification approach on student engagement in online discussions. A gamified online discussion tool, gEchoLu, was implemented in an undergraduate level online course, which held 17 online discussions. The data was collected through individual interviews with 12 students and the teaching assistant as well as a self-reported survey. The results revealed that the gamification approach positively affected student engagement. Additionally, factors such as technical issues, classmates' behaviors that either promoted or impeded students from engaging in the gamified online discussions were identified. The interview with the teaching assistant further revealed the influence of the gamification approach on student engagement from a teacher's perspective, and the obstacles that he encountered in the gamified online discussions. Lessons learned are also shared in detail.

Keywords: Gamification; Student engagement; Online discussions; Interviews

Introduction

Online discussions have been widely used in face-to-face, blended, and mostly distance classes (Gao, Zhang, & Franklin, 2013; Hew, Cheung, & Ng, 2010). Among its numerous benefits, an online discussion assists in building a learning community (Yang, Yeh, & Wong, 2010), facilitates knowledge sharing (Zhu, 1996), and encourages high-level thinking (Aderson, Reder, & Simon, 1996; Yang, Newby, & Bill, 2005). However, to actualize these benefits in practice, students' active participation and their deep levels of engagement (e.g., negotiating meaning, synthesizing, or applying new knowledge) are necessary (Gunawardena, Lowe, & Anderson, 1997). However, the literature often notes surface level engagement in discussions due to students' lack of interest and motivation (Gunawardena et al., 1997; Hara, Bonk, & Angeli, 2000; Hew et al., 2010; Xie, Debacker, & Ferguson, 2006), which largely minimizes the benefits of online discussions for students learning. The current study aims to use the *gamification* approach to address low engagement in online discussions. Gamification refers to the incorporation of game elements into a non-game activity in order to make the activity motivating and engaging (Deterding, Dixon, Khaled, & Nacke, 2011; Zichermann & Cunningham, 2011). The potential benefit of the gamification approach on teaching and learning has long been proposed, however, only a few empirical studies have examined this approach in teaching and learning (Dicheva, Dichev, Agre, & Angelova, 2015). Specific research on using the gamification approach in online discussions is especially sparse.

Given the problem context and the gap in the literature, this study attempts to promote student engagement in online discussions using a gamified online discussion tool called *gEchoLu*. In particular, this study reports the findings of an empirical study that tested the effects

of gEchoLu on students' engagement in online discussions in an upper-level undergraduate online course, this study addresses the followıng research questions:

1. How does gEchoLu influence student engagement in online discussions?
2. What are the factors that encourage or discourage students to participate in the gamified online discussions?
3. What is the instructor's experience with the gamified online discussions?

College Student Engagement in Online Discussions

Although they share many pedagogical commonalities, online courses are distinct from traditional face-to-face lectures in some aspects. For example, online courses are dependent on digital technologies. Therefore, in online courses, face-to-face in-class discussions are replaced with online discussions in digital forums. A meaningful online discussion experience involves a wide variety of cognitive and social activities. Guzdial and Turns (2000) notes that an effective discussion should be sustained over a certain period of time and should stimulate many interactions among students. However, when an asynchronous medium (i.e., computers) is used, students' interactions with peers and instructors experience a substantial change (Dixson, 2010; Puzziferro, 2008; Swan, 2001). Lacking opportunities of face-to-face interactions with peers and omnipresent of instructors, students may easily tend to disengage in online discussions.

Student engagement is one of the primary components of effective online learning (Dixson, 2010). It is positively related to students' academic performance (Carini, Kuh, & Klein, 2006). There is no unified definition of student engagement, rather it is a multi-faceted construct which usually encompasses several subsets; each of which has its own indicators. The three-component model often consists of behavioral, emotional, and cognitive engagement (Fredricks, Blumenfeld, & Paris, 2004).

Behavioral engagement is related to student participation, such as time spent on learning activities (Jimerson, Campos, & Greif, 2003). As for behavioral engagement in online discussions, number of student posts (Xing & Goggins, 2015), number of times students log on to the discussions (Dennen, 2008), and duration that students spend on composing and reading discussions can be considered as indicators of behavioral engagement in online discussions. *Emotional engagement* draws on the idea of students' affective reactions to learning and learning environments (Fredricks et al., 2004). Students' reactions to instructors and classmates in the forms of showing appreciations, for example, can be considered as an indicator of student emotional engagement in online discussions. Moreover, emotional engagement also comprises indicators such as student interest and enjoyment toward different discussion topics. *Cognitive engagement*, according to Fredricks and his colleagues (2004), refers to students' psychological and cognitive involvement in learning activities. The psychological component encompasses student willingness to expend extra effort on learning, and it is understood as students' motivation to learn (Lester, 2013). The cognitive component stresses "being strategic in thinking and learning" (Lester, 2013, p. 3). For instance, students' use of reasoning, critiquing, analyzing in reading and composing discussion posts can be considered some examples of cognitive component.

Gamification in Teaching and Learning

Gamification has been proposed over past several years as a potential approach that can motivate and engage students in learning (e.g., Kapp, 2012; Lee & Hammer, 2011; Simões, Redondo, & Vilas, 2013). However, empirical studies examining gamification in promoting student learning are sparse. The majority of the existing research reported that the gamification approach can have positive influence on student learning, such as encouraging participation

(Barata, Gama, Jorge, & Goncalves, 2013), promoting a sense of autonomy in learning (Kopcha, Ding, Neumann, & Choi, 2016), quantity of assignments (Denny, 2013), bolstering interests in learning (Barata, Gama, Jorge, & Goncalves, 2013; Leong & Luo, 2011). However, although a few, negative results have also been reported. For example, Hanus and Fox (2015) found that in an experimental study, students in the gamified group showed less motivation, satisfaction, and empowerment than those in the non-gamified group. The main reason might be due to the sensitivity of the gamification approach to small changes in the implementation (O'Donovan, Gain, & Marais, 2013). Therefore, it is necessary for a detailed and thorough design section when reporting the results of the gamification approach. Should studies be lacking in sufficient description of the design of the gamification, then it is less likely that others can make a fair judgement on the effectiveness of the approach.

Instructors play a crucial role in students' learning procedures (Koschmann, Kelson, Feltovich, & Barrows, 1996a, 1996b; Oshima & Oshima, 2001) and this role might involve further responsibilities when a gamification approach is adopted. However, only a few studies investigated the gamification approach from instructors'/teachers' perspective. Iosup and Epema (2014) noted that implementing the gamification approach effectively requires extra workload from instructors. O'Donovan and his colleagues' (2013) work has also emphasized the fact that gamification approach requires a considerable time investment. In order to implement a gamification approach aligned with the instructional objects determined by the instructor, instructors may need to play an active role in the design process. Then, when the gamified learning activity is taking place, they need to put additional effort to ensure that the gamification will work as planned (e.g., introducing the approach, facilitating the execution, concluding the final awards). Moreover, because the gamification approach always involves a computer

management system, most of the time instructors/teachers need to provide students technical support (Dicheva et al., 2015).

Almost a quarter of the empirical research studying gamification approaches in teaching and learning did not provide valid evaluation of its impact (1 out 7 of the studies were not properly evaluated) (Dicheva et al., 2015). Most of the studies were quantitative, and the majority of them only provide descriptive statistics (Hamari, Koivisto, & Sarsa, 2014). Descriptive statistics are valuable (Fraenkel, Wallen, & Hyun, 2012); however, they alone are inadequate when generalizing the findings beyond the study group (Best & Kahn, 2006). A reliable and well planned design and evaluation is necessary when an innovative and complex instructional approach such as gamification is tested.

Design of gEchoLu

gEchoLu is a gamified online discussion tool and besides basic discussion board features such as posting and commenting it contains unique features guided by gamification including : badges, experience points (XPs), leaderboards, progress bar, reactions and awards, which were implemented to address students' needs for clear goals and guidelines, autonomy support, respectively (Shroff, Vogel, & Coombes, 2008; Xie & Ke, 2011), sense of competence (Shroff et al., 2008; Xie, Durrington, & Yen, 2011), and social interactions (Cheung, Hew, & Ng, 2008; Xie & Ke, 2011). It also has an email-based notification system to notify students when they have any achievements (e.g., earning a badge) or interactions from peers and instructors (e.g., someone replies to their comment, or gives a like to their comment).

Badges and Progress Bars to Provide Clear Goals and Guidelines

It is well documented that an effective online discussion is usually clearly goal-directed and guided (Dennen, 2005; Ng, Cheung, & Hew, 2009). Badges and progress bars were added to

provide clear goals and guidelines to students in online discussions. Badges are the basic units of the gamification system implemented in gEchoLu, and several other features (e.g., awards) are built upon the badge system. Two main categories of badges exist in gEchoLu: system (automatic) badges and instructor (manual) badges. System badges are pre-programmed and are automatically assigned to students when certain conditions are met. For example, a “noticeable” badge would be assigned automatically when students received at least 3 replies. Thus, system badges are assigned automatically based on the quantity of student activities. On the other hand, instructor badges are the badges that are designed and later assigned by the instructor considering the quality of discussion posts instead of the quantity.

For the current course, 12 instructor badges were created focusing on different aspects of students’ posts. “Devil's Advocate” badges, for instance, require students to propose challenging ideas for their peers to consider. Each badge is displayed in gEchoLu along with the detailed description of the criteria to earn the badge, which is expected to guide students in composing their posts and provide them a goal to work toward. Appendix D provides the list of the badges that were created for the current study. Another game feature aiming at providing students with clear goals is the progress bar. Figure 4.1 is a screenshot of a progress bar used in the current study. The progress bar displays students’ current scores (i.e., XPs), the average score of the class, and presents the previous and past awards with their scores needed to earn them. With the help of the progress bar, students can monitor their own progresses while comparing with class average and they can also plan their work toward earning next awards.

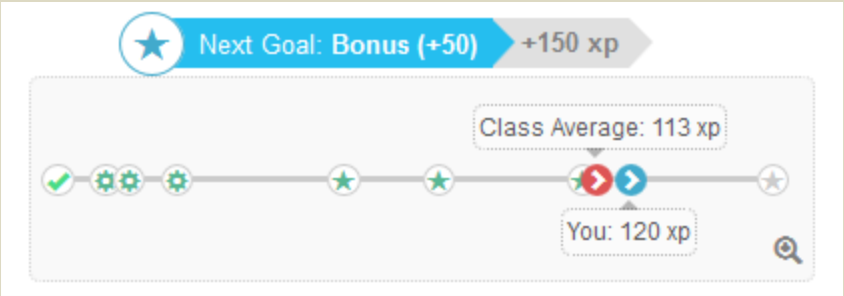

Figure 4.1. A screen shot of progress bars

Xps and Awards to Provide Autonomy Support

Autonomy is a sense of having control of one's own actions (Ryan & Deci, 2000, 2002). and it is closely related to student participations in online discussions such as information sharing behaviors (Xie & Ke, 2011) since it promotes the intrinsic motivation to engage in online discussions (Shroff et al., 2008). In order to provide students with a certain level of autonomy support, gEchoLu proposes the awards that can be configured by the instructor to support autonomy of students in the discussions. To earn an award, students need to collect enough XPs through earning instructor and system badges (each of which comes with a different XP value). For the current course, four awards were designed, two of which allowed students to opt out from two online discussions that they think they are not interesting, and the other two allowed them to earn a small amount of bonus points.

Badges, Reactions, and Leaderboards to Provide a Sense of Competence

Perceived competence defined as an individual's belief of his/her capability of performing an activity well (Ryan & Deci, 2000) plays an imperative role in students' engagement in online discussions such as posting behavior (Shroff et al., 2008) and in their attitude toward the course (Xie et al., 2011). In gEchoLu, badges can be assigned automatically or manually as a type of optimal feedback to students, acknowledging their high cognitive efforts in their posts. Optimal feedback from others supports students in developing a sense of

competence (Ryan & Deci, 2000). The reaction feature in gEchoLu allows students to send a quick optimal feedback to peers when they like their posts. There were seven reactions created in gEchoLu for the current study represented by seven emojis: happy, thank you, wow, cool idea, great question, thumbs-up, and brilliant input. Therefore, gEchoLu also provides means for providing immediate optimal feedback to peers. Figure 4.2 shows a post that received several reactions from peers.

Figure 4.2. A screenshot of a post with reactions

Recognition of individuals' contributions to a community can promote their competence (Harter, 1978). In many games, a leaderboard is implemented to promote the recognition of the top players' achievements and contributions by other players (Bunchball, 2010). In this regard, in gEchoLu, there is a leaderboard section that lists students based on their achievements. However, the ranking characteristic of leaderboard, which emphasizes competition among players, may have a negative influence on learning, such as impeding interpersonal support among students (Bryant, 1977) and decreasing self-efficacy of students (Chan & Lam, 2008). To minimize the competitive nature, the leaderboard implemented in gEchoLu only displays the top five students' achievements excluding those with lower performances.

Reactions to Provide Opportunities of Social Interactions

A close rapport is positively related to students' willingness to participate in online discussions (Thompson & Savenye, 2007). Encouraging more social interactions helps in establishing rapport. In gEchoLu, the reaction feature is implemented to allow students to

acknowledge peers' help or appreciate peers' high quality posts by sending a simple reaction. For example, students can indicate a comment as useful by clicking the "Thumbs Up" button in gEchoLu. With the reaction feature, we expect more social interactions to occur during the discussions. Appendix E listed all reactions that created for this study.

Method

Research Design

An exploratory mixed methods design was used in the current study, in which this design prioritizes qualitative methods. Mixed methods design allows researchers to take advantages of both quantitative and qualitative methods, thereby providing a more comprehensive and valid understanding of a phenomenon (Johnson & Christensen, 2014). The predominance of qualitative over quantitative methods lies on the exploratory nature of most research questions (Onwuegbuzie & Leech, 2006). In the current study, the quantitative portion includes data from self-reported questionnaires and students' logs from gEchoLu database. The quantitative data aimed to illustrate the changes in student engagement in online discussions throughout the semester. The qualitative portion focuses on the data regarding the interviews with the participants, and aimed to triangulate as well as compliment the quantitative data. Triangulation refers to the use of different methods to measure the same phenomenon, and seek convergence and corroboration between the methods (Greene, 2007). The purpose of complementarity in a mixed methods study is to use different methods that explore different aspects of the same phenomenon and seek more comprehensive understandings (Greene, 2007). The qualitative data was used to validate the results of the quantitative methods, and also investigate a deeper understanding of why and how gamification approach influences student engagement. The

interview conducted with the instructor of the course helped to provide a more complete insight into the gamification intervention.

Moreover, in order to further examine the influence of gEchoLu, students were divided into three groups (high achiever, medium achiever, and low achiever) in accordance with their gamification achievements (XPs). Descriptive statistics, herein, helped to describe the differences of student engagement among the groups. Interviews were then used to explain why there was a difference among the groups.

