



The Use of Gamification as an Innovative Practice Pedagogy to Enhance Student Engagement during COVID-19 Pandemic

PRACTICE-BASED PAPER

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ABSTRACT

In this paper I share my experience of using gamification on a Big Data Analytics module to enhance student engagement with online teaching and learning during the COVID-19 pandemic.

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INTRODUCTION: THE PANDEMIC AND LEARNING AND TEACHING

In this paper the use of gamification as an innovative practice pedagogy in response to the disruption to traditional ways of teaching and learning brought about by the COVID-19 pandemic is discussed. Disruptions are generally not welcome but can create opportunities for innovation. The pandemic has brought about unprecedented challenges in the teaching and learning space. In the earlier days of the pandemic, whole nations were locked down, this meant life including teaching and learning had to go virtual. This also meant that traditional ways of encouraging engagement and participation in students needed to be revisited. These traditional methods were mostly based on face to face (in person) time spent with students (lectures, labs and so on) the 'new normal' changed that. This major disruption presented us as educators with the opportunity to be innovative in our response.

GAMIFICATION AND MASTERS-LEVEL LEARNING AND TEACHING

Gamification was embedded within a masters programme's Big Data Analytics module as a case study. The overarching aim being to increase student engagement and their overall experience positively. Gamification is said to be "the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals" (Burke, 2014). The idea was to use gamification elements such as badges, certificates, leaderboards, and prizes to enhance student engagement on this module. These were expected to have a positive impact on student engagement both within learning and assessments. The gamification of the module included the provision of incentives to promote engagement with the learning material and provided instant feedback and rewards for engagement with elements such as quizzes, tests, recordings and upward progression on a leaderboard.

A blended learning approach was adopted, and this meant that larger amounts of learning resources were made available online than was the case prior to the pandemic. Getting students to engage with online learning usually takes greater motivation and gamification can help provide this. In this case it enabled me as the educator to make tasks/learning more interactive and engaging, thereby making learning 'fun'. Examples include a student automatically being awarded a badge, points, or certificates in Blackboard for watching a recording, doing a quiz, contributing to a discussion board and so on. All of which would in turn then contribute towards their standing on the leaderboard. Figure 1 depicts some of the gamification elements and rewards that I used.

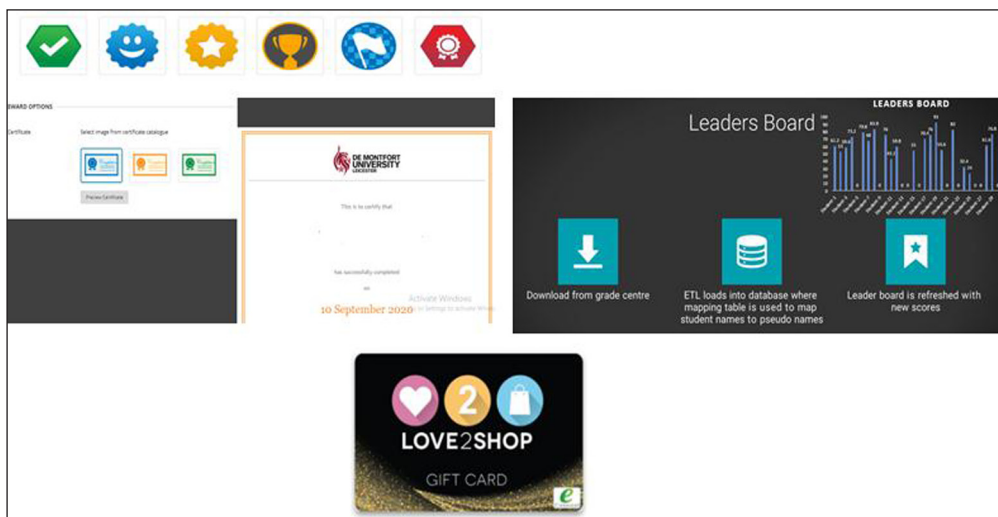


Figure 1 Gamification Elements (badges, certificates, leaderboard and gift vouchers).

