GAËTAN TEMPERMAN, GLORIA VANDENPLAS,
CASSANDRE GIOTIS, KARIM BOUMAZGUIDA,
BRUNO DE LIÈVRE

Analysis of the Real and Perceived Effects of the Integration of Open-Badges on Engagement in a MOOC

ABSTRACT

This article focuses on the integration of digital badges in a distance learning environment such as a MOOC. By comparing two sessions of the same course (without badges vs. with badges), we observe that participants in the session with badges have a higher level of engagement than participants in the session without badges. Based on a questionnaire provided at the end of the course, the positive opinion of the students about the badges shows that badges can influence the motivation and the implementation of self-regulation strategies during their learning process.

Keywords: MOOC, Badges, Engagement.

Introduction

Within distance learning environments, digital badges are increasingly used to boost online learning from a gamification perspective (Fajiculay et al., 2017; Imran, 2019). For learners, they are proof of achievement, of reaching a goal. Informatively, they usually include metadata such as the issuer of the badge and the criteria for assessment or achievement. Socially, the ability to share the badge on networks allows new evidence of this mastery to be disseminated among one's contacts (Stefaniak & Carey, 2019). In this study, we focus on the effects of these badges on learner engagement and the links between this engagement and learning quality. In addition, we analyse students' views on the perceived experience of these badges.

Open-badges

Open Badges are a digital badge system developed by the Mozilla Foundation[1]. It is a form of certification of mastery of skills and participation in various training systems. They are inspired by video games and are part of a movement that promotes gamification as a modality of interactivity in learning devices (De Lièvre et al., 2017). In an educational context, the aim of badges is to enhance learners' motivation and engagement with the activities offered (Reid et al., 2015). Research often indicates a positive effect on motivation (Reid et al., 2015; Fajiculay et al., 2017). However, this effect is relative due to a novelty effect often reported by learners (De Lièvre et al., 2017).

In terms of process, Uanhoro and Shwu-Ching Young (2022) examined the effect of awarding badges following quizzes. Their analyses show that learners complete their activities in a more regular and distributed manner. The learners' perceived experience shows an increase in the level of motivation for the course with the addition of digital badges. This result corroborates Rollin's (2021) data which shows that students' level of self-determination, academic performance or level of digital skills influence their engagement with an open-badge device and the number of digital badges acquired. Davis and Singh (2015) report evidence of the positive impact of badges on student engagement levels. Badges increase the quantity of student contributions and the length of engagement without decreasing the quality of their contributions. De Lièvre et al. (2017) show that this engagement with badges can be enhanced by proactive tutoring that regularly reminds them of their interest in the learning process.

A real difficulty with the use of digital badges is that they could undermine the intrinsic motivation of goal-oriented learners. According to Alt's research (2021), however, this risk can be limited at the design stage so that learners see them as tools for systematically working towards goals and developing the targeted competences. When instructions make the badge approach explicit (De Lièvre et al., 2017), these can thus be used to visualise the learning path of content and activities. In this perspective, the use of badges can be compared to a roadmap in scouting or a dashboard in the time management of a project.

From a pedagogical point of view, however, it is important to understand how digital badges impact on learning by questioning both engagement in

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[1]   A non-profit organisation established in July 2003. It manages the Mozilla community, which develops and publishes Mozilla products, all of which are freely available – https://en.wikipedia.org/wiki/Mozilla_Open_Badges.

learning and students' perceptions of that engagement in relation to badges. The study that we report in the following text, carried out in the context of a MOOC, questions these two dimensions in a complementary way in order to put into perspective what students actually do and what they want to tell us about their learning experience with badges. We plan to collect this perception of the learning experience by looking at self-regulation strategies, motivational dynamics and emotional management.

Self-regulation, motivation and emotions

In a learning process, engagement is partly linked to the learners' ability to implement self-regulatory and motivational strategies. From a conceptual point of view, regulation can be defined as the process that allows a system to maintain itself in a state of equilibrium (Raynal & Rieunier, 2009). Self-regulation applies to a system when regulation is taken over by the system itself. Informed by their results, these systems modify their behaviour if necessary. It therefore corresponds to the capacity of people to adapt to changes that involve continuous movements between desired and actual states (Viau, 2009). It is a form of regulation whose regulator is simply the learner himself.

