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RESEARCH ARTICLE

A Qualitative Investigation of Team-Based Gamified Learning in an Online Environment

Yunjo An

ABSTRACT

Background/purpose – This study examined how team-based gamified learning influenced students' attitudes towards the gamification of learning, online collaboration, and competition. Furthermore, the study explored what factors contributed to the students' positive or negative experiences with gamified learning.

Materials/methods – Game elements used for the team-based gamified learning experience included challenges, points, peer feedback and voting (social influence), and inter-team competition. Qualitative data were collected from pre- and post-surveys and participants' reflections.

Results – Overall, the gamified learning experience had a positive influence on the participants' attitudes toward the gamification of learning. The major factors that contributed to the positive change included (1) fun and enjoyment, (2) motivation and engagement, (3) relevance, and (4) choice and freedom. Most participants reportedly enjoyed the online collaboration in the study. The major factors that contributed to the positive online collaboration experience were effective teamwork, benefits of collaboration, and game elements. While the majority of the participants found the inter-team competition to be fun, friendly, and motivating, a few did not enjoy the inter-team competition. Teamwork was a major factor that led to either a positive or negative team-based competition experience.

Conclusion – The findings of the study provide practical insight into what should be considered when designing and implementing team-based gamified learning in online environments.

Keywords – Competition, gamification, gamified learning, online collaboration, team-based gamification.

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1. INTRODUCTION

During the past decade, gamification has become increasingly popular and has been applied in a variety of settings, including education, health/exercise, crowdsourcing, software development, business, marketing, and entertainment (Koivisto & Hamari, 2019). The literature provides various definitions of gamification. For example, it has been defined as "the use of game design elements in non-game contexts" (Deterding et al., 2011, p. 10), "the process of game-thinking and game mechanics to engage users and solve problems" (Zichermann & Cunningham, 2011, p. 14), "the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals" (Burke, 2014, p. 6), and "the craft of deriving fun and engaging elements found typically in games and thoughtfully applying them to real-world or productive activities" (Chou, 2015, p. 8). In the education context, Kapp (2012) defined gamification as "using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems" (p. 10). Most definitions of gamification share common characteristics, and it is commonly accepted that gamification focuses on the use of game elements and game thinking, instead of fully-fledged games, to improve the user experience and their engagement in non-game contexts (Deterding et al., 2011).

Collaborative learning in online environments can be challenging, especially for adult learners with family and work commitments. Can gamification make online collaboration more enjoyable and effective? Can experience with gamified learning change students' perceptions regarding the gamification of learning? The current study examined how team-based gamified learning influenced students' attitudes toward the gamification of learning, online collaboration, and competition. Further, the study explored what factors contributed to students' positive or negative experience with team-based gamified learning.

2. LITERATURE REVIEW

2.1. Gamification in Education

Gamification is sometimes used to engage and motivate learners within the educational setting. Increasingly, research has been focused on studying its effectiveness, suggesting that gamification has positive influences on students' motivation (Asıksoy, 2018; Chapman & Rich, 2018; Hamari et al., 2014; Hassan et al., 2021; Lister, 2015; Nair & Matthew, 2021; Park & Kim, 2021), engagement (Çakıroglu et al., 2017; Ding et al., 2017, 2018; Hamari et al., 2014; Hew et al., 2016; Tan & Hew, 2016; Zainuddin et al., 2020), participation (Huang & Hew, 2018; Lister, 2015), and performance (de-Marcos et al., 2014, 2016, 2017; Ding, 2019; Hew et al., 2016; Landers & Landers, 2014; Mekler et al., 2017; Tsay et al., 2018; Zahedi et al., 2021; Zainuddin, 2018). In a review of gamification research undertaken by Koivisto and Hamari (2019), it was revealed that whilst positive research findings were frequent, the majority of studies reported somewhat mixed results.

Researchers have suggested that the effectiveness of gamification largely depends upon the design and implementation of gamification, as well as other contextual factors (An, 2020; Hamari et al., 2014). Despite the importance of thoughtful design of gamification, the majority of previous research into gamification within the education context has been focused on "the blueprint" of gamification (i.e., points, badges, and leaderboards) (Deterding, 2015; Hamari et al., 2014; Koivisto & Hamari, 2019), hence the scope of game elements used in the gamification of learning is very limited.

