Not All Competitions Are the Same: Digital Game-based Learning Environments That Incorporate Competition Facilitates Students' Learning Motivation

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Keywords

competition, digital game-based learning environments, learning motivation

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Abstract

This text presents an argument that competition, as a pedagogical design element, facilitates students' learning motivation in digital game-based learning environments (DGBLEs). Since competition has long been regarded as an adverse pedagogical element for fostering students' learning motivation, a considerable proportion of educators and researchers in the U.S. have a variety of concerns about implementing competition in educational practices. However, the function of competition in DGBLEs could be fundamentally different. By reviewing major concerns about competition, this text refutes two major concerns about competition and claims that DGBLEs that incorporate competition facilitate students' learning motivation.

Key Words: competition, digital game-based learning environments, learning motivation

Introduction

Competition, as a pedagogical design element, has a controversial history. Many researchers argue that competition has positive impacts on students' learning processes. Empirical evidence has shown that competition increases students' learning interest and efficiency (Atanasijevic-Kunc et al., 2010) and has the potential to draw students' attention and raise their excitement when learning (Atanasijevic-Kunc et al., 2010; Cheng et al., 2009). Other researchers reported that competition is positively related to the students' academic performance (Johnson et al.,1985) and cooperation among students (Burguillo, 2010). However, the negative aspects of competition are more arresting. Competition has been considered to be harmful to students' intrinsic motivation. Based on empirical evidence from an experiment, Deci et al. (1981) claimed that competition decreased the participants' intrinsic motivation. Although some

other empirical studies have shown that competition is positively related to learning motivation (Burguillo, 2010; Bazylev et al., 2014; Cagiltay et al., 2015; Chen, 2019), most of these studies emphasize that extrinsic motivation is what competition has salient effects on. Researchers and educators are also concerned that competition could undermine low-achieving students' learning motivation (Kohn, 1992, 2019), create anxiety in students (Deci & Flaste, 1996; Schaefer et al., 2016; Yang et al., 2020), and compromise collaboration and cooperation in inquiry learning (Tracy & Morrow, 2017).

However, this text argues that digital game-based learning environments (DGBLEs) change how competition functions for educational purposes. As early as the beginning of the 21st century, Prensky (2001b, 2001c) pointed out that learning through games is the way of the future. Digital games have been pervasive in not only the lives of digital natives, but the lives of all modern residents (Prensky, 2001a, 2001b). Compared with traditional educational games (non-digital games, such as board games) in the classroom and home settings, DGBLEs utilize rich display features, multimedia elements, instant feedback, worldwide connectivity, and automatic adaptivity to create appealing gameplay experiences for educational purposes (Law & Sun, 2012). This text argues that, in DGBLEs, competition facilitates students' learning motivation. This text will firstly introduce the nature and characteristics of competition and DGBLEs, and then critically refute two major concerns about competition by presenting how competition facilitates students' learning motivation in DGBLEs.

Competition

To better understand how competition functions in educational practices, it is necessary to clarify the nature of competition and the relationship between competition and collaboration in learning.

The Nature of Competition

Competition is an aspect of the nature of both humanity and human society (Cornaglia et al., 2019). Animals compete to win food, territory, and the chance to mate. In the modern world, humans compete with each other to win limited resources (Cornaglia et al., 2019). Cantador and Conde (2010) asserted that "Human competition is a contest where two or more people strive for

a goal that cannot be shared, usually resulting in a victor and a loser" (p. 11). Based on the definition of competition, the occurrence of human competition relies on two core factors: that resources are limited, and that people desire such resources (Johnson & Johnson, 1989). The limitation of resources means that these resources cannot meet all competitors' needs.

