Gamifying The Classroom: Tips from the Trenches

Lynne N Kennette, Durham College;
Michelle P. Beechler, Adrian College

Authors' Contact Information

Lynne N. Kennette, Professor, Durham College,
2000 Simcoe St. N., Oshawa, Ontario
Phone: (905) 721-2000 x3704
Email: lynne.kennette@durhamcollege.ca

Michelle P. Beechler, Associate Professor, Adrian College
110 S. Madison St., Adrian, Michigan
Phone: (517) 265-5161 x3957
Email: mbeechler@adrian.edu

Abstract:

Classroom gamification uses game-like elements to engage and motivate students, improving their overall experience in the course (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Research suggests students benefit from gamification across social, emotional, and cognitive domains (Granic, Lobel, & Engels, 2014). This paper explores gamification at two levels. First, smaller games which are useful for introducing and reviewing relevant concepts that can be completed within a single class. Second, larger games which provide a fully immersive and engrossing gaming experience which take place over an entire course. The authors provide concrete examples across the gaming spectrum, and offer research based advice for instructors considering introducing gamification to their courses.

Key Words:

gamification, groups, games, competition, motivation.

Introduction

Games (video games, board games, card games, apps, etc.) have been present in our students' lives since early childhood and, for many, are a part of their everyday routines (Fromme, 2003; Oblinger, 2004). Students are motivated to out-perform their opponents or themselves and players can spend hours engaged in gaming tasks. Additionally, over 90% of children over the age of two play video games (NPD Group, 2011) and are therefore likely to be familiar with video games and accustomed to their structure. Whether card games, arcade games, or story-based games, students have previously completed tasks for intangible rewards like points, tokens, or gemstones. Why not take advantage of student familiarity with gaming to engage and motivate them (Glover, 2013), using similar principles in their coursework?

Gamification refers to using gaming elements (badges, leaderboards, storylines, etc.) in non-gaming environments, such as the classroom, with the goal of improving engagement and overall experience (Deterding, Sicart, Nacke, O'Hara, & Dixon 2011). Publications about gamification have increased dramatically over the past 15 years, especially in education (Hamari, Koivisto, & Sarsa, 2014). When students are not engaged in the course, their academic performance suffers (Carini, Kuh, & Klein, 2006).

In this paper, we first outline the benefits of games, then describe possibilities for gamifying the structure of an entire course as well as smaller elements within a course. Our description includes concrete examples and tips and we support our suggestions with research where applicable. We also discuss some limitations of gamification as pedagogy.

Benefits to students

A review of 24 empirical studies in various contexts outside education concluded most investigations reported benefits and positive effects as a result of gamification, measured in both psychological and behavioral outcomes (Hamari et al., 2014). In addition to the benefits of other games, playing videogames has benefits across cognitive, motivational, emotional, and social domains (Granic, Lobel, & Engels, 2014). Most relevant to the classroom are cognitive improvements in attention, spatial skills, problem-solving skills and creativity (Green & Bavelier, 2012; Jackson, Witt, Games, Fitzgerald, von Eye, & Zhao, 2012; Prensky, 2012). Video games also encourage incremental (growth) theories of intelligence (Dweck & Molden, 2005) through balancing successes and failures, and rewarding persistence (Granic et al., 2014). Adapting gamified elements in the classroom may help students reap these benefits.

Student performance may also benefit from gamification. Anecdotally, Laster (2010) reported after a semester of monster-fighting (test/quiz), crafting (various writing assignments), and quests (presentations), the class average increased by an entire letter grade compared to the previous semester's non-gamified class average. However, more empirical research should aim to test the effects of these specific gaming elements on learning outcomes.

How to begin

There are at least two approaches to gamification: turning an entire course into a game or incorporating smaller gaming elements. We will discuss these two options in turn.

Gamified course structure

The first, and most involved method of gamification, is to gamify an entire course. For example, in one of our introductory psychology courses, we generated a gaming adventure story (based on the *Legend of Zelda* video game) to follow the course structure. Students were adventurers in the fictitious kingdom of Psyrule. By battling mini-bosses (quizzes) and dungeon bosses (exams), and completing other tasks, students leveled up and earned items which they could use in the future. For example, the Boomerang allowed students to resubmit a homework assignment and the Hookshot allowed them to retake a quiz. The game's story was present in all course

elements, from the syllabus, to assessments, and it was even used to encourage participation in research studies (Beechler, 2016).

