Adapting Gamification Approach in Massive Open Online Courses to Improve User Engagement

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Abstract. As learning can be done anywhere, and anytime, people only need to connect to internet and then they are able to browse any knowledge they wanted to seek. In addition the growth of online learning platform increased from time to time. However, even though lot of courses provided online, students' dropout rate seems to be really critical. This research is conducted to propose an alternative for online learning courses to engage students with courses offered online. One way to increase students' engagement level towards the course is by implementing gamification elements. Instead of focusing on type of courses to apply gamification elements, this research is applying gamification in an online courses platform. Gamification elements to be applied in online learning platform are achievers and schedule reward. Findings of this research can be benefit to the teachers who adapt online learning to increase user engagement in their course.

Keywords: MOOC, online learning, problem-solving video, self-paced learning, paired t-test, usability, effectiveness, efficiency, and satisfaction.

1   Introduction

Online learning have a lot of differences compared to traditional education. One of the advantages of online learning from traditional education is the flexibility of learning [1]. Flexibility of learning means that people are allowed to learn at their own pace. However, by giving this flexibility, online learners tend to not to complete the courses. A survey have been done and 15.35 percent from 508 students from different online learning platform claimed that course offered is not engaging enough to force them to stay with the course [2]. Engagement of students in online courses is important and if the completion rate is really low, then it shows that online learning is not really effective for them.

2   Related Work

In this research, student engagement and gamification were the main focuses. In learning, whether it is traditional learning or online learning, student engagement is important in helping a student in understanding the content of the course [3]. Student engagement can be seen as the willingness of a student in participating activities and the time spent for the activities of a course [4]. Each participation done by the student depict his or her engagement towards the course.

In traditional learning, students' engagement were seen when a student answering question in class. However, the traditional learning process was claimed to have lot of flaws compared to online learning [5]. One of the flaws mentioned was about students' motivation. In traditional learning, students' motivation were low because the students were force to take the subjects in the school. Students felt that the subjects they were taken in the school have "distant" with them. Hence, they were not motivated to learn and that lead to low engagement between students and the subject that they were taking.

For the case of online learning, students were able to select their desired course that meet their own satisfaction. However, since learning virtually – without a physical classroom and no need to meet the teachers or lecturers,

students' engagement were more difficult to earn [6]. This situation occurred because, the learning platform such as Massive Open Online Courses (MOOC) has less restriction. The students tend to enrol a course and then leave the course unfinished. A high completion rate were really difficult to get due to the lack engagement offered in MOOC platform.

There were several actions taken by the MOOC instructors to help in increasing student engagement with online learning course. One of the initiatives was taken is through the synchronous chat [7]. This initiative helps in building the relationship between instructor and the students. A group of students will be online at a certain time together with the instructor to exchange ideas or ask questions. Through this actions, Scheuermann [7] believes the students will be more engaged towards the course since students were able to reach the instructor. However, the internet connection seems to be the main reason on to have some students online at the time given.

Another initiative was using enabling method [8]. Dail [8] believes enabling method was meant by injecting daily or weekly assessments. Simple assessment given periodically help in engaging online students. When there are assessment needs to be assessed, students will tend to be online and participate in the online learning to complete the activities. In addition, through assessment, instructor was able to know students' strength and weaknesses. Dail [8] also believes from student's point of view, students are able to see tangible evidence on their performances through the assessment.

In this research the approach of adapting gamification in online learning were taken to improve student engagement towards online courses. Gamification brings the means of game mechanic elements, experience design, digitally engaged, motivating people and help people to achieve their goals [9]. Through the adaptation of gamification elements, students' motivation can increase [10]. There are some gamification elements proposed by Borr *et al.* [10] that can be applied in the MOOC courses as shown in Table 1.