2.2. Competition in Gamified Learning Environments

Most of the research published on gamification has focused on competitive approaches and presented mixed results (de-Marcos et al., 2017; Dindar et al., 2021). Several research studies have reported that competition has positive influences on learner engagement and performance in the educational setting. For example, Landers and Landers (2014) found that students completing an online wiki-based project in the gamified condition made 29.61 more edits, on average, than those in the control condition. Çakıroglu et al. (2017) reported that 20 out of 37 students were motivated by the chance to become listed on the leaderboard in a competitive gamified course. Similarly, Zainuddin (2018) found that pre-class competition, competing for a gamified quiz, motivated students to learn pre-class content.

On the other hand, other researchers have reported negative effects of competitive gamification mechanics in the educational context. For example, Hanus and Fox (2015) found that students in a gamified course exhibited less motivation, satisfaction, and empowerment over time than those in the non-gamified version of the same course. These results suggest that the combination of leaderboards, badges, and competition mechanics can be detrimental to learners' motivation, satisfaction, and empowerment. Dominguez et al. (2013) reported that some students did not find it fun to compete with others, and Çakıroglu et al. (2017) also noted that not all learners were motivated by the presence of a leaderboard. These findings suggest that, although competition can make learning more fun and increase learner engagement, it can also thwart intrinsic motivation, especially when learners shift their focus to winning rather than learning (Deci et al., 1981). Researchers have suggested that gamification design should therefore focus on learning aspects rather than simply aiming for a win (Kapp, 2016), and that an unpleasant competitive environment amongst students should be avoided when a leaderboard is used (Ding et al., 2017).

2.3. Social Interaction and Relatedness

According to Self-Determination Theory (SDT), social environments can facilitate intrinsic motivation by supporting our innate psychological needs to feel belongingness and connectedness with others (Ryan & Deci, 2000). Ryan and Deci (2000) stated that extrinsically motivated behaviors are often performed because they are perceived as being valued and modeled by significant others, and not because they are of particular interest. Chou (2015) also contended that, when used properly, social influence and relatedness can serve as one of the strongest motivators for learners to become engaged in their studies. According to a recent study by An et al. (2021), increasing social interactions was one of the major reasons why instructors sought to gamify their Massive Online Open Courses (MOOCs). Emphasizing the importance of social interaction and cooperation, a number of gamification experts and researchers have suggested using cooperative or collaborative gamification approaches rather than the more customary competitive approach (An, 2020; Chou, 2015; Garcia & Tor, 2009; Kapp, 2016; Morschheuser et al., 2019). In a meta-analysis published by Roseth et al. (2008), the researchers reported that higher levels of achievement and more positive peer relationships were associated with cooperative rather than competitive or individualistic goal structures.

In the same vein, the literature shows that social gamification can promote social interaction and improve learning performance. Simões et al. (2013) defined social gamification as "the use of game mechanics and game-thinking from social games to be applied in non-game applications, specifically in social learning environments" (p. 348).

Further, they presented the guidelines and primary features of a social gamification framework that could be applied within an existing K-6-level social learning platform called "schoooools.com." Additionally, de-Marcos et al. (2016) examined the effects that educational games, gamification, social networking, and social gamification had on learning performance in an undergraduate course. In their comparison of the four experimental conditions plus a control group, it was revealed that whilst all of the experimental conditions had some significant impact on learning performance, social gamification produced the better results across all evaluation items and at earlier stages too. In another study, de-Marcos et al. (2017) conducted an experiment that tested the effects of social gamification on an undergraduate course. The results showed that the experimental group (social gamification) outperformed the control group (traditional blended learning) on four practical assignments, but that the control group outperformed the experimental group in the final examination. These findings suggest that social gamification can be used to promote social interaction and improve learner performance in practical assignments.

Huang and Hew (2018) proposed a goal-access-feedback-challenge-collaboration (GAFCC) gamification design model based on the synthesis of five theories of motivation (Flow Theory, Goal-Setting Theory, Social Comparison Theory, Self-Determination Theory, and Behavior Reinforcement Theory). As the name of the model suggests, one of the five motivating elements of the GAFCC model is collaboration, which relates to opportunities presented to learners where they can work together to achieve a shared goal or just to interact with each other. The results from their two experiments revealed that the GAFCC class completed significantly more pre- and post-class activities than the control group. Additionally, the GAFCC class produced notably higher quality work than the control group.