Participants and Context

Fourteen students (9 females and 5 males) and one instructor were recruited from an upper-level undergraduate course about technology in the workplace at a large public university in the southeastern United States. Participants were selected using a convenience sampling strategy. Convenience sampling is a technique that allows researchers to recruit participants without excessive difficulty (Creswell, 2008). Of the 14 participants, 13 were Caucasian and one was African American. All of the participants were seniors with various majors (e.g., communication studies, history, computer science, accounting).

Procedure

The course was a two-month summer course, and was offered in an asynchronous online format. The main purpose of the course was to train each student to develop a design mind, and the final delivery was a mobile app design that could demonstrate that they had mastered the design skills that they had learned. The majority of interactions among students took place in gEchoLu. 22 discussion walls were created: five walls for journal feedback, seven walls for reading discussions, five walls for presenting and discussing desk crits, three walls for sharing and discussing the tools that students plan to design, one wall for sharing the final project (i.e., a

mobile application), and one wall for seeking general help. Journal feedback allowed for the tracking of evolving students' projects ideas; reading discussions allowed students to share their reflections on the readings with peers; desk crits were the places that they can share videos about their apps and discuss them with a partner; tool reports were designed for the students to share what tools that they could use for designing apps; final report was a wall that allow students to share and advertise their final apps; students can post their general questions and receive answers from the instructors or peers from help wall. In general, each week students needed to post at least twice to gEchoLu and provided at least one feedback to their assigned partners.

A student engagement questionnaire was administered at the beginning, middle, and end of the semester. Meanwhile, all of the participants' logs (e.g., number of entries, times of logons) was stored in the gEchoLu's online database. Interviews were conducted with participants after all online discussion activities were completed.

Data Collection

Students' number of entries, frequency of logins was exported from the gEchoLu database, and used as indicators of student behavioral engagement. Moreover, the amount of time that the students spent on online discussions per week as another behavioral engagement indicator was reported by students in the questionnaire. Emotional engagement was measured by two subscales: students' enjoyment and perceived relatedness. Seven items measuring student enjoyment and eight items measuring relatedness among students in online discussions were adapted from the Intrinsic Motivation Inventory (IMI; Ryan, 1982); each of which was rated from 1 (not at all true) to 7 (very true). Nine items adapted from Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991) were used to measure students' cognitive engagement. Students' achievements (e.g., XPs, number of badges, number of reactions sent)

were exported from the gEchoLu database. Moreover, students were asked to report the frequency that they checked leaderboard and progress bar every week in the final questionnaire. Knowledge of gamification was rated twice at the beginning and the end of the semester by students (1= lowest, 5 = highest).

Semi-structured interviews (face-to-face or over phone depending on the participants' preference and availability) were conducted with 12 students upon the completion of the discussion activities at the end of the semester, each of which lasted from 15 to 30 minutes. The teaching assistant who was in charge of assigning badges and grading students' assignments was also interviewed face-to-face after all the grading had been finished. The interview lasted more than half an hour.

Data Analysis

Data analyses for addressing each research question of this study are discussed below. Table 4.1 demonstrates the alignment of research questions, data source, and data analysis approaches of this study.

Questionnaires and students' logs. IBM SPSS Statistics 22 was used to perform the quantitative data analyses. Descriptive statistics are used in a study to describe and interpret what the data is (Best & Kahn, 2006; Johnson & Christensen, 2014); it is especially concerned with conditions or relationships and the development of trends (Best & Kahn, 2006). Descriptive statistics were used to describe the change in students' behavioral, emotional, and cognitive engagement throughout the semester. In addition, descriptive statistics were also used to present students' involvement in the gamified activities, such as numbers of badges earned, number of reactions sent, frequencies of checking the leaderboard and the progress bar.

Line graphs were used to illustrate student emotional and cognitive engagement change over time. The line graph displays data as a series of data points, and the data points are connected by lines (Johnson & Christensen, 2014). It is usually used to show trends of a data set over time (Best & Kahn, 2006; Johnson & Christensen, 2014).

Interviews. The interviews were transcribed verbatim and coded using MAXQDA 12. The analysis of interviews followed the procedures of open coding, axial coding, and selective coding (Strauss & Corbin, 1998). Open coding is a procedure in which the similar concepts or patterns emerging from the data are identified and labeled (i.e., coded) (Strauss & Corbin, 1998). In the current study, the open coding was performed first to identify the themes regarding the effects of the game elements of gEchoLu on student engagement, as well as the factors that impeded from or promoted students engaging in the gamified approach. Open coding was also applied to teaching assistant's interview to identify the barriers and supporters when implementing the gamification approach in online discussions from an instructor's perspective. Axial coding is the process of relating and combining codes into broader categories (Strauss & Corbin, 1998). In other words, the coded labels in the open coding procedure are constantly compared to each other and interconnected into broader categories. Last, selecting coding is the process of further integrating categories and refining the theory (Strauss & Corbin, 1998). Then, in the selecting coding procedure, the categories were brought together to capture and describe the (positive or negative) influence of the game elements on student engagement in online discussions, factors encouraged and discouraged students to/from engaging in the gamified approach, and instructor's perceptions of the gamified approach.

During the open coding process, two researchers coded the same data set independently and then came together to discuss the discrepancies. Agreement was made on the initial coding

sets, and categories were decided and created by the two researchers together. Based on the initial code set, the two researchers revised their own codes again. Meanwhile, new codes were generated by each researcher. After both researchers refined their codes, another meeting was conducted which allowed the two researchers to discuss their analysis on each participant until 100% agreement was reached.

Table 4.1

Alignment of Research Questions, Data Source, and Analysis

Research Questions	Construct	Analysis
How does gEchoLu influence student engagement in online discussions?	• Questionnaires • Interviews	• Descriptive Statistics • Theme Generation
What are the factors that encourage or discourage students to engage in the gamified online discussions?	• Interviews	• Theme Generation
What is the instructor's experience with the gamified online discussions?	• Interviews	• Theme Generation

Results

A total 240 badges were assigned to the students during the whole semester, and the average badges earned by each student was about 17 (M = 17.14, SD = 2.54). On average, 120.71 XPs were earned (Minimum = 85, Maximum = 165) and 16 reactions were sent to peers (Minimum = 0, Maximum = 42) per person. Students reported in the survey that on average they check the progress bar (M = 2.89, SD = 3.19) and the leaderboard (M = 2.96, SD = 3.16) 3 times a week respectively. Students' knowledge of gamification approach increased from fairly low (M = 1.57, SD = .94) at the beginning of the semester to high (M = 4.43, SD = .94). The results are organized below by the research questions.

RQ 1: Student engagement in the gamified online discussions

The Influence on Behavioral Engagement

According to descriptive statistics (see Table 4.2), the three indices of behavioral engagement (number of posts, number of logins, and time spent on the discussions) indicated a fairly high level of engagement. Students were required to post 40 to 42 entries to gEchoLu in total throughout the semester. However, according to the results, students went beyond the minimum requirement and on average they posted around 45 entries (M = 44.64, SD = 5.1). Moreover, the average number of logins (M = 58.21, SD = 16.23) was much higher than the total number of entries per student, suggesting that students visited gEchoLu not only when they post their entries but also for other reasons. Moreover, students spent about 2 hours (SD = 1.03) on the online discussions each week. Therefore, according to the logs of gEchoLu, students appeared to exhibit fairly high behavioral engagement.

Table 4.2
Overview of Student Engagement

	n	Begin		Middle		End	
		M	SD	*M*	SD	*M*	SD
Entries	14	-	-	-	-	44.64	5.1
Logins	14	-	-	-	-	58.21	16.23
Duration (hours)	14	-	-	-	-	2.01	1.03
Emotional engagement: Enjoyment	14	4.51	.94	4.32	1.07	4.64	1.24
Emotional engagement: Relatedness	14	4.26	1.05	4.22	.98	4.90	.96
Cognitive engagement	14	6.29	.57	5.97	.68	6.23	.68

Note. Possible range of scores: 1 – 7

The results of the interview analysis provided further evidences suggesting positive effects of gEchoLu on students' behavioral engagement. Based on the interview data, there were several ways that the gamification features of gEchoLu promoted students' behavioral engagement. The main reason that encouraged students to visit gEchoLu more often was to check the updates, such as what were the badges that they received, where they were ranking in

the leaderboard, what reactions that they received from peers (n = 5). For example, as one student noted:

> *I've gotten a habit of when I get a notification of somebody has reacted to my posts, I make sure to go look at the posts and then see what I said and hopefully seeing and trying to analyze where they're reacting to.*

Another effect of the game features on students' behavioral engagement was the contributions in terms of posting more entries (n = 7). For instance, the desire of staying in the leaderboard encouraged students to post more. One student indicated that "*[the leaderboards] helped my participation, just to make sure I'm doing everything in time, and responding to enough discussion posts*." The badges were another factor that encouraged students to post more often as one student reported. Similarly, receiving reactions from peers also encouraged students to post more often in online discussions, as one student noted:

> *It [the reaction system] definitely inspires me, it definitely motivates me to post a little bit more, and kind of doing a simple "like" to a post and response. I think you feel like, I mean I definitely feel more inclining to post a couple of more times, then I would interact more.*

In addition to the frequency of logins and number of entries, the gamification approach also had effect on students' behavioral changes: encouraging students to pay more attention to the posts (n = 2), the leaderboard motivated students to submit posts before deadlines (n = 2), badges and awards prolonged students' time spent on the discussions (n = 1).

However, the email notification feature of gEchoLu might have limited students' direct visits and consequence activities in gEchoLu since some students did not prefer to visit the site after they were informed in the email about the activities. For example, one student noted that

when receiving email about the gamification achievements, he/she did not need to visit the actual site (gEchoLu).

The Influence on Emotional Engagement

Quantitative data (see Table 4.2) revealed that overall students maintained medium to high emotional engagement throughout the semester, in which both enjoyment and relatedness showed a downward-pointing triangle (see Figure 4.3). That is, both enjoyment and relatedness decreased from the beginning to the middle of the semester, and then increased toward the end. More importantly, both enjoyment and relatedness at the end ($M_{\text{Enjoyment}} = 4.64$, $SD_{\text{Enjoyment}} = 1.24$; $M_{\text{Relatedness}} = 4.90$, $SD_{\text{Relatedness}} = .96$) were higher than what students reported at the beginning ($M_{\text{Enjoyment}} = 4.51$, $SD_{\text{Enjoyment}} = .94$; $M_{\text{Relatedness}} = 4.26$, $SD_{\text{Relatedness}} = 1.05$) of the semester.

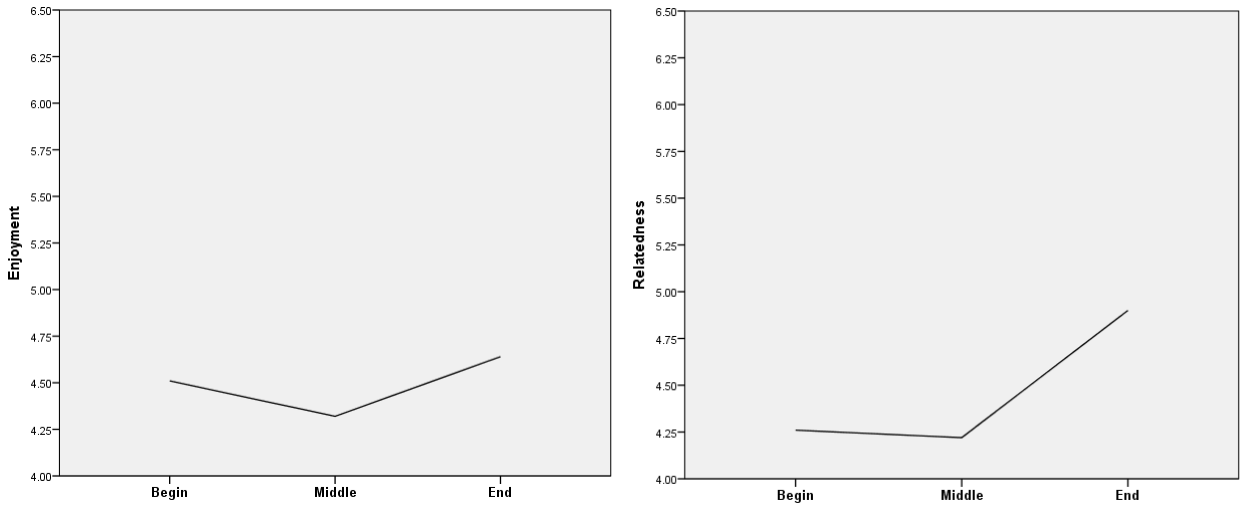

Figure 4.3. Changes in enjoyment, relatedness

The analysis of the interviews helped to reveal how gEchoLu influenced students' emotional engagement. Many students compared gEchoLu to regular threaded discussion boards that they have used in other courses and they stated that gEchoLu was more interesting and that having discussions in gEchoLu was more enjoyable and engaging (n = 6). The reasons were that

gEchoLu provided more activities to be involved in (i.e., gamification-related features), that its interface was user-friendly and easy to navigate, and that the gamification approach implemented in gEchoLu added a motivational layer to it. A comment from one student is illustrative:

> *I like it better, this one is more attractive, the gamification makes it way more interesting, it's very necessary, because the just regular elc discussion interface is really boring and old. Just kind of people writing paragraphs, and post over there and leave it and forget about it. But this one, you can have some other ingredients, you can have some sort of motivation.*

Moreover, the interview data showed that gEchoLu had some influence on students' social interactions and relatedness. Many students (n = 7) indicated that the game features promoted the social presence of peers as well as the instructor. In particular, badges and reactions were helpful for students to acknowledge that other members in the online discussions were reading their posts and caring about their opinions. The following excerpts are the examples from the interviews.

> *But seeing thumbs up and other thing such as "thank you" buttons, you know the emojis, it was just really nice to know that somebody just react to your entry and it was also a great way to get badges, it was nice to know that multiple people were reading and listening what you had to say.*
>
> *The badges made us to know that people [instructor] are actually reading our responses, and not just giving credits for we completing our assignment.*

Similarly, gEchoLu also seemed to promote the interactions among students (n=5). More specifically, earning more points, receiving or giving reactions from/to peers, and gaining more badges were mentioned by students as the main features that increased interactions. For example,

a student stated in the interview that "*I think gamified is a lot better, you have more interaction with your classmates, with your professors, and you wouldn't just post on the discussion.*" In addition, one student told the interviewer that because it was very easy to post and reply in gEchoLu, she/he intended to interact more often with peers than expected.

The Influence on Cognitive Engagement

According to the descriptive statistics (see Table 4.2), students had a quite high level cognitive engagement over time with a downward-pointing triangle pattern (see Figure 4.4). However, unlike emotional engagement, students showed slightly less cognitive engagement at the end (M = 6.29, SD = .57) of the semester than at the beginning (M = 6.23, SD = .68).

