Gamification

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All too often traditional school is perceived as boring or inefficient by many students (Dicheva, Dichev, Agre, & Angelova, 2015). In an effort to combat this problem, teachers look for new ways to motivate and engage their students in learning. One way of addressing this problem is through gamification, which is a rapidly growing approach in education, due in part to advancements in technology. Research on gamification and its applications in K-12 and higher education has grown over the years, but there is a need for further research, especially in the K-12 setting (Dichev & Dicheva, 2017).

Most people are familiar with the concept of games, so the term “gamification” is probably familiar. A game can be described as a system that allows players to engage in an abstract challenge, which involves defined rules, interactivity, and feedback; ends in a quantifiable outcome; and may elicit an emotional response (Koster, 2004). Simões, Redondo, and Vilas (2013) list additional game elements that are relevant to K-6 classrooms, including the following: encouraging repeated experimentation, breaking tasks into subtasks, adapting tasks to skill levels, allowing different routes to success, and giving recognition or rewards. Gamification involves using these types of game design elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2014), such as the classroom. In this chapter we will focus on gamification in K-12 classrooms by providing (a) a brief history of the origin of gamification, (b) justification for gamification, (c) practical applications of gamification for teachers, and (d) cautions to consider when applying gamification to learning activities.

Origin

The term “gamification” originated in 2008 within the digital media industry (Deterding et al., 2014), but using game design elements in a non-game context started long before the term was used. When you were in elementary school, did you ever have a chart where you added stars for every book you read, and at the end of the month the student with the most stars received an award? Whether an effective learning activity or not, the star chart was an example of adding game elements to a non-game context. Teachers in traditional classroom settings naturally incorporate game elements to classroom learning to increase student motivation and engagement.

In the digital age, teachers often gamify classroom activities through the use of technology. For example, technological tools such as Class Dojo aid teachers with classroom management and communication as they award points for good behavior. Digital badges are visual representations of achievement that are available online and contain rich metadata as evidence of the achievement; they are often combined with points and leaderboards to gamify learning (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). Students may use clickers or smart devices to answer questions in gamified response systems such as Kahoot! or ActivInspire. Technology tools facilitate gamification by providing a framework for teachers to quickly and more easily add elements of gameplay to the classroom.

Defining Gamification

In this chapter, we define gamification as the incorporation of elements of game design in a classroom setting. The goal of gamification is to use these elements that are game-like, or fun, to create meaningful learning experiences (Kapp, 2012). In creating these meaningful learning experiences, gamification in education has the potential to motivate and engage students during the learning process.

Motivating and Engaging

Gamification includes elements that stimulate both extrinsic and intrinsic motivation. Intrinsic motivation in a classroom manifests itself when students are inherently interested in the content (Ryan & Deci, 2000). Teachers generally want their students to be intrinsically motivated. However, not all classroom tasks are inherently interesting or enjoyable to all students. To address this, game elements can be added to increase extrinsic motivation, which is behavior driven by external rewards. Kapp (2012) asserts that the value of extrinsic motivation should not be dismissed; research studies show that extrinsic rewards can foster intrinsic motivation. For example, intrinsic motivation is fostered when gamification elements "work to increase a feeling of agency and ownership" (Stott & Neustaedter, 2013, p.13), which can help to increase interest and enjoyment.

The excitement and engagement that accompany gameplay is almost universal for all ages but especially for younger students. Simões, et al. (2013) put it this way:

The gamification of education approach has the advantage of introducing what really matters from the world of videogames – increasing the level of engagement of students – without using any specific game. The aim is to extract the game elements that make good games enjoyable and fun to play, adapt them and use those elements in the teaching processes. Thus, students learn, not by playing specific games but they learn as if they were playing a game. (p. 3)

Let's try this out on you, as a reader. Within the next ten seconds, think of at least five words that rhyme with "learn". Ready? Go! 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. Likely, you felt a sense of urgency and focus as you either wrote or thought about these rhyming words. You may be feeling ready to design a gamified learning experience for the classroom. First, we must address a couple of common misconceptions about gamification.