Recently, Dindar et al. (2021) compared the impact of gamified cooperation and gamified competition on task effort, learning achievement, motivation, and social relatedness associated with gamified English vocabulary learning. Although there was no significant difference found between the cooperation and competition conditions regarding task effort, learning achievement, and motivation, social relatedness was found to be significantly higher in the gamified cooperation condition than in the competition condition. This result suggests that gamified cooperation can foster stronger social relationships amongst learners.

2.4. Team-based Gamified Environments

Team-based games can minimize the negative effect of learners competing directly against one another as the focus shifts to making their team better rather than on defeating each other as individuals (Garcia & Tor, 2009). Similarly, team-based gamified environments can provide learners with a safe environment in which they can feel that their learning efforts are contributive to some larger purpose. Thus, Kapp (2016) suggested using team-based, cooperative gameplay wherever possible as opposed to one-on-one competitions.

There have been a few research studies published on the subject of team-based gamified learning. Chang and Wei (2016) identified 40 engaging gamification mechanics in MOOCs, where the third most engaging gamification mechanic was shown to be team leaderboards. In the context of crowdsourcing, Morschheuser et al. (2019) investigated how three versions of gamification, competitive, cooperative, and inter-team competitive gamification, affected users' perceived enjoyment and usefulness of the crowdsourcing system, their behaviors, and their willingness to recommend the system to their peers. The comparison of the three gamification conditions revealed that inter-team competitions were

particularly effective in invoking enjoyment and engaging users in higher levels of crowdsourcing participation compared to pure competitive or pure cooperative gamification. Furthermore, the results showed that users were more likely to recommend crowdsourcing approaches when the gamification included cooperation. The findings suggest that inter-team competitions may yield promising results in gamification approaches by combining the beneficial aspects of both competition and cooperation. However, further research is still needed in this area.

2.5. The Purpose of the Study

The current study aims to examine how team-based gamified learning influences students' attitudes toward the gamification of learning, online collaboration, and competition. Furthermore, the study explores what factors may contribute to students' positive or negative experience with team-based gamified learning. To this purpose, the following research questions guided the study:

(1) How does team-based gamified learning experience influence students' attitudes toward and perceptions of gamification of learning?

(2) How does team-based gamified learning experience influence students' attitudes toward online collaboration? What factors contribute to positive or negative online collaboration experience?

(3) How does team-based gamified learning experience influence students' attitudes toward competition? What factors contribute to positive or negative competition experience?

3. METHODOLOGY

3.1. Study Context and Participants

The study was conducted in an online, graduate-level course on online learning, which was offered at a public university in the United States. Team-based gamified learning was implemented in two course assignments, which are referred to as Challenge 1 and Challenge 2. Five teams were formed, with each team consisting of three members. For Challenge 1, the students were asked to collaboratively design a virtual reality (VR) learning activity using a given template. For Challenge 2, the students were asked to collaboratively explore and present at least five different ways to use social media and/or mobile technologies in an online learning environment. The students were given the freedom to present their ideas in a format of their choice.

The researcher of the current study was the instructor assigned to teach the course. In order to ensure that the students did not feel pressured into participating in the study, and that having knowledge of the study did not influence the students' coursework, the researcher posted an announcement regarding the study at the end of the course. Nine out of the 15 students attending the course agreed to voluntarily participate in the study, and each submitted a signed informed consent form to that effect. All nine of the participants were female, and they were from four out of the five teams previously mentioned. Table 1 provides a summary of the participants' demographic information.

Table 1. Participants' Demographic Information

Demographic information		*n*	%
Gender	Female	9	100.0
	Male	0	0.0
Age (years)	20-29	1	11.1
	30-39	2	22.2
	40-49	4	44.4
	50-59	2	22.2

Four of the participants worked as K-12 teachers and had considerable prior experience with gamification in the classroom. They had been using gamified programs such as *Kahoot!*, *Quizlet*, and *Prodigy* with their students. Two of the participants had some prior indirect experience with gamification through other people or from having read research articles. The other three participants expressed having had very limited or no prior experience with gamification.

