IS GAMIFICATION REALLY PRODUCTIVE?

Study on aspects of an effective gamified app

Abstract

This study aims to find how gamification affects student motivation and productivity in educational applications by looking at past studies and current surveys to find correlations between poor implementations and loss in effectiveness as well as most favorable and productive elements of a gamified app for best implementation practices.

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Is Gamification Really Productive?

Introduction

Many may have used gamified apps such as *Duolingo*, *Kahoot!* or *Prodigy*, but how much do you think it affects your productivity? Recent popularity of video games in modern times brought developers and teachers to start using gamification, which is the use of game elements in apps that are not primarily meant to be just games, to help increase student learning and engagement. Gamified apps use elements such as points, levels, rewards and stories along with challenges to create a more interactive form of learning. Prior research had found that gamification enhanced a student's motivation as shown in the research paper "Does Educational Gamification Improve Students' Motivation? If so, Which Game Elements Work Best?" talking about a survey of 124 undergraduates which resulted in 67.7% students feeling a gamified course was more motivating compared to a traditional course (Chapman et al.). These findings also agree with the 2024 recent meta-analysis, reporting gamified learning giving a more positive impact on learning achievement and motivation more than "serious games" which were made specifically for educating (Ren et al.). All these studies showed that gamification indeed had the potential for helping with a student's motivation and learning.

There has also been research as regards to which game elements were responsible for such benefits. Chapman et al. investigated how individual game mechanics (like points, badges, or leaderboards) increased a student's motivation the best. They presented statistical data for certain elements that helped in a student's motivation while ranking them. Also supporting this, a similar paper compared gamification with game-based learning (Ren et al.). Both supporting that design of a gamified element changed how a student responded to what they were learning.

Learning effectiveness was also studied by Luo et al., who conducted 44 studies to find the factors that contributed to the changes in a game's effectiveness. It was found that having clear goals, a visible progress, immediate feedback, adaptation of the game to the user, the use of proper challenges based on the user, having meaningful reward, with a healthy competition that allowed space for "fun failure" increased engagement of a student towards a game. This showed that a gamified game had to be crafted well, and it wasn't just points and challenges, but there was more to a student's psychological need for them to be drawn to a gamified app. Even experts like Kapp have argued that a gamified game had to have more than rewards but rather narrative content, problem solving and more engagement for proper learning. Rice (2012) reviewed Kapp's work and brought theories saying that game elements had to have immersion for proper effective learning.

Despite the positives of gamification, some scholars found the drawbacks of gamification. Toda et al. explored performance loss, learner indifference, undesired behaviors and declining engagement. They found that elements such as leaderboards, points and badges were associated with the negative outcomes (Toda et al.). Their findings showed that adding ranks or points without considering a student's needs undermines the learning of a student. This connects to the idea of making a thoughtful game.

While many studies have been looking into the motivation and engagement of gamification, few have connected these game elements to productivity in terms of student retention and learning. In other words, we know how to make a gamified game fun, but not about how the design of it impacts what a student gets academically. This gap in how students perceive the change in their productivity due to gamification is what is yet to be answered. Questions such

as whether points make students just feel good or if they help a student learn better, and if stories and collaboration help in retaining knowledge are all some questions to ask.

In the study, I have decided to examine which game elements have affected a student's motivation and their perceived productivity in gamified educational apps most effectively. By comparing how different elements have helped in a student's motivation and which elements they have found to cause negative effects, I would be able to answer the question on: Which gamification elements in educational apps help improve a student's motivation and perceived productivity the most and which don't? By compiling my survey results with past archival data, I would be able to find the most suitable answer to this.

Methods

A survey was distributed to undergraduate students publicly through social media posts and class announcements collecting around 45 undergraduate students in different majors and years to participate anonymously to answer a 10-minute survey on Google Forms. Undergraduate students were chosen since most of the participants were above 18 and may have at some point in their life used a gamified game during their time in school.