The Big Data Analytics module is a very practical one and prior to the pandemic most of the teaching was done in computer labs and was very hands on. As a result of the pandemic, most of the sessions for this cohort of students had to be moved online and I realised early on that if the learning outcomes were to be met then student engagement with the provided online material and resources needed to greatly increase. To encourage this, gamification elements were set up to engage/motivate different levels of students. The conceptual framework (see

Figure 2) and gamification strategy that I developed for this recognises three levels of learners; level 1 – passive engagers, level 2 – active engagers and level 3 – deep engagers and the strategy incentivises all three levels of engagement. For instance, the module Blackboard shell was set up to trigger a reward for the passive engager who just watches a recommended recording or reads a recommended article whilst on the other hand for your deep engager, the Blackboard adaptive learning capabilities would be used to suggest optional additional tasks/ learning which go above and beyond. The same strategy was also used for the overall prizes to ensure that these do not only apply to those on the top of the leaderboard (who might be the more academically oriented ones) but for others as well there were prizes for the most improved and for the most engaged students over different periods.

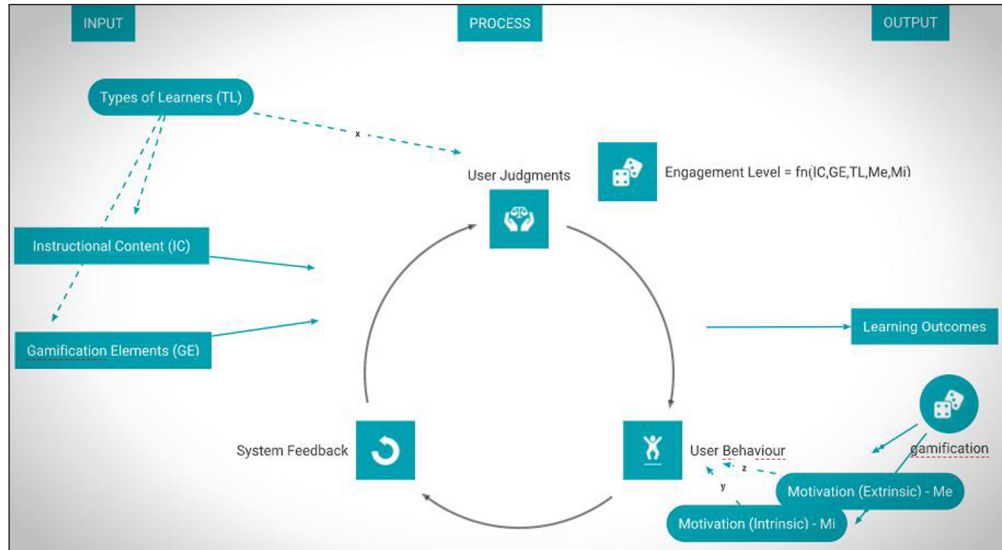


Figure 2 Gamified Input-Process-Output-Model (adapted from Garris et al., 2002).

The main objective of the framework was to motivate and encourage student engagement with the course materials and the module as a whole. More on the different layers/levels of engagements are listed below and also depicted in Figure 3. This is also followed by a discussion on how the levels were defined and characterised.

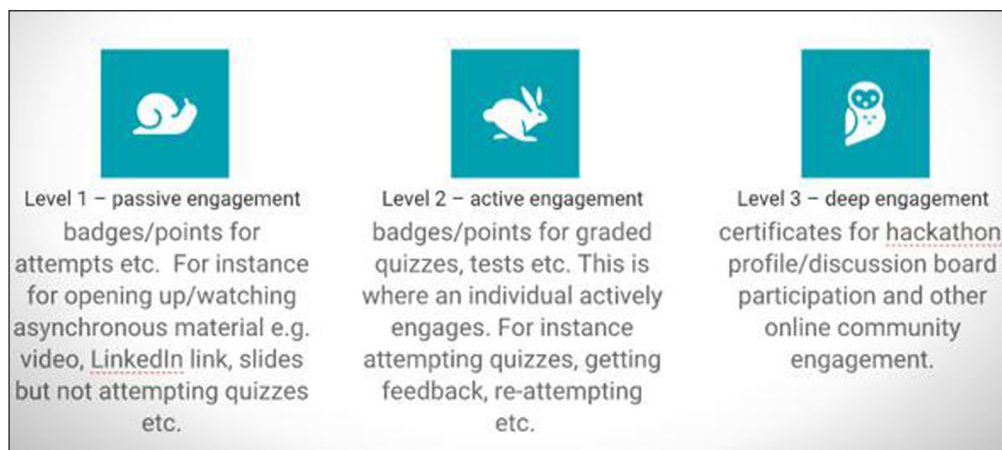


Figure 3 Levels of Engagement.