3.2. Gamification Design

The game elements used for the team-based gamified learning experience included challenges, points (earning points, losing points, extra points), peer feedback and voting (social influence), and team leaderboards (inter-team competition). Table 2 describes how each game element was applied in the study.

Table 2. Game Elements

Element	How it was applied
Challenge 1	Students were asked to collaboratively design a virtual reality (VR) learning activity.
Challenge 2	Students were asked to collaboratively explore and present at least five different ways to use social media and/or mobile technologies in an online learning environment.
Earning points	Teams could earn up to 50 points for each challenge.
Losing points	Teams lost 5 points if they failed to upload their work by the given due date.
Extra points	The top three rated teams would receive an extra 5 points.
Peer feedback & voting	Students provided constructive feedback to the other teams, and also selected the top three teams.
Team leaderboards (inter-team competition)	The top three teams were placed on the team leaderboard, which was shared as a course announcement.

Both Challenge 1 and Challenge 2 involved collaboration and competition. After having completed each challenge through collaborative working, the teams were then tasked with reviewing the other teams' work and to provide constructive feedback to at least three other teams. In addition, they were asked to select their choice of the top three teams based on given criteria, along with a rationale for each selection. A team leaderboard was manually created by the instructor and shared in the course management system (Canvas). Figure 1 illustrates how the team leaderboard was presented to show the top three teams, along with their respective scores.

Figure 1. Team Leaderboard

Rank	Team	Score
#1	The Cellmates	31
#2	PAC	18
#3	The Stars	17

3.3. Study Procedure

Pre-survey

Prior to engaging in the team-based gamified learning exercise, the participant students each completed a pre-survey. The pre-survey included demographic items, two multiple-choice items, and four open-ended items regarding online collaboration, competition, and the gamification of learning.

Challenge 1

The student teams were each given 1 week to complete Challenge 1. The students communicated and collaborated on the challenge in a fully online environment, and so did not have any face-to-face meetings at all.

Peer Feedback & Top 3 Teams

After submitting their Challenge 1 report, the students were then tasked with reviewing all of the other teams' reports for Challenge 1, and to provide constructive feedback to at least three other teams. Additionally, they then selected their choice of the top three teams, and the final top three were announced on the team leaderboard (see Figure 1).

Reflection

The students' final task was to reflect on their learning experience, the online collaboration, and the team competition. Four reflection questions were provided in order to facilitate their reflection.

Challenge 2

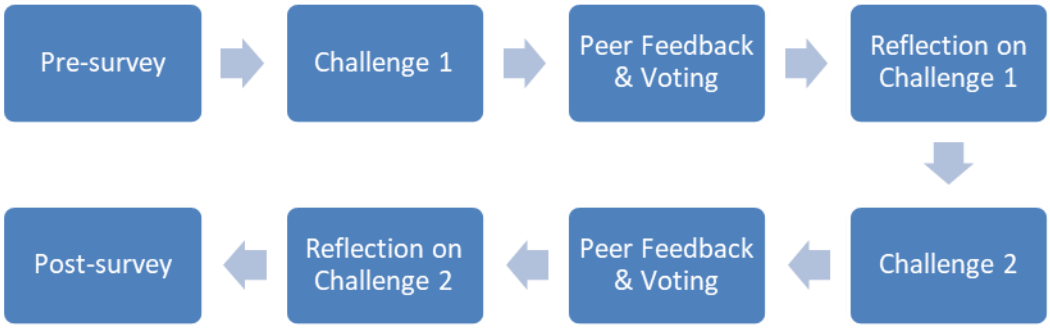
The same procedure for Challenge 1 was then repeated for Challenge 2, including providing peer feedback, selecting the top three teams, and completing a reflection of the challenge.

Post-survey

After completing both challenges, the participant students completed a post-survey. The post-survey included two multiple-choice items and four open-ended questions.

Figure 2 provides a summary of the overall study procedure.

Figure 2. Study Procedure



3.4. Data Analysis

The qualitative data generated from the open-ended items and from the participants' reflections on each challenge were carefully read by the researcher, and then coded and constantly compared for thematic analysis (Miles et al., 2014). Furthermore, the qualitative data from the completed pre-survey forms were carefully compared with those from the post-survey in order to comparatively examine any changes in the participants' attitudes towards the gamification of learning, online collaboration, and competition. Descriptive statistics were also used to analyze the data generated by the four multiple-choice items which measured changes in the participants' attitudes toward online collaboration and competition.