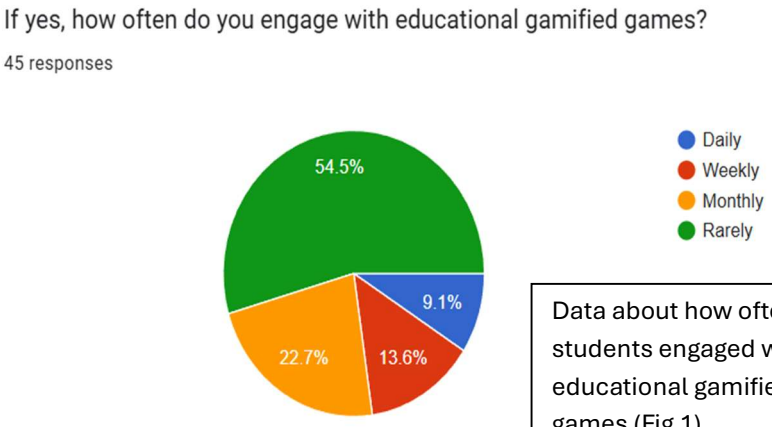
The survey was designed in such a way that it included 11 questions of different types (MCQ, checkbox, and open ended) and aimed to find if a participant has played a gamified game before and how often, if they found it to be better than traditional methods, which elements of a game they preferred, how much they believe they retained from using gamified learning apps, what type of game they generally preferred (such as collaborative, competitive or narrative), and if they had any negative experiences regarding such gamified games. I have also questioned the

participants regarding how their motivation was affected due to a gamified game with several open-ended questions for students to reflect on and share their thought regarding the topic to see what they preferred.

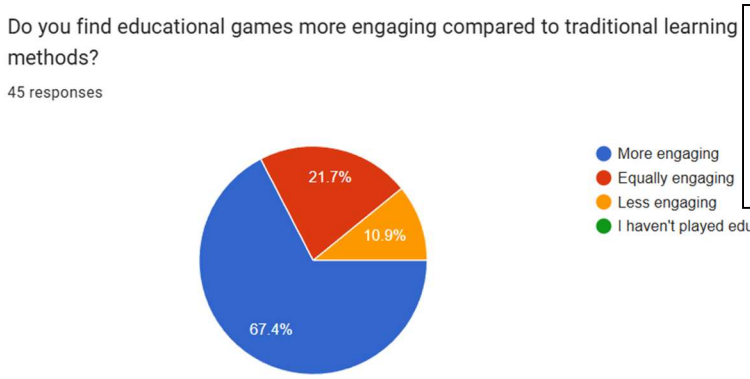
The qualitative responses were gone through and have been coded into 3 categories based on what they related to. With the 3 being motivation improving related responses (like feedback, rewards, competition and narrative), productivity supporting related responses (such as retention, the challenges and progression in a game) and the third category is how negative impacts came about from the games (with responses related to boredom, bad difficulty balance and stress from leaderboards). Connecting terms and common ideas between the responses were used to find general conclusions to connect with archival data.

Results

After analyzing the results, some general trends I found of those who responded (see Fig 1) were that only 9.1% used educational gamified games daily with a majority of 54.5% rarely using them. 67.4% of them found it more engaging compared to traditional learning (See Fig 2).



Data about how often students engaged with educational gamified games (Fig 1)



Pie chart on engagement of traditional learning vs games (Fig 2)

73.9% have also reported retaining most of what they learned through gamified leaning apps. This aligns with past research about gamification boosting a student's motivation and perceived productivity (Chapman et al.; Ren et al.).

