

## **The Convergence of Gamification and Mindset: Fostering Growth Mindset Through the Implementation of Game Mechanics in Education**

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The notion of mixing play with learning has long been accepted as an effective instructional strategy. Game-based learning as related to learning theory has been deeply explored through meta-analysis (Wu, Hsiao, Wu, Lin, & Huang, 2012). A concept less explored by the research, however, is gamification, which is the application of game mechanics and game design elements to non-game contexts (Simões, Redondo, & Vilas, 2013). Limited research requires cross-disciplinary discussions to increase both widespread interest in the topic and authority in subsequent research proposals. Based on a review of the literature, we have discovered a few studies (Dubbels, 2016; O'Rourke, Haimovitz, Ballweber, Dweck, & Popović, 2014; Pike, 2105; Prakash & Rao, 2015) that relate gamification to growth mindset - the belief that intelligence is malleable (Dweck, 2006). These foundational articles, coupled with other articles that explore each concept individually, have led to the conclusion that gamification could be a valuable instructional strategy in the classroom because of its ability to encourage a growth mindset. This article will first describe gamification and growth mindset individually, and our conceptual framework will then illustrate the convergence of these concepts in relation to the topics of motivation, freedom to fail, and resilience. This convergence demonstrates that the intentional use of gamification can encourage growth mindsets in students leading to positive 21st century educational outcomes such as the development of creativity, critical thinking, collaboration, and communication.

### **Gamification**

Gamification is a relatively new term that has become popular in recent years

(Zichermann & Cunningham, 2011) with rapid adoption in business, marketing, healthcare, and social media (Dicheva, Dichev, Agre, & Angelova, 2015). In contrast to game-based learning, which employs fully-developed games for educational purposes, gamification is the application of game mechanics and game design elements to non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011; Simões et al., 2013) with the common objective of increasing user engagement (Domínguez et al., 2013) and influencing behavior (Morford, Witts, Killingsworth, & Alavosius, 2014; Schoech, Boyas, Black, & Elias-Lambert, 2013). To further dissect this definition, game mechanics are the interactions between the player and the game that results in gameplay (e.g., badges, leaderboards, and point reward systems), and game design elements are the strategies to engage the player in the game (e.g., storytelling, collaboration, and competition) (Deterding et al., 2011). In educational contexts, examples of desired student behaviors that can be influenced by gamification include attendance, level of focus, creation of meaning, and risk-taking (Huang & Soman, 2013). Gamification encourages gameful, or playful, behavior, leveraging students' natural proclivity for socializing, learning, competing, reflecting, and growing as individuals (Morford et al., 2014).

In defining gamification, it is important to clarify what gamification is not. While most people will connect gamification to digital video games, it is not limited to technology because games manifest in various forms such as board games, card games, mental games, and even imaginative games. Technology does not have to be the vessel through which gamification delivers a lesson, and technology illiteracy or inaccessibility should never be the reason for avoiding gamification in the classroom. Most

importantly, gamification is not simply the addition of badges, or visual indicators of achievement, to a classroom; rather, gamification requires purposeful instructional design strategies to elicit the desired behavioral changes (Zichermann & Cunningham, 2011).

### **Growth Mindset**

To theoretically inform the practice of gamification, research pulls from cognitive psychology - specifically from the concept of growth mindset (Dubbels, 2016; O'Rourke et al., 2014; Pike, 2105; Prakash & Rao, 2015). This research shows that the influences of one's mindset permeate through a plethora of academic, emotional, and personal realms (Dweck, 2006). Cognitive psychology research has distinguished two main categories of mindset: growth and fixed. A growth mindset is defined as the belief that intelligence is a fluid construct that directly reflects past, present, and future effort and learning experiences (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 2006, 2010). Fixed mindset, on the other hand, is the belief that people have a rigid intelligence that they are unable to change through learning experiences (Dweck, 2006, 2010). Although mindsets are relatively pliable, they stem from deep-rooted beliefs about the nature of intelligence; thus, they influence how people perceive and approach challenges, how they respond to failure, and what they value (Dweck, 2006; Farrington, 2013).

People displaying a growth mindset actively seek out experiences that can make them more intelligent while people with fixed mindsets shirk situations and experiences in which they could appear unintelligent. This difference stems from the aforementioned beliefs about the rigidity of intelligence. If a person believes that intelligence grows over time with learning experiences, then that person is more likely to seek out such experiences in an effort to cultivate and extend their intelligence (Mangels, Butterfield, Lamb, Good, & Dweck, 2006). A person who believes that their intelligence is set in stone, on the other hand,

doesn't believe that anything they do can change their qualities. The only task, then, is to create a superficial illusion of intelligence in an attempt to deceptively inflate others' perceptions of one's intelligence. In other words, rather than actively seeking out challenging learning experiences, people with fixed mindsets prefer rote exercises that can easily be accomplished without effort (Mueller & Dweck, 1998). Taken holistically, the mindset students embody affects their motivation, their perception of failure, and even their resilience, which in turn impacts their ability to engage in deep learning (Farrington, 2013). It is therefore essential that instructional models foster growth mindset attitudes and avoid fixed perceptions of failure.