4. RESULTS

Research Question 1: Attitudes toward Gamification of Learning

Before Gamified Learning

In the pre-survey, the participants were asked what they thought about the gamification of learning. Five of the nine participants (55.6%) already had a positive attitude towards the gamification of learning prior to participating in the study. Four of them were serving K-12 teachers with considerable prior experience with gamification. One of the teachers stated, "It can be effective to increase motivation and engagement when used correctly. I have had students excited to practice math to earn badges and points." Another teacher mentioned that gamification is "definitely a must" for high school students. The following quote shows an elementary teacher's positive experience with gamification.

> As an elementary teacher, I see a lot of this in my field. Generally, I think there are lots of benefits. It is difficult to engage students in phonics instruction or numerical fluency practice (that requires daily instruction to foster automaticity), but gamification has revolutionized these tasks! Prodigy [a math game] is a great example of this.

Four of the participants (44.4%) were somewhat unsure or skeptical about gamification. For example, one participant considered that gamification was "gimmicky," and another mentioned that, "If people are learning for the sole purpose of a badge, then that is wrong." All four of these participants had limited or no prior experience with gamification.

After Gamified Learning

Overall, the gamified learning experience had a positive influence on the participants' attitudes toward gamification of learning. Those who were initially skeptical about gamification showed more positive attitudes after completing the challenges. Those who already had positive attitudes towards gamification reported that the challenges strengthened and reinforced their opinions about gamification.

Contributing Factors

Four themes regarding gamified learning emerged from the participants' reflections and post-survey: Fun and enjoyment, Motivation and engagement, Relevance, and Choice and freedom. Table 3 presents sample quotations for the identified themes.

Table 3. Gamified Learning Themes and Sample Participant Quotes

Theme	Sample participant quotes
Fun and enjoyment	• Gamifying learning makes learning more effective and fun in my opinion. Challenges 1 and 2 strengthened my opinion about this. • I think gaming elements can be incredibly fun and motivating to students. I think the challenges just reinforced that for me. • I enjoyed gamified learning as a student and I enjoy it as a teacher, it helps keep students engaged. • I enjoyed the challenges.
Motivation and engagement	• I've seen students do well with gamified learning in the past, but this was the first time I have gotten to see it from the student's perspective. It definitely increases engagement and motivation. • I think gaming elements can be incredibly fun and motivating to students. I think the challenges just reinforced that for me. • The game elements made me feel more motivated, and influenced me to learn more.
Relevance	• I thought it was relevant and had real world applications. The final product could actually be used in a high school classroom. I also liked increasing my knowledge about ways to use VR as an instructional tool. • I liked Challenge 2 - I thought it was an important topic. I thought the activity was great. The subject was relevant to the class and to my personal course of study. • The topic of social media and mobile learning was relevant and I enjoyed learning about the various ways to use these technologies for instruction.
Choice and freedom	• We had a lot of choice and room for interpretation. • I liked how we had the freedom to address the question as we wanted. For our group, we decided to base our suggestions around a central assignment idea which made coming up with the social and mobile media aspects more focused and fun.

Fun and Enjoyment: The participants reported that they enjoyed the gamified learning activities in the current study. They felt that the activities were fun, interesting, and enjoyable, and believed that gamification could make learning more effective and fun. Even those who had been initially skeptical reported that they enjoyed the gamified learning experience, and started to understand the educational potential of gamification.

Motivation and Engagement: The participants also reported that the game elements motivated them to learn more. For example, one of the participants who had positively experienced gamification as a teacher reported that her first experience with gamified learning from the student's perspective was definitely motivating. Another participant mentioned that the competition element made her more alert of other teams' work and wanted their team to stand out. Most of the participants believed that gamified learning could increase student motivation and engagement. However, it is worth noting that one participant felt that gamified learning might not work for introverts or those who do not like competition.

Relevance: In their reflections, five of the participants reported that they enjoyed the gamified learning activities because they were relevant to their work or study. For example, one participant mentioned having enjoyed Challenge 2, since the topic of social media and mobile learning was considered relevant to her work. Another participant found Challenge 2 very relevant and believed that the final product that their team actually produced "could actually be used in a high school classroom."