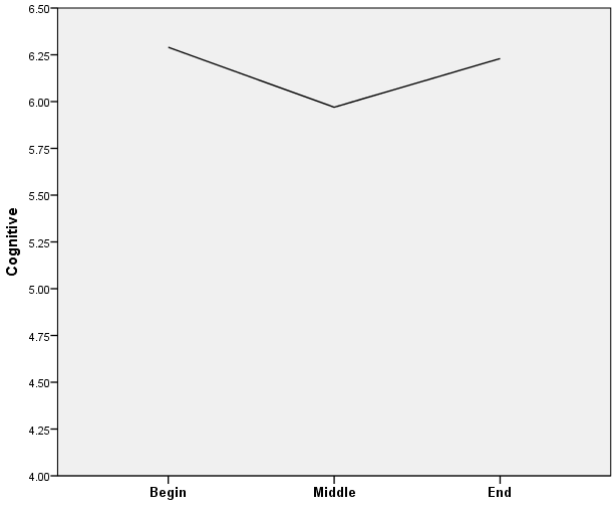

Figure 4.4. Changes in cognitive engagement

The results of the interview analysis revealed that the influences of the gamification approach on cognitive engagement fell into three categories: motivation to work hard, guiding learning, and self-regulation. The majority of the students (n = 10) believed that the gamification approach motivated them to invest extra effort in online discussions. Particularly, the leaderboard, progress bar, badges and reactions were the four game elements that contributed to the students' investment of extra effort. For example, when some students realized that the class

average came close to where they stand, they would put some additional cognitive effort to the discussions such as providing more detailed content or spending more time on writing the posts to stay above the class average. For example,

> *I would also like the progress bars that tell your scores and class average, I would always want to stay above class average. So, if I see the class average come close to where I am, I would always do some extra effort to get a little above it, the class average.*

The leaderboard was also influential on cognitive engagement. Students indicated that being recognized as the top contributors in the leaderboards was motivational and it encouraged them to work harder to stay in the leaderboard. Similarly, the badges helped students to set their goals to work toward, which led to higher cognitive engagement in writing posts, and in turn resulted in high quality of posts. More specifically, students (n=10) spent more effort in writing high quality of posts that could meet the criteria of the instructor badge that they wanted to earn. Instructor badges were designed based on the quality of the discussion content, and each badge was displayed in gEchoLu with its own definition and requirements. By checking the badges' requirements, students were able to composite their posts in accordance with the requirements of earning the badges. Relevant excerpts from the interviews are provided as follows:

> *The gamification part of it where I'm trying to get a badge in my replies. So maybe I get extra mile, which I did. I was trying to get "over the top" badge.*
>
> *In the back of your mind knowing that you have the leaderboard and badges and different points and reward. It's kind of motivate you to write more quality content and posts for discussions or for people feedback.*
>
> *...different badges and stuff, I'm like "OK, what can I say" to make sure that I'm getting the professionalism [badge], or hoping to get professionalism [badge], that kind of thing,*

all of the different badges are kind like on the back of my mind and making sure that I can put as much details in my responses as possible.

Reactions, which were designed to promote social interactions among students were mentioned as helpful in terms of promoting cognitive engagement as well. Some students re-analyzed the content of their posts that received the reaction to understand why their post received the positive reactions from peers and what they should do in their future posts to receive further reactions.

All students reported that the progress bar and the leaderboard were helpful in self-regulating their learning. The progress bars, especially the average 'live' class score on it, was helpful for students to monitor their own progresses, and it was assisting them to adjust their participation. An interesting finding from the interview data was how students used the leaderboards in gEchoLu for different purposes. The original purpose of leaderboards was to introduce a *healthy* competition among students. However, according to the interview data, students treated the leaderboards as a self-regulation tool. They used the leaderboards to gauge their progress and adjust their participation in accordance. As one student indicated in the interview:

I really like the leaderboard. So you kind of see how you measure up against the rest of the class, which is super helpful, especially for an online class, cause you don't get to see everyone. It's just kind of hard to understand what's going on and keep you updated. So, the leaderboard and the progress bar that was super helpful. Just to measure up and to see where I stand compare to everyone else in the class.

The Influence on Different Groups

Students who enrolled in the interviews were divided into three groups (four students per group) based on their XPs: high achievers, medium achievers, and low achievers. A clear distinction of student engagement in the online discussions emerged among the groups as showed in the Table 4.3.

Table 4.3

Differences Among Three Achievement Groups

	High Achievers	Medium Achievers	Low Achievers
XPs	146.3	125	102.5
Badges earned	20	17.8	14.8
Reactions sent	16	26	6
Leaderboard	3 times/week	4.5 times/week	2.1 times/week
Progress bar	3 times/week	4.5 times/week	2.1 times/week
Frequencies of logins	58	74.3	47.8
Posts	44	49	44
Time Spent	110 mins/topic	135 mins/topic	116.3 mins/topic
Changes in Enjoyment	-.18	.57	.07
Changes in Relatedness	.38	.88	.44
Changes in Cognitive	-.11	.08	-.11

In general, the descriptive statistics showed that gEchoLu had the most positive influence on medium achievers. In comparison to other groups, students in the medium group were more active in engaging in the gamification activities: checking the leaderboard and the progress bar more frequently and sending more reactions to peers than the other two groups. Medium achievers also demonstrated higher behavioral engagement than their counterparts. Moreover, the changes in the indicators of emotional and cognitive engagement suggested that the medium achievers' engagement in the online discussions increased over time. However, the students in the other two groups either showed less increase in those indicators or decreased overtime.

The fact that high achievers were interested in the course content rather than the gamification approach may explain why gEchoLu had less influence on their engagement,

however better performance than the medium group. For example, two students in the high achievement group noted in the interviews:

> *I kind of just like to discuss, I make sure it [my post] was relevant to the content, but I felt like the content itself dictated what I was writing about rather than the badge was.*
>
> *Badges definitely influence my participation, but I think just having interest in the course and all the elements as a whole.*

In comparison, medium achievers may be less motivated at the beginning than those high achievers, however, the gamification approach had higher positive influence on them while the course was moving forward. Therefore, they showed higher engagement level than their counterparts.

Low achievers were less engaged in the online discussions may due to the fact that they were as interested in the course as the high achievers, and they did not care about the gamification approach. As one student in the low achievement group said:

> *I honestly didn't care that much about what the badges are, or how that works. But as long as I, you know I just do what I suppose to do.*

Another possible explanation for why the low achievers showed less engagement than medium achievers was that the badges and the awards were too hard for them to gain. For example, a low achiever noted:

> *I'm trying to get a badge in my replies. So maybe I get extra mile, which I did. I was trying to get over the top badge. I didn't get that, I should get that. I'm mad about that.*

RQ 2: Influential factors in student engagement in the gamified discussions

The obstacles experienced in participating in the gamified online discussions were associated with gEchoLu, the gamification design, and the course. The majority of the students

(n = 11) indicated that they have encountered technical issues of gEchoLu during the online discussions, and that to a certain extent these problems influenced their engagement, particularly their emotional engagement. For example, one participant noted:

> *I really need to refresh it a lot of time, because it's times out really quickly. And a lot of times, I'm like typed my whole response, and I would click on submit, and it would already have timed me out and wouldn't let me know, and all of my work would have been gone. What I have to do is to go back and redo everything, and um, that's really frustrating.*

Moreover, some students (n = 4) reported that the design of the badges in gEchoLu influenced their cognitive engagement. More specifically, students would prefer longer description of each badge, therefore they could better tailor their posts to cater the requirements of earning the badges and collected more points. Moreover, the fact that the reaction-related system badges were too hard to gain was critiqued by participants as an obstacle. Another student reported that all the instructor badges in gEchoLu value the same XPs, which meant there was no meaning to spend extra effort to earn a relatively harder badge. This is very unlike full-fledged games, in which players always use strategies to take advantages of the rule system to win the games (McGonigal, 2011). As the student noted:

> *[In order to play a game] you need to do something a little bit complicated or do something you wouldn't normally do in order to beat the game. … [For example] If you can make "the devil's advocate" badge more, it would encourage people to go out their way to, not to say disagree, but look at the other side of coins. I did that for a while, because nobody was doing that, I felt like I was the only people that got the devil's advocate badge.*

Course related obstacles include low peer involvement (n = 2), high workload (n = 1), and fairness of badge assignment policy (n = 1). Students reported that classmates' gamification behaviors impacted their engagement in using the game features. For example, a student noted that they ceased to use reactions because they believed that the other students in the course did not use the reaction feature. Another student believed that the workload of this course was very high, and the high workload directly impeded them from using the game features. In addition, when some students did not gain the badge that they believed otherwise, they started to feel "*mad about that*."

There were also some factors that positively influenced student engagement in gEchoLu. The user-friendly interface of gEchoLu and the facilitation of the gamification approach were the two factors noted by the students that promoted their engagement in the gamification discussions. Nine students reported that gEchoLu was very easy to use, and compared to the threaded discussion board it was better organized. Because it was easy to see peers' posts and provide feedback, students indicated that they were more engaged in discussing in gEchoLu.

> *I think because it was so easy to use, kind of encouraged me to interact more, and encouraged me to post more.*
>
> *It's easy to navigate, especially easy to post and that kind of comment tree. So you could post it on a comment. … I think it definitely contributed to how I did, how I felt about the online discussions.*

Being informed that there would be a gamification approach in online discussions from the very beginning of the course was helpful for participants to get involved in the approach (n = 5). In the introduction video in week 1 module, the instructor informed the students that the online discussion activity was gamified, and the instructor briefly introduced the concept of

gamification. In the following weeks, the instructor, the TA, and the researcher kept instilling the idea of the gamification approach, and explaining the badges and their goals to students. This could quicken the process of familiarizing students with the gamification approach, and thus promoting their engagement in the gamified activities from the start. As one student indicated:

> *He [the instructor] is done a good job of incorporating that [the gamification approach] into our lesson plan, and make sure something that we're doing are consistently, and doing it often. So I felt like, I've got some pretty good use and knowledge of it.*

RQ 3: TA's perception toward the gamification approach

The TA observed an increasing trend in the quality of the students' posts. The TA further explained that when students started to notice the badges in gEchoLu, and students had options to earn awards that gave them the option to skip some assignments, that was when "*it [gEchoLu] started to really seemed to affect the engagement and quality of those discussion posts.*" Moreover, according to the TA, the badges did not only provide the students with a sense of competence, but allowed the other students to acknowledge what a good response was as well. Thus, the badges also provided a guidance to students in writing high quality posts, supporting the results of the interview analysis. As he indicated:

> *Those people got reinforced to when they got the right thing, and then when others saw what the right thing was, that did help them learn what a good response is. It helped shed a light on quality work, so it's another way of telling them this is what we expect for high quality work, but it's a fun way of doing it.*

Although the TA believed that the gamification had positively affected the quality of students' posts, he further indicated the obstacles that he encountered when assigning badges. First was the specificity of the badges. There were more than ten instructor badges, each of

which had its own requirement. The original purpose of designing a variety of badges with detailed descriptions was to guide students in writing their discussion posts. In this way, the badges could be also used as rubrics by the instructor. Acknowledging and appreciating the differentiation, however, due to the specificity of each badge, sometimes it was hard for the TA to find an appropriate badge for a certain post or to fairly assign the badges to students' posts.

> *When I wanted to assign a creativity, and the language in the badge seemed to couldn't necessarily apply it. I wanted a creative badge or badges like that can go on anything whether it was a response to reading or desk crit, or anything.*

Moreover, since some badges were designed specifically for some discussion topics, the generic badges were assigned more frequently than the other badges. For example, the "Top Dawg" badge was designed to reward students when they effectively applied readings to their projects, and this badge could not be assigned to the posts for readings. As the TA noted:

> *I just found myself naturally gravitating towards that on helper badge and Dr. Who, because the helper badge was generic and simple, and that could just cover a lot.*

An obstacle associated with the specificity of badges was that assigning badges accurately was very time-consuming. Because each badge had its own detailed criteria description, it was not easy for the TA to remember all badges with their all criteria when reading the discussion entries of students. Trying to recall each badge, or finding an appropriate badge for a certain post, thus, led to a very slow and tiring grading process. He told the interviewer:

> *As I read any given posts, I would have a hard time thinking at the end of it that which badge to assign. It slowed me down a little bit, and it was a little bit confusing to me as an instructor knowing which badge might be appropriate to assign.*

Third, the TA pointed out that when assigning badges, he was concerned about low achievers. That is, the high achievers were more likely to gain more badges, and they have established high standard that other students may not be able to reach. The fact that the high achievers were always the ones who received the badge may demotivate the other students who relatively earned few badges. Therefore, in order to appreciate the efforts that the other students put in their posts, the TA sometimes assigned a generic badge to everyone. As he noted:

> *I don't want anybody to be left out, they can't do it. I would just, my first response to that just gave everybody a helper badge. Just for making the effort.*

Discussion

General Discussion

This study explored the effects of gamification on students' engagement through students' use of a gamified online discussion tool (i.e., gEchoLu) for their discussion activity in an online course. Multiple sources of data were triangulated to identify the effects of the gamification approach on student engagement in the discussions. Behavioral engagement was identified through the discussion logs (via the online database of gEchoLu) whereas the emotional and cognitive engagement were measured through a questionnaire. The descriptive statistics indicated high levels of student engagement in terms of cognitive, behavioral and emotional engagement (although there was a slight decrease in the middle of the semester regarding students' cognitive and emotional engagement). The interviews with students and the instructor also suggested a positive effect of gamification on student engagement and provided a better understanding of the specific effects of game-related features of gEchoLu. The badges (and awards), the leaderboard, the progress bar, and the reactions appeared to have many direct and indirect effects on students' behavioral, cognitive, and emotional engagement.

Regarding the behavioral engagement, students visited the gEchoLu site more often to keep track of their achievements (e.g., earning badges or awards) and to view the reactions they received and they tended to post more often to enter or to maintain their position in the leaderboard. This finding is aligned with the conclusion of Barata and his colleagues' study (2013) that leaderboards can increase students' participation rates in learning. Goehle (2013) studied the effect of the implementation of the gamification approach in an online homework platform and found that students felt more fun with the gamified platform. In agreement with Goehle, students reported in the current study that gEchoLu was more interesting and enjoying to use with the gamification features implemented compared to a traditional online discussion forum. Moreover, in consistent with previous study (Kopcha et al., 2016), the badges and the reactions used in the current study were found to be helpful in promoting social interactions among students. Regarding the cognitive engagement, students seemed to spend more time and put additional effort in writing their posts thanks to the motivation of earning valuable badges, staying on top of the class average (based on the progress bar), maintain their ranking in the leaderboard, and receiving positive reactions from peers. Similar findings were reported by several previous studies (Barata, Gama, Jorge, & Goncalves, 2013; Denny, 2013; Leong & Luo, 2011). Additionally, this study also found that students showed self-regulated learning in online discussions thanks to the progress bar and the leaderboard. A self-regulated learner takes on the learning responsibility by monitoring his/her progress (Zimmerman & Kitsantas, 1996). In order to be self-monitored, a leaner will be able to set learning goals and plan ahead. The progress bar and the leaderboard in gEchoLu visualized learners' these needs.