If using this approach, we recommend using a game or story with which you or your students are at least somewhat familiar, so you will feel more comfortable with the transition. In addition to video games, inspiration may come from literature (*Harry Potter*), film (*James Bond*), or other popular games (*Dungeons and Dragons)*. More research is necessary to test whether it is especially engaging for students to include immersive storylines threaded throughout a course.

Gamified elements

If restructuring a course around a game is too daunting, gamifying only a subset of course activities or elements is also an option. Small groups of students can compete for best participation in that week's discussion, the highest combined homework score, or fewest missed classes during the semester. For example, students in a statistics laboratory competed weekly in groups named after different houses from *Harry Potter* (Tibbett, 2017). Competition may also be created between two or more sections of a course or with a "rival" instructor.

Similarly, a leaderboard can help students see where they stand. For example, students select a pseudonym for privacy reasons, and then student rank is posted on a leaderboard based on course achievements or effort, with badges displayed next to their pseudonym. Even for students who rank near the bottom, this list can give important feedback to their performance in the course. Effort and achievement recognized with course badges could also have advantages tied to them: bonus points, candy, or simply bragging rights. Many learning management software (LMS) programs have a progress tracker already built in, so a system for monitoring points for gamification may already be in place.

Assignments may be presented as gaming stories. For example, we developed a game in which students save a kidnapping victim by completing ransom demands. Those demands include summarizing and contrasting the research on a given topic, but the story-telling aspect gives context to the assignment, making it more fun, engaging, and game-like. Feedback on the assignment provides the ending to the story based on the assignment grade (A = *victim released without harm;* B = *victim released but injured*, etc.).

Escape rooms are "live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal (usually escaping from the room) in a limited amount of time" (Nicholson, 2015, p. 1). Escape rooms and other similar games have grown in popularity and can be incorporated into the classroom setting (Nicholson, 2018). Breakout EDU sells puzzle-based boxes for educators, and their website houses a variety of games (https://www.breakoutedu.com). The use of escape rooms as pedagogy is associated with positive learning outcomes: in a pre-post design, pharmacy students had a greater knowledge of diabetes management when using an escape room as pedagogy (Eukel, Frenzel & Cernusca, 2017). We recommend future research compares a non-gamified control group to test whether students learn more with an escape room than more traditional teaching methods.

Small games may be created for specific in-class assignments as well. For example, we created a game for learning the different areas of the brain, *Cranium Cranium*. Students work in groups to illustrate concepts by describing, drawing, sculpting, or acting; their classmates try to guess the correct term. Additionally, we often use a variant of the game *Taboo!,* in which small groups of students try to guess a concept without using predetermined "taboo" words. Before gameplay, groups of students can create the "taboo" words other groups will have to avoid, making this an excellent opportunity for students to pick up on key concepts by engaging in deeper processing than rote memorization or retrieval would allow (Craik, 2002; Craik & Lockhart, 1972; Jorczak, 2011).

Key elements

Whichever gamification strategy you select, several features of gamification are associated with greater student outcomes (specifically motivation to engage and put forth effort), and should be included in the design where possible. These gaming elements include: freedom to fail, immediate feedback (Gee, 2008), the feeling of making progress, choice and responsibility for game outcomes, and story-telling elements (Clark & Rossiter, 2008).

Freedom to fail means students are free to experiment and make mistakes, and errors are recoverable. Examples include allowing students to re-submit an assignment by earning that opportunity through another optional task in the course, receiving a high score on an assessment, or "leveling-up" via total course points (Beechler, 2016; Gee, 2008; Kapp, 2012; Stott & Neustaedter, 2013).