What Gamification is Not

Many people write or talk about gamification based only on their background knowledge, due to almost universal familiarity of how games work and engage players. This leads to misinterpretation of the term "gamification" and confuses it with other concepts. We will address this messiness before we approach the practical application section.

Game-based learning. Oftentimes, the terms "gamification" and "game-based learning" are used interchangeably, when their meanings differ significantly. Perrotta, Featherstone, Aston, and Houghton (2013) define game-based learning as "the use of video games to support teaching and learning". These are often used to teach or apply specific information and skills. Although video games can be important learning tools, simply bringing a game into the classroom is not gamification. Recall that gamification extracts and uses elements of games to enhance non-game environments, like the classroom.

Badges, points, and rewards. Effective gamification in education is not simply adding game elements like leaderboards and reward systems with the expectation that students will suddenly learn more. Students do not play games for the points alone, but also for the engaging play, the feedback, and the sense of accomplishment that comes with working hard to master a task (Kapp, 2012). Learning activities that are poorly or inappropriately designed will lead to the overall failure of gamifying the classroom (Winoto & Tang, 2015). For this reason, the rest of this chapter aims to help K-12 teachers design effective learning experiences using gamification.

Common Elements for Successful Classroom Gamification

There are many elements of game design with innumerable possible applications in the classroom. As every teacher must learn, what works in one classroom for one teacher with a particular set of students may not work for another teacher with different students. Incorporating game elements into effective teaching and behavior management strategies will require time for thoughtful preparation, experimentation in implementation, and periodic reflection and adjustments. Research into the effective implementation of gamification is still relatively scarce, especially in the K-12 setting.

Authors studying game-based learning and gamification use different terms to describe similar game elements. Stott and Neustaedter (2013) identified four elements that were consistently successful when applied in the classroom: (a) freedom to fail, (b) rapid feedback, (c) progression, and (d) storytelling.

Freedom to Fail

Much has been written in recent years about building resilience and persistence in the face of setback and failure (Duckworth, 2016; Dweck, 2008). Freedom to fail means giving students the chance to experiment and fail without pressure or fear of irreversible damage (Stott & Neustaedter, 2013). Video games incorporate this element by offering players multiple lives and opportunities to start from a check-point, rather than at the very beginning each time. Failure can be presented as a necessary step in the learning process rather than being seen as a final destination. In a classroom, having the freedom to fail is important in maintaining student motivation, because it encourages experimentation in problem-solving and fosters persistence through difficult tasks. Related to this idea of freedom to fail is the freedom to choose, or the opportunity to decide one’s own path to reach the goal.

One attraction of games is that they allow players to choose both missions and the path to success. These choices require problem solving and lead to natural consequences, from which the player can learn for future attempts. Having agency and autonomy is an element of gamification that can increase engagement and intrinsic motivation in students as they take ownership of their learning and monitor their own progress (Tu, Cherng-Jyh, Sujo-Montes, & Roberts, 2015).

In a classroom, the freedom to fail and to choose can be implemented in many different ways. It can begin with the teacher’s attitude. The teacher sets the tone for the class and can emphasize to the students that getting things wrong is a part of learning and not necessarily a bad thing. How a teacher models the learning process and responds when students struggle to understand will affect how students view their failures and ability to learn in the future.

Frequent, low-stakes formative assessments, which may already be a part of a teacher’s pedagogy,

can be an effective way to incorporate the freedom to fail element by gauging understanding without the pressure of grades. These assessments can take many forms including ungraded quizzes, explanations to peers, and using hand signs to indicate answers. One way to provide the freedom to choose is to give students different options to show mastery of a skill. For example, instead of assigning certain spelling tasks each night, a teacher might provide a list of possible spelling activities to be completed over the course of the week, with each activity being assigned a certain number of points. By the end of the week, each student must complete enough activities to earn the required number of points. This allows students to choose the course of their learning while promoting mastery of the content.