It becomes apparent that the gamification approach is most effective in promoting students' engagement in online discussions who are less interested in the course content at the

beginning, but they also show a certain level of care to the gamification approach. Due to the infancy of the gamification approach, students may not be able to notice the value of it or even aware of it in the early stages. However, this value can be established by instructors at the beginning of the courses (Belland, Kim, & Hannafin, 2013). A possible strategy is to provide students with the rationale for the gamification approach and how it can be beneficial to their current and future life. For example, in the current study, the instructor or TA can explain to the students that they may have a chance to opt out from one or two online discussions that they are not interested in. This study also found that student engagement may be diminished by the virtue of badges are too hard to gain. This finding is congruent with self-determination theory, which argues that the task should be optimally challenging for enhancing individuals' motivation (Deci & Ryan, 2000). Therefore, when designing or assigning badges, attention needs to be paid to the challenge level.

Lessons Learned

Dilemma of awards. An important component of the gamification in gEchoLu that the students highlighted often is the awards. There were two types of awards: the first type of awards allows students to opt out from two discussions at most; another type of awards allows students to earn some bonus points added directly to their final course score. Although these two awards contributed a great deal to the motivation dimension of the gamification approach implemented in gEchoLu, they indeed provided options for students to avoid some work. That is, although the purpose of the gamification was to promote engagement in discussions, with the awards the students were given the autonomy to *legally* disengage. We have not observed any negative influences of these awards in the current study but positive influence on students' autonomy, which might be because of the fact that the workload of the course was relatively high. Being

able to opt out from the topics that students believed that may not be beneficial to their learning allowed them to focus more on the other important topics. Moreover, bonus points can relieve the students' anxiety level that caused by losing points from the assignments. More importantly, the buffer that the awards can provide is from students own hardworking, the extra effort that they have proved in their posts. However, still, caution should be warranted when using awards to provide students the options to opt out from some work.

Specific or generic. It becomes apparent that the TA and the students held opposite opinions toward the descriptions of badges in the current study. On the one hand, students would prefer longer descriptions for each badge, therefore the badges could better guide them to write their posts. On the other hand, too specific description of badges limited the performance of assigning badges (in terms of accuracy and speed), and thus creating a burden on the TA's grading process. Feedback without specific information about the substantive elements of student work is usually considered not helpful in learning, and it often leads to shallow learning (Shute, 2008). When a specific badge is assigned, the detailed description associates with the badge indirectly conveys the information regarding the quality of the posts in certain aspects. On the other hand, a generic badge does not carry such information, and therefore would provide limited feedback, minimizing its effect on student learning. However, it is also important to acknowledge the degree to which assigning badges can be overwhelming since the TA needs to memorize various specific badges, and accurately assign them to the posts in a certain time period. One manual solution for this issue could be to increase the number of instructors or teaching assistants who can help with assigning badges. If the number of students are very high in a course (e.g., 500) where online discussions are conducted via gEchoLu, it might be even impossible to assign badges to thousands of student posts. For such cases, machine learning can

be used to automatically assign badges to student posts. For this to happen, instructors may need to perform an initial assignment of badges to students, which can be used as the training data for the machine learning algorithm to predict future badge assignments automatically considering the content of the entries. Also, for such crowded courses, assuming that there might be more interactions with high number of students, more system badges might be preferred over the instructor badges.

Students' familiarization for gamification and instructor facilitation. Instructors play an imperative role in facilitating successful distance learning (Garrison, Anderson, & Archer, 2001). Gamification is relatively a new term in teaching and learning. Therefore, many students are probably not familiar with gamification and very highly likely none of them experienced a gamified online discussion activity. Hence, facilitation in gamified online discussions is even more vital than that in regular discussions. For example, in the current study, most students had no prior knowledge about gamification at the beginning of the semester (whereas, as expected, most of students indicated medium to high level knowledge about gamification at the end of the course). The introduction of the concept of gamification at the beginning of the semester through a video prepared by the instructor substantially helped the students to overcome any early resistance to this new discussion approach. Later, the instructor, the TA, and the researchers kept investing a great deal of effort in explaining the badges, promoting the leaderboards, and congratulating on the gamification achievements students obtained, which helped students to get involved in the gamified activities and thus engaging in the discussions. The results of this study suggest that the gamification approach has potential in engaging students in online discussions, however, considering students' low or lack of knowledge about this approach, educators and

researchers need to pay more attention to the facilitation of the gamified discussions to realize its actual potential.

Limitations and Future Directions

The biggest limitation of this study is the sample size. Only fourteen students were enrolled in the current study, which limits the generalizability of it. Although the current study provids descriptive statistics to demonstrate students' overall engagement increased throughout the semester, no inferential analysis can be carried out to test if there is a significant change. In the future, a larger sample size should be used to test the impact of the gamification approach. Moreover, lack of a control group in the current study lessens the credibility of the conclusion. If a control group can be included in the future research, and to test if the treatment group is going to perform better academically or show higher engagement level. The conclusion of the study would be more convincing. Last, the current study does not take into account students' control and autonomous motivation. Common critiques of the gamification approach are from the statement of the extrinsic motivation can harm students' intrinsic motivation (Deci, Koestner, & Ryan, 2001). In the future research, students' controlled and autonomous motivation needs to be measured to test if the gamification approach is harmful for their intrinsic motivation.

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CHAPTER 5

STUDENT ENGAGEMENT IN ONLINE DISCUSSION THROUGH A GAMIFIED ENVIRONMENT[3]

[3] Ding, L., & Orey, M. To be submitted to *Computers and Education.*

Abstract

Engaging students in online discussions is challenging. This paper presents a quasi-experimental study using a gamification approach to promote student engagement in online discussions. A total 70 students were enrolled in this study from an asynchronous online undergraduate level political science course. The study findings suggested that the gamification approach had positive effects on some students' performance in online discussions. However, it appears that the gamification approach failed in promoting student emotional, behavioral, and cognitive engagement. Additionally, interviews were conducted with the students to explore what game elements function to enhance student engagement and what factors encourage or discourage students engaging in the gamification approach. Number of discussion topics, user-interface, and technical issues were found as general factors that influence student engagement in both gamified and non-gamified online discussions. Students' awareness of the gamification approach and the challenge level of the gamification approach were found impacting student engagement in the gamified group.

Keywords: Gamification; Engagement; Online discussions; Mixed Methods; MANOVA

Introduction

Online learning has gained popularity in higher education to deliver a high-quality education to a larger number of students at the same cost (e.g., Allen & Seaman, 2010). Consequently, online discussions have gained further importance as an essential component of online learning. Online discussions allow interaction among students, and between students and instructors through reflecting on the course content and previous postings, and sharing ideas (Lee, Kim, & Hackney, 2011; Macknight, 2000). They serve as a supplementary strategy for the content delivery and also solidify the communication and the connection among students (Blignaut & Trollip, 2003). However, low student engagement in online discussions appears to be a constant challenge to educators (e.g., Cheung & Hew, 2005; Hara, Bonk, & Angeli, 2000; Hew, Cheung, & Ng, 2010; Hewitt, 2005). Compared to face-to-face discussions, online discussions require students to be more motivated and engaged in participation so that the expected level of discourse can occur (Blumenfeld, Kempler, & Krajcik, 2006). Gamification, defined as a process of using game elements in non-gaming context to motivate and engage users (Deterding, Dixon, Khaled, & Nacke, 2011), has recently gained popularity in education (Kapp, 2012), and this approach could be effective in addressing low student engagement in online discussions.

However, there exists limited empirical knowledge regarding the influence of gamification on teaching and learning (De-Marcos, Domínguez, Saenz-de-Navarrete, & Pagés, 2014). Experimental studies are scarce, and within those, findings are mixed (Caponetto, Earp, & Ott, 2014; Dicheva, Dichev, Agre, & Angelova, 2015). For example, an experimental study conducted among 200 students used a gamified online learning system, in which levels, experience points (XPs), badges, and leaderboards were incorporated (Domínguez et al., 2013).

The results of the study showed that the gamified group performed better on assignments and overall scores but performed poorly on written assignments and their participation rates were low compared to their counterparts. In another study, De-Marcos, et al (2014) found that the students who used a gamified learning system performed not as good as those who used a social networking system. Similarly, Hanus and Fox (2015) found that students in the gamified course indicated lower motivation, satisfaction, and empowerment compared to the non-gamified group. These conflicting results indicate that further experimental studies are needed to obtain data that could depict the impact of the gamification approach.

The current study aimed to examine the effects of a gamified online discussion tool, called gEchoLu, in promoting student engagement in online discussions in an online course. gEchoLu is a gamified version of EchoLu (Erkan, Kopcha, Orey, & Dustman, 2015) that is similar to Facebook wall for online discussions. The current study aimed to contribute to the existing knowledge of using gamification in teaching and learning through a quasi experimental study to investigate its effects and the whys. Rigorous design and implementation phases are antecedent to the successful execution of gamification in a learning setting (O'Donovan, Gain, & Marais, 2013). It becomes important to practitioners and researchers to plan well and enact gamified learning activities, as well as to explore the reasons of why the implemented approach yields a success or failure.

Effective Online Discussions

Learning is an active process in which individuals construct knowledge through interacting with the learning contexts including other learners (Duffy & Cunningham, 1996). An effective online discussion experience involves a wide variety of emotional and cognitive activities (Guzdial & Turns, 2000). High quality online discussion may not occur without well-

structured activities and a supportive facilitator (Cheung, Hew, & Ng, 2008). Online discussions should not only involve exploring questions and presenting evidence to support the answers, but should also involve returning to reflect on the questions. Participants should engage in online discussions to comprehend, critique, construct, and share knowledge to yield a productive online experience (Gao, Wang, & Sun, 2009). Clear guidance and expectations from instructors and activity designs become crucial in enabling an effective online discussion to take place (Ng, Cheung, & Hew, 2009). When students willingly participate in a learning activity, meaningful learning are more likely to occur occur. In order to achieve a high quality online discussion, students need to be self-regulated so that they invest considerable mental effort in interacting with their peers (Bromme, Hesse, & Spada, 2005). Lacking an omnipresent instructor could make self-regulation more critical in an online course. Thus, instructors should emphasize the importance of self-regulated learning to students when facilitating online discussions. Enabling social spaces that allow students to socialize with each other can also be critical to the success of online discussions (King, 1998).

What Is Student Engagement

Student engagement is closely related to motivation (Appleton, Christenson, & Furlong, 2008; Reeve, 2012). As a student's motivation to learn increases, the student will likely engage in learning activities and learn (Beachboard, Beachboard, Li, & Adkison, 2011). Motivation answers the whys of one's behavior or actions, and engagement reflects one's active involvement in a task (Appleton et al., 2008). Skinner, Kindermann, Connell, and Wellborn (2009) defined engagement as an action that is "energized and directed by motivational processes" (p. 225), which emphasized the relationship between motivation and engagement.

According to the notion of viewing engagement within a motivation framework, engagement can change through the cyclical interactions with contextual variables such as instructional regulations (Furrer, Skinner, Marchand, & Kindermann, 2006). Studies on online discussions also demonstrated that highly motivated students show higher engagement in online discussions and more persistent in engagement compared to low-motivated students (Xie, Debacker, & Ferguson, 2006; Xie & Ke, 2011).

Student engagement is generally defined as students' behavioral involvement (behavioral engagement) and psychological investment (emotional engagement and cognitive engagement) in learning (Marks, 2000). Student engagement is critical in learning, and engaged students tend to have higher academic achievement (Carini, Kuh, & Klein, 2006; Finn & Zimmer, 2012; Martin, 2012). Researchers often espouse a three-component model of engagement that includes behavioral (e.g., time on tasks, participation), cognitive (e.g., self-regulation, metacognition), and emotional or affective engagement (e.g., belongingness, positive attitude about learning) (Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003). Some researchers have proposed an engagement taxonomy with four subtypes that usually bifurcate behavioral engagement into two components: academic engagement (e.g., time on task) and behavioral engagement (e.g., participation) (S. L Christenson et al., 2008). The three-component model has been widely accepted in engagement research and is also adapted in this study.

Research Questions

It was hypothesized that student engagement would be higher when gEchoLu was used than when the original, non-gamified EchoLu was used.

1. What is the effect of gEchoLu on student behavioral engagement in online discussions?

Hypothesis 1: Students who use gEchoLu would have a higher number of logins than students' who use EchoLu.

Hypothesis 2: Students who use gEchoLu would exhibit higher participation in terms of number of posts than students who use EchoLu.

Hypothesis 3: Students who use gEchoLu would spend more time in online discussions than students who use EchoLu.

2. What is the effect of gEchoLu on student emotional engagement in online discussions?

   Hypothesis 1: Students who use gEchoLu would demonstrate higher enjoyment than students who use EchoLu.

   Hypothesis 2: Students who use gEchoLu would demonstrate higher perceived belongingness than students who use EchoLu.

3. What is the effect of gEchoLu on student cognitive engagement in online discussions?

   Hypothesis 1: Students who use gEchoLu would use more self-regulated learning strategies to contribute to discussions than students who use EchoLu.

4. What is the effect of gEchoLu on students' performance in online discussions?

   Hypothesis 1: Students who use gEchoLu would have higher grades than those who use EchoLu.

5. What are the factors that encourage students to participate in or discourage them from engaging in the gamified online discussions?

   According to the previous gamification studies in education, students' attitudes toward gamification variously depending on the designs (Caponetto, Earp, & Ott, 2014). *Interviews and open-ended questions were used to explore the factors that impede or promote student engagement in gamified online discussion.*

Design of gEchoLu

The design for gamifying EchoLu was done using the framework of two motivational theories, self-determination theory (SDT; Ryan & Deci, 2000) and goal setting theory (Pintrich, 2000) for the purpose of addressing students' motivational needs and promoting student engagement in online discussions. SDT is a macro-theory that explains human motivation to perform a task or an activity as internally driven as opposed to externally driven (Deci & Ryan, 1985). SDT theory emphasizes that meaningful learning happens when individuals are intrinsically motivated to learn. Intrinsic motivation refers to one's inherent interest, enjoyment, or satisfaction in enacting a behavior (Ryan & Deci, 2000, 2002). Such behaviors are thus experienced for one's own personal sake. It would be natural for people to be engaged in activities in which they are interested. Hence, intrinsic motivation often results in a higher level of engagement and high-quality learning (Deci & Ryan, 2000). However, most school activities are not intrinsically motivated (Ryan & Deci, 2000). SDT postulates that intrinsic motivation can be internalized by external instrumentalities (Ryan & Deci, 2000). *Internalization* is an active, natural process in which individuals adopt social mores and requests as personally endorsed values and self-regulation (Ryan, Connell, & Deci, 1985). More specifically, SDT postulates that when students' basic psychological needs for relatedness, autonomy, and competence are met, external instrumentalities can be internalized to individuals' intrinsic motivation.