Often, feedback is not given immediately because of the time necessary to grade and return assignments. However, rapid feedback during engagement with a game is a key feature for successful implementation (Kapp, 2012; Stott & Neustaedter, 2013). Incorporation could take place both inside and outside of class. For example, employing the Immediate Feedback Assessment Technique (epsteineducation.com) in a competitive classroom review game provides students with both enjoyment and immediate feedback (see Kennette & McGuckin, 2018). Additionally, instructors can create weekly auto-graded quizzes with immediate feedback on their LMS or through a textbook resource platform.

Progress refers to completing tasks and progressing to more difficult "levels" within a game, such as bonuses attached to "leveling up" at 100-point intervals in a course (Beechler, 2016). Some of the most popular motivating components studied are measures of progress such as points and leaderboards (Hamari et al., 2014). Seeing progress is motivating in a number of non-academic areas as well (for a discussion, see Pink, 2009).

Student choice and responsibility are also important to consider in gamification. Offering choice is engaging for students and provides a more inclusive learning environment by making use of Universal Design for Learning principles (Center for Applied Special Technology, CAST, 2011). Further, rewarding responsible student choices such as attendance and homework completion promotes student self-policing and accountability (CAST, 2011).

Story-telling is helpful because we are better able to remember information presented in the context of a story than in an isolated list (Kapp, 2012). Story-telling can provide an exciting context for mundane course tasks, thereby increasing student motivation and engagement (Clark & Rossiter, 2008). Story-telling can be incorporated in both an overarching gamified course structure, such as our game in the Kingdom of Psyrule, or in smaller gaming elements, such as our kidnapping scenario.

Limitations

Although there are many benefits to gamification, there are some limitations to keep in mind. Some research has found using badges and leaderboards may lead to negative outcomes for intrinsic motivation and class satisfaction compared to a non-gamified course (Hanus & Fox, 2015). Although the games themselves are inherently intrinsically motivating (Barata, Gama, Jorge, & Gonçalves, 2013; McGonigal, 2011), reinforcing classroom behaviors with badges and other rewards may shift intrinsic motivation towards extrinsic motivation (Deci, Koestner & Ryan, 2001; Lepper, Greene & Nisbett, 1973) and lead to less enjoyment of learning the course content. Additionally, removing gamified elements may have negative effects due to the loss of extrinsic rewards (Hamari et al., 2014).

Personality characteristics may also affect student engagement or other benefits of gamification. Students who score high in need for achievement may be more motivated by accomplishment and progress than by other gaming elements, such as competition or group membership (Sailer, Hense, Mandl & Klevers, 2013). Extraversion and neuroticism appear to be the most critical Big Five personality traits when considering the design of a game (Jia, Xu, Karanam, & Voida, 2016). People rated high on extraversion prefer the elements of points, levels and leaderboards, while those demonstrating higher levels of neuroticism prefer points, badges, progress and rewards. For those low on neuroticism, gamification may not be appropriate as these users are not motivated by any of the gaming elements. Regardless of personality characteristics, the gaming characteristics of having clear goals, feedback, rewards and progress were rated most favourably (Jia et al., 2016).

Not all forms of gamification may be appropriate for all students. For example, non-traditional students may not be interested in some forms of gamification (such as a fully gamified course), but may enjoy smaller in-class games. Additionally, although there does not appear to be much of a gender difference in video game use (Granic et al., 2014), women may experience discrimination in some online gaming environments. Research is necessary to determine which individual differences impact the effectiveness of different gamification experiences.

Finally, technology can make implementing and keeping track of gaming elements easier. For example, an LMS can deliver badges and monitor student performance. However, even in a low-tech classroom, many forms of gamification require only some imagination and monitoring of student progress. Arguably, the benefits to students in terms of course outcome, engagement, and motivation (Granic et al, 2014; Hamari et al, 2014) outweigh the extra work.

Concluding remarks

We recommend that educators interested in gamification give it a try. It is a learning experience, and elements can be improved in the future. Smaller gamification elements allow instructors to dip their toe in the water, whereas full gamification is more of a plunge. With either strategy, we recommend the incorporation of as many key elements as possible to increase the probability of success. Additionally, many of the effects of gamification in the classroom have yet to be tested experimentally, so there are many opportunities for teaching and learning innovation and research in the identification of best practices.

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