Choice and Freedom: Having options and choices in each challenge appeared to positively influence the participants' attitudes toward gamification. Four of the participants reported in their reflections that having choice and freedom was one of the things they liked about the gamified learning activities.

Research Question 2: Online Collaboration

Table 4. Changes in Attitudes toward Online Collaboration

Before	*n*	%	After	*n*	%
Yes, I like it	4	44.4	Yes, I like it	7	77.8
I have mixed feelings	3	33.3	I have mixed feelings	1	11.1
No, I dislike it	2	22.2	No, I dislike it	1	11.1

The participants were asked if they liked working collaboratively in an online environment before and after the online team-based gamified learning experience. The three options provided were: (1) "Yes, I like it," (2) "I have mixed feelings," and (3) "No, I dislike it." The participants were also asked to explain why they liked or disliked working collaboratively in an online environment. Overall, the team-based gamified learning experience had a positive influence on the participants' attitudes toward online collaboration. As Table 4 shows, most of the participants (77.8%) chose "Yes, I like it" after completing the challenges.

Before Gamified Learning

A little less than half of the participants (44.4%) had a positive attitude regarding online collaboration before the team-based gamified learning experience. The qualitative data collected from the pre-survey revealed that the participants had some positive online collaborative experiences from previous courses or from their work, as can be seen from the following quote:

> My first semester at [university name] involved a huge collaborative project that forced my partners and I to create avenues of communication to get the job done beyond what was created by the professor. We set up Slack for daily communication about various school-related topics (and kept the channel open after the project was done to have more personal conversations!) and we had video calls regularly so we

> could brainstorm in real time. It not only enhanced our project, but has spilled over into other classes and has created friendships between the three of us that we have maintained throughout our graduate school years.

A few negative aspects of online collaboration were discussed by those participants who selected "No, I dislike it" or had mixed feelings. For example, one of the participants with mixed feelings stated that, "It can be hard when group members live far apart." Another participant explained that she did not like online collaboration because it significantly interfered with her family commitments and work. The following quote from an introverted participant shows her strong preference to working alone.

> I am highly introverted, because I have an accent and try to avoid speaking in front of others. I like to study alone and depend on myself. Working together makes me compare myself to others, and as a result I do not perform well.

After Gamified Learning

Overall, the participants showed more positive attitudes toward online collaboration after completing the gamified challenges. For example, a participant who had not liked online collaboration prior to the gamified learning experience reported in her reflections that she enjoyed "working with a group of fun people and exchanging ideas" and "understood the importance of teamwork and started appreciating it."

Contributing Factors

Four themes emerged from the participants' reflections and the post-survey: (1) Effective teamwork, (2) Benefits of collaboration, (3) Poor teamwork, and (4) Effects of game elements. Table 5 presents example quotes for each of the identified themes.

Table 5. Online Collaboration Themes and Sample Participant Quotes

Theme	Sample participant quotes
Effective teamwork	• My teammates and I work well together and each bring a unique skillset to a project. • My teammates and I all came to our meeting with different ideas, and the final product was the result of true collaboration.
Benefits of collaboration	• I enjoy working in a team since I always learn something new. • I learned about several great resources from the other members of my group and from the other teams.
Poor teamwork	• I had one group member that for both group activities rarely participated until the due date, which I found completely frustrating. • One team member did not contribute at all yet benefited from extra points.
Effects of game elements	• I think the game elements made collaboration more effective. • My team was very inspired by earning extra points on the first challenge. I believe that motivated us to do well on the second challenge.

Effective Teamwork: The participants who were happy with their team members and teamwork showed positive attitudes toward online collaboration. For example, one of the participants stated, "My teammates and I just work well together, so working on anything with them is always fun and productive." The following quote shows another participant's satisfaction with her "amazing" team members:

> My teammates are amazing. We work really well together. We communicate and we trust each other. When we work together, we really do work together. Nobody is overbearing. I will miss working with them when our grad school experience is over.

Benefits of Collaboration: Those who were in effective teams appreciated the benefits of collaboration. They reported that they enjoyed brainstorming or exchanging ideas, learned about some great resources from their team members, and gained something new from collaboration.

