

Gamification in MOOCs - General Overview

Mohammad Khalil¹, Dan Davis¹, Jacqueline Wong²

¹ Delft University of Technology, Delft, Netherlands

² Erasmus University Rotterdam, Rotterdam, Netherlands

Abstract

It has been 10 years since the first MOOC was prepared by George Siemens and Stephen Downes on connectivism and connected knowledge at the University of Manitoba. From 25 participants only to hundreds of thousands of students in 2011, MOOCs became a hype in technology-enhanced learning context. Nevertheless, the phenomenon of MOOCs has become widely experienced with low completion rates. As a result, It becomes necessary to improve the learning experience of MOOC users using different types of interventions. One of the suggested actions is gamifying learners experience and captivating the MOOC learning environment. In this presentation, we discuss the added value of employing gamification, the context that can fit in MOOC environment, as well as list the most popular gamification elements that enhance student engagement and motivation.

Keywords: massive open online courses (MOOCs), gamification, motivation, elements

Extended narrative

Introduction

MOOCs hype reached the milestone in 2011-2012. More and more students enroll in thousands of free courses on the Internet. The traditional way to start learning in MOOCs is to signup on a webpage, enroll in one of the offered courses, and visit your beloved course every week. Don't forget, you need to be dedicated! If you successfully finish all the weekly quizzes, you get a certificate either for free or for a small amount of money.

A lot of research has been done to explain the dropout issue, among of those is the low level of student engagement that may drive student excitement to boredom and then drop out at any stage. Other reasons can be explained by weak student preparation, bad strategy planning, or even for some personal circumstances (lack of time, forgetting, feeling isolated...etc.). Provided the preceding issues, gamification has the potential to reduce the negative impact. While gamification involves entertainment, it can function as a playground for collaboration and motivation in MOOCs (Khalil et al., 2017).

Gamification refers to the use of "game design elements in non-game contexts" (Deterding et al., 2011, p.1). It is thus important to differentiate between serious games and gamification. In serious games, designers refer to develop a game for a specific, non-entertainment goal (Deterding et al., 2011). On the other hand, gamification relies on using elements of a game characteristic. As a result, gamification uses elements and not fully developed games.

Gamification has been used thoroughly in health, environment, crowdsourcing, and education. Within all these disciplines, gamification was relied on to stimulate users, i.e. motivation, and foster goal-directed behavior (Schunk et al., 2012).

Purposes of using Gamification

Games may support learning by influencing cognitive processes and motivation using i) interactivity to promote active cognitive processing of educational materials, ii) simulation of task performed in a game to mirror that of a real world, iii) immediate feedback to correct misconceptions and errors, and iv) choices offered to learners to enhance autonomy and build competencies (Wouters, Van Nimwegen, Van Oostendorp, & Van Der Spek, 2013). However, developing elaborate games can be expensive and time-consuming. Therefore, a less costly way is to employ game elements using gamification features in a non-game environment (Dicheva et al., 2015).

In search of an answer to whether gamification works, Hamari, Koivisto, and Sarsa (2014) reviewed studies examining gamification in a variety of contexts. All the studies reviewed reported positive effect on enjoyment and engagement. The authors concluded that gamification works but its effect depends on the context being gamified and the users. More recently, Looyestyn et al (2017) conducted a systematic review to examine the effectiveness of gamification strategies on online engagement. The results suggested that gamification increased online engagement through more time spent on the online programs, more visits to the online programs, and more participation in online quizzes and discussions. Moreover, studies that examined learning performance also reported an increase in knowledge test when gamification is used. Among the list of gamification features (e.g., points and progress bar), leaderboards appeared to be an effective way to enhance motivation by stimulating competition amongst peers.

All in all, gamification seems to be an effective way to enhance learning. The different game elements, in theory, can enhance learning and motivation to learn. For example, giving learners the choice to decide the number of badges they want to earn can promote autonomy and competence that are both essential to support motivation according to the Self-Determination Theory (Ryan & Deci, 2000).