Competition will not occur where any one of the two factors is missing (Johnson & Johnson, 1989). Unfortunately, the resources in modern society can by no means meet everyone's needs and, as a result, "competition has also spread to all sectors of society, including fields like the arts, education, health care, and philanthropy, where there are growing needs but scarce resources" (Porter, 2008, p. xi). Thus, competition is constantly and pervasively occurring in modern life, as well as in educational practices. In educational practices, the scarcity of resources is pervasive as well. One direct example is that students compete with each other for the limited enrollment places from outstanding high schools, colleges, and universities. Education is also assumed to be the path by which individuals facilitate their personal development and pursue better careers (Butera, 2021; Nelson & Dawson, 2017). It is inevitable that the competition for superior job opportunities could cause competition on campuses. Although teachers have been deliberately avoiding competition in the classrooms of elementary and secondary schools in the U.S., there is always a tendency for competition to take place (Butera, 2021; Rich, 1988; Rich & DeVitis, 1992; Sarid, 2021).

The Two Concerns About Competition That This Text Refutes

Among the variety of concerns that educators have regarding competition, two major concerns stand out since they are related to the crucial psychological factor of learning: motivation. This text will refute these two major concerns and illustrate how competition can facilitate students' learning motivation.

First, the concern that competition undermines students' intrinsic motivation has been widely accepted by researchers and educators since Deci and Ryan (1985, 2008, 2012) brought Self-determination Theory (SDT) to the areas of psychology and education. Yet, this text argues that, with the help of gameplay mechanisms in DGBLEs, competition has a positive effect on students' intrinsic motivation.

Second, teachers are concerned that competition could create anxiety, and thus, harm students' learning motivation (Deci & Flaste, 1996; Reeve & Deci, 1996; Schaefer et al., 2016; Tauer & Harackiewicz, 2004; Yang et al., 2020). They believe that zero-sum game is the only diagram of competition that will inevitably make some of the students losers. The fear of being losers in competition could harm students' learning motivation, especially for the low-achieving students, while motivating others (Deci et al., 1981, 1991; Deci & Flaste, 1996; Reeve & Deci, 1996; Santhanam et al., 2016; Tauer & Harackiewicz, 2004). This text criticizes this belief by analyzing the nature of competition and demonstrating how DGBLEs profoundly change the way competition functions in educational practices.

DGBLEs Address Two Major Concerns about Competition

In this section, this text will (1) introduce the basic concept of DGBLEs, (2) present the theoretical base of the concern that educators have about competition undermining students' intrinsic motivation, (3) illustrate how DGBLEs address this concern and facilitate students' intrinsic motivation, (4) present the theoretical base of the concern that educators' have about competition creating anxiety, and (5) illustrate how DGBLEs address this concern and create enjoyment and motivation.

Digital Game-based Learning Environments (DGBLEs)

The DGBLE is a relatively new concept in education. It incorporates the learning process into the gameplay environment and utilizes the features of games to facilitate learning (Prensky, 2001). Given that individuals are more likely to engage in activities that are enjoyable and fun (Nakamura & Csikszentmihalyi, 2003), DGBLEs utilize digital features, such as story, leading board, badges, and interaction to motivate students and improve their learning engagement (Prensky, 2003). In DGBLEs, students can easily cooperate or compete with others who live in another country with the help of the internet. Mobile network and cloud computing allow students to learn/play anywhere at any time from any device connected to the internet. With help from the internet, cloud computing, and various new digital technologies, DGBLEs are helping students to learn in innovative ways and make changes on critical factors in education practice, including competition.

The following sections of this text will present two major concerns that educators and researchers have about competition and then build the argument that DGBLEs have the potential to profoundly change these concerns or significantly diminish them.