### **Conceptual Framework**

In reviewing literature on gamification and growth mindset separately, three topics emerged as shared attributes. The conceptual framework illustrated in Figure 1 identifies these shared attributes as motivation, freedom to fail, and resilience.

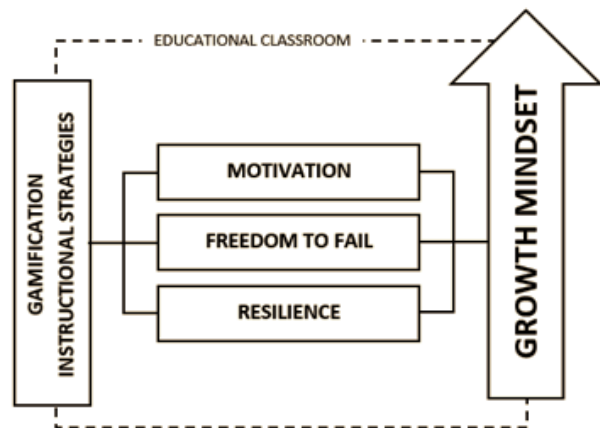


Figure 1. Conceptual framework. This figure illustrates the convergence of gamification and growth mindset.

Within the confines of the educational classroom, the application of gamification instructional strategies involves motivation,

freedom to fail, and resilience, all of which encourage a growth mindset. The relationship among gamification, growth mindset, and these shared attributes is fluid in nature resulting in a play of various concepts overlapping and interacting to improve student learning. The following discussion will explore each of these shared attributes with respect to gamification and growth mindset. While these concepts are interrelated and often dependent upon each other, this review will discuss each concept individually to help highlight the important nuances in terminology. This discussion will help support the conclusion that gamification could be a valuable supplemental instructional strategy in the classroom because of its ability to encourage a growth mindset.

### **Motivation**

Research has shown that the instructional strategies employed by teachers affect students' motivation which then impacts achievement (Lin-Siegler, Dweck, & Cohen, 2016). Good teaching, like good video games, requires three main principles for motivation: the student must want to try even when they are afraid to try, the student must want to put in effort, and the student must achieve some meaningful success from the result of this effort (Gee, 2007). Interestingly, students with fixed mindsets often see these same principles as threats to their perceived intelligences (Dweck, 2015). Gamification targets the first principle by enticing students to try or to participate in a new learning activity through both intrinsic and extrinsic motivators. A common gamification instructional strategy is to first identify behaviors that are to be encouraged and then to assign rewards, or extrinsic motivators, such as badges, achievements, or points to those behaviors (Becker & Nicholson, 2016; Zichermann & Cunningham, 2011). Reward-based gamification such as this is very similar to current education practices in that it utilizes performance-based measures of success which elicit fixed mindsets from students and rely on extrinsic motivators to encourage behavioral change (Elliott & Dweck, 1988). Conversely,

meaningful gamification explores intrinsic motivators such as player-created narratives, authentic play-based experiences, and reflection to help students make meaningful constructs around the content being delivered, which will encourage students to continue the learning process even after the game mechanics themselves are no longer exciting or novel (Becker & Nicholson, 2016). While rewards-based gamification is the most commonly deployed gamification instructional strategy, meaningful gamification is the approach that encourages opportunities to learn for the sake of learning, which is the desired motivation behind students displaying a growth mindset (Dweck, 1986, 2015). Research shows that only people with growth mindsets prioritize such meaningful learning over superficially appearing intelligent (Dweck, 2006).

The second principle of motivation requires the student to put forward effort in trying. Motivation to put forward effort stems from the student's identity in the classroom and voluntary participation (Gee, 2007; Pike, 2015). Similar to role-playing in video games, gamification requires the students to play specific roles in the classroom; how the students view their individual identities is paramount to their success in the classroom (Gee, 2007). When students commit to a learning activity, they must be willing to see themselves in terms of an identity that is capable of learning and capable of being successful (Gee, 2007). This identity encourages a growth mindset in viewing effort as the catalyst of ability, which then turns into accomplishment (Dweck, 2006, 2015). Students with this growth mindset value the effort regardless of the outcome because the effort is how someone can change as a person (Dweck, 2006), promoting an incremental theory of students' intelligence that focuses on the process of learning and the malleable view of intelligence (Blackwell et al., 2007). Gameplay rewards this effort with several benefits including positive feelings, social connections, and a meaningful connection with the content (Pike, 2015).