- Level 1 – passive engagement with the online course material e.g. watching recorded materials or reading written materials.
- Level 2 – active engagement, e.g. attempting quizzes. Generally characterised by reasonable understanding of the online material and where there is a lack of understanding, highlighting of the gaps in knowledge.
- Level 3 – deep engagement, characterised by thorough understanding of the online material. In this level the gaps in understanding identified in level 2 are filled.

These three levels of engagement (i.e., passive, active and deep engagement) are defined based on extant literature on student engagement, particularly research that identifies three

dimensions to student engagement; behavioural, emotional, and cognitive engagement (Fredricks et al., 2004; Trowler, 2010). In their work on these three dimensions of engagement, Fredricks et al., (2004) and Trowler (2010) describe behaviourally engaged students as those who would conform to basic expectations that institutions have of a student. For instance, attendance of classes and submission of assessments. They go on to describe the emotionally engaged students as those whose emotions are engaged in the whole learning process and so would in the course of their students experience feelings such as enjoyment, interest and a sense of belonging. Finally, in terms of cognitive engagement they describe these as students who are intrinsically driven, those who would go well and above basic requirements and hence would meet and even exceed expectations. Based on these dimensions, where there is a low amount of each of the dimensions this maps to passive engagement. Where there is an average (medium) amount of the dimensions then it maps to active engagement. Finally, where there is a high level of these dimensions it maps to deep engagement. Figure 4 depicts these mappings.

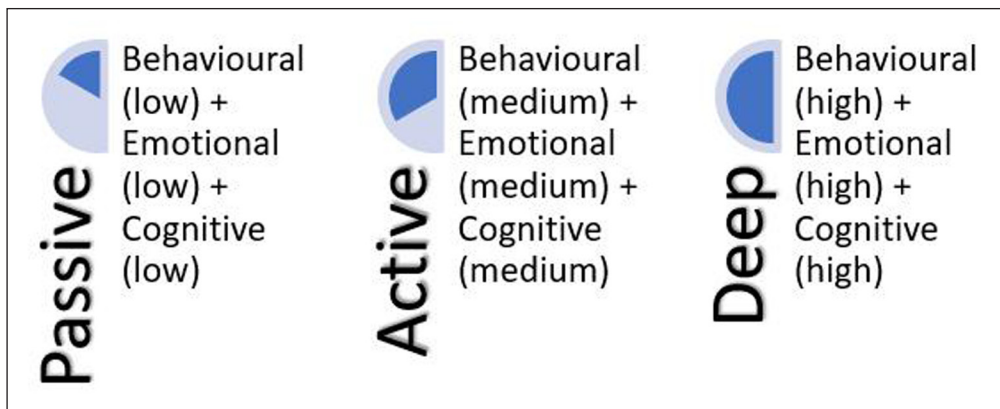


Figure 4 Mappings to Levels of Engagement from the Dimensions of Engagement.

A gamification strategy that catered for each of these engagement levels was then designed and implemented. One key element in the strategy was linking it to the modules learning outcomes and at the same time ensuring the design also focused on the enhancement of student engagement. The learning outcomes for the big data analytics module are listed below:

- A systematic understanding of what Big Data is, where it comes from and what the key challenges are.
- Gain comprehensive knowledge of the Hadoop Distributed File System architecture and how it relates to the idea of the 'data warehouse' and traditional relational databases.
- Demonstrate self-direction and originality in analysing vast amounts of unstructured data using massively parallel and scalable cloud computation systems.
- Critically evaluate data mining and machine learning algorithms for large scale data analytics using Apache Spark.

Based on the module learning outcomes it was clear that for the gamification strategy to have a positive impact on the learning outcomes, two main things needed to be incorporated; firstly, the design of a gamification strategy that encourages students to engage with the resources and material in terms of reading and watching them. Secondly as the module is an extremely practical hands on one, the gamification strategy needs to also motivate students to participate in hands on activities. Figure 5 summaries the various components that make up the strategy and breaks them down into four main components namely;

- Gamification elements for online learning communities – these are the elements that have been included in the gamification strategy to specifically target the development of an online learning community. These are not focused just on the individual but on the individual as part of a group and would help in fostering a sense of belonging in the group. An example of this is the leaderboard which showed an individual's position in terms of engagement in relation to their class mates.
- Gamification elements for individual engagement – In this case the focus is on enhancing the individual student's engagement and increasing their motivation levels. Some of the elements that are used here include badges and certificates.