Gamification Context in MOOCs

The opportunity space for the application of gamification elements in the context of a MOOC is expansive. While creating a fully integrated gaming or simulation environment has not yet been achieved to our knowledge, a number of studies have explored specific instances of gamified elements in a MOOC setting. In this section we will describe these implementations and discuss how these may open the door to inspire future designs for gamified learning at scale.

Coetzee et al (2014) ran a randomized controlled experiment evaluating the effectiveness of a reputation system in the discussion forum of a MOOC. This system rewarded learners who

make strong contributions to the forum with a points-based system. The authors found that, consistent with other MOOC research, increased use of the forum leads to increased achievement. However, in their causal analysis, they report that the reputation system did not have any impact on learners' grades, engagement, or sense of community. On the other hand, learners with the reputation system responded significantly faster and more often in the forum than those without in the control condition.

While not explicitly presented as a gamified course element, Davis et al (2017) delivered a data visualization of learners' data to learners in a MOOC. This visualization offered a visual comparison of a learner's own data against that of a successful learner from a previous run of the course in the form of a spider chart (or radar plot) displaying six measures of engagement. The theory behind this was that by making learners more aware of what successful behavior looks like, they can learn from that and shape their own behavior accordingly. The authors found that across all four courses it was deployed in, this visualization led to increased passing rates.

It is worth noting, though, that not all gamification elements must be social---another approach to visualization of learner feedback would be to have a learner compete against themselves each week. For example, each week, show learners a visualization of their behavior from the previous week and challenge them to reflect and improve upon it going forward.

Ritter et al (2016) examined the effectiveness of a mastery learning stipulation in a large-scale learning environment. While not commonly thought of as a gamification element, their implementation aligns with the common game element of unlocking achievements and more content. In their experiment, they only allowed learners to advance to the next chapter or topic once the learner had demonstrated mastery over the previous materials. The authors found that when mastery learning is violated (learners skipped ahead without achieving mastery), learner performance suffered.

Gamification Elements

Taking into account the added value of gamification in leveraging student engagement and motivation, this section lists briefly six popular gamification elements that may be offered on MOOCs.

Leaderboards (Antonaci et al., 2017): Leaderboards assess learner performance and provide feedback . As a result, the feeling of competence is provoked upon. Leaderboards may also support the learning process by evoking student inner motivation to be at the top among other colleagues.

Trophies and Badges (Chang and Wei, 2016): Badges are used to record an achievement. Provided that there is a wide range of MOOCs available on the ground, badges and trophies can serve as an archive of one's completed activities and highlights his/her interest. Moreover,

badges can play a major role in enhancing user's engagement in MOOCs. Chang and Wei (2016) found out that learners in MOOCs opt to collect as more types of trophies as possible.

Progress bars (Renz et al., 2014): Within the learning path, it is important for students to track their progress towards their goals. There is nothing better than seeing your progress. Progress bars trigger "sense of completion" and therefore derives a feeling of satisfaction which is an essential in the Self-Determination Theory (Ryan & Deci, 2000).

Course Coins (Antonaci et al., 2017): Course coins or currency is a newly fresh element in gamification. They can be served in various models such as credits to gain a MOOC certificate, buy services or support, or get access to paid degrees.

Quests and achievements (Chang and Wei, 2016): Doing quests and earning achievements afterward evoke user satisfaction. Achievements serve as a recognition for reaching a milestone of doing general or specific tasks. Believing in one's own ability to do something is what is called self-efficacy, hence, identifying a goal "quest" and following a path to achieve that goal increase learner's self-efficacy.

Avatars: Avatars are visual portrayals that can be customised by users. Avatars achieve, to some extent, the psychological need of someone's autonomy as well as the freedom to personalize and adapt a special character along the learning path.

Empirical Experience

In this part of the presentation, we show one experiment of using gamification in MOOCs. The followed gamification approach depended on the early-published framework called 'Activity-Motivation Framework' (Khalil & Ebner, 2017). The framework conceptualizes using battery gamification symbols that target increasing student engagement through focusing on the intrinsic and extrinsic motivation factors of learners. The used gamification elements which are battery symbols (see figure 1) represent MOOC activities of users based on their previous week interactions such as their logging frequency, social activity, and quiz trials.