The third principle of motivation is the idea that the student must achieve some meaningful success as the result of the effort put forth. Games are very good at rewarding different levels of play and different levels of success, but the initial increase in motivation comes from the idea that the initial minimal input results in a lot of output (Gee, 2007, ). This idea should not be confused with the fixed mindset philosophy that hard work should be avoided because it is a sign of unintelligence (Dweck, 2010, 2015); instead, gamification provides an opportunity to award students immediately for their efforts (Gee, 2007). In praising this effort through growth mindset messaging, students become motivated by mastery and difficult challenges (Mueller & Dweck, 1998), rather than by compliance-based or performance-based assessments (Pike, 2015). The convergence of gamification and growth mindset motivates students towards mastery, which requires the freedom to fail in the learning environment.

### **Freedom to Fail**

Michael Jordan epitomized the importance of failure when he said “I’ve missed more than nine thousand shots. I’ve lost almost three hundred games. Twenty-six times, I’ve been trusted to take the game-winning shot, and missed” (as cited in Dweck, 2006). Failures are important in learning as they allow synapses to fire which help neurons form connections and ultimately enable the brain to grow (Boaler, 2016; Mangels et al., 2006). These findings contrast with the beliefs that within the classroom mistakes are to be ridiculed and not celebrated, and that failure is not a viable option (Boaler, 2016). This belief -- that failure should be avoided at all costs -- stems from a culture that stresses performance over deeper conceptual learning (Boaler, 2016). This results in students who shirk challenges (Mueller & Dweck, 1998), who avoid learning opportunities and exhibit learned helplessness (Elliot & Dweck, 1988), and who pay attention when feedback allows them to self-assess their own intelligence rather than when feedback

stimulates learning (Mangels et al., 2006). Most significantly, these cultural influences create fixed mindsets in students that increase their likelihood of succumbing to challenges (Blackwell et al., 2007) and rejecting learning opportunities (Dweck, 2006).

In gamification and growth mindset, however, although students may be just as frustrated by failure, they respond to it very differently. The “cost of caring is not prohibitive” (Gee, 2007, p. 57), and students are able to quickly rebound (Mangels et al., 2006) and then persist to find a solution (Elliot & Dweck, 2006). This freedom to fail comes from the idea that “losing is not losing, and the point is not winning easily or judging yourself a failure” (Gee, 2007, p. 175). Gamification drives at the main point of failure, which is the learning opportunities that arise from making mistakes.

Teachers should therefore adapt to this paradigm of freedom to fail because research shows that changing a person's mindset affects how they respond to failure (Nussbaum & Dweck, 2008). By embracing failure, students are able to struggle through problems (Gee, 2007) and to respond to mistakes with increased effort (Blackwell et al., 2007). When educators couple the freedom to fail in gamification with feedback and teaching students how to learn from failure, they help foster and sustain growth mindset qualities (Dweck, 2006). This atmosphere nurtures resilience in students (Pike, 2015) by teaching them that failure is nothing more than a learning experience on the road to success (Dress, 2016).

### **Resilience**

Resilience as related to academic persistence is essential for students in that it can foster deeper learning (Farrington, 2013). In relating resiliency to mindset, Dweck (2006) noted that “willpower is not just a thing you have or don’t have. Willpower needs help” (p. 240). Coupled with research showing that praising effort over achievement increases



motivation (Mueller & Dweck, 1998), and research that suggests that mindsets are malleable and are influenced by design factors (Farrington, 2013), resilience becomes a learned attitude. This notion transforms the idea of resilience from an accidental educational by-product into an intentional instructional design element that requires cultivation.

Gamification cultivates resilience through the sharing of failures rather than just successes, which leads to taking more calculated risks in the hopes of making an impact among peers (Prakash & Rao, 2015). When beginning an activity, gamers believe they have the potential to succeed by learning from their inevitable mistakes (McGonigal, 2011). Similarly, growth mindsets allow students to develop resolve and transforms learning into a process of tackling challenging pursuits and using failures to bolster their confidence of success (Dress, 2016; Dweck, 2006). The link of resilience between gamification and growth mindset is exemplified in a study by Pike (2015) who found that the use of gamification instructional strategies resulted in higher levels of student resilience, self-esteem, and willingness to learn from mistakes. Interestingly, the students also displayed growth mindset attributes in their belief that “learning is more important than watching other people fail” (Pike, 2015, p. 5).

This research study further supports research in growth mindset because students with growth mindsets are more eager to take risks, challenge themselves, and persist through difficulty (Dweck, 2006). Although students with fixed mindsets start with the same amount of confidence as those with growth mindsets, the confidence and resiliency of the former group becomes increasingly fragile when setbacks occur (Dweck, 2006). So, whereas students with fixed mindsets are likely to give up and experience a drop in self-esteem, students with growth mindsets will persist and search for strategies until they are finally able to solve the problem (Dweck, 2006).