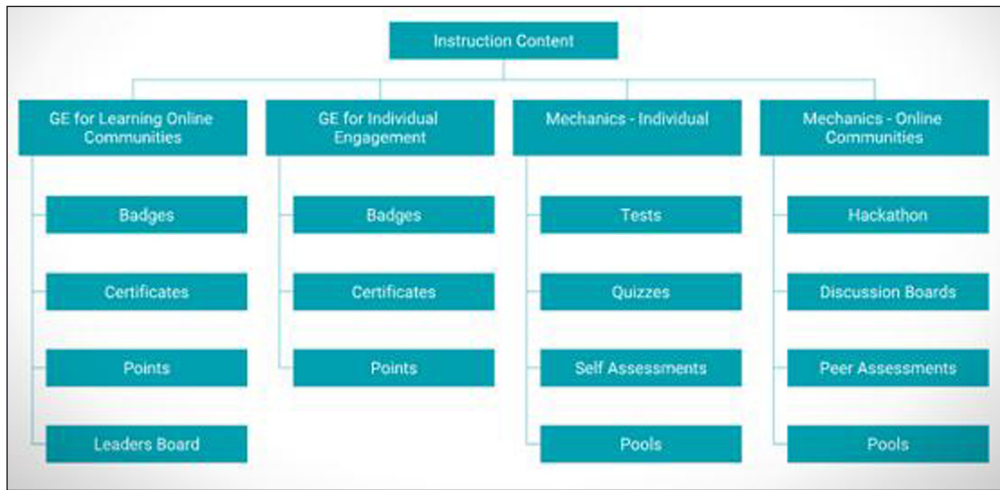


Figure 5 Elements of the Gamification Strategy.

- Mechanics for individual engagement – In terms of mechanics these refer not to the rewards that are given for engagement but the actual elements that the individual engages with such as tests and quizzes. The focus here is on the individual learner.
- Mechanics for online communities – In this case these refer to the elements that the students engage with but the focus here is on the group and not the individual learner. Examples here are the use of hackathons and discussion boards.

Each of these elements together cover the elements that motivate engagement, the elements that engagement is actually done with and all these have an impact on the learning outcomes. **Figure 6** depicts a high-level simplified view of how the cycle works.

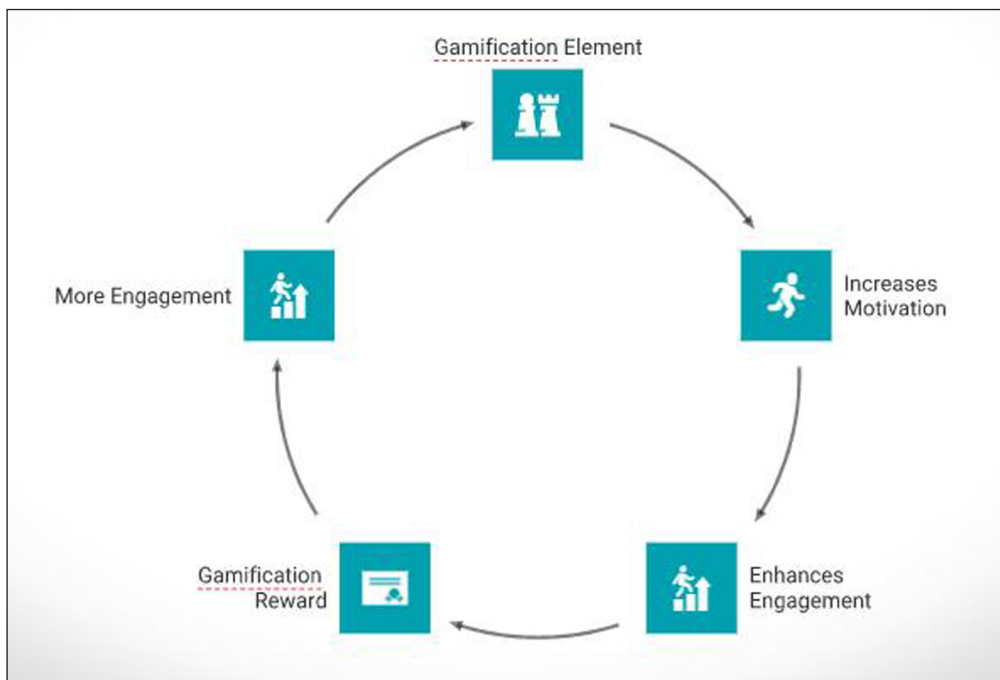


Figure 6 Gamification Simplified.