According to Cosnefroy (2010), self-regulation requires a subtle balance between autonomy and effort. The ability to learn independently of the teacher requires significant effort. The idea of effort is also taken up by Vohs and Baumeister (2004) cited by Cosnefroy (2012) who defines the concept as the personal effort made to modify one's internal states and behaviour. This link between effort and autonomy can be explained by the fact that engaging in a learning activity represents a significant cost that requires giving up other, perhaps more attractive, activities in one's immediate environment. An individual's different goals are thus in constant competition. While learner autonomy is a desirable skill, it should not be a prerequisite. It should be seen as an objective to be achieved, in the sense that a learner is not autonomous in the absolute, but rather in relation to a task to be performed. Maintaining priority in the activity therefore always requires a relatively large effort. This situation of arbitration can be reinforced by the confrontation with the difficulty of the task. An autonomous individual is an individual who defines his own objectives, his criteria for success, and who is then able to implement the strategies he has devised to achieve his objectives (Cosnefroy, 2012). A learner is self-regulating

during the course of an activity when he/she becomes aware of his/her abilities and then adjusts his/her behaviour, according to them.

To achieve this, he must implement three successive processes which are based on a cycle logic: a process of anticipation, a process of control during the task and a process of self-reflection. The anticipation and planning process concerns the prior analysis of the task. It leads the learner to analyse the different constraints of the learning situation, to evaluate his/her resources and to elaborate his/her work plan. It involves highlighting the steps to be followed and the effective strategies for carrying it out. This orientation stage amounts to the learner asking the question: "Where am I going?". Control is more about overseeing the plan to complete the task. It allows the learner to collect data that will enable him/her to objectify the situation. It consists in coming back, by comparison, to the objectives set and the strategies implemented in order to evaluate their progress. This second stage plays a sort of feedback role by providing answers to the question: "What is my progress?". The third process, in which the learner takes a step back, is initiated. It is based on the data from the monitoring. This self-reflection leads the learner to make the necessary decisions to modify, if necessary, ineffective or inadequate strategies in the process. The question that then arises is: "What work do I do next" (Feed Forward). When the learner goes through these three stages, his or her learning can be described as self-regulated.

In parallel with the implementation of self-regulation strategies, we can also question the determinants of motivation insofar as they directly impact on the actual commitment to learning (Viau, 2009). A distinction can be made between the perception of the value of the activity, which relates to perceived usefulness, and the perception of one's competence (of oneself). The perception of one's competence can be associated with the concept of a feeling of self-efficacy (Bandura, 2019), which he defines as the knowledge that an individual has about himself and that he uses and modifies during events. It is constructed by the individual. It is subjective and does not correspond to the reality of the facts. This perception arises from past activities and is modified according to new experiences and the person's failures or successes.

Finally, a relative consensus exists in the literature around the idea that emotions play a central role in learning and influence our cognition (Tyng et al., 2017). The management of emotions in relation to badges therefore seems to us also relevant to question, in particular at the level of the pleasure and stress dimension of obtaining them.

Context and learning environment

The context of our experimentation concerns the MOOC: Evaluation of digital environments for human learning (Season #02), organised by the University of Mons (UMons) and the UMP of Oujda in Morocco. It is freely accessible from the portal: https://umooc.umons.ac.be.

This MOOC is structured around seven modules. Each module deals with a specific topic and is divided into three complementary phases: an informative phase with video clips accompanied by various resources (infographics, commentaries and bibliographies), a formative phase with a self-correcting quiz and an applicative phase, with learning tasks enabling the transfer of the content discovered. The last module deals with the review and certification of knowledge.