Goal setting theory explains individuals' motivation from the expectation perspective. It postulates that important relations exist between specific goals with a higher difficulty level and the level of task performance (Locke, 1996; Locke & Latham, 2002). Individuals are more highly motivated by clearly and challengingly set goals compared to vague goals without a challenge; therefore, goals that are both specific and set at a high level of difficulty may lead to a

higher level of task performance (Locke & Latham, 2006). Along these lines, badges, experience points (XPs), a progress bar, reactions, and awards were designed in gEchoLu to provide students with a certain sense of autonomy, relatedness, competence, and clear but challenging goals.

The basic unit of the gamification approach used in gEchoLu is the badge system. Badges can motivate users to complete a task by which they can earn the badge, and subsequently the experience points (Bunchball, 2010). In a learning context, badges can function as clear goals for students to achieve, and they can help students recognize their engagement when students complete the task to earn a badge. Therefore, badges can promote students' sense of competence (Dickey, 2005). gEchoLu included five instructor badges, and 13 automatic badges were created for the use in the current study. *Instructor badges* are designed based on the quality of students' posts and are assigned by the course instructor manually. For example, *Devil's Advocate* was a badge that should be awarded to students when their posts proposed challenging ideas for consideration. *Automatic badges*, on the other hand, are automatically assigned by gEchoLu, based on student's quantitative participation (e.g., receiving 5 likes). *Noticeable badges*, for instance, was an automatic badge assigned to students whose posts receive at least three reactions from peers. All badges are displayed on gEchoLu in association with the detailed description of how each badge could be obtained. In this way, when students wrote their posts, they could easily refer to the requirements for a certain badge. Figure 5.1 is a snapshot of how badges were displayed in gEchoLu.

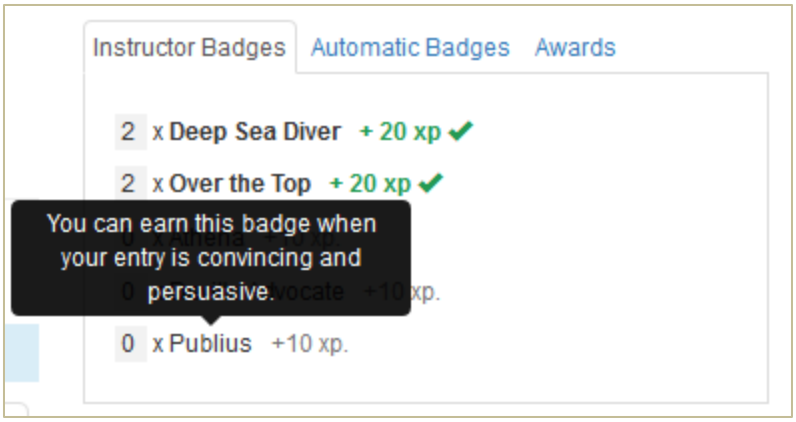

Figure 5.1. A snapshot of badges displayed in gEchoLu

In gEchoLu, each badge carries certain eXperience Points (XPs) value. When students earn a badge, the corresponding XPs are assigned to students. Those XPs are reflected in the progress bar to help students track their achievements and progress in terms of XPs earned. Each student has his/her own progress bar that displays the XPs that he/she has earned, so students can monitor their achievements when checking the progress bar. The immediate feedback on students' performance that the progress bar offers could promote students' sense of competence (Przybylski, Rigby, & Ryan, 2010). Additionally, as Figure 5.2 shows, the progress bar helps students set goals by showing their standing against the class average XPs and also by showing how close they are to achieve the next goal (e.g., earning a badge or an award).

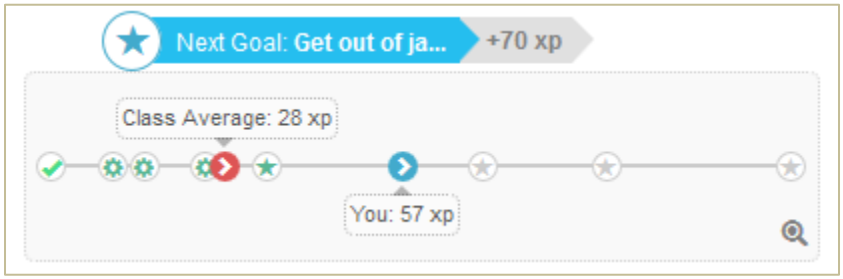

Figure 5.2. A snapshot of the progress bar in gEchoLu

Autonomy is related to personal agency and can be achieved by "providing flexibility in goals" and "opportunity for action" (Przybylski et al., 2010, p. 155). In order to provide students

with a certain amount of autonomy and a certain level of flexibility in online discussions, two types of awards were created in gEchoLu in collaboration with the instructor. More specifically, one award allowed students to submit assignments two days beyond the deadlines. The other award provided students with one to two bonus points for their course grades. Students had to collect enough XPs by gaining badges in order to be able to receive an award.

Relatedness is referred to as individuals' social connections (Ryan & Deci, 2000). In order to promote social connections among students in online discussions, gEchoLu introduces *reaction system.* The system was designed for students to provide a quick reaction to the posts that they like instead of providing extensive feedback. The reaction system was expected to stimulate more social interactions in the course. Seven reactions were displayed under each post to make them available for students' use for each post. To react a peer's post, students need edto click on a sutiable. Figure 5.3 shows a student post with several reactions received from peers.

Figure 5.3. A snapshot of a post with several reactions

Method

Design

This study was a convergent parallel mixed methods design (Creswell & Plano Clark, 2011), in which the quantitative portion used a quasi-experimental design (Johnson &

Christensen, 2014). Mixed methods research combines both qualitative and quantitative approaches to broaden and deepen the understanding and corroboration of a phenomenon that cannot be adequately understood by a mono-method (Greene, 2007; Johnson, Onwuegbuzie, & Turner, 2007). The convergent parallel design occurs when the quantitative and qualitative data are collected concurrently, and then the results of both are mixed during the interpretation phase to provide a more complete understanding of a phenomena (Creswell & Plano Clark, 2011). The purpose of using both quantitative and qualitative methods in this study was *complementarity* and *triangulation* (Greene, 2007) since the goal was to explore different aspects of the effects of gamification and seek a comprehensive understanding (Greene, 2007). In this study, quantitative data (e.g., questionnaire results) were used to identify *if* the gamification approach has any statistically significant effects on student engagement and learning. Quantitative results were then complemented by the interview data and open-ended questions with the purpose of further investigating the various factors that either impeded or promoted student engagement in the gamified online discussions. Triangulation refers to the use of different methods to measure the same phenomenon, and seek convergence and corroboration between two methods (Greene, 2007). Interview data and open-ended question responses were used to triangulate the Likert-scaled data collected from the survey.

The quasi-experimental design represents a situation in which researchers do not have full control of the potential confounding variables, and the experimental and control group are statistically compared to determine the effect of the treatment (Johnson & Christensen, 2014). The main disadvantage of quasi-experimental design, the absence of randomness, makes the results of quasi-experimental design less compelling (Shadish, Cook, & Campbell, 2002). The current study used a nonequivalent comparison-group quasi-experimental design, in which a pre-

test and a post-test were conducted on both groups (Johnson & Christensen, 2014). The two groups were the two intact sections of an undergraduate level online course. The purpose of the pre-test was to determine whether the two groups were comparable, and the post-test examined if the gamification approach had affected student engagement in online discussions.

Participants and Context

Seventy non-political science major students who enrolled in an introductory political science course at a large public university in the southeastern United States participated in the study. The course consisted of two sections taught by the same instructor. One section had 45 students, and the other section had 25 students. The treatment of gamified discussion was applied in the section with 45 students, and the other section was used as a control group. The course was a two-month summer course offered in an asynchronous online format. gEchoLu was used in the treatment group. The non-gamified version of the tool, EchoLu, which removed all the game elements was used in the control group.

At the end of the course, a total 53 participants completed the post-survey: 36 and 17 from the experimental and control groups respectively. Demographic information such as gender, ethnicity, and age was obtained in a survey at the end of the semester (see Appendix F). Of the 53 participants, 38 were female (71.7%). The majority of the participants (71.7%) were Caucasian (n = 38), followed by 13.2% Asian (n = 7), 11.3% African American (n = 6), and 3.8% Hispanic (n = 2). The mean age of participants was 20.6. About 31.8% (n = 17) had a previous experience in online discussions; however, the majority (n = 49, 93.2%) reported a medium to high level of technology skill.

Procedure

Treatment procedure. In total, 5 online discussion walls were created for the course: one *general questions wall*, one *voluntary discussion wall*, and three *mandatory discussion walls*. *General questions wall* was designed to allow students to ask questions about the materials or course-related questions. The topics of the other four walls were related to the readings of the course. One month prior to the discussions started, a meeting was scheduled with the course instructor to discuss the procedures and determine the badges, reactions, and awards that could be incorporated into the online discussions. During online discussions, the instructor assigned the manual badges to the students in accordance with their performance in the online discussions.

Data collection procedure. Figure 5.4 illustrates the data collection procedure for this study. IRB approval was obtained from the University of Georgia one month before the data collection. The same student engagement survey was administered at the beginning and at the end of the online discussions. The purpose of the pre-survey was to compare whether the participants in the two groups initially comparable in terms of engagement toward online discussions. The post-survey measured whether there was a difference between the two groups after the treatment. gEchoLu and EchoLu served as data collection tools that tracked the online logs regarding students' activities during each online discussion. Meanwhile, interviews were conducted with seven students who volunteered to participate. The interviews aimed to obtain the insights of how gEchoLu affected students' engagement in online discussions and identify the factors that either discouraged or promoted student engagement in the discussions.

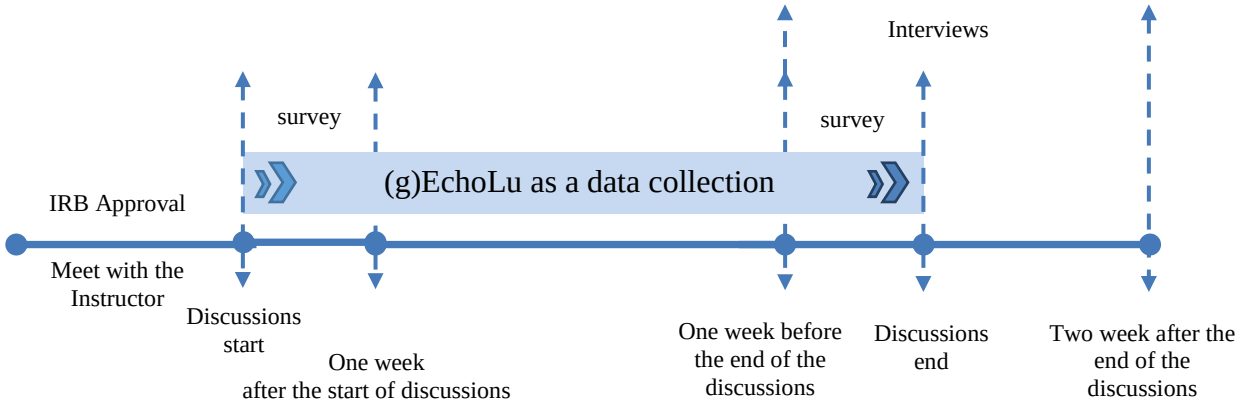

Figure 5.4. Data collection procedure

Data Source

gEchoLu and EchoLu, the student engagement survey, and the interviews were the data collection methods in the current study. The behavioral engagement data was collected directly from the database of gEchoLu and EchoLu and the survey; emotional engagement and cognitive engagement were measured by the student engagement survey. Interviews and open-ended questions were used to investigate students' experiences with using gEchoLu and EchoLu. The measurement methods are detailed below.

gEchoLu and EchoLu. The main purpose of using gEchoLu and EchoLu as data collection instruments was to track participants' behavioral engagement. The number of students' posts and replies, and the frequency of logins as indicators of student behavioral engagement were exported directly from the gEchoLu and EchoLu database. Also, gEchoLu and EchoLu also provided information about participants' gamification achievements, such as the number of earned badges.

Survey (see Appendix G). The survey consisted of three subscales. The emotional engagement subscales measured participants' enjoyment (seven items) and perceived relatedness

in online discussions (eight items). These two subscales were adapted from the Intrinsic Motivation Inventory (IMI; Ryan, 1982); each of which was rated from 1 (not at all true) to 7 (very true). The IMI had been modified and used in previous studies that investigated student engagement in online discussions (Ke & Xie, 2009; Xie, 2013; Xie, Durrington, & Yen, 2011). Previous research reported good reliability scores for enjoyment scale (Cronbach alpha = .94) and relatedness scale (Cronbach alpha = .86). Moreover, an adequate construct validity was reported by Tsigilis and Theodosiou (2003). The Cronbach's alphas of these two subscales in the current study were .93 and .87 for enjoyment and perceived relatedness respectively.

The third subscale that measured participants' cognitive engagement was adapted from Motivated Strategies for Learning Questionnaire (MSLQ). The subscale contains nine items, which mainly focus on participants' self-regulated learning strategy use. The original MSLQ was developed and used for college students (Pintrich, Smith, Garcia, & McKeachie, 1991). The MSLQ is a self-reported instrument; students rate themselves on a 7-point Likert scale, from 1 (*not at all true of me*) to 7 (*very true of me*). Developers reported in their study Cronbach's alphas of .63 to.88 for the self-regulated learning strategies scale (Pintrich & de Groot, 1990). Construct validity from correlational studies showing that self-efficacy, interest, and task value correlates positively with cognitive strategy use and self-regulation (Pintrich, 1999). In the current study, the Cronbach's alpha yielded a fairly high acceptance level: .89.

Additionally, in the post-survey participants were asked to report the amount of time they spent on each online discussion topic (another indicator of behavioral engagement). Moreover, two questions: participants' awareness of the gamification approach and the frequencies of checking the progress bar were included in the post-survey for treatment group. Students were required to rate on a 5-point scale ranging from 1 (not aware) to 5 (very aware) for the first

question. The second question asked students to rate from 1 (never) to 5 (very often) on their visits to the progress bar.