The use of gamification to enhance student engagement on the Big Data Analytics module was extremely successful and when compared with the system statistics from previous years obtained from the Blackboard module shells, engagement in terms of average time per active student in hours between the last two cohorts had increased by 112%. Additionally, in terms of impact the following were also observed

- Good engagement from the students which in turn meant the subject matter being taught was reinforced outside of the instructor led sessions by the activities the students engaged in for badges, points, gift vouchers and to move up on the leaderboard.

- I had more late starters during the semester than in previous years (another effect of the pandemic) and as the gamification provided means for self-learning and getting instant feedback, it came in very handy.
- It helped me as a tutor to get a good feel for areas to revisit in my sessions with the students based on the quizzes and review metrics for the various resources. For instance, by looking at the badges awarded I could instantly get a good sense of the level of engagement with specific topics and so on.
- When students responded via a mid-module survey on whether it had helped in consolidating what they were learning, 85% of the respondents said 'yes' it had and all the others said it 'sometimes' did.

Some of the more detailed feedback received from students on the impact of gamification of the module for them can also be seen in the quotes below:

- *'Personally, the gamification elements did add a bit of incentive for me in terms of my engagement with the material. Much of the material in this module was completely new territory for me, so getting to grips with the basics was my first priority. But knowing that completion of the quizzes and reading extra material carried the opportunity of a prize certainly encouraged me to go beyond those basics. And, in hindsight, that rendered quite well for me in terms of how I ended up performing in the assessments. Seeing how I was doing in the leaderboard against others at key milestones throughout the module certainly helped me stay engaged too, always love a bit of competition!'*
- *'The quizzes were very helpful as they reinforced what I had already studied and to some extent summarised the topics for me. The questions were also very clear to understand and also about the right number of questions. Moreover, the leaderboard and badges compelled me to give in my best especially when you had said there were some rewards involved.'*
- *'Personally, my own experience is that gamifications works perfectly because it helps to increase the participation/ engagement of the students by checking the badges, leaders board, quizzes etc. I will recommend that gamifications should be used subsequently for the next academic sessions and the free vouchers for the students that top the leadership board should continue if possible.'*

CONCLUSION AND RECOMMENDATIONS FOR PRACTICE

On a personal note, it has been a great starting point for the use of gamification on my modules and I am beginning to explore ways to build on this initial project and do even more going forward. Some of these include exploring how I can use learning analytics to improve on and drive the gamification strategy. Learning analytics is all about using data that is produced and generated about students, such as those generated in virtual learning environments (VLEs) such as Blackboard to produce insights that can be used to improve an individual students' performance by tailoring their learning to them. The objective is the harnessing of this data (which could come from various sources) to optimise the student experience and outcomes. Most virtual learning environments such as Blackboard provide tonnes of data that can be used for these purposes. However, often times educators are unaware of them or simply ignore them. Other reasons for this include a lack of digital skills and issues around workload and having the time to design and set up these strategies. To mitigate against this when a strategy is found to work in an institution this good practice could be rolled out to other programmes so that educators are not always having to start from scratch. In institutions another approach to promote this could be to have a group of champions who can be approached with questions or for support with setting up strategies to improve engagement.

The VLEs are also designed to make it feasible for these additional features to be used by all and sundry. However, sometimes the issue is that educators are simply unaware of what is available or could be available. When it came to the actual implementation of the gamification strategy that I have described in this paper, I had one of two options either do my development by programming myself from scratch or use the facilities provided in Blackboard. From the research I did, I could see that Blackboard provided inbuilt facilities that can be used for

gamification such as badges and certificates but these were not available on the university's version of Blackboard. However, because I had become aware that Blackboard provides them I was able to request that they be added and this was done for me (and is now available to all educators across the university).

As educators we should keep exploring ways to enhance student engagement and optimise their experiences and one tested way of doing is through gamification. In addition to this I recommend exploring the use of learning analytics which has the potential to be a game changer when it comes to students' individual outcomes. Although all of these might seem like they would be time consuming in the short term, in the long term in terms of engagement, learning outcomes and students' overall performance they more than pay off for the initial setup time.

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COMPETING INTERESTS

The author has no competing interests to declare.

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