The training is spread over a period of 7 weeks. Throughout the course, participants can return to the learning and manage it as they wish, both in terms of discovering the video clips and carrying out the proposed activities. For each self-correcting quiz, learners can obtain a mastery badge (see Figure 1). This badge is obtained when the learners have achieved a level of success of at least 80%.
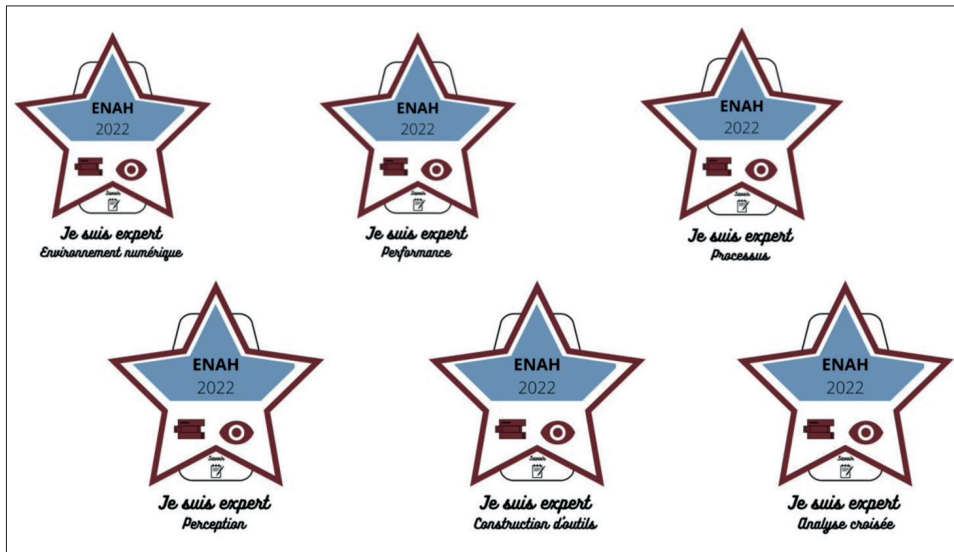

Figure 1. Examples of badges awarded in the MOOC

Source: Authors' own elaboration.

Methodology

Our sample consists of 281 participants, registered for the MOOC (Season #02). Of the 281 participants, 90 completed the final test to validate the training. In our study, we will also rely on the data from the previous year's MOOC (Season #01) where the participants (N = 1,468) benefited from the same scenario except for the integration of digital badges associated with the formative quizzes.

Based on our theoretical review of the literature, this study will try to provide some answers to the following two research questions:
- Q1: Do badges impact on effective engagement in learning?
- Q2: How do learners perceive their engagement with badges?

To answer the first question, we exploit the learning traces which concern the number of attempts at the quizzes associated with the badges as well as the number of badges obtained.

To answer the second question, which concerns the participants' perception, we asked them at the end of the training (week 7) to complete a questionnaire based on different complementary indicators that can explain the effective engagement in learning (see Table 1), namely self-regulation strategies, dynamics in terms of motivation and management of emotions. We have a total of 79 respondents to this perception questionnaire. In the online questionnaire, respondents expressed their level of agreement with different statements on a 4-level scale that includes two negative and two positive poles (strongly disagree - -, disagree -, agree +, strongly agree + +).

Table 1. Dimensions of the perception questionnaire

Perceptions of the...	Actions	Description
...to self-regulation	Planning	Estimating the time needed, managing time effectively, choosing appropriate strategies
	Anticipation	Forecast of expected results, identification of steps, clarification of implementation procedures
	Control	Justification of choices made, verification of understanding and goals, self-assessment, comparison of results obtained with the objectives set.
	Adjustment/adaptation/ self-reflection	Adapting planned procedures, making decisions on resource allocation (human and material), correcting errors.

	Commitment	Entry into action and investment
... to motivation	Perception of competence	Self-image (sense of efficacy, competence, values, etc.) and description of how one acts
	Goal setting	Formulation of objectives to be achieved
	Assessment of the activity	Perception of the value of the activity
...to emotions	Expression of emotions	Stress, pleasure, competition

Source: Authors' own elaboration.

Analysis of the results

Our analysis of the results is structured around the two research questions (actual engagement and perceived engagement).