Table 1: Gamification elements [13]

Gamification Elements	Description
Ranking Rating	Best scores in quizzes Best scores in completed modules Best scores for entire course
Voluntary Activity (Voting)	Submitted by groups of students by the end of the course The best group work will be vote by other groups in the course Winning's group activities will be place in "Hall of Fame" in the course.
Course Progress	Progress bar shown in each student's homepage To motivate students to keep enrolled in the course Shows activities remains to be done by students
Certification	Awarded when course have been completed in time As a recognition when finished the course
Number of Likes	Similar to Facebook Students publish it contents of work in MOOC and publish it to social networks

3   Methodology

Adapting gamification elements in MOOC platform to test whether the implementation improve student engagement towards the course was the main focus in this research. Before implementing the gamification elements, the objectives, aim, and scope were finalized first. During this phase, the problems with student engagement in online learning were identified. The information of previous work done that related to the research area was gathered.

The second phase was the development phase. During this phase, the gamification elements were selected and implemented in the Web Programming course. The gamification elements selected for the course were onboarding phase, rewards, and leaderboard. The onboarding phase was meant to help students during their first time in signing up the course, knowing and understanding the course interfaces and what do they need to do to earn badges and certificate. For reward type of gamification, there were two different rewards given in course. The first reward was the badges and the second reward was KFC vouchers. The badges were given through the kudos earned or through the completion of selected activities. The vouchers were given to selected students which were able to complete hundred percent completion rate. The leaderboard was meant to increase student's motivation by allowing them knowing how they performed weekly by showing top ten students with highest completion rate.

The final phase was the evaluation phase. Data were gathered through the analytics results provided by OpenLearning – one of the MOOC platform that was used to deploy Web Programming course. The data gathered were used to analyse through three different measurement to determine whether the gamification elements improve

student engagement. The first measurement was determined by analysing difference in mean between the group without gamification elements and the group with gamification elements. The next measurement was to find the difference in mean between group with and without gamification elements through the comments made by the students. Lastly, the difference made between the two groups in mean was analysed.

4 Experimental Results

As mentioned in previous section, the data gathered for this research were collected through analytic results made by OpenLearning platform. For this research purpose, there were a total of fifty students for both group with and without gamification elements. The first group which the group without gamification elements have thirty-one students while the other group have twenty-two students.

To test whether gamification elements help in improving student engagement towards the course, independent t-test was chosen. Independent t-test was selected because the groups came from a different population. Null hypothesis for this research was there is no difference in mean between two groups while the alternative hypothesis was there is a significant difference in mean between both groups. Below are the hypotheses for the independent t-test.

H₀: $\mu_{\text{non-gamification}} - \mu_{\text{gamification}} = 0$

H₁: $\mu_{\text{non-gamification}} - \mu_{\text{gamification}} \neq 0$

Table 2: Statistic for progress made by both groups

	Group	N	Mean	Std. Deviation	S.E. Mean
Progress	Non-gamification	31	3.05	8.09	1.45
	Gamification	22	17.17	29.49	6.29

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*Lower*	*Upper*
Progress	Equal variances assumed	30.62	.000	-2.54	51.00	0.014	-14.12	5.55	-25.27	-2.98
	Equal variances not assumed			-2.19	23.26	0.039	-14.12	6.45	-27.47	-0.78

Both groups' data for completion rate made by each student were inserted. Table 2 shows the outcome of the results between two groups in terms of their completion rate. Meanwhile, Table 3 depicts the statistic outcomes from the comments made by both groups. Statistic outcome for the kudos earned by both groups were illustrated in Table 4.

