

# Potential Negative Impact of Gamification Education: A Review of Gamification Research

Junhang Xiao\*

*School of Humanities and Law, Yanshan University, Qinhuangdao, China*

*\*Corresponding author. Email: guanghua.ren@gecademy.cn*

## ABSTRACT

Gamification education is becoming more and more popular today with the development of electronic technology such as the Internet. Gamification allows students to engage in immersive and experiential learning through the environment and peer social interaction, and it can also set clear game goals to enable students to better complete daily learning tasks. However, recent research trends mainly focus on how to create the novel game elements and make games more interesting to all the students. Less research has been done to discuss the impact of gamification to the learning efficiency from the perspective of the individual. This paper aims to summarize possible factors that can affect the result of gamification education by analysing relevant papers in recent years, identify potential negative impact factors from them and propose risk avoidance schemes for subsequent research. The cases of gamification teaching in recent years reveal that three factors could affect the outcomes of gamification: duration, student personality and game mechanism. Duration is closely related to the profound influence of gamification teaching on students. Students' personality can determine their adaptability and benefits to novel gamification teaching methods, and game mechanism can determine the learning methods and effects of gamification among students. It was also found that short-term gamification teaching with a total duration of less than 21 days and gamification teaching with rewards may be disadvantageous to some student groups, which are mainly introverts. These findings have a reference role in the study of the negative effects of gamification teaching. In the future, specific gamification plans can be formulated in view of these negative effects in the practice of gamification teaching, so that in the classroom gamification teaching can give students a better experience.

**Keywords:** *Gamification, Education, Negative impact*

## 1. INTRODUCTION

Gamification education is a kind of teaching activity that lasts for a period of time and uses game elements to assist courses. It helps to improve students' behavioral engagement and cognitive engagement. Gamification allows students to engage in immersive and experiential learning through the environment and peer social interaction, it can also set clear game goals to enable students to better complete daily learning tasks. Specifically, word games use some interesting images to show the important connections between words and help learners expand their vocabulary. Games based on mathematical operations can also exercise learners' logical skills. Many researchers put forward novel and complex game mechanisms. For example, Qian's study divided game elements into 28 types [1]. There are also various game elements, including collaboration [2], role-

playing [3], exploration [4], interactivity [5], curiosity [6], and rewards [7]. A gamified mechanic that contains more than five game elements is considered as complex. Complex game mechanics can increase the fun of the game, thereby attracting the attention of students. But gamification has contingent effects on different students. Researchers have done empirical teaching for different game elements and students at different stages in recent years, such as undergraduate management students [8], fourth grade students, and junior high school students [9]. They integrate game elements into the classroom, and after a period of teaching activities, they verify the impact of gamification teaching based on student feedback. In these cases, their teaching activities have achieved satisfactory results. However, recent research trends mainly focus on how to create the novel game elements and make games more interesting to all the students. Less research has been done to discuss the impact of gamification to the learning efficiency from the

perspective of the individual. In Chiang's study, an AR environment is provided for elementary school students to explore learning activities and share knowledge. It can be seen from the conclusion that this AR technology can mobilize students' enthusiasm for learning. But the study lacked long-term insights into the negative effects of the early introduction of electronic devices in elementary school. In Huang's study, the games are provided with various kinds of badges, and students can get badges when they reach their target. This game mechanism drives students' enthusiasm and improves the completion rate of the test. However, Huang's study also ignores the problem of whether this mechanism will cause excessive competition.

This paper aims to summarize possible factors that can affect the result of gamification education by analyzing relevant papers in recent years, identify potential negative impact factors from them and propose risk avoidance schemes for subsequent research.

## **2. DISCUSSION**

### **2.1. Influencing Factor**

The character of students, the duration of teaching activities, and the game elements contained in gamification were found as factors which will determine the impact of gamification teaching to individuals. First, people with different personalities have different response to the game. Goldberg's five-factor model indicates that personalities can be categorized as openness, conscientiousness, extraversion, agreeableness, and neuroticism [10]. This theory defines introverts as people who lead their lives through subjective attitudes and are less guided by external things. They will be disgusted or bored by the phenomenon of everyone competing fiercely for gamification rewards, so they need to remain passive to achieve inner satisfaction. In the research of Koceva [11], it was observed that introverts tend to be silent and do not actively express their opinions in teamwork. This will definitely reduce the amount of creative thinking introverts do in the classroom. Not only that, partial students tend to be conservative. Some students have been accustomed to traditional teaching methods before they are exposed to novel gamification teaching. It is difficult for these conservationists to adjust their original learning methods.

Second, intermittent game design achieves better performance than a game that lasts for a long time. According to Psycho-Cybernetics, it takes 21 days for the brain to build a new nerve channel. Human behavior implies that after 21 days of repetition, a habit will be formed. Therefore, this research divides teaching activities into short-term and long-term. Short-term is defined as the total time span of teaching activities not exceeding 21 days, regardless of the teaching time of this

teaching activity in one day. Gamification teaching activities with a total time span of more than 21 days are classified as long-term. The advantage of short-term gamified teaching is that it can let students experience innovative teaching methods at a lower time cost, and perhaps a lower economic cost, thereby enhancing their mental development and expanding their horizons. However, this is only for the general situation, this kind of judgment often ignores the character of students.

Third, the effects of game reward mechanisms are ambiguous [12]. Research mentioned the use of badges in the classroom can increase students' participation. But when there are too many designs and too many rules, it is noted that students can experience being underwhelmed, unmotivated. Badges do not always have the desired effect, as report that they were either difficult to achieve or identify, leading to student frustration. In addition, Pitesa's research revealed that external incentives can undermine intrinsic motivation [13]. The researchers designed extrinsic rewards to engage participants to solve a puzzle, but participants were so care about extrinsic rewards, as evidenced by lower performance after the payment was withdrawn.