Poor Teamwork: On the other hand, a few of the participants did not enjoy the online collaborative working or had mixed feelings about it because one team member did not participate in any of the group work. One participant reported that a team member did not join their meetings, and that she and the other member of the team were left waiting for feedback. Having a non-participating team member appeared to make their online collaboration a "very frustrating" experience.

Effects of Game Elements: Several of the participants reported that game elements motivated their teams. For example, a participant mentioned that game elements made their team want to win and motivated them to "do a little extra."

Research Question 3: Inter-team Competition

Before Gamified Learning

In the pre-survey, the participants were asked whether or not they enjoyed competing with others. Three options were provided: (1) "Yes, I enjoy competition," (2) "Sometimes, but not always," and (3) "No, I don't enjoy competition." They were also encouraged to explain their choice. Seven of the nine participants (77.8%) chose "Sometimes, but not always" indicating that they did not always enjoy competing with others. They noted that competition could increase motivation and be fun sometimes and but it could "reduce enjoyment of the experience," "hurt people's feelings," and "turn ugly." One of the participants stated, "I am competitive by nature, but don't always appreciate when competition becomes the main focus of something." Two of the participants chose "No, I don't enjoy competition," but none chose the "Yes, I enjoy competition" option (see Table 6).

Table 6. Attitudes toward Competition

Before	*n*	%	After	*n*	%
Yes, I enjoy competition	0	0.0	Yes	5	55.6
Sometimes, but not always	7	77.8	I have mixed feelings.	2	22.2
No, I don't enjoy competition	2	22.2	No	2	22.2

After Gamified Learning

In the post-survey, the participants were asked whether or not they enjoyed the inter-team competition. Three choices were provided: (1) "Yes," (2) "I have mixed feelings," and (3) "No." Overall, the team-based gamified learning experience had a positive influence on

the participants' attitudes toward competition. More than half of the participants (55.6%) indicated that they enjoyed inter-team competition, whilst none answered positively prior to the gamified learning experience (see Table 6).

Contributing Factors

Four themes regarding inter-team competition emerged from the participants' reflections and the post-survey: Fun, Motivation, Poor teamwork, and Learning from other teams. Table 7 presents sample quotations from the participants for each of the four identified themes.

Table 7. Inter-team Competition Themes and Sample Participant Quotes

Theme	Sample participant quotes
Fun	• I think we were mostly motivated by wanting to turn in a good final project, but the competition aspect was definitely interesting and made it more fun. • It made the assignments much more fun.
Motivation	• I found the friendly competition motivating. :) • I think it is extremely motivating. • After being in the top three for Challenge 1, we felt we had to uphold our status and go for it again.
Poor teamwork	• One of our group members did not contribute to the report at all, yet benefited from the 5 extra points. • I didn't like this since not everyone contributed equally. Not very fair.
Learning from other teams	• I also was able to view the work of other groups and see different takes on the same topic. • I liked seeing the other presentations and the different views on the same topic. • I enjoyed getting to see what other teams came up with and the peer feedback was helpful.

Fun: Those who chose "Yes" reported that inter-team competition was "definitely interesting" and "made the assignments much more fun." Most of the participants found the inter-team competition to be "friendly" and reported that they had enjoyed the competition.

Motivation: Six of the participants (66.7%) found the "friendly" competition to be a "motivating" experience. They reported that they were "motivated to win" and that the competition made them "try even harder" to present their best work. One of the participants mentioned that "it was motivating to see who would come up with the most creative project." Another participant reported that her team was "excited to have the opportunity to earn extra points."

Poor Teamwork: Poor teamwork appeared to negatively influence the participants' attitudes toward inter-team competition. Two of the participants who chose "No" reported that they could not enjoy the inter-team competition because one of their team members had not participated in the group work.

Learning from Other Teams: Inter-team competition appeared to provide the participants with the opportunity to learn more from the other teams. Seven of the participants (77.8%) reported that they enjoyed seeing "the different views" or "different takes" on the same topic and that they benefited from reviewing other teams' work.