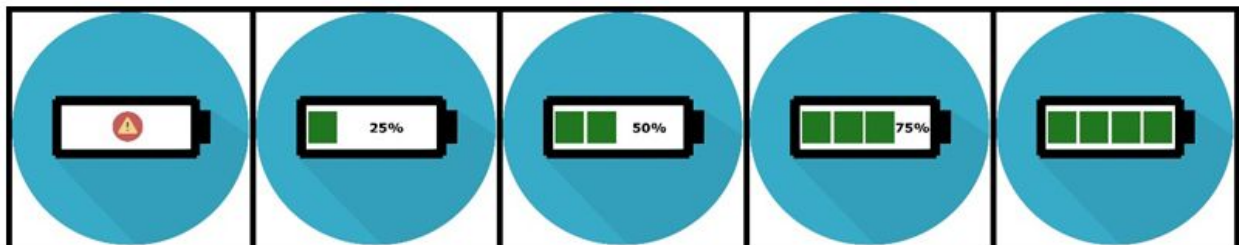


Figure 1: Statuses of deployed gamification element (battery) in a MOOC platform (Khalil et al., 2017)

The deployment results show that the MOOC by which gamification was applied to (2016 version), has gained an increased level of students attention and engagement (experimental

group). In a comparison of two versions of the MOOC in 2015 and 2016, the certification ratio has increased from 19.74% in 2015 to 26.05% in 2016.

It should be noted that gamification in MOOCs carries promising results in enhancing student engagement, however, it is still questionable whether gamification solely is the right intervention to increase MOOC completion rates (Khalil et al., in press)!

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References:

- Antonaci, A., Klemke, R., Stracke, C.M., and Specht, M. (2017). Gamification in MOOCs to enhance users' goal achievement. In IEEE 2017 Global Engineering Education Conference (EDUCON), pp. 1654-1662, IEEE, 2017.
- Chang, J.W. and Wei, H.Y., (2016). Exploring Engaging Gamification Mechanics in Massive Online Open Courses. *Educational Technology & Society*, 19(2), pp.177-203.
- Coetsee, D., Fox, A., Hearst, M. A., Hartmann, B. (2014). Should your MOOC forum use a reputation system? In: CSCW '14. (pp. 1176–1187). ACM.
- Davis, D., Jivet, I., Kizilcec, R. F., Chen, G., Hauff, C., & Houben, G. J. (2017). Follow the successful crowd: raising MOOC completion rates through social comparison at scale. In LAK (pp. 454-463).
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15). ACM.
- Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: a systematic mapping study. *Journal of Educational Technology & Society*, 18(3), 75.
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 3025-3034). IEEE.
- Khalil, M., & Ebner, M. (2017). Driving Student Motivation in MOOCs through a Conceptual Activity-Motivation Framework. *Zeitschrift für Hochschulentwicklung*, 12(1), 101-122.
- Khalil, M., Ebner, M., & Admiraal, W. (2017). How can Gamification Improve MOOC Student Engagement?. In Proceedings of the 11th European Conference on Games Based Learning: ECGBL 2017, Graz, Austria, (pp. 819-828).
- Khalil, M., Wong, J., Koning, B., Ebner, M., Paas, F. (in press). Gamification in MOOCs: A Review of the State of the Art. In proceedings of the EDUCON conference 2018. Spain.
- Looyestyn, J., Kernot, J., Boshoff, K., Ryan, J., Edney, S., & Maher, C. (2017). Does gamification increase engagement with online programs? A systematic review. *PloS one*, 12(3), 1-19.
- Renz, J., Staubitz, T., Pollack, J., and Meinel, C. (2014). Improving the Onboarding User Experience in MOOCs. In Proceedings of the EduLearn conference, pp. 3931-3941, 2014.

Ritter, S., Yudelson, M., Fancsali, S. E., & Berman, S. R. (2016). How mastery learning works at scale. In Proceedings of the Third (2016) ACM Conference on Learning@ Scale (pp. 71-79). ACM.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.

Schunk, D. H., Meece, J. R., & Pintrich, P. R. (2012). Motivation in education: Theory, research, and applications. Pearson Higher Ed.

Wouters, P., Van Nimwegen, C., Van Oostendorp, H., & Van Der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games.