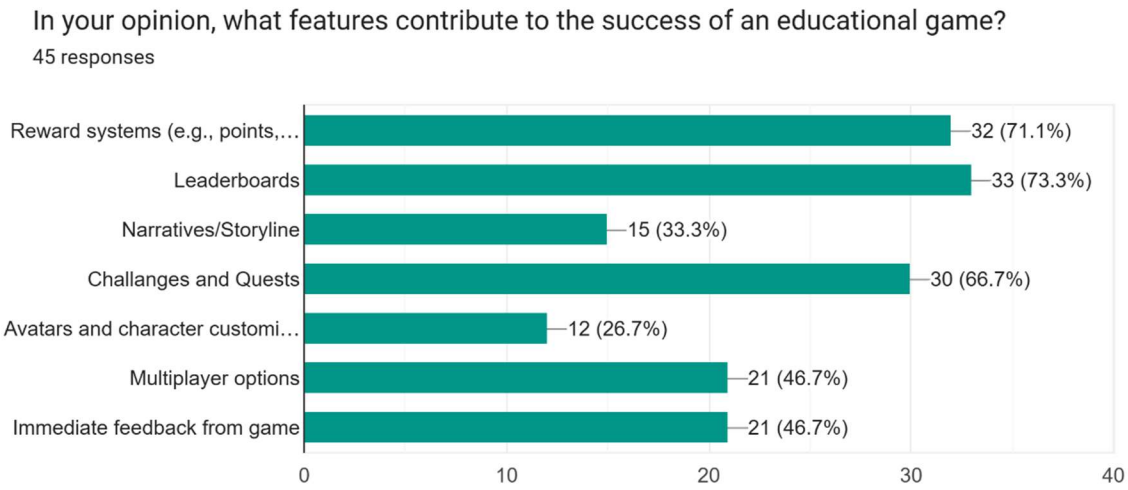


Fig 3

Also given the options to select the features they found were most effective, the data (See Fig 3) showed that it supported prior research by Chapman et al. which said narrative, challenge and feedback were one of the most essential motivators of gamified learning. It also showed the complexities which were talked about by Toda et al. who said some elements may backfire if they are emphasized too much. One thing that was surprising was that although feedback and narrative are highly valued in the literature (Luo et al.; Rice), they ranked low in the survey results.

The free response questions were coded based on 3 categories as stated before (motivation, productivity and negatives) which kept on repeating among the participants.

Code	Description
Motivation - Feedback	Talked about an app giving feedback on what you're doing
Motivation - Rewards	Talked about how rewards such as points helped motivate
Motivation - Competition	Talked about how leader boards and a competitive game was preferred
Productivity - Retention	Talked about how much retention they had from the use of an app
Productivity - Progress	Talked about how their visible progress helped in their advancing
Negative – Stress and Demotivation	Talked about how they were demotivated or discouraged and why
Negative - Repetition	Talked about how they did not prefer repetition and what made them bored in a game.

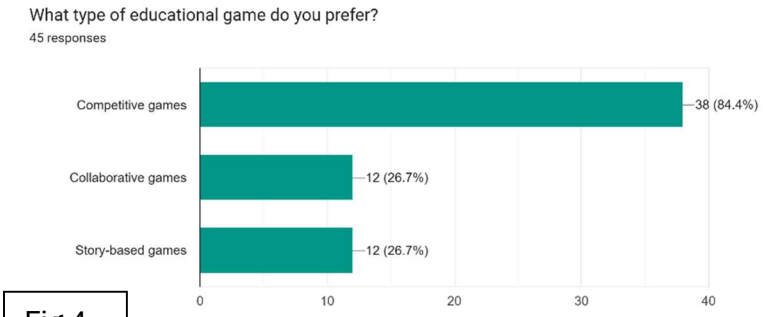


Fig 4

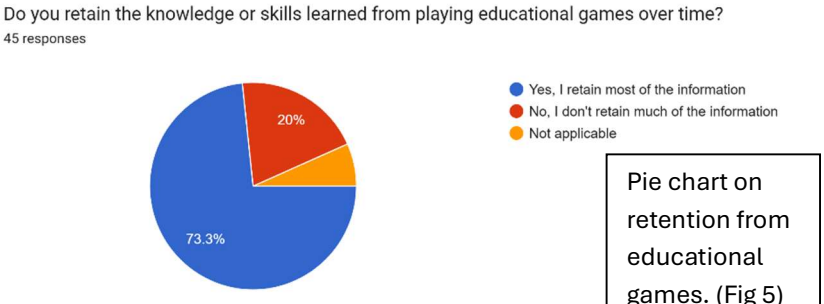
When it comes to game type preferences, 84.4% preferred competitive games while the rest preferred either collaborative or story based (See Fig 4). This was also evident in the free responses coded under "Motivation – Competition" where one such participant talked about how competitiveness was their primary motivation:

"I'm a very competitive person... if it's an educational game, that means learning what I need to learn in order to win."

There were also some opposing views (coded under "Negative – Stress and Demotivation") where one said:

"If a game is too competitive or based too much on accuracy, I focus more on that than actually retaining the info."

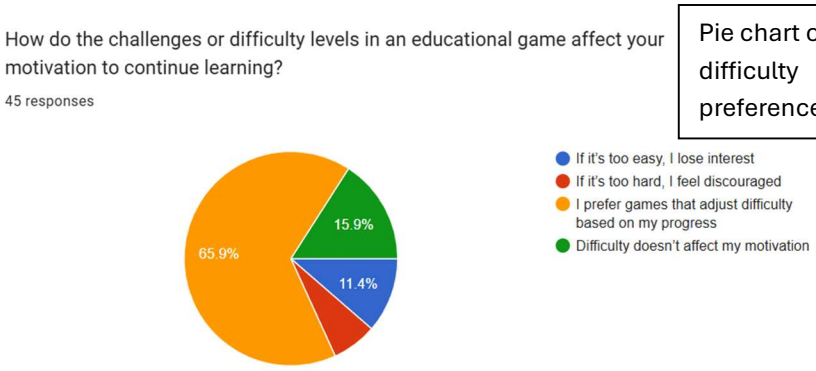
This supports Denden et al.'s findings which said that competition motivates some while discouraging others.