Rapid Feedback

Feedback is an integral part of learning in our education system and is important for both the teachers and the students (Stott & Neustaedter, 2013). Rapid feedback allows teachers to gauge the student's current understanding and make instructional decisions in the moment. It also allows students to evaluate their own learning, see the results of their efforts, and make decisions about strategies and next steps. Immediate feedback, especially when paired with repeated chances to implement that feedback, can be an effective learning tool (Simões, et al., 2013). In games, immediate feedback can be seen in earning points, advancing levels, unlocking achievements, earning badges, and moving up on a leaderboard. Take into consideration that gamified feedback can be provided for making academic progress as well as for meeting behavior expectations. Providing feedback can be implemented in a variety of ways.

Technology tools exist that can make it easier for a teacher to record and quickly analyze student answers. Classroom response systems (i.e., clickers or other electronic feedback devices) have become more readily available in many schools. Teachers can prepare questions or quizzes in advance or create a class poll in the moment. While technology can make immediate, individualized feedback easier, there are other ways to provide feedback as well. Teachers can provide immediate feedback in written and verbal forms. Peer feedback and input can also be effective in helping students gauge their own progress.

Feedback in the form of leaderboards or progress charts can serve to motivate students in various tasks. There are examples of school-wide leaderboards for reading books and mastering math skills, and even for measuring the progress of fundraising competitions. Leaderboards provide a visual representation of accomplishments, provide recognition, and, in theory, provide motivation for other students.

One teacher applied both the freedom to fail and rapid feedback elements while teaching a college psychology course. The course involved a two-day unit on statistics, one of the more potentially boring portions of the class for many of the students. For several semesters this unit was conducted as a lecture, which consistently led to increased absences and social media usage during class, so a follow-along approach was employed. The follow-along approach yielded little benefit, however. Finally, a gamified approach was taken, in which a mystery was presented to the students in several rounds and data sets. Each round required students to submit a summary of their findings, which were only accepted when the students had met the learning objective for each round. This led to many iterations on behalf of the students and instantaneous feedback. An analysis of student perceptions showed that students thought more highly of statistics after participating in the game. Furthermore, they were less worried about failing and were more willing to ask questions. Overall, the activity gave them a sense that they could learn statistics.