The Concern about Competition Undermining Intrinsic Motivation

Self-Determination Theory (SDT) distinguishes human motivation between intrinsic motivation and extrinsic motivation (Deci & Ryan, 1985, 2008, 2012). Robert Henri, the great American art teacher, described the state of being intrinsically motivated: "The object of painting a picture is not to make a picture - however unreasonable this may sound. The picture, if a picture results, is a by-product and may be useful, valuable, interesting as a sign of what has passed. The object, which is back of every true work of art, is the attainment of a state of being, a high state of functioning, a more than ordinary moment of existence" (Deci & Flaste, 1996, p. 21). Ryan and Deci (2000) defined intrinsic motivation as "the doing of an activity for its inherent satisfactions rather than for some separable consequence" (p. 56) while extrinsic motivation "refers to doing something because it leads to a separable outcome" (p. 55). Ryan and Deci (2000) also assert that "when intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards" (Ryan & Deci, 2000, p. 56). Deci and Flaste (1996) used the terms self-motivation and external motivation to refer to intrinsic and extrinsic motivation. To advocate for intrinsic motivation, they stated:

> *Self-motivation*, rather than external motivation, is at the heart of creativity, responsibility, healthy behavior, and lasting change. External cunning or pressure (and their internalized counterparts) can sometimes bring about compliance, but with compliance come various negative consequences, including the urge to defy. (Deci & Flaste, 1996, p. 9)

Realizing intrinsic motivation is the power that drives people to fully engage in an activity, educators have a deep desire to foster and maintain intrinsic motivation in their students. In contrast, competition has been regarded as a pedagogical approach that undermines intrinsic motivation and, thus, has been rejected by researchers and educators (Kohn, 1992; Rich, 1988; Rich & DeVitis, 1992).

The negative perception of competition is rooted in the early research of Deci, Betley, Kahle, Abrams, and Porac (1981). Based on empirical evidence from an experiment, Deci et al.

(1981) reported that competition decreased the participants' intrinsic motivation. In this experiment, 40 male and 40 female participants were told to solve a spatial puzzle named Soma. The experimental group of participants was told they were competing with another participant who was actually an experimental accomplice, and the control group was simply requested to solve the puzzle as fast as they could. The experimental accomplices let the participants in the experimental group win all three rounds of solving the puzzle. After solving the puzzle, the participants in both groups were left in the experimental room individually for eight minutes and were secretly observed. There were two other sets of puzzles in the experimental room that were available to the participants. The independent variable of this experiment was how much time the participants chose to continue to play the puzzle game after being told the experiment was over. The dependent variable of the experiment was the participants' intrinsic motivation. The hypothesis of Deci et al. (1981) was that the more time the participants used to play with the other puzzle sets after solving the required one, the higher-level intrinsic motivation was demonstrated.

The results of this experiment above indicated that the intrinsic motivation of the participants in the experimental group was significantly lower than that of the participants in the control group. According to SDT, what substantially undermines intrinsic motivation is the sense of being controlled, which can be pressure from affiliated relationships or, surprisingly, rewards (Deci & Flaste, 1996; Ryan & Deci, 2000). If people are promised to get a reward by taking certain actions, they are under the control of the reward to engage in the action, instead of engaging autonomously (Deci & Flaste, 1996). Deci and Flaste (1996) believed that it was the competition experience in the aforementioned experiment that undermined the intrinsic motivation of the participants in the experimental group since they were controlled by the winning state. Deci et al. (1981) claimed that the winning state, which is the reward from competition (such as beating the other person or the other team) is actually extrinsic to the activity itself since it is "separate from and follows the behavior" (p. 79). The sense of being controlled by the goal of winning spoiled the intrinsic motivation of playing the interesting puzzle game (Deci & Flaste, 1996). The finding of this experiment has been the essential empirical evidence that is frequently cited as proving the detrimental effect of competition. Thus,

researchers such as Deci et al. (1981) and Kohn (1992, 2019) regarded competition as an adverse factor for intrinsic motivation and raised the long-existing concern about competition in educational practices. However, in DGBLEs, the relationship between competition and intrinsic motivation is significantly different.