Pie chart on retention from educational games. (Fig 5)

When it comes to retention, 73.3% said they retain knowledge from gamified tools, 20% said no (See Fig 5). From the responses it was found that many saw increasing difficulties,

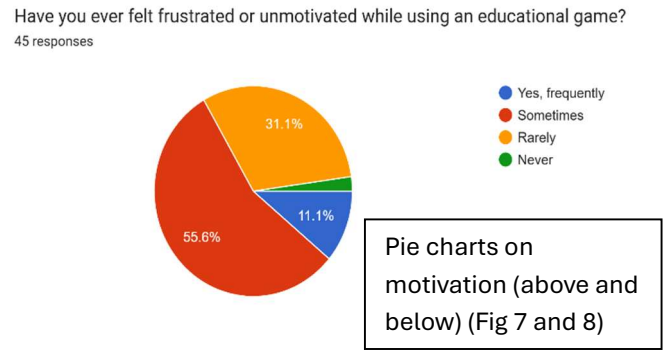
visible progress and timely feedback were the main contributors to their productivity. Some negative comments said repetition and a lack of challenge with distracting visuals hindered their learning. One student (coded under "Motivation – Feedback") responded:

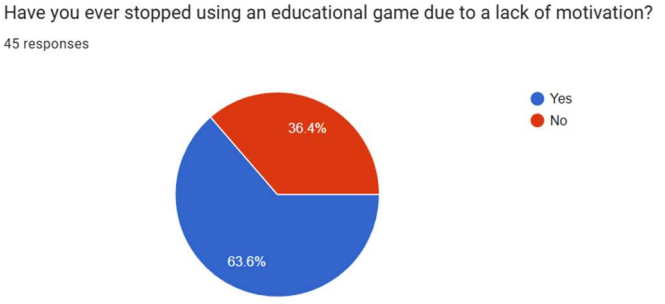


Pie chart on difficulty preference (Fig 6)

"A good game explains why I got something wrong. Without that, I don't feel like I'm learning."

This supports Chapman et al.'s emphasis on feedback but also opposes that only feedback guarantees learning when other flaws in design are there.





Pie charts on motivation (above and below) (Fig 7 and 8)

Coming to the link between the negative impacts and motivation, when participants were asked if they felt demotivated from educational games, 55.6% said sometimes, while only 11.1% said yes (See Fig 7 (above)). Also, when asked if they quit a game due to low motivation, 63.6% answered with a yes (See Fig 8 (below)).

After given options to select such demotivators, the answers given were:

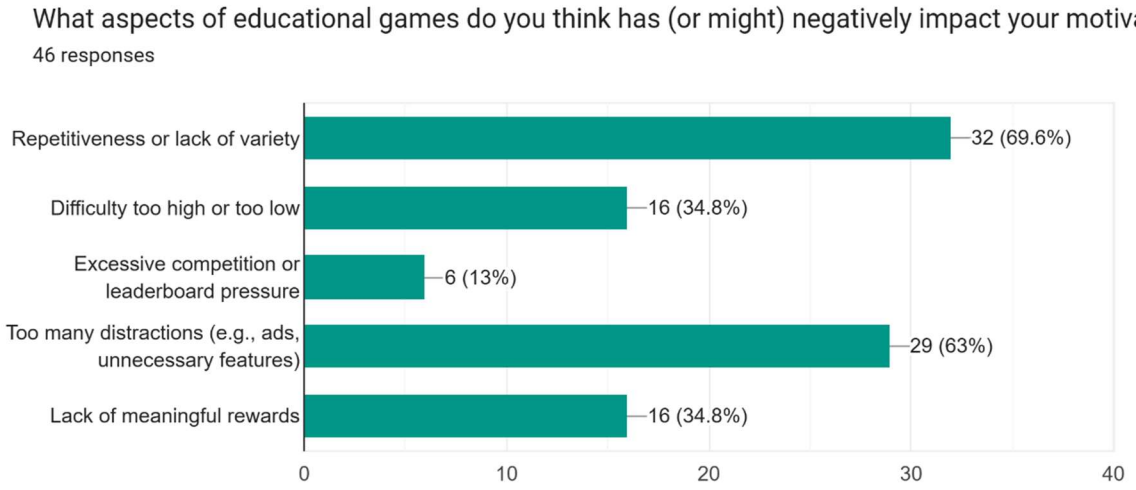


Fig 9

Despite leaderboards being a highly selected positive feature, some have selected it as a cause of their negative impact on motivation (See Fig 9). This, as mentioned by Toda et al. brings again the idea that game elements should be balanced in terms of how they are implemented.