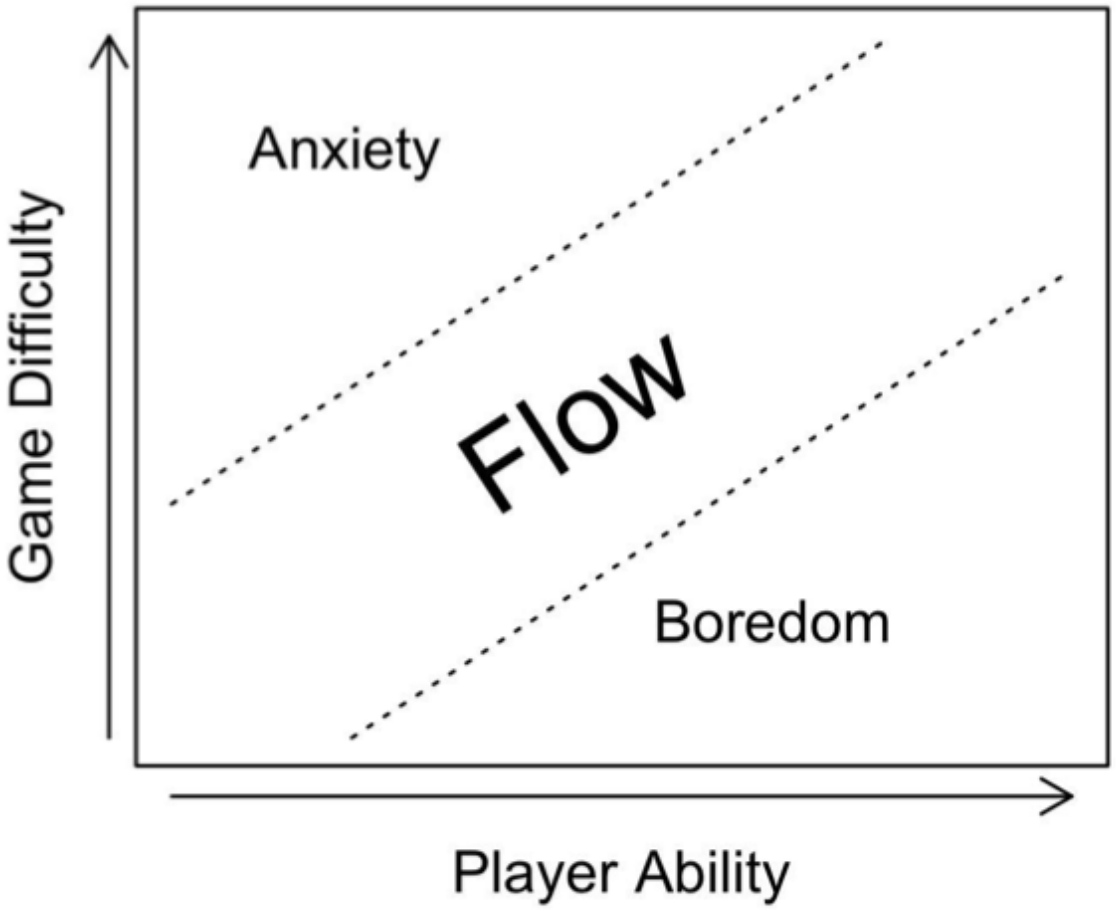
Progression

Progression is another element of game design that often leads to success in the classroom. Progression gives the player the impression of advancement by (a) increasing the difficulty of obstacles (e.g., more capable opponents, limited resources, more complex missions) and (b) enhancing the player's ability (e.g., extra resources, new powers, leveling up, experience, increased skill) (Stott & Neustaedter, 2013). These obstacles and enhancements often serve to keep the player "[operating] at full capacity" (Nakamura & Csikszentmihalyi, 2014, p. 90). This phenomenon is known as being in flow (Figure 1).

It may be possible that the dynamics of game progression encourage students to be in Vygotsky's zone of proximal development as well (Chaiklin, 2003), since scaffolding is associated with the principle of progression (Stott & Neustaedter, 2013). This would also imply a balance between what is asked of students and the resources provided for them to succeed.

Figure 1

Games and Flow Theory. Limitations Such as Resources, Levels, Etc. Work to Keep Game Players in Flow.



Take a moment and consider a game you have played recently. In what way did the game progress? Did the challenges become increasingly difficult? Were you more capable of success by the end of the game than at the beginning? Examine the following examples of progression applied to the classroom, and consider how you might incorporate this principle into your teaching efforts.

One professor incorporates progression by the passage of “years” in a simulation he has designed. In the simulation, students are required to make decisions for a country as if they were the governing body. They are responsible for balancing public opinion, carbon emissions, stability of the economy, and money. In order to play the game, students must do the basic homework. Students are able to write reports for bonuses within the simulation, which have increasing requirements as the semester goes on.

Another way to incorporate progression may be in the form of badges. Badges in this setting are much like they are in the Boy Scouts. They represent skills that a student has shown they possess. Khan Academy is one example of using badges to encourage progression in academic skills, as well as in behaviors such as persistence. Students can earn points and badges for small academic achievements, such as completing 3-5 math problems correctly in a row, or for large achievements, such as mastering a set of skills. Extra badges are awarded for persistence through difficult tasks. For example, when a student struggles with a skill, they can earn a badge for watching an explanatory video on that topic. Khan Academy encourages regular use of the program by giving badges for logging in every day for a week or month. Student progression in different areas of a classroom can be acknowledged using badges.