Competition in DGBLEs Facilitates Intrinsic Motivation

While Deci et al. (1981) claimed that the reward from competition, which is the winning state, is "actually extrinsic to the activity itself" (p. 79), Kohn (1993) defined the structure of extrinsic reward as "Do this to get that" (as cited in Miklasz, 2020, p. 3). The substantial feature of extrinsic reward is that it is not a part of the activity itself, and it diverts people from engaging in the activity to pursuing the reward. Extrinsic rewards can be the need to acquire things, certain status (e.g., the title of a championship), or the sense of belonging (Miklasz, 2020). Extrinsic motivation leads the participants of an activity to a separate goal and never loops back to the activity itself. It is a one-way process where the participants lose their intrinsic motivation to further engage in the activity as soon as they obtain the extrinsic reward. For example, professional tennis athletes train themselves to compete with other athletes. The reward for this kind of competition is winning the titles and/or the prizes from the games. But winning the titles and/or the prizes is not a part of playing tennis itself. Figure 1 shows the structure of extrinsic reward.
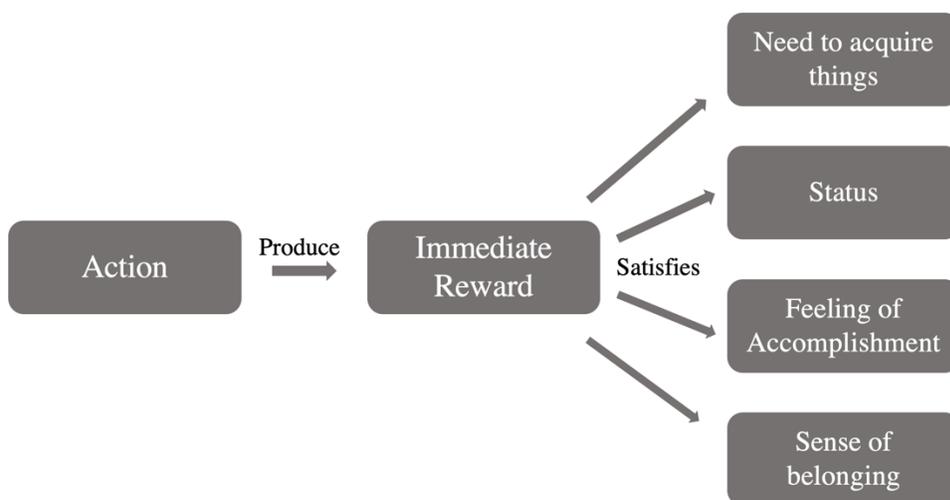

Figure 1: The structure of extrinsic reward (Miklasz, 2020, p. 6)

According to Deci et al. (1981) and Miklasz (2020), the prizes are extrinsic rewards that could undermine the players' intrinsic motivation.

However, the reward from competition in DGBLEs, which is the winning state, is intrinsic rather than extrinsic. In his seminal work *Man, Play, and Game*, Roger Caillois (2001) defined play as "an activity which is not obligatory, has its own space and time, is uncertain in its outcomes, creates no material wealth, is governed by rules, and has elements of make-believe and unreality" (as cited in Prensky, 2001c, p. 5-6). On the basis of these characteristics of play, DGBLEs create boundaries that delimit digital gameplay worlds that have their own space and time, where the players engage in the games autonomously and play for no extrinsic reward (such as material wealth). The rewards DGBLEs provide are from the gameplay environments themselves instead of external and separable goals. The structure of intrinsic rewards is "Do this, to do this more" (Miklasz, 2020, p. 3). The winning state from competitions in DGBLEs matches this structure. The following logic loop can be seen in many games:

> Why fight monsters? To get experience points.
> Why get experience points? To go up levels.
> Why go up levels? To get stronger.
> Why get stronger? To fight harder monsters. (Miklasz, 2020, p. 4)