Discussion

This study was done to answer which game elements in education apps were most effective in increasing a student's motivation and perceived productivity. From the study, a connection between motivation and productivity was found. Leaderboards and rewards were factors of excitement in terms of learning. Repetition of such features was found to disengage students on the other hand. This supports the theory that gamification helps enhance learning depending on how it was designed (Toda et al.). Despite not being ranked at the top in what a student preferred; feedback was stated in the open responses as being one of the crucial parts of one understanding their mistakes. This builds upon Chapman et al's statements on real time progress indication.

This research supported the following: Chapman et al. had found rewards and leaderboards increased motivation, Luo et al. have talked about how adaptive difficulty caused students to prefer a game more, Denden et al. found variations in students based on their response to competition where while some liked it, others opposed it. Leaderboards were also found to be more favored as compared to Toda et al.'s findings which said some found it problematic.

From all this, we could ponder the fact that a change in the generation might have caused nowadays students to prefer competitive environments given their positive response towards leaderboards. Design formats such as using competition for students to be able to improve themselves against others. Avoidance of repetition is also a key factor for gamification as well as the proper tie of a student's progress to their rewards, all while getting feedback for their actions.

Conclusion

Gamification is a good way for a more engaged form of learning which, as my research showed, most of the success of a game and its productivity comes from the way it is implemented. After a survey of 45 students, it was concluded that leaderboards, rewards and the challenges were the most motivating in a game with the most perceived productivity by their proper use where repetition, distractions and imbalances are avoided.

The limitations were however the small sample size of 45 responses and a self-reporting bias which may not really be so generalizable. There is also no control group to measure the actual progress of these educational gamified apps but rather responses were perception based. For future studies, I look forward to a larger group of people being used for surveys and a more in-depth analysis of the results.

Works Cited

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Appendices

Consent form added into the survey description of google form (https://forms.gle/Ex7DxE5zrevarpzd8):

I ,_____ , [NAME OF INTERVIEWEE] am consenting to participate in an anonymous survey about the **impact on productivity due to gamification of learning apps**.

Which is being conducted by **Pranavsai Gandikota** for ENC 1102 at the University of Central Florida with **Professor Kalijah Rahming**.

My participation is voluntary, and I understand that I can discontinue the study at any time. I understand that I am also free to withdraw from the study after the interview has been completed without penalty.

I understand that I will not be paid for my participation.
I understand that this study may pose the following risks to me:
[THERE ARE ALWAYS RISKS, EVEN IF IT IS MILD DISCOMFORT]

I understand that I may decline to answer questions which make me uncomfortable.

The researcher anticipates that this research will take **10 minutes** of your time.

If I do not wish for the researcher to record or keep/use my answers, I understand that I will not be able to participate in the study.

I understand that I have the right to ask that the researcher not identify me by name and that I have the right to remain anonymous if I wish to remain so.

I understand that this study has not been reviewed by UCF's IRB.

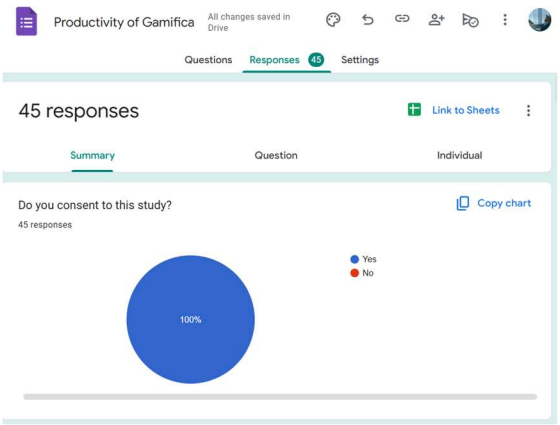
I am over 18 and I have read and understand the statements above and consent to participate in the study.

_____(signature)

_____(date)

_____(principal researcher)

Accepted consent from all participants



Response coding table has been show in the results with example sentences used for coding