Interview and open-ended questions. Both interviews and open-ended questions served two purposes: (a) to triangulate the results of the post-survey, and (b) to solicit the reasons of why participants engaged or did not engage in the online discussions in this course. Seven interviews (four with the experimental group and three with the control group) were conducted to explore participants' experiences with using gEchoLu or EchoLu as an online discussions tool. The interview is a qualitative instrument that follows a set of questions to be asked of participants (Corbin & Strauss, 2015). The questions were designed to elicit detailed information about how gEchoLu and EchoLu influenced their engagement in online discussions. The participants in the experimental group were asked several more questions about their attitudes toward the gamification approach implemented in gEchoLu. The interview protocols for both groups are included in Appendix H and I. Four open-ended questions that focused on participants' overall experiences with online discussions were also included in the post-survey. Two sample questions are "How did you like or enjoy your online discussions in this course?" and "In what ways do you think EchoLu influenced your participation in the online discussions and why?"

Data Analyses

Table 5.1 presents the research questions, data sources, and data analyses for each research question in this study. The details of the data analyses are discussed in this section.

Table 5.1

Alignment of Research Questions with Data Source and Analysis Strategies

Research Questions	Data Source	Variables		Analysis Strategies
		Independent Variables	Dependent Variables	
What is the effect of	▪ gEchoLu and	▪ Group	▪ Students'	MANOVA

gEchoLu on student behavioral engagement in online discussions?	EchoLu ▪ Survey	(experimental group and control group)	posts ▪ Students' logs ▪ Average time spent	Inductive analysis
What is the effect of gEchoLu on student emotional engagement in online discussions?	▪ Survey	▪ Group (experimental group and control group)	▪ Enjoyment ▪ Perceived relatedness	MANOVA Inductive analysis
What is the effect of gEchoLu on student cognitive engagement in online discussions?	▪ Survey	▪ Group (experimental group and control group)	▪ Self-regulated skills	MANOVA Inductive analysis
What is the effect of gEchoLu on students' performance in online discussions?	▪ Online discussion grades	▪ Group (experimental group and control group)	▪ Grades	MANOVA
How gEchoLu influences student engagement in online discussions?	▪ Open-ended questions ▪ Student interviews			Inductive analysis

Quantitative data analysis. Multivariate analysis of variance (MANOVA) were performed with IBM SPSS Statistics 22. MANOVA is a statistical technique that can evaluate differences among means for several dependent variables (Tabachnick & Fidell, 2007). It is a widely used statistical analysis technique in educational research (Bray & Maxwell, 1985). Several advantages of using MANOVA were expected in this study. First, several dependent variables (DVs) are investigated. In this study the DVs were behavioral engagement, emotional engagement, and cognitive engagement. Unlike analysis of variance (ANOVA) for the situation in which there is only one DV, MANOVA evaluates the combination of several DVs (Bray & Maxwell, 1985; Field, 2009). In this regard, MANOVA can control the overall alpha level at a desired level, while performing several ANOVAs for several DVs cannot. Second, by including all DVs simultaneously, MANOVA takes into account the relationships among all DVs. Separate

ANOVAs for each DV, however, would not account for the relationships among the DVs. Moreover, MANOVA is preferred to ANOVA because MANOVA considers the effect of all DVs in combination. Thus, it can detect group differences which cannot be revealed by separate ANOVAs (Field, 2009; Tabachnick & Fidell, 2007). MANOVA was first performed on the pre-survey in order to test if the participants' initial emotional and cognitive engagement were equivalent. The results indicated that there was no significant difference between the two groups in terms of their initial emotional and cognitive engagement at $\alpha = .05$ level ($p = .56$). Then, MANOVA was carried out at the end of the semester to compare the means of two groups participants' behavioral engagement (i.e., posts and comments, time spent on each discussion, and logins), emotional engagement (i.e., enjoyment and perceived relatedness), and cognitive engagement (i.e., self-regulated strategy use).

Although MANOVA has many aforementioned advantages, Bray and Maxwell (1985) noted two disadvantages of this statistical method. First, because of the inclusion of several DVs in the analysis, sometimes the results of MANOVA could be more difficult to interpret in comparison to those from ANOVA. The second disadvantage is that it is unnecessary to use MANOVA when the DVs are not correlated. However, a series of bivariate correlations were performed to test the correlations among the subcomponents of student engagement from two pilot studies. The results of Pearson correlation indicated that the relationships among the DVs were low to moderately correlated (.183 to .499). In the current study, all DVs were correlated (.181 to .726); therefore, MANOVA was preferable to ANOVA in this study.

Assumptions. Before MANOVA was carried out, four assumptions were checked. Those four assumptions are independence, random sampling, multivariate normality, and homogeneity of covariance matrices (Bray & Maxwell, 1985; Field, 2009). In this study, convenience

sampling was used, which violated the random sampling assumption. In this regard, the results cannot be generalized; however, the results can still provide useful information for answering research questions (Creswell, 2008). The third assumption, multivariate normality was carried out on all dependent variables. The results indicated that except for enjoyment, perceived relatedness, and self-regulated learning strategies, this assumption was violated on all other variables. However, MANOVA is typically robust to multivariate non-normality (Huberty & Olejnik, 2006). Fourth, Box's M Test of homogeneity of covariance matrices showed that all DVs exhibit roughly equal levels of variances in each group at $\alpha = .05$ ($p = .407$).

Level of significance. The common level of significance used in teaching and learning research is 0.05, therefore the current study used 0.05 significance level for quantitative data analysis. The level of significance is the probability of Type I error, which refers to the rejection of a null hypothesis that is actually true (Johnson & Christensen, 2014).

Effect size. *P*-value alone is suggested to be inadequate for indicating the statistical significance of a treatment. *P*-value can help to determine if there is an effect of an intervention, but fails to reveal the size of the effect (Sullivan & Feinn, 2012). Effect size helps to quantify the magnitude of the difference resulting from the treatment (Field, 2009). Partial η_p^2, the most popular standardized effect size index for MANOVA was used to determine the effect size of the gamification approach in the current study. Its values of .01, .06, and .14 represent small, medium, and large effect sizes, respectively (Cohen, 1988). Nevertheless, there are no universal guidelines in interpreting effect sizes; it depends on the research field and the study type (Tabachnick & Fidell, 2007).

Qualitative Data Analysis

MAXQDA 12.3 was used to analyze the qualitative data. The analysis of open-ended questions and interviews followed a five-step inductive analysis procedure: 1) data preparation (i.e., data transcription and organization), 2) data familiarization (i.e., thoroughly reading the data), 3) data coding (i.e., labeling similar concepts, pattern, etc. appear in the data), 4) data reduction (i.e., reducing overlapped codes), and 5) continuing refinement of codes (Thomas, 2006). To establish the trustworthiness of the qualitative data analysis, two researchers were involved in the data analysis procedure. The two researchers first worked together on two sample interviews in order to reach a certain level agreement on the coding procedure. The two researchers then coded the rest of the data independently with the focus of looking for patterns of student engagement and the factors playing role in student engagement. During the data reduction procedure, the two researchers had two 2-hour meetings in which they could discuss the discrepancies of the initial codes. After a 100% agreement was reached, the two researchers constantly compared the codes to each other and interconnected them into broader categories.

Results

Quantitative Data Results

In the treatment group, 40 participants (88.89%) completed all three mandatory online discussions, four participants (8.89%) did not complete one discussion, and one participant (2.22%) completed only one discussion. Among those participants in the control group, 20 (86.96%) completed all three discussions; two of them (8.70%) completed two discussions; and one participant did not complete all three discussions (4.35%). Twenty-two participants (61.11%) in the treatment group reported a low level of gamification approach after the course, and 14 participants showed moderate to high level awareness. In regard to the gamification

achievements, the average XP was 30 (SD = 12.00) after all online discussions. On average, about five badges were assigned (or earned) (M = 4.82, SD = 1.39) and fewer than three reactions (M = 2.68, SD = 3.98) were sent by each participant. Thirty-six participants responded to the question about their frequencies of checking the progress bar. Seventeen participants indicated that they never or rarely checked the progress bar; only four participants checked it sometimes; and fifteen participants checked the progress bar often or very often.

Using Pillai's trace, no significant difference was found between the two groups, $V = .17$, $F(8, 44) = 1.31$, $p > .05$. Therefore, no follow-up tests were carried out. Table 5.2 summarizes the descriptive statistics of all engagement indicators. Although MANOVA yielded no statistically significant difference between the two groups, in regards to behavioral engagement, participants in the treatment group posted higher number of replies, spent more time on the discussions, and logged in to gEchoLu more often than the participants in the control group. Moreover, the mean of cognitive engagement indicator, self-regulated learning strategies use, revealed that participants in the treatment groups were more cognitively engaged in the discussions when compared to the participants in the control group. However, two indicators of emotional engagement suggested that participants in the treatment group were less emotionally engaged than their counterparts, although no significant difference was found. The means further suggested that the participants in the treatment group scored higher in online discussions than those in the control group.

Table 5.2

Mean of Pre-survey and Mean of Post-survey for Dependent Variables

Dependent variables	Group	*n*	Pre-survey				*n*	Post-survey			
			M	*SD*	*Skew*	*Kurt*		*M*	*SD*	*Skew*	*Kurt*
Behavioral: Original posts	Gamified	-	-	-	-	-	36	3.25	.81	.20	1.62
	Non-gamified	-	-	-	-	-	17	3.41	.80	.75	.32
Behavioral: Replies	Gamified	-	-	-	-	-	36	4.36	1.31	.32	1.60
	Non-gamified	-	-	-	-	-	17	3.53	.94	-.35	-.61

Behavioral: Time	Gamified	-	-	-	-	-	36	70.28	35.31	1.08	1.15
	Non-gamified	-	-	-	-	-	17	61.76	23.65	.98	.93
Behavioral: Logins	Gamified	-	-	-	-	-	36	20.06	8.25	.10	-1.23
	Non-gamified	-	-	-	-	-	17	18.41	8.87	1.47	2.50
Emotional: Enjoyment	Gamified	28	4.54	1.31	-.47	.49	36	4.22	1.19	.21	-.26
	Non-gamified	16	4.49	1.43	.54	-.66	17	4.37	1.61	-.64	-.29
Emotional: Relatedness	Gamified	28	4.34	.84	-.47	.89	36	4.15	1.01	-.20	.95
	Non-gamified	16	4.34	1.29	.07	.21	17	4.21	1.38	-.84	.45
Cognitive: Self-regulated strategies	Gamified	28	5.91	1.04	-1.45	1.19	36	5.57	.90	-.81	.46
	Non-gamified	16	6.29	.80	-.96	.01	17	5.44	.94	-.24	-.45
Online Discussion Performance	Gamified	-	-	-	-	-	36	94.63	2.38	-1.91	4.70
	Non-gamified	-	-	-	-	-	17	93.58	2.79	-1.65	3.63

Note. Emotional engagement and cognitive engagement scores can range from 1 to 7

In order to further determine the effect of the gamification approach, a secondary MANOVA was performed between the two groups, in which only the participants who indicated a moderate to high level awareness of the gamification approach were included in the treatment group. Because the low awareness participants in the experimental group did not really experience the treatment, we thought it would be useful to examine the individuals that actually experienced the gamification. Assumptions were tested before the MANOVA was carried out. Based on a series of Levene's *F* tests and Box's M Test ($p = .143 > .05$), the homogeneity of variance assumption and homogeneity of covariance assumption were satisfied. MANOVA revealed a significant difference between the two groups by Pillai's trace, $V = .55$, $F(8, 22) = 3.49$, $p = .010 < .05$, partial $\eta_p^2 = .559$.

Then, a series of one-way analysis of variance (ANOVA) on each of the eight dependent variables was conducted as follow-up tests to the MANOVA. According to the ANOVA results, the two groups were significantly different in number of comments, $F(1, 29) = 4.39$, $p = .045$ with partial $\eta_p^2 = .132$ and performance, $F(1, 29) = 9.04$, $p = .005$ with $\eta_p^2 = .238$. However, after Bonferroni adjustment was applied on α level ($.05/8 = 0.006$), only participants'

performance in online discussions was significant. Table 5.3 summarizes the descriptive statistics of the two groups.

Table 5.3

Mean of Post-survey for Dependent Variables in Secondary Analysis

	Gamified (medium to high awareness)				Non-gamified			
	M	*SD*	*Skew*	*Kurt*	*M*	*SD*	*Skew*	*Kurt*
Behavioral: Original posts	3.21	.20	1.25	2.88	3.41	.18	.75	.32
Behavioral: Replies	4.50	.34	.85	.65	3.53	.31	-.35	-.61
Behavioral: Time	83.57	8.46	1.17	1.38	61.77	7.68	.98	.93
Behavioral: Logins	21.21	2.28	.28	-1.66	18.41	2.07	1.47	2.50
Emotional: Enjoyment	4.36	.40	-.47	-.63	4.37	.37	-.64	-.29
Emotional: Relatedness	3.98	3.62	-.31	-.42	4.21	.33	-.84	-.45
Cognitive: Self-regulated	5.95	.20	-.25	.11	5.44	.19	-.24	-.45
Performance	95.93	.63	-.94	.16	93.37	.57	-1.98	4.64

Qualitative Data Results

In this section, we report the qualitative data to get an insight into the factors that played a role in participants' engagement. Open-ended questions and interviews both served the purpose of eliciting in-depth understanding of participants' engagement in the online discussions. Therefore, findings obtained from open-ended questions are reported in this section in conjunction with those obtained from interviews. The analysis includes 36 participants in the treatment group and 17 participants in the control group for the open-ended questions, and four and three participants from the treatment and the control groups respectively for interviews.

The influence on student engagement. Thirty participants in the treatment group (83.33%) and thirteen participants in the control group (76.47%) showed overall positive attitudes toward the online discussions. Participants in the treatment group commented that the gamification approach made the gEchoLu more "*incentive and involved*" compared to a traditional online discussion forum. As a participant noted, "*It [gEchoLu] allowed the class to*

have a very interactive platform to discuss thoughts and then comment further. It required me to be a bit more vulnerable and open, and that often does not happen in my other online class experiences."

Particularly, 23 participants (63.89%) in the treatment group, and 8 participants (47.06%) in the control group found that the online discussions were interesting and enjoyable. These participants reported that it was interesting to read peers' posts and to voice their own ideas. Nine participants (25%) in the treatment group and two participants (11.76%) in the control group noted that the online discussions helped them to build close rapport with peers. That is, the online discussion was a good format that allowed participants to interact with others and to learn peers' "*personality and beliefs*." In regard to the gamification approach, participants highlighted the usefulness of the reaction system by noting how handy it was to provide quick feedback to peers, which also helped them interact with peers more. One participant noted: "*I gave thumbs-ups to the students if something is good you know you wanna be positive in that sense if there is something that you can help them with*." With regard to the enjoyment, a participant commented that "*the badges were a fun addition to discussion*."

In addition to emotional engagement, 25 participants (69.44%) in the treatment group and 9 participants (52.94%) in the control group reported that the online discussions supported their understanding of the class materials, learning from peers, and thinking, as one participant in the gamified group commented, "*It was good to see what my peers thought about similar topics and whether they agreed or disagreed with each other. It also encouraged me to think beyond what I had read or heard.*" Similarly, a participant from the control group stated "*It allowed me to reflect on what I learned and present it in a unique way that was independent of the material*." In regard to the influence of the gamification approach, participants noted that the badges and the

awards were great incentives that encouraged them to write posts with more detail and motivated them to think beyond their original arguments. The following two excerpts illustrate how the badges and awards influenced participants' cognitive engagement in the gamified group.