In this example, the competition happens between the players and the monsters in the game. The winning state from this in-game competition is not leading the players to pursue something outside the game, such as money or prizes. Instead, winning the competition with the monsters leads the players to play the game more (on a higher level). It is "do this, to do this more" (Miklasz, 2020, p. 3). The winning state of competition in DGBLEs generates effects as the rewards that help the players to compete with their opponents better in the following gaming process. In other words, the winning state of in-game competition loops back to the game itself, instead of leading the players with extrinsic rewards, such as money and prizes out of the game. Figure 2 shows the loop of intrinsic rewards.
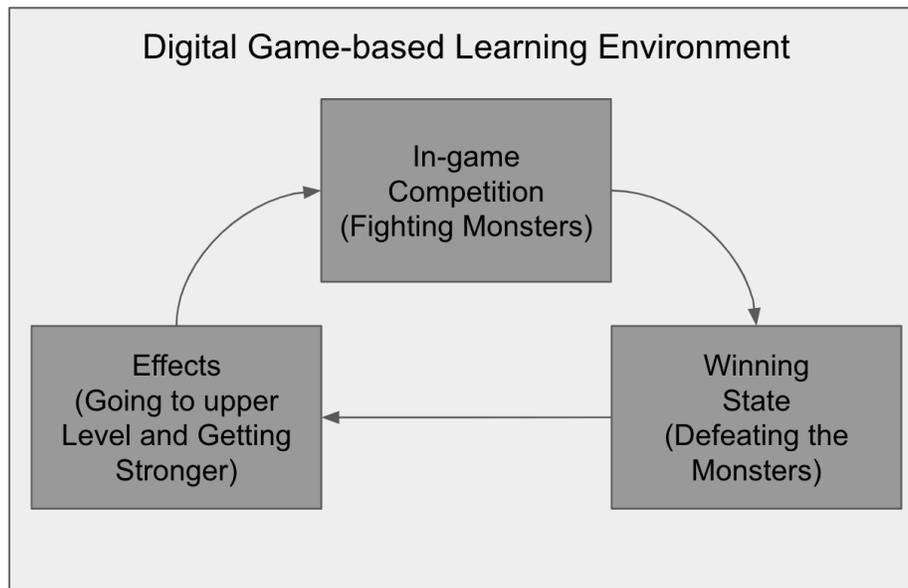
Figure 2: The loop of intrinsic rewards

Moreover, the competition in DEGLEs can be modified in multiple ways. Instead of fighting with monsters in the game, the players can of course directly fight (compete) with each other. When the winner picks his trophies or get more experience points from the game, the reward from the competition still loops back to the game itself, as Figure 2 has shown.

While playing the game and engaging in the in-game competition, the players' motivation strictly aligns with what Ryan and Deci (2000) described about intrinsic motivation: doing an activity "for its inherent satisfactions rather than for some separable consequence" (p. 56). The inherent satisfaction of engaging in the game is reinforced by the in-game competition, and thus, the intrinsic motivation is formed and facilitated.

The Concern About Competition Creating Anxiety and Undermining Learning Motivation

Among all the concerns about competition in educational practices, causing anxiety in students (Reeve & Deci, 1996; Tauer & Harackiewicz, 2004) seems to play a major role at the intersection of multiple concerns, including creating mutual mistrust among students (Kelley & Thibaut, 1969), leading to poor academic performance (Kohn, 1992, 2019), and undermining students' learning motivation (Santhanam et al., 2016). The direct source of the anxiety is the fear of being losers in competitions. For students, especially lower-achieving students who are less competitive than their peers, avoiding participating in competitions is the best strategy to

avoid the fear of being losers. However, this strategy prevents students from engaging in competitions which can be beneficial to their learning outcome. If the competitions keep happening, the students will raise constant anxiety about participating in new competitions and other educational activities that are related to competitive scenarios (Kohn, 1992). As a result, their learning motivation decreases. Nevertheless, based on the pedagogical advantages of DGBLEs, this text argues that competition in DGBLEs is able to diminish students' anxiety, create enjoyable learning experiences, and then facilitate their learning motivation.