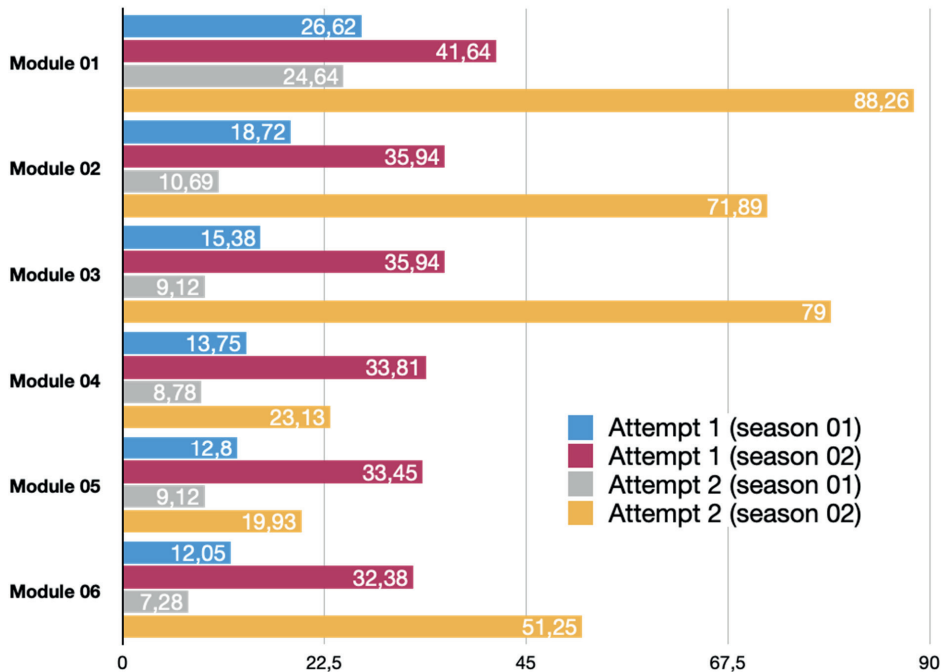**Q1: Do badges impact on participants' engagement with the MOOC?**

Figure 2. Relationship between number of attempts at quizzes and number of participants (MOOC #01 vs MOOC #02)

Source: Authors' own elaboration.

To answer this question, we compared the number of first and second attempts at the quizzes taken during each module (N = 6) between the two MOOCs (Season #01 vs. Season #02) weighted by the number of participants (see Figure 2). This ratio allows us to express the results in % and to compare the real engagement of the students between the two sessions of the MOOC (season #01 = no badge vs season #02 = with badges).

While there was a gradual decline in engagement over the course of the course (between Module 01 and Module 06), examination of Figure 1 shows that participants in Season 02 (with badges) were more active than those in Season 01 (without badges) in using the quizzes. This trend is observed on the one hand at the first attempt and on the other hand at the second attempt. This finding suggests that badges have a positive influence on learners' engagement with the device.

Table 2 shows the number of badges and the number of attempts per module. Although the number of badges is gradually decreasing, it can be observed that the number of badges given is still significant in relation to the total number of participants (N = 281) and corresponds to more or less 1/3 of the registered participants. These results correspond to a rather high level of commitment in a MOOC-type device (Boumazguida, 2020).

Table 2. Number of badges issued per module

Module	Number of badges issued	Ratio number of badges / number of participants
01	104	37.01
02	97	34.51
03	94	33.45
04	93	33.09
05	92	32.74
06	90	32.02

Source: Authors' own elaboration.

Q2: How do learners perceive their engagement with the MOOC in relation to badges?

Let's now look at what participants want to tell us about their learning experience with the badges. Table 3 shows the participants' views on the regulation of their learning. It shows that students were able to adapt their learning

strategies (57.50% positive) to take ownership of the content as they have the opportunity to check their level of mastery (67.50% positive). However, they were more sceptical about the ability of the badges to help them with time management (37.50% positive).

Table 3. Links between badge use and self-regulation (%)

	- -	-	+	++
I adjusted my learning strategies as a result of getting or not getting badges in each module.	15.38	25.64	38.46	20.51
The badge awarded in each module is a good check on my understanding of the subject.	10.25	20.51	53.84	15.38
The allocation of badges by module helped me in my time management in the course.	21.79	39.74	28.20	10.26

Source: Authors' own elaboration.

Regarding the motivational dimension, Table 4 summarises the students' opinions on four complementary items. It can be seen that the badges contribute to the achievement of the learning objectives (57.68% of positive opinions) and at the same time stimulate the value of the task. They support their commitment to the MOOC (62.83% positive opinions) and motivate them to complete the MOOC (55.12% positive opinions). However, they are more reserved about their commitment at the beginning of the MOOC (34.61% positive opinions). It is therefore more during the process that participants discover the value of Open badges for learning, probably reinforcing their sense of control over the task on this occasion.