Table 3: Statistic for comments made by both groups

	Group	N	Mean	Std. Deviation	S.E. Mean
Comments	Non-gamification	31	0.1	0.4	0.07
	Gamification	22	1.68	4.19	0.89

Table 4: Statistics for Kudos earned by both groups

	Group	N	Mean	Std. Deviation	S.E. Mean
Kudos	Non-gamification	31	0	0	0
	Gamification	22	2.05	5.72	1.22

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Kudos	Equal variances assumed	16.69	0.000	-2	51	0.051	-2.05	1.02	-4.1	0.01
	Equal variances not assumed			-1.68	21	0.108	-2.05	1.22	-4.58	0.49

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Differenc	Std. Error Difference	Lower	Upper
Comments	Equal variances assumed	18.63	0.000	-2.1	51	0.041	-1.59	0.75	-3.1	-0.07
	Equal variances not assumed			-1.77	21.27	0.091	-1.59	0.9	-3.45	0.28

5 Discussion

By referring to previous section, Table 2 depicts positive results in showing the difference between group of students without gamification and group of students with gamification elements applied in Web Programming course. In this research, **α was assumed as 0.05 and equal variances not assumed since the p**-value for Levene's test was less than 0.001. From the results, it also depicts a significant difference in means between group of students without gamification elements and group with gamification elements. This result can be said so since the p-value for t-test was 0.039 which was less than 0.05. Hence, from this results can be said that gamification elements improve student engagement in OpenLearning platform.

From this results, the completion rate of students were seen to be increased compared to students without gamification elements. The significant difference in mean which was -14.12 shows that students without gamification elements having low percentage of completion rate.

Students that experiencing the usual online course that having no gamification elements only excited to do the course during the early phase. After some time, students were not seen to be doing the activities anymore. There are not much progress made by the students neither daily nor weekly. This situation led to the results of having low completion rate made by the first group of students.

On the other hand, group with gamification shows different reaction from the completion rate of students. At first month of the implementation for gamification elements, students show zero progress of activities. However, towards the end of the research experiment date, positive results started to be seen. Students become more active and starts to participate in the course's activities. They also did leave some comments showing that they hoped to gain all the badges that were given through the kudos earned or by completing selected subtopic. The comments were depicts in Figure 1.

Figure 1: Comments made by the students show their excitement to gain the badges

However, the comments made and kudos earned by group with gamification elements were not able to show the difference in means compared to group without gamification elements. From this result, as shown in Tables 3 and 4, both *p*-values were more than **α value set in early experiment. This situation means that the null hypothesis was** accepted which means there were no significant difference in means for both comments and kudos statistics showed.

In achieving social participation in online learning seems to be difficult for both group that experiencing without and with gamification elements. According to this results, a conclusion can be made that, students that learn in online learning were more focused to gain the knowledge that they want to seek rather than earning kudos or leaving comments.

Kudos and comments are related to each other since to earn kudos, a student need to leave comments. Then, the comments that have been made will earned kudos when another students click 'like' button of the comment. Since both of these were related, there were students that love to leave comments while the other students only clicked the 'like' button. The balance between students that leave comments and the other students that only preferred to click 'like' button lead to the results gathered in this research.

When only certain students made comments, and other students only click the button, the social interactions can be made. However, it is not enough to prove that there is a difference in means to accept the alternative hypothesis. Hence, in this research, proves from comments made and kudos earned were unable to show any differences in means between group without gamification elements and group without gamification elements. Social participation between students seems to have a big gap during this research were made. Students have less social interaction in online learning because it depends on students' objectives whether they want to seek for knowledge or to find friends or doing both in the same time.

6   Conclusion

In a nutshell, this research shows a positive results when implementing gamification elements in MOOC platform. The Web Programming course had been chosen to apply the gamification elements and students that were enrolled in the course were being monitored to evaluate their performances whether gamification elements help in improving student engagement towards the course.

Results obtained from the experiments show that students with gamification shows higher completion rate compared to students without gamification elements. However, social participation between both groups did not make any differences whether there are gamification elements implemented in the course or not.

Results may be affected based on individual intention to seek the knowledge. Some students that want to obtained knowledge tend to focus only to finish the course and gained the badges that can be earned through completing activities. Some other students eager to earn all the badges provided hence they participated socially in the course. Hence, this research yield a conclusion that adapting gamification help in improving student engagement towards the course based on higher completion rate made by the group of students with gamification elements.

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