> *It caused students to write in detail due to the fact that they earned badges through good discussion posts. It made myself really write a good discussion post instead of going through the motions.*
>
> *I think the badges make it a lot better. It motivates me personally, you know I wanna write a good discussion for the fact you can earn the badges and you can earn more points. It brings the best thought you are able to write, you [ever] write severely descriptive, a lot of descriptions, and get feedback from your classmates.*

The progress bar was another game feature that affected participants' cognitive engagement positively. These participants noted that they spent more cognitive efforts on online discussions. Staying above the class average, in particular, was the main motivator. For example,

> *With the progress bar, you know I see where I stand with XP points versus the class average. It makes you wanna be above the class average. So, it is something that I check to see if where I can gain some XP points to be beyond that [class average].*

Although the open-ended questions and the interviews focused on exploring participant emotional and cognitive engagement in online discussions, several participants mentioned the positive effects of (g)EchoLu on their behavioral engagement. In particular, seven participants (19.44%) from the gamified group indicated that gEchoLu was helpful in promoting their behavioral engagement (e.g., encouraging them to log on to check peers' posts more often and to post more often). As one participant commented "*the badges and awards give an incentive to respond and post more."* The reaction system was another feature that encouraged the

participants to log on to the site more often because they wanted to see what reactions they had received from others. Another reason that was relevant to the gamification approach was that participants logged on to the gEchoLu more often to check their gamification achievements. Some participants also noted that gEchoLu was a very user-friendly site, which promoted their participation in online discussions. In comparison to the gamified group, only one participant (5.88%) in the non-gamified group indicated that EchoLu had influence on his/her behavioral engagement, because the participant wanted to learn others' views on the topic.

The Factors that Influenced Student Engagement

The analysis of the open-ended questions and the interviews revealed some reasons why participants engaged or disengaged in the online discussions. First, participants ($n_{treatment} = 12$, $n_{control} = 4$) reported that they would prefer that more online discussions had been available. Although five online discussion walls were created for the course, only three of them were mandatory for participation. Participants from both groups noted that they did not feel immersed in the discussions enough, and they felt that the (g)EchoLu was superficially used. Hence, insufficient discourses or no in-depth conversations took place. For example,

> *There had not happened whole a lot of discussion. I feel like when I post something it is just kind of out, I do not know if people are reading or not.* [Gamified]
>
> *The only thing I do not like is that we are only using it [EchoLu] I think 4 or 5 times. I kinda like a discussion that, maybe use for every module we have. I know that it requires extra writing and extra work but I am taking an another online class that has a discussion each week.* [Non-gamified]

Two issues related to the design of (g)EchoLu that played a role in student engagement in online discussions. First, participants from both groups ($n_{treatment} = 4$, $n_{control} = 4$) indicated that

in comparison to a traditional online discussion forum, (g)EchoLu was more user-friendly; therefore, they would have preferred to post in (g)EchoLu than in a traditional discussion forum. As one participant noted in the control group, "*It [EchoLu] made it easy to comment and reply to people which helped make participation easier.*" Similarly, a participant from the treatment group said, *gEchoLu is very visually pleasing, it is very organized. It got a lot more going on the ELC discussion page which kinda makes it very confusing.*

Interestingly, although many participants liked the interface of the (g)EchoLu, there were several participants who were not satisfied with the layout of (g)EchoLu ($n_{control} = 2$). For example, a participant from the control group said, "*I do not like how the EchoLu discussion is set up. I found it to be a lot more aggravating and less user friendly than the discussion forum that eLC [the traditional online discussion forum] already has set up.*"

Second, (g)EchoLu, being a standalone website that has advantages and disadvantages. The university has an e-learning commons (eLC), which has its own online discussion tool. All the course related materials were uploaded to the eLC, and the separation of the online discussions from the other course materials was inconvenient for some participants ($n_{treatment} = 1$, $n_{control} = 1$). For example, as a participant noted.

> *Embedding it in eLC page, you don't have to go a different website, I think that would make people read a lot more and participate a lot more.* [Gamified]

On the opposite, being separated from eLC was deemed as beneficial by another participant, because "*the eLC discussion page kind of looks like any other page in eLC, which is very confusing when posting.*"

Technical issues (e.g., crashes, copy and paste function did not work properly) emerged throughout the discussions, was another inevitable reason influencing engagement as noted by participants from both groups ($n_{treatment} = 5$, $n_{control} = 4$). For example:

> *I like most of it [gEchoLu], the only thing is I could not copy and paste it from the thing. That is a little bit frustrating.* [Gamified]
>
> *There is one concern, sometimes when I check people to see if they post something new, sometimes it only shows five.* [Non-gamified]

Two factors that related to the gamification approach that were reported by the participants in the gamified group were the visibility of the gamification approach and the difficulty level of badges. The participants (n = 3) reported that the badges were not very attractive, and they would prefer *"the badges are more visible and give an explanation of what badges are in general.*" The badges and the awards were too hard to achieve was reported as another factor about the gamification approach that annoyed the participants (n = 2). For example, as one participant noted:

> *[Badges and awards] make you can turn in the assignment later, and I really do like that, but the only problem is I cannot get it.*

Discussion

Summary and Interpretation

The findings of the current study, albeit limited, suggesting the gamification approach had positively influenced student engagement in online discussions. Although no significant difference was found by the first round MANOVA, the means indicated that the students in the gamified group contributed more posts, logged in to the online discussion tool more often, spent more time in online discussions, reported higher level of cognitive engagement, and performed

higher in comparison to their counterparts. A significant difference was found between the two groups on their performance in online discussions in the secondary analysis that took the awareness of the gamification approach into account. It appears that the gamification approach influenced students' performance in online discussions if they were involved in the gamification approach. The qualitative data further suggested that badges, awards, and reactions were the three game features that contributed to the difference. With regard to the cognitive engagement, students from both groups acknowledged the benefits of the online discussions to their understanding of the course content. However, students showed higher level of self-regulated learning in the gamified group in comparison to those in the non-gamified group. Badges and awards were the two main incentives that encouraged students to post more detailed posts. Additionally, the progress bar allowed students to monitor their ongoing progresses in online discussions also played a role in promoting student cognitive engagement.

Despite the fact that the qualitative data suggested more students from the gamified group were emotionally engaged in the online discussions than the students in the non-gamified group, the means of the two indicators revealed that students from the gamified group showed slight lower level of emotional engagement in comparison to the students from the other group. A possible reason may be due to the badges and awards were too difficult to earn for some of the students in the gamified group, which may diminish their enjoyment in online discussions. When the challenge level of a task is much beyond an individual's capability may lead to decreases in enjoyment (Abuhamdeh & Csikszentmihalyi, 2012). Therefore, although more students indicated that they enjoyed the online discussions, the average rating of the enjoyment level was lower in the gamified group. The lower enjoyment level of the gamified group may also by virtue of deep cognitive processing. It is found that when individuals execute high cognitive effort in a task,

they tend to experience negative emotion (Zeidner, 1987). Students in the gamified group showed higher cognitive engagement in online discussions compared to those in the non-gamified group. Therefore, it is likely that students in the gamified group may demonstrate lower level of enjoyment in comparison to their counterparts.

Higher percentage of students from the gamified group indicated in the qualitative data that the online discussions helped them to build close rapport to peers; however, students in the gamified group rated lower on the perceived relatedness in the self-reported survey compared to the students in the non-gamified group. Class size may play a role in this discrepancy. The class size is found to be negatively related to the rapports built among students (Benton, Li, & Pallett, 2013). In the current study, there were 45 students in the gamified group, which was twice the number of students in the non-gamified group. Therefore, although a higher percent of students in the gamified group indicated that the online discussions helped them to build rapport with classmates, they experienced slightly lower level of sense of relatedness than the students in the control group.

Implications and Future Direction

A primary concern about this study is the limited effect of the gamification approach. Why the gamification approach had influenced positively on student engagement, nevertheless the effect was not as much as we expected? The foremost reason may be attributed to the fact that there were too few online discussions for students to participate. Students from both groups indicated that because they were only required to participate in the online discussions three times throughout the semester, they felt that the (g)EchoLu were halfhearted used. When asked about their awareness of the gamification as an instructional approach used in the course, the majority of the students in the gamified group reported a fairly low level. Therefore, the insufficient time

allowed the students to be exposed to the gamification approach may not enable students to be fully benefitted from the approach. This finding is consistent to the conclusions of the previous pilot study. One possible strategy to compensate for the low number of online discussions and maximize the potential of the gamification approach can be instructor facilitation. Arbaugh (2000) suggested that an interactive teaching style is significantly associated with students' acceptance level of online learning. That is, if the course instructors can give more facilitation on promoting the gamification approach, more care might be given to the game features in gEchoLu by students. Another possible solution can be an automatic gamification achievement summary system. That is, a summary of students' gamification achievements (e.g., the badges that have been gained by students) can be automatically emailed to students by instructors. Therefore, the potential of the gamification approach might be more effective on student engagement in online discussions.

The results of the current study also carry implications for instructional designers for the gamification approach. The challenging level of the badges and awards need to be carefully assessed during the designing process. Badges or awards that are too hard or too easy to achieve may diminish student engagement in participating in the gamification approach. Moreover, instructional designers and/or educators can monitor students' performance and adjust the difficulty level of badges and awards in accordance along with the progress of courses. Students reported that the badges of the current study were not very visible at the beginning, which may lower down their awareness of the gamification approach. Individuals tend to be attracted by visual arts, and students are more likely to be engaged in an activity that involves visual cues (Beeland, 2002). Thus, a possible solution to make the badges more visible can be the inclusion of graphics. Another solution can be the inclusion of a students' orientation system in the

website, which introduces each feature of the website when students first log on to it. Such orientation systems have been widely used in commercial websites, such as Facebook and Quora.

The findings also hold an implication for researchers. Students in the gamified online discussions showed lower enjoyment level whereas higher cognitive engagement in comparison to the students from the non-gamified group. It has been found that individuals tend to experience lower level of enjoyment when the tasks require higher cognitive efforts (Zeidner, 1987). Therefore, it is hard to determine that the lower enjoyment level of students in the gamified group is due to the high cognitive demand from the gamification approach (i.e., achieving badges and awards) or the other factors such as the difficulty level of the badges and awards were beyond the students' capabilities. Hence, researchers may consider to use multiple measurements to examine the actual effect of the gamification approach on student enjoyment level (Fredricks & Mccolskey, 2012).

Limitations

There are several limitations that make this study's findings tentative. The first is the number of online discussions. Students were only required to participate in three online discussions, which resulted in short involvement in the gamification approach, and due to the short duration, the gamification approach may have restricted influence on student engagement in online discussions. The second limitation is the sample size of the current study. The unequal sample size for treatment group and the control group may have impacted on the results of the study. Although no evidence shows that the unequal sample size can jeopardize the results of MANOVA (Tabachnick & Fidell, 2007), it may influence the interaction dynamics among students in online discussions. Considerable variations regarding the quality of interactions and

learning in collaborative learning are associated with different group sizes (Lipponen, 2001). Third, the cognitive engagement was only measured in the current study by self-reported survey. The transcripts of students' discussion posts carry rich information about their cognitive engagement (Zhu, 1996). In the future research, analysis strategies such as content analysis should be considered.

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CHAPTER 6

CONCLUSION

The manuscripts that are included in the current dissertation present a product of an ongoing research initiative that is focused on generating evidence of the impact of the gamification approach on student motivation and engagement in online discussions. Informed by the empirical literature on online discussions and framed by self-determination theory and goals-setting theory, a gamified online discussion tool gEchoLu was designed and developed for the current dissertation. gEchoLu incorporated various game elements, and each of which was designed to meet students' specific motivational needs in online discussions and promoted student engagement. Chapter 2 detailed the design guidelines of gEchoLu in order to promote student motivation and engagement in online discussions. Two pilot studies were conducted with students in an undergraduate level psychology course and a graduate level educational technology course. The studies enabled the continuous refinement of the incorporation of gamification in gEchoLu to better address students' needs. These two pilot studies were presented in the Chapter 3. Two main studies were conducted with two undergraduate level political science courses and educational technology courses. Chapter 4 and Chapter 5 reported the results of the two main studies respectively.

Overall the gamification approach demonstrated its potential to promote student engagement in online discussions. In particular, Chapter 3 and Chapter 5 reported that gEchoLu had a positive effect on students' participation in terms of number of posts and frequency of logins. Additionally, student enjoyment and cognitive engagement increased over time. Chapter

3 further suggested that students' perceived relatedness was significantly increased throughout the discussions. The current dissertation revealed that badges, progress bars, and leaderboards were the most influential game features on student engagement in online discussions. It appears that the virtual gift system was the least powerful game features in all studies included in the current research due to students' not recognizing value in using the virtual gift system. Moreover, several factors were found that could affect student engagement in the gamified online discussions: instructor facilitation of the gamification approach, technical issues of gEchoLu, the user-friendly level of gEchoLu, classmates' active level of using the game features, and the availability of time spent in online discussions. Table 6.1 summarizes the goals, gamification designs, contexts, and findings of each study presented in the current dissertation.

Implications and Future Directions

This program of inquiry presents initial start toward implementing the gamification approach in online discussions. Along with this inquiry, several cautions were raised that could require special attention from designers, researchers, and educators in the future.