### **2.2. Shortcomings of Gamification**

The following are actual cases that the author has noticed among undergraduates showing the shortcomings of gamification teaching. Huang's study was conducted, involving two classes of undergraduate students in an Information Management course. The test results show that students in gamified learning groups are more likely to complete the pre-class and post-class activities on time than those are not.

By the second week of the experiment, the completion of the test in the treatment group within the limited time was 58%, which was not much different from the 55% of the control group, and the difference was only 3%. The difference widened to 17% in the third week and 50% in the sixth week. The above mentioned is the result of pre-class. Something similar happened in the result of post-class. When the gap widened to 17% is three weeks later.

The purpose of Huang's study is to examine whether gamification can enhance student engagement in a flipped course in nine weeks. The improvement in the test completion rate in the first three weeks of the treatment group was not significant compared to about 50% in the sixth week, because the difference between the treatment group and the control group was less than 20%. According to the definition of short-term gamification teaching, these data can confirm that short-term gamification teaching does not significantly improve students' learning efficiency.

The reasons for this can be explained as follows. First of all, young age students show higher level of

conformity. The younger they are, the more they are accepting the orders from teachers. Students can achieve good results in short-term gamification teaching, because they can actively follow the rules of the game and cooperate with the teacher's gamification teaching. But older students will form a more independent way of thinking. They need to understand and agree with the rules of the game before they are willing to cooperate. Most of these 96 undergraduates have the ability to think critically, so there are bound to be some people who are not willing to cooperate or are not comfortable, for those students whose personality cannot adapt to gamification, we cannot deny that they will adapt to this mechanism one day in the long-term teaching, but short-term gamification teaching will undoubtedly disturb them. So in the first two or three weeks, the overall average completion rate has been lowered, but in the first two or three weeks After the sixth week, they slowly began to obey or adapt, so that the effect of gamification has risen significantly.

At the same time, the game mechanism may also be a reason for the unsatisfactory effect of the early gamification, because the elements contained in the game include six elements including rewards and cooperation, which can be called a complex game mechanism by definition. According to reinforcement theory, when people engage in a behaviour, they get a pleasurable result from others, which in turn acts as a force that pushes them toward or repeats the behaviour. What most games have in common is that people who have the ability to get a reward first are more interested in learning, and more interest in learning makes those people more likely to get the reward next time, just like the Matthew effect. As a result, students who lagged behind in the initial stage became more negative in short-term game-based teaching. This only happens in the short term, because after a long term gamification of rewards, the threshold of the regular reward winner rises and he doesn't crave the reward as much as he did in the beginning.

Third, teamwork is one of the elements of gamification. Groupwork or teamwork is also used in English interactive game-style teaching. This method can also transform a teacher-centered classroom into a student-centered, but the researcher's conclusion is that introverts are at a disadvantage in interactive game teaching. Through observation they found that extroverts are very willing to share their opinions in group discussions and this behaviour suppresses the introverts. The positive thinking introverts maintain when they are alone cannot be completed in group discussions. So introverts in the oral English class did not benefit from teamwork.

A gamified math teaching case that contains 40 students in Chongqing can be compared with the above research. The instructors used rewards as the basic game

element, and the mechanism stipulates that students can accumulate 50 points for each correct answer, which can be exchanged for gifts after class. In class, instructors show a question worth 50 points for students to raise their hands to answer after each chapter. During the approximately 35 minutes of the class, the educational resources were significantly biased in favor of the three outgoing students, as they actively raised their hands to the teacher, hoping to get the first chance to go to the blackboard and write down their answers. It can be seen that the learning interest of these three students was improved by the reward mechanism. The rest of students did not actively try to answer the questions in class, and as time went by, they began to feel bored with the rewards connected with questions. Therefore, they seemed to stop thinking about the questions positively and just waited for others to respond and actively cooperate with the teacher's game.

According to the Big Five personality theory, the behaviour of the three students who actively responded to the novel gamification teaching could be regarded as extroversion, while those who never raised their hands could be regarded as the negative reaction to the external reward stimulus, which belong to introverts. In this example, when the 35 minutes were over, the latter did not get the opportunity to actively output their thinking results, but missed part of the knowledge teaching time, because that part of the time was used to gamification, the main beneficiaries of the time were extroverted students. So, in the best interest of the individual, students who lack of extraversion are not suitable for gamified teaching with reward and teamwork game elements.

### **3. CONCLUSION**

This paper analyses the research on gamification teaching and reveals that three factors could affect the outcomes of gamification: duration, student personality and game mechanism. How to design richer game elements and how to attract students' interest in games is now a mainstream direction of gamification research. Generally, gamification teaching can bring positive effects to individual students. It was found that short-term gamification teaching with a total duration of less than 21 days and gamification teaching with rewards may be disadvantageous to some student groups, which are mainly introverts. Based on the complex student characteristics, when gamification needs to be applied to a class, the flexibility of the game is not infinite and the class is difficult to achieve personalized, and it is impossible to adapt to everyone.

In future gamification teaching, we can take effective methods to avoid this possible negative impact. For example, teachers are supposed to adopt eclectic teaching methods, combining different forms and techniques. When a game mechanism is tried and the feedback in the

student group is not good, it should be stopped in time to avoid some mistakes. If it is necessary to apply a reward-based game mechanism, teachers should pay more attention to taking care of these disadvantaged student groups to ensure the normal improvement of the overall effect of student learning, and in this way gamified teaching can be beneficial to the teaching class collectively.

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