Table 4. Links between badge use and motivation (%)

	- -	-	+	++
Obtaining the badges helped me to achieve my learning objectives.	17.95	24.36	47.43	10.25
The badges motivated me to engage in the MOOC.	15.38	21.80	29.50	33.33
The badges motivated me to start this MOOC.	26.92	38.46	21.79	12.82
The badges motivated me to complete this MOOC.	15.38	29.49	34.61	20.51
The badges awarded represent my work.	10.25	20.51	57.69	11.53
I expect to earn more badges in the future.	11.53	30.769	46.15	11.54

Source: Authors' own elaboration.

Regarding the link between the work invested and the achievement of the badge, the students expressed a rather positive opinion (69.22%). This result suggests that the integration of badges can enhance the participants' sense of controllability in a learning process (Bandura, 2019). In terms of prospects, however, opinions are more divided about earning more badges in the future (57.69% positive). This result is quite logical as motivation is linked to the learning context in which learners operate.

Table 5 examines the relationship between badges and emotions. It can be seen that students feel pleasure (79.48% positive). Few students felt stress about getting the badge (27.27% positive) or competition for the badge (12.89% positive). This result is quite logical as the environment does not offer a dashboard allowing students to observe the activity of other learners in terms of badges. They can only do so by consulting the learners' profiles to see whether or not they have acquired the badges in question. This navigational constraint probably tends to limit the mechanisms of social comparison within the community of learners in this way (Temperman, 2013). The low level of stress can also be explained by the formative nature of the test associated with each badge. From a correlational point of view, however, we observe that perceived stress in relation to badges is positively related to being in a competitive dynamic (Rho = 0.254; p = 0.026). This suggests that competition in relation to the principle of social comparison could perhaps induce stress in participants.

Table 5. Links between badge use and emotions (%)

	- -	-	+	++
I felt pleasure when I got a badge.	6.41	14.10	51.28	28.20
I felt stressed about acquiring badges	36.36	36.36	20.78	6.49
I felt that I was in competition with others as a result of acquiring the badges.	47.43	39.74	7.69	5.12

Source: Authors' own elaboration.

Discussion of the results and perspectives

Our results show that digital badges can have a positive effect on motivation and limit learners' procrastination. In a MOOC context, the integration of badges stimulates learners to engage in learning by acquainting themselves with the content and testing their mastery of it repeatedly via the available formative

tests. These results are in line with Uanhoro and Shwu-Ching Young's (2022) observations on effort distribution and Rollin's (2021) observations on engagement with the learning device. In terms of instructional design, this result is interesting in that the effect of the formative test positively impacts learning. Thomas et al (2016) show that it is not the score on the self-assessment tests that has a significant impact on the quality of learning, but rather the number of attempts that proves to be a positive predictor of learning quality. In a previous study, we were able to corroborate this result of the link between the use of online tests and the level of mastery at the end of learning (Boumazguida et al., 2018).

The analysis of perception proved to be interesting, as it allows us to highlight explanatory leads to the actual engagement of MOOC participants with the badges. Their actual use can be linked to certain self-regulatory strategies such as a means of checking the level of mastery of the content discovered and, to a lesser extent, of adjusting their learning strategies. At the motivational level, obtaining badges seems to have a positive influence on the determinants of motivation such as the learners' feeling of competence during the learning process, the value placed on the task and the feeling of controllability (Viau, 2009). Finally, it can be highlighted that the emotions linked to the acquisition of badges seem to reflect a positive learning experience (high sense of pleasure and low perceived stress).

All of our observations indicate that the integration of Open Badges is an interesting lever for boosting the learning experience of participants in a MOOC. This approach proves to be relatively efficient for managing large groups of participants, as it is based on automatic badge allocation according to the results of formative tests. It seems to us to be particularly well suited to learning environments such as MOOCs.

In terms of research perspectives, the effects of the use of badges on learners' performance in the short term and in the longer term in terms of transfer probably remain to be questioned. This is a complex issue from a methodological point of view, and one that is still poorly documented in the educational literature.

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