In turn, gamification brings “the psychological strengths you naturally display when you play games - such as optimism, creativity, courage, and determination - to your real life” (McGonigal, 2015, p. 2). These strengths allow students to persist through challenges and utilize strategies that allow them to become more and more successful at tackling tough problems (McGonigal, 2015). In other words, gamification produces perseverance and resilience – two attributes essential for growth mindset (Dweck, 2006).

### **Implications for Practice**

The adaptable and challenge-seeking mindset that is associated with a growth mindset and that is encouraged by gamification is becoming increasingly important in the 21st century. This importance is due, in part, to its ability to equip students with essential literacies such as creativity, critical thinking, collaboration, and communication (Kingsley & Grabner-Hagen, 2015). Educators can introduce gamification into the classroom with the intention of encouraging desired behaviors that lead to a growth mindset. By supplementing classroom instruction with gamification strategies, such as leaderboards, goal-setting, and rewards, educators can provide students with increased opportunities to focus on the process of learning rather than focusing on grades alone, which will make them more likely to succeed over the long term (Dweck, 2006).

A common application of gamification in many classrooms is the use of a leaderboard. Within an already safe and supportive environment, a leaderboard can provide an ongoing source of motivation for some students (Domínguez et al., 2013). Purposeful design of the leaderboard can prevent students from focusing too heavily on the results and achievements instead of the process of learning, which better illustrates their tenacity and challenge-seeking nature. An example of good instructional design is a leaderboard that does not directly track the grades of students, but rather tracks positive changes implemented after

revisions, or problems solved after consultation with peers. Another good design example is a leaderboard that keeps track of desirable learned techniques or behaviors. This type of leaderboard cultivates a growth mindset by celebrating the process of learning instead of fixating on instant perfection, which can lead to a fixed mindset (Boaler, 2016; Dweck, 2006).

When people think of games, most will point to the rules of a game and the overall goal of a game (*how do I win?*). Gamification applies these rules and goals to any learning activity for a student to *win*, or master the content. These goals should not only be lofty, but they should also be crafted in a way that is ultimately attainable through struggle (Boaler, 2016; Gee, 2007). For developing a growth mindset in the gamified classroom, the goals must require high standards of effort, work quality, and attention to the learning process (Dweck, 2006). The goals for a truly engaging learning experience should also include a mixture of small incremental goals and overarching long-term goals which are tied to learning objectives or standards of learning. Formative assessments of smaller goals provide opportunities for safe failure, during which the students can explore the concepts being presented, receive feedback on their techniques, and make informed adjustments. This freedom to fail gives students the flexibility and autonomy necessary to find unique paths to goals and to cultivate creativity (Kim, 2016). Most importantly, the student is allowed to choose *how* to win or how to attain the goal, based on their own experience, which is valuable for maintaining motivation and creativity (Becker & Nicholson, 2016).

Many educators are familiar with reward structures in the form of points and grades, and therefore, they are most comfortable applying rewards-based gamification strategies using these traditional and extrinsic motivators in their classrooms. As previously discussed, however, this application of rewards-based gamification utilizes performance-based measures of success which elicit fixed mindsets from students

(Elliott & Dweck, 1988). To encourage growth mindsets in the classroom, educators must connect meaningful rewards with the desired behaviors. For example, O'Rourke, Peach, Dweck, and Popović (2016) found that rather than rewarding students at arbitrary moments throughout a course, such as at the end of a unit of study, educators should reward students immediately with feedback when they display the desired behavior. Coupling these rewards with adequate time for reflection within the curriculum, students can better create meaningful and personal connections from learned facts and techniques to the real world (Becker & Nicholson, 2016). Thus, when used appropriately and in conjunction with reflective learning, rewards can enhance students' motivation to engage in meaningful learning.

### **Conclusion**

Leaderboards, goal-setting, and rewards represent valuable supplemental gamification instructional strategies for capturing students' attention and keeping students motivated toward topics that they may have been reluctant to engage in. Skilled educators have successfully applied rewards-based gamification to the classroom in the past, but the alignment of meaningful gamification with a designed purpose allows educators to encourage an adaptable and resilient growth mindset in students. This cross disciplinary discussion on gamification and growth mindset illustrates a convergence on the topics of motivation, freedom to fail, and resilience, specifically when referencing instructional strategies in the classroom. This convergence results in implications for educational practice in that educators wishing to prepare their students with relevant 21st century literacies can leverage gamification instructional strategies to encourage the desired behaviors consistent with a growth mindset. While our conceptual framework begins to make connections between gamification and growth mindset, in the educational classroom, our conclusions are limited by the lack of empirical research covering this convergence. These limitations

restrict the strength of our conclusions; however, they simultaneously highlight the need for further research in this area.

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