5. DISCUSSION

The results of the study showed that the team-based gamified learning experience had a positive influence on the participants' attitudes toward and perceptions of the gamification of learning. The participants enjoyed the gamified learning activities and believed that gamified learning could increase student motivation and engagement. One of the reasons that the participants in the current study reportedly enjoyed the gamified learning was that the challenges were seen as being relevant to their work or study. This finding is in line with Keller's ARCS (Attention, Relevance, Confidence, and Satisfaction) model, which suggests making instructional materials relevant to students' backgrounds or experiences (Keller, 1987, 2010). Another aspect appreciated by the participants was having an element of choice and freedom during the challenges. This finding is in line with self-determination theory (SDT), which suggests supporting the need for autonomy (e.g., choices and options) along with competence and relatedness (Deci & Ryan, 1985). These findings suggest that a gamified learning experience should be relevant to the students and provide meaningful choices and options wherever possible (An, 2020; Chou, 2015; Deterding, 2013; Lee & Hammer, 2011; Mollick & Rothbard, 2014).

Some students dislike collaborative learning, especially when they have to collaborate online without any face-to-face communication. As addressed by a few participants in the current study, communicating and collaborating online can be challenging and stressful to adult students who are required to juggle a mix of family, work, and school responsibilities. However, online collaboration could seem to be more enjoyable and more effective with team-based gamification. The results revealed that most of the participants (77.8%) enjoyed online collaboration in the current study. Interestingly, the major factor that contributed to their positive online collaboration experience was effective teamwork. For example, the participants who were happy with their team members and teamwork showed very positive attitudes toward online collaboration and appreciated the benefits of collaboration. In addition, game elements appeared to make online collaboration more effective by motivating the student teams to go that "extra mile" to win and receive extra points.

Although competition can be fun and motivating, it can also thwart intrinsic motivation when people focus overly upon winning rather than on the activity itself (Deci et al., 1981). It can also increase the probability of burnout and skewed performance (Chou, 2015). However, as discussed in the literature review, team-based competition has the potential to take advantage of the benefits of both collaboration and competition by minimizing the negative effects of competing directly against one another and focusing on teamwork (Garcia & Tor, 2009). The results of the current study reported that the majority of the participants found the inter-team competition to be "fun," "friendly," and "motivating." Approximately 80% of the participants reported that they enjoyed seeing different views and different approaches on the same topic and that they felt they benefited from reviewing the other teams' work. This finding suggests that instructors should consider providing students with opportunities to learn more from other teams beyond simply competing against them in team-based gamification.

Although the results revealed positive changes in participants' attitudes toward competition, two of the participants did not enjoy the inter-team competition, which is a finding consistent with previous research (Çakıroglu et al., 2017; Dominguez et al., 2013), even though the competition in the other studies was not inter-team based. Interestingly, the major reason that the participants in the current study did not enjoy the inter-team competition was reportedly poor teamwork; that is, having a team member who rarely participated or did not contribute at all. Overall, teamwork was a major factor that led to either positive or negative team-based competition experience. As Aldemir et al. (2018) noted, balancing team skills is necessary for a team-based gamified learning environment.

It is also worth noting that students' prior experience and personality could also influence their perceptions and motivation in a gamified learning environment. As the results showed, the participants with positive prior experience with gamification showed more positive attitudes toward gamified learning. Also, one participant who believed she was an introvert reported a very strong preference for working alone. Although her attitude towards online collaboration changed in a positive way following the gamified learning experience, she still disliked the competition aspect of the challenges. These findings confirm that students' prior experience and background factors can influence their perceptions of and participation in a gamified learning environment (Landers & Armstrong, 2017; Tsay et al., 2018).

6. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

The results of the study shed some light on the design and implementation of team-based gamified learning, but their generalizability is unknown because the findings are from self-reported data provided by a small number of participants attending an online graduate-level course; therefore, the results should be interpreted with some caution.

Future research could investigate the impact of team-based gamified learning on students' attitudes toward the gamification of learning, online collaboration, and competition in other learning contexts (e.g., different levels of education, different subject areas, different types of tasks or challenges). Future research could also collect quantitative data as well as qualitative by including Likert-type scales that measure participants' attitudes toward the gamification of learning, online collaboration, and competition with a larger sample in order to develop a deeper understanding of the impact of team-based gamified learning on students' attitudes and perceptions.

It would be interesting to examine the effects of team-based gamified learning on students' engagement and performance by comparing team-based gamification with non-gamified and other gamified learning conditions. Finally, future research could further explore how students' prior experience and personality influence their motivation and performance within a team-based gamified environment.

DECLARATIONS

Author Contributions The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Conflicts of Interest The author declares that there is no conflict of interest.

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