The Competition in DGBLEs Creates Enjoyment and Motivation Instead of Anxiety

In DGBLEs, Everyone Wins

Cantador and Conde (2010) define human competition as "a contest where two or more people strive for a goal that cannot be shared, usually resulting in a victor and a loser" (p. 11). Likewise, Kohn (1992) claims that competition is about allowing one or a few group members to win, or to be rewarded, which implies the existence of losers. The paradigm of competitions in sports, gambling, and other fields has shaped the belief pervasively that competition is always a zero-sum game, where there must be winners and losers. If making some of the students losers in competitions is inevitable, it may be appropriate to exclude competition from their classrooms. Yet, it is not the case for competition in DGBLEs. Every participant can be the winner simultaneously.

Firstly, DGBLEs make it possible to set multiple (theoretically unlimited) criteria to be the winning standard for any given competition. For example, in a car race game, such as *Need for Speed*, participants could be the fastest racer, the best drifter, the fastest lap record holder, the most beautiful car body modification designer, or even the safest driver (with the least scratches and collisions). All the winning criteria can also be set to multiple time points in the process of the competition. Likewise, when playing an ESL vocabulary game, a student may be the leading player in the spelling competition, and another student can be the winner of the following sentence translation contest. Secondly, DGBLEs have flexible space and time spans, which allows the competing participants to reach the winning standards wherever and whenever they can. For instance, a student who participates in an educational game is actually one of the slowest students to reach the winning standard, but he will also be able to "win" the game when

he reaches the standard of winning at a later time point, the system (game) can set to give this student an equal congratulation as all other "winners." In addition, the rewards or "prizes" in DGBLEs are unlimited. With the help of digital features in DGBLEs, the winning state in competitions can be divided into smaller pieces and deployed throughout the whole process of competitions. One player of an ESL vocabulary game may be the tenth out of 15 players at the final leaderboard of a word spelling contest, but he is awarded as the fastest player who finishes the first ten correct word spellings. This player is also one of the winners of the in-game competition.

Well-designed DGBLEs should and can award every student in competitions. With the help of artificial intelligence and big data technology, future DGBLEs can even create new winning titles based on specific players' performance while the in-game competition is ongoing. By allowing the majority or even all the students to win in competitions and letting them enjoy the satisfaction of winning, DGBLEs diminish the anxiety of being losers in the students and create the intrinsic reward loop illustrated in the previous section.

Well-Crafted Winning Information Alleviates Students' Anxiety

In traditional classroom settings, students know who the winners and losers are after competitions end. The depression of being the losers or the fear of being the losers in future competitions could cause anxiety in students (Kohn, 1992, 1993). Even if there is no punishment or serious consequences when students fail in competitions in classrooms, they have visual contact with the teachers and the "winners", which gives them considerable social pressure. Especially when the "winners" enjoy their winning and accept congratulations from the teacher and other students, the depression of losing the competition will be augmented at the "losers" end. However, the situation is different in DGBLEs.

In DGBLEs, information about winning and winners can be presented in ways that avoid causing anxiety in the competitors. When a boy finishes a round of Slither.io (an online game where players control their snakes trying to eat each other) and ends up getting the 15th highest score in the group, the information shown on his screen is a congratulation on how many snakes he has eaten and the scores he has gained. He does not know there are just 16 players in the game

since the game was designed to show the ranking information to the top three players only. The boy knows that the game is a competition and how it shows winning information. He also knows that he is not one of the top three plays. However, if the competition is a math quiz happening in the classroom and this boy gets the second-lowest score in his class, he would be much more frustrated and have a lower motivation to engage in future quizzes. Let's further imagine that the classroom teacher moves the math quiz to an online quiz game and the boy still gets one of the lowest scores in his class, but the information on the boy's screen is just his answers to the questions and an explanation about how many more right answers he needs to be one of the winners. In this scenario, the online math quiz is still a competition but without losers. The boy is not a loser here either. He is one of the players, as everyone else, trying to win the game next time. When we compare the stress and anxiety the boy has from the classroom math quiz and the online math quiz game, it is not hard to draw the conclusion that the boy's learning motivation is better protected in the online game environment, which is a DGBLE. In these examples, the boy can be considered as a low-achieving student but his anxiety of participating in competitions is significantly reduced in DGBLEs.