Storytelling

A well-made story in a game draws players in and compels them to move forward. Likewise, in an educational setting, a story functions as a way to put learning into a meaningful context, thus increasing engagement and motivation (Stott & Neustaedter, 2013). According to Brandon Sanderson, New York Times Best Selling Author, the most important principles of storytelling are character, setting, and plot. These are held together by the conflict of the story (BYU English, 2014). For example, consider a familiar story where the main character is a small yellow blip on a screen. The setting is a neon maze filled with Pac-Dots, which our hero, Pac-Man, is determined to devour. However, ghosts haunt this labyrinth and are after our hero. The player must navigate Pac-Man through the maze, while avoiding danger and eating Power Pellets for a distinct advantage over the ghosts. All of this is weaved together in the continual pattern of eating, running, and fighting that is characteristic of the Pac-Man series.The same principles of story that have pulled generations of players into Pac-Man may be applied just as effectively to the classroom.

Consider, as an example, a class driven by a semester-long consulting project. The setting is the classroom, the characters are the students and teacher, and the plot is driven by the need of a client. After an initial presentation of the client problem (i.e., the conflict), every moment in class is directed toward devising a solution. Consequently, learning occurs in an authentic context. An application of storytelling does not require warlocks or ninjas to be successful. Here the story was provided by simply giving the students a reason for their learning. This goes to show that a story does not need to be fantastical or to begin with “Once upon a time.” Instead, good use of story may be as simple as providing a meaningful problem to solve with the learned material.

Cautions

Gamification can be useful in motivating and engaging students in K-12 classrooms, but there are times when gamification should not be used. Karl Kapp (2013) in his book The Gamification of Learning and Instruction Fieldbook: Ideas into Practice offers several “wrong” reasons to use gamification.

Just because something is cool, fun, and popular does not mean it will lead to learning (Kapp, 2013). Be on the lookout for this “wrong” reason when making the decision to gamify something in the classroom. PBL (points, badges, leaderboards) are the most commonly implemented aspect of gamification, though often without justification (Dichev & Dicheva, 2017). Neither the fun factor, nor the popularity factor (e.g., other teachers are using gamification) should be the driving force behind using a gamified approach for an interactive learning activity.

Deciding to gamify a learning activity on the assumption that everyone loves a game is another “wrong” reason to use gamification (Kapp, 2013). Evaluating the audience that will be participating in the activity is an important step in the design process. Some students love games and competition, but others do not. Instructors should use an approach that will appeal to their specific group of students.

Using gamification with the idea that students will play the game and never know that they are learning is not a good justification for gamifying a learning activity. Research shows that students retain information longer when they know what they are learning (Kapp, 2013). Gamification should highlight the lessons learned. Pre-discussion and post-discussion about concepts learned in the gamified activity are important to consider.

Some instructors choose to gamify activities in the classroom, because they think it is easy. It is not. Designing gamified activities that meet specific learning outcomes is challenging. It requires a large amount of/planning beforehand and thoughtful consideration of the desired outcomes of the activity.

Conclusion

Gamification uses game elements in a classroom setting to increase motivation and engagement. Teachers naturally use game elements in classroom activities, and the digital age has increased the technological tools that are available to do so. Currently, more research is needed in the realm of gamifying K-12 education, where only a limited number of studies have been published (Dichev & Dicheva, 2017). However, there have been four game elements identified that can help a K-12 teacher to successfully gamify learning activities in the classroom: (a) freedom to fail, (b) rapid feedback, (c) progression, and (d) storytelling. While implementing these game elements in the classroom, teachers should purposefully consider what will best help their student to learn. When teachers thoughtfully gamify their classrooms, they are likely to see an increase in student motivation and engagement.

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