One question that deserves to be considered before implementing the gamification approach in educational settings is how to balance the instructors' workload and the number of manual badges. Manual badges are designed based on the quality of a student's completion of a task, and this type of badge is more meaningful compared to participatory badges (Abramovich, Schunn, & Higashi, 2013). However, assigning badges is a time-consuming task and sometimes can require enormous effort from instructors. Therefore, evaluation of the potential of participatory badges would be useful. More specifically, I plan to investigate the effect of participatory badges on student engagement in Massive Open Online Courses (MOOCs). MOOCs allow more learners with diverse age ranges, cultural backgrounds, and social statuses

Table 6.1

A summary of studies presented in this dissertation

	Implementation Goals	Context	Gamification Design	Findings
Trial I in Ch. 3	To investigate the effectiveness of gEchoLu on student engagement	Graduate level asynchronous online course in instructional technology	▪ A Badge system ▪ A XP system ▪ A progress bar ▪ A leaderboard ▪ An avatar system	▪ Student perceived relatedness increased throughout the course ▪ The gamification approach had no influence on students' behavioral engagement, enjoyment, and cognitive engagement
Trial II in Ch. 3	To investigate the effectiveness of gEchoLu on student motivation and engagement, and explore the effects of each game element.	Undergraduate level hybrid course in psychology	▪ A Badge system ▪ A XP system ▪ A progress bar ▪ An avatar system ▪ A like system ▪ A virtual gift system ▪ A monetary system	▪ gEchoLu had some positive impact on student engagement ▪ The badges, the like feature, the progress bars, and the system of posting with avatars may have played positive roles in promoting students' engagement ▪ Student controlled motivation was higher than autonomous motivation ▪ Virtual gifts, badges, technical issues, unlocking new features, and monetary system were reported as the least liked game elements or the issues that hindered them from engaging in online discussions
Ch. 4	To explore the effectiveness of gEchoLu on student engagement change, the factors that influence student engagement in the gamified online discussions, and	Undergraduate level asynchronous online course in political sciences	▪ A badge system ▪ A XP system ▪ A progress bar ▪ A leaderboard ▪ A reaction system	▪ Student engagement in online discussions decreased from the beginning to the middle of the course, and then increased from the middle to the end of the course ▪ The badges (and awards), the leaderboard, the progress bar, and the reactions appeared to have many direct and indirect positive effects on students' engagement

				▪ The gamification approach influenced the most on the medium achievers ▪ Assigning badges created extra workload for the TA
Ch. 5	To investigate the effectiveness of gEchoLu on student engagement, and identify the factors that influence student engagement in the gamified online discussions	Undergraduate level asynchronous online course in instructional technology	▪ A badge system ▪ A XP system ▪ A progress bar ▪ A reaction system	▪ The gamification approach had no influence on students' engagement ▪ Students who actually experienced the gamification approach outperformed the students from the control group ▪ Number of discussions, user interface of (g)EchoLu, (g)EchoLu is a standalone website, and technical issues influenced students' engagement in the both gamified and non-gamified online discussions ▪ Students' awareness of the gamification approach, and the challenge level of the badges influenced students' engagement in gamified online discussions

to have free access to education. MOOCs are believed to be able to scale up the availability of education to a much broader base. However, the more than 90% dropout rate (Halawa, Greene, & Mitchell, 2014) results in the imagined potential remaining far from being realized. Motivation plays a pivotal role in the high dropout rate; therefore, I plan to use the gamification approach in MOOCs to promote learners' motivation and engagement. In particular, I will use learning analytics to track and analyze the behavioral patterns of students who complete the course and are highly engaged in learning. Based on the patterns, I plan to design specific game features (e.g., badges, progress bars, virtual gift system) for the course and investigate the effects of the gamification approach on student engagement and dropout rate.

Autonomy, as a basic psychological need (Deci & Ryan, 2000), deserves the foremost support when the gamification approach is implemented in educational settings. "Mandatory fun" can take the fun part out of a learning activity (Mollick & Rothbard, 2013). When the gamification approach is directly associated with grades, the motivation for encouraging students to engage and perform better in a learning activity is the desire of achieving a higher grade or engaging in the gamification approach becomes a conundrum. Students may feel obligated to participate in the gamification approach if the motivation is grades; therefore, they are more likely to be extrinsically motivated. Researchers tend to criticize extrinsic motivation due to its potential in harming students' intrinsic motivation in the long-run (Ryan & Deci, 2000). Providing students with a certain level of autonomy becomes pivotal in designing a gamified learning activity. I plan to further investigate the effect of the gamification approach on student motivation and engagement when it is not related to students' grades.

It is worthwhile to extract more elements of games that can be applied in educational settings and can intrinsically motivate students to learn. Alternate reality games (ARGs) employ

storytelling to deliver a story that can be altered by players' ideas (Kim, Allen, & Lee, 2008). Players use texts or any form of media to express their ideas and participate in the creation of the story. Researchers argue that ARGs are an example of the most meaningful gamification (Nicholson, 2012). Therefore, I plan to further investigate the potential of ARGs in educational settings. Particularly, my research contexts will be targeting learning English as second language students in K-12 classrooms. As student populations grow more diverse, more non-native speakers are enrolled in schools. However, due to the different cultural backgrounds and languages, those students are more likely to disengage in schools. ARGs, I believe, hold a great potential in engaging students in language learning.

In conclusion, in the future I plan to divert my research interests to student motivation and engagement. Using more motivational strategies in games to design and develop more engaging learning environments, and to promote student self-regulated strategies use in learning.

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APPENDIX A. STUDENT ENGAGEMENT SURVEY FOR TRIAL I AND TRIAL II

Behavioral engagement

1. I follow the rules in online discussion
2. When I post in the discussion tool, I just act as if I am contributing (REVERSED)
3. I pay attention in online discussion

Emotional engagement (Enjoyment)

1. I like participating in online discussion
2. I feel excited by my posts in online discussion
3. Online discussion is a fun activity to participate
4. I am interested in participating in online discussion
5. I feel happy in online discussion
6. I feel bored in online discussion (REVERSED)

Emotional engagement (Relatedness)

1. I like the people I interact with in the online discussion.
2. I consider the people who I interacted with in online discussion to be my friends
3. People in the online discussion care about me
4. The people I interact with in online discussion do not seem to care me much
5. The people in the online discussion are generally pretty friendly towards me
6. I feel accepted by others in the online discussion
7. I pretty much keep to myself and don't have a lot of interactions in online discussion (REVERSED)
8. I feel ignored by others in online discussion (REVERSED)

Cognitive engagement

1. When I plan to participate in online discussion, I try to put together the information from class and from the book.
2. It is hard for me to decide what the main ideas are in what I read in the discussion posts (REVERSED).
3. When I post in online discussion, I put important ideas in to my own words.
4. I always try to understand the posts in the discussion forum even if it does not make sense.
5. I use what I have learned from old assignments and the textbook to participate in online discussions.
6. When I read or participate discussions, I try to make everything fit together.

7. When reading the discussion posts, I try to connect the things I am reading about with what I already know.
8. I participate in online discussions even when I do not have to.
9. Before I begin participating I think about the things I will need to do to contribute.
10. I often find that I have been posting but do not know what it is all about (REVERSED).
11. When I am participating in online discussion I stop once in a while and go over what I have read.

APPENDIX B. MEASUREMENT FOR STUDENT AUTONOMOUS AND CONTROLLED MOTIVATION IN TRIAL II

1. I actively participated in the online discussions because I felt it is a good way to improve my understanding of the course.
2. I actively participated in the online discussions because I would feel bad about myself if I did not.
3. I actively participated in the online discussions because my instructor would have thought badly about me if I did not.
4. I actively participated in the online discussions because it was interesting to learn more about the course.
5. I actively participated in the online discussions because it was exciting to try new ways to learn.
6. I actively participated in the online discussion because I would get a good grade if I did what my instructor suggested.

APPENDIX C. OPEN-ENDED QUESTIONS USED IN TRIAL II

What do you think about EchoLu as a discussion tool? Do you like participating in online discussions in EchoLu? And why?

Please name the features of EchoLu that you liked the most and why?

Please name the features of EchoLu that you do not like or you like the least and why?

Do you have any suggestions for improving EchoLu?

APPENDIX D. BADGES CREATED FOR CHAPTER 5

Badges			
Instructor badges	10 pt.	Creative	Your post showing your great creativity!
	10 pt.	Devil's Advocate	Your post proposes very challenging ideas to consider.
	10 pt.	Deep Sea Diver	Showing great depth in understanding the readings.
	10 pt.	Librarians	Providing great external information related to the discussion topic.
	10 pt.	Top Dawg	Applying readings effectively to your own projects!
	10 pt.	Synthesizer	Showing connections between the current reading with the previous readings.
	10 pt.	Over the Top	Contributing to a discussion topic above and beyond minimum expectations.
	10 pt.	Athena	Demonstrating kindness to others in course.
	10 pt.	Profession	Your post suggests very professional ideas for improvement!
	10 pt.	Helper	Great help!
	10 pt.	Pragmatist	Practical feedback!
	10 pt.	Dr. Who	Great reply! (when students' crits do not belong to Profession or Pragmatist but meaningful this badge will be assigned)
Participatory badges (introduce badges)	5 pt.	Welcome	You can earn this by uploading a profile photo.
	5 pt.	Mask	You can earn this badge by completing your anonymous profile.
	5pt.	Warm Up	You can earn this badge by posting your first entry in the system.
Automatic badges	5pt.	Early Bird	You can earn this badge if you are the first to write a comment to a post within 12 hours after the post.
	5pt.	Noticeable	You can earn this badge when your comment receives at least 3 replies (excluding your own).
	10 pt.	Magnetic	You can earn this badge when your comment receives at least 5 replies (excluding your own).
	5pt.	Involved	You can earn this badge when you made your 15th entry in the system.
	3pt.	Sparkle	You can earn this badge when your entry gets 5 reactions (Haha, Wow, cool idea, thumbs up, and brilliant input).
	5pt.	Pundit	You can earn this badge when your entry gets 15 reactions (Haha, Wow, cool idea, thumbs up, and brilliant input).

	3pt.	Helper	You can earn this badge when you receive 5 “thank you” reactions.
	5pt.	Guru	You can earn this badge when you receive 10 “thank you” reactions.

APPENDIX E. REACTIONS CREATED FOR CHAPTER 5

Reactions	
Haha	
Thank you	
Wow	
Cool idea	
Great question	
Thumbs up	
Brilliant input	

APPENDIX F. DEMOGRAPHIC SURVEY FOR CHAPTER 4

1. As of your last birthday, how old are you?

2. What is your gender?

   ◯ Female

   ◯ Male

3. What is your declared major?

4. Please specify your ethnicity.

   ◯ Asian

   ◯ African American

   ◯ Caucasian/White

   ◯ Hispanic

   Other, please specify

5. Please select the number below that best represents your level of technology knowledge today.

Lowest				**Highest**
1	2	3	4	5

APPENDIX G. STUDENT ENGAGEMENT SURVEY FOR CHAPTER 4

Directions: Please rate the following items based on your experiences in the online discussions. Your response will only be used for research purposes. Through this brief survey, your answers will be helpful in understanding your experience in online discussions. We really appreciate your participation.

Behavioral engagement

1. On average, how often did you check EchoLu? And how much time did you spend on each topic?

Not at all True			**Somewhat True**			**Very True**
1	2	3	4	5	6	7

Enjoyment

2. I enjoyed participating in online discussions very much.
3. This online discussion activity was fun to do.
4. I thought this online discussion was a boring activity. (R)
5. This online discussion activity did not hold my attention at all. (R)
6. I would describe this online discussion activity as very interesting.
7. I thought this online discussion activity was quite enjoyable.
8. While I was participating in this online discussion activity, I was thinking about how much I enjoyed it.

Perceived relatedness

1. I felt really distant to the people in the online discussions. (R)
2. I really doubted that the people in the online discussions and I would ever be friends. (R)
3. I felt like I could really trust the people in the online discussions.
4. I'd like a chance to interact with the people in the online discussions more often.
5. I'd really prefer not to interact with the people in the online discussions in the future. (R)
6. I didn't feel like I could really trust the people in the online discussions. (R)
7. It was likely that the people in the online discussions and I could become friends if we interacted a lot.
8. I felt close to the people in the online discussions.

Cognitive engagement

1. When I planned to participate in online discussion, I tried to put together the information from class and from the book.
2. When I posted in online discussion, I put important ideas in to my own words.
3. I always tried to understand the posts in the discussion forum even if it did not make sense.
4. When I read or participated discussions, I tried to make everything fit together.
5. When reading the discussion posts, I tried to connect the things I was reading about with what I already know.
6. Before I began participating I thought about the things I needed to do to contribute.
7. When I was participating in online discussion I stopped once in a while and went over what I had read.
8. Even when online discussions were dull and uninteresting, I kept working until I finish.
9. I worked hard to get a good grade even when I didn't like the online discussions.

For Gamified group about the gamification approach

1. How often did you check progress bars in EchoLu?
2. How much are you aware of the game features (e.g., badges, progress bars, reactions)?

APPENDIX H. INTERVIEW PROTOCOL FOR GAMIFIED GROUP IN CHAPTER 4

Read to participant by interviewer: Thank you for your willingness to participate in this interview. I would like to spend the next 20 minutes or so discussing your experience in Pols 1101 – specifically with regard to the gamification approach used in that course. If there are any questions that you do not wish to answer, you may skip them. You may terminate the interview and/or participation in the study at any time without recourse. Do you have any questions for me? Let's begin.

1. Can you briefly introduce me about yourself?
2. In general, can you talk about your experience about online discussions (using gEchoLu)?
3. How do you like the online discussion topics?
4. How did you like or enjoy your online discussions (experience with gEchoLu)?
5. Is there anything that you don't like about your online discussion experience?
6. How were your interactions with your classmates in online discussions?
7. Could you describe how you completed the online discussions in general?
8. What motivate you to participate in online discussions?
9. In what ways do you think gEchoLu influenced your participations and learning in online discussion activities?
    - Does it motivate you to participate more in the online discussions?
    - Does it influence your posts in the online discussions?
    - Does it influence your interactions with your classmates? And how?
10. Did you receive any awards in gEchoLu and did you claim your awards in EchoLu?
11. Did gamification have any positive influence on your visits to EchoLu? I mean did you tend to visit gEchoLu more often because of the gamification?
12. What game elements (like badges, awards) in gEchoLu you liked the most and why?
13. What game elements in gEchoLu you did not like and why?
14. Do you have previous experience in online discussions before Pols 1101? If so, could you please compare your previous experience with the one in Pols 1101? Do you like the gamified approach more, or do you prefer the ELC discussions, and why?
    a. Would you prefer using gEchoLu for discussions in future classes if you have a chance?
15. What would you suggest to improve gEchoLu? What can be done to further improve it?
16. What factors so far that influenced your participations in gEchoLu?
17. Is there anything else that you want to add?

APPENDIX I. INTERVIEW PROTOCOL FOR NON-GAMIFIED GROUP IN CHAPTER 4

Read to participant by interviewer: Thank you for your willingness to participate in this interview. I would like to spend the next 20 minutes or so discussing your experience in Pols 1101 – specifically with regard to the gamification approach used in that course. If there are any questions that you do not wish to answer, you may skip them. You may terminate the interview and/or participation in the study at any time without recourse. Do you have any questions for me? Let's begin.

1. Can you briefly introduce me about yourself?
2. In general, can you talk about your experience in online discussions?
3. How do you like the online discussion topics?
4. How do you like or enjoy completing your online discussions?
5. Is there anything that you don't like about your online discussion experience?
6. How were your interactions with your classmates in online discussions?
7. Could you describe how you completed the online discussions in general?
8. What motivate you to participate in online discussions?
9. In what ways do you think EchoLu influenced your participations and learning in online discussion activities?
10. How often do you check EchoLu?
11. If you have participated asynchronous online discussions before, compare to your previous experience, which type of online discussions do you prefer, and why?
12. What would you suggest to improve EchoLu? What can be done to further improve it?
13. Is there anything else that I did not ask, but you want to share with me?