Multiple Attempts Feature and Self-competition In DGBLEs Make Competition Low-stake

Even though there are no serious consequences for losing competitions in the classroom setting, students still may face depression, social pressure, and self-doubt caused by losing competitions. Competitions in classroom activities are still high-stakes games for students. Yet, the competition happening in DGBLEs is another story.

DGBLEs are capable of restarting a new round of competition much more quickly and conveniently than in the classroom settings, which allows the players/students to quickly get over the depression from the previous failure and engage in the new competition with the hope to do better in the new round. When the boy from previous examples is playing an online math quiz game, he knows he is able to restart a new game quickly and easily if he does not get ideal outcomes in this round. Knowing he has multiple chances to try, the pressure of taking the risk of losing the competition will be significantly reduced.

More importantly, the form of the competition can be changed in this case: the boy can be competing with just himself instead of other students. Deci et al. (1981) claimed that

competition is endogenous to sports, but not to education. Education is about learning instead of competing. Competitions will divert learners' intrinsic motivation to extrinsic motivation. Likewise, Helmreich et al. (1978) divided achievement into mastery and competitiveness, thus arguing that competition only increases competitiveness, not mastery. However, when DGBLEs allow the players to compete with themselves on the time dimension, these claims seem doubtful. First of all, when students are competing with themselves, other methods to win besides mastering the game itself, including cheating, become meaningless. In this case, students will not cheat themselves in the next round of the game to beat their own records. Being more competitive in the following rounds, which means mastering more of the game content, is the only choice the players have. The mechanism of the competition in this case is helping students to transfer outer reward, which is winning the game, into inner reward, which is mastering more knowledge and enjoying learning itself. Thus, extrinsic motivation and intrinsic motivation work convergently in this case. Secondly, the pressure and anxiety of participating in the competition will hardly exist. Even if students lose in the self-competition, no pressure will come from others and there will be no serious consequences in DGBLEs. Self-competition provides the students with low-stake opportunities to prove themselves as competent learners. Their motivation for engaging in future learning processes is not only protected but fostered. In addition, since there is only one participant in self-competition, the mutual mistrust between competitors claimed by Kelley and Thibaut (1969) does not exist anymore.

It is important to admit that self-competition is not a unique function of DGBLEs. Self-competition can also be arranged and conducted in physical classroom settings. However, with the features of quickly restarting a new round, automatically recording achievements, and highly private gameplay environments, DGBLEs are the optimal tool for conducting self-competition in educational practices.

By allowing all the students to be winners, reshaping the way to show winning information, and giving students more chances to win, competition in DGBLEs effectively reduces the anxiety in students. When the anxiety of being losers is removed, the willingness of students to engage in competitions will be increased, and thus, students' motivation for engaging in competing activities is facilitated.

Discussion and Conclusion

While competition has a great potential to engage students in active and creative learning activities, it has been stigmatized in education based on empirical evidence from the pre-digital time. However, learning environments have evolved significantly in the digital era. With the help of digital features, DGBLEs have been pervasively recognized and utilized in educational practices. The characteristics and functions of multiple traditional pedagogical elements, including competition, have been profoundly changed by DGBLEs. Although, as noted, there are other considerations yet to be examined in exploring the role of competition in DGBLEs, this theoretical analysis demonstrates how competition in DGBLEs functions differently and puts a positive psychological impact on students. It is a minor, *but important*, step forward.

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