Play as you learn: gamification as a technique for motivating learners

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Gamification as a Technique for Motivating Learners

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Abstract: Motivation can sometimes be a problem for learners, especially when they do not find the purpose of a learning activity to be clear. Gamification is a recent concept, primarily from the web development industry, that can make learning activities more active and participatory. This paper provides an overview of the background of gamification, the relevant key game concepts, gives an overview of examples from outside education and provides some suggestions for implementing gamification in education generally, and e-learning specifically. This paper is intended to give readers an overview of gamification, allowing an informed analysis of the technique in their own context to be made.

Introduction

Learning is an active process and, as with all active processes, it requires motivation to both begin and continue the process. In young learners, motivation to learn is often readily available, but it can wane in older learners, and this is especially the case when an element of self-direction and autonomy is required (OECD, 2000). Rollings and Adams (2003, p.34) define a game as "*a form of participatory, or interactive, entertainment*" and contrast this with passive activities, such as watching television or reading. As learning is a participatory process, it follows that there could be greater benefits from incorporating games concepts with education than with these other, passive activities.

Games, especially computer games, often excel in creating an illusion of autonomy from a highly structured set of rules. Juul (2003) provides a more detailed definition of a game, which makes the correlation with a learning process even more explicit: "*A game is a rule-based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels attached to the outcome, and the consequences of the activity are optional and negotiable.*" Many of the elements listed in this definition are directly comparable to elements within formal learning, from '*variable and quantifiable outcomes*' (grades) to the effort required by the learner ('player') to affect the outcome (gain a particular grade). A significant difference, however, is in the final clause, as the consequences of learning are typically more concrete and long lasting, for example failing within a formal learning process can have detrimental effects on the learner's future.

The idea that effortful activity encourages motivation and engagement is fundamental to gamification, which has been defined as "*the use of video game elements (rather than full-fledged games) to improve user experience and user engagement in non-game services and applications*" (Deterding et al., 2011a). This is a reliable definition in many instances, such as those related to learning; however, the concept is broader in that it is not necessary for the elements to be derived solely from video games - the use of elements from playground or board games would be equally valid. Gamification typically makes use of the competition instinct possessed by most people to motivate and encourage 'productive' behaviours (and, as a result, discourage 'unproductive' ones). However, it would be a mistake to assume that it is solely an individualistic concept, as the same mechanisms can be used to encourage collaborative and cooperative behaviours. While gamification has been particularly embraced by organisations seeking to encourage the creation of online communities, it has also been applied to situations beyond the scope of this computing-focused definition, including encouraging people to perform administrative tasks, exercise, or visit retail outlets. Gamification has the potential to be a 'disruptive innovation' in education, that is, an emergent change that can alter practices in a positive way (Christensen & Raynor, 2003).

Deterding et al. (2011b) claim that the first documented use of the term 'Gamification' was in 2008 within the digital media sector, but it has since been used in many different domains as the concepts become more pervasive, and so, more familiar. Some of the core concepts have been used for much longer than the term has existed. It has long been used in early years teaching, with 'gold stars' next to a student's name on a poster being a familiar feature of many classrooms, yet this motivational technique has been little used beyond primary education. Educational gamification is a method that could encourage some of the same sense of pride and achievement in learners of all ages.

Educational Gamification is not to be confused with Game-based Learning, Simulation, or Serious Games. These focus on creating games (and game-like experiences) which impart an educational benefit, and includes software such as simulators. This is the direct opposite of educational gamification, which seeks to add game-like concepts to a learning process.

Core Game Concepts

To understand gamification it is necessary to understand the core concepts of games. There are three basic parts in most games: goal-focussed activity, reward mechanisms, and progress tracking (Dickey, 2005). Each of these is briefly described below; however, it is clear from the broad labels that there is a significant correlation between the design of games and of learning activities.

Goal-focused activity

Smith-Robbins (2011) points out that activities in games are typically goal-oriented with a clearly defined set of 'win' conditions and a number of obstacles to overcome in order to complete the activity (Figure 1). From this definition, it is clear to see the similarity between games and learning, with players/learners being directed to undertake tasks in order to achieve a desired outcome, moving to the next level/mission in the case of a game, or complete understanding a complex topic in the case of education (Ames, 1990; Pintrich, 2003). This shared focus on achieving specific goals is a major reason for the applicability of gamification to education. Goals that lead to mastery of a topic or skill (as opposed to ones that focus on performance targets) have been shown to increase the amount of time spent on learning tasks, especially when the difficulty level is high, and so lead to increased engagement and motivation (Ames, 1992). For performance-related goals, motivation is increased when there is public recognition of achievement (such as by the use of class rankings), though actual learning may be unaffected (Meece et al., 2006).

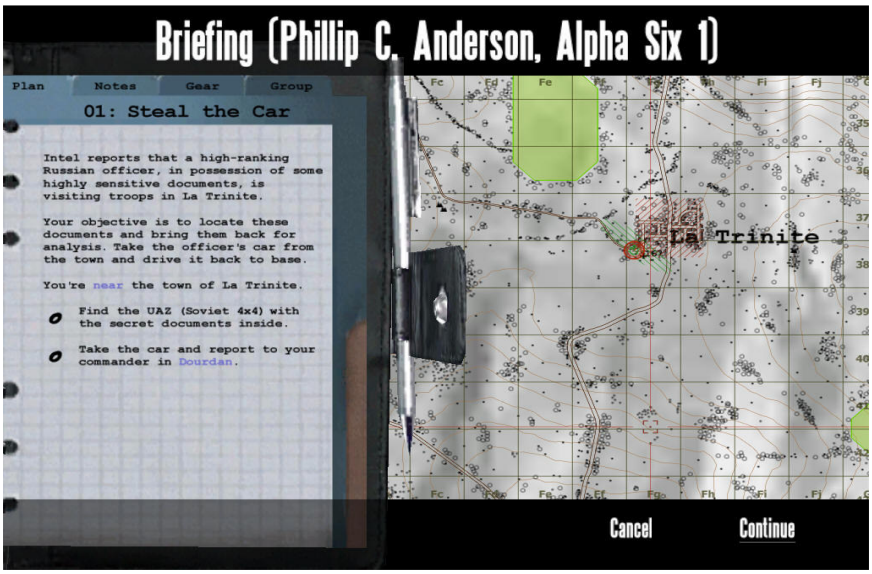

Figure 1: Mission Goals (on left) in Operation Flashpoint.

Reward Mechanisms

Games make use of many different reward mechanisms, depending on the context, but three main categories typically evident: Leaderboards, Prizes, and Achievements.

Leaderboards

As the name suggests, these are lists of players ranked according to their success within the game. The same concept is used within sport, but it is prominently used in multiplayer games, especially ones that use rounds of a fixed time or objective (Figure 2). A Leaderboard is a very coarse-grained technique as it lends itself to repetitive actions, but it can be a powerful motivator (though it provides little further motivation once the top of the leaderboard is reached). The leaderboard is typically used in competitive activities but can also be used to encourage teamwork.

Figure 2: Battlefield 3 End-of-Round Leaderboard.

Prizes

Computer games often feature customisation elements that allow players to adapt their character to their preferred playing style or personalise their character's appearance. This helps to make the player more engaged with the character and deliver a more tailored playing experience. In games that feature customisation options, the opportunity to acquire special items is typically linked to the completion of particular tasks within the game, and the desirability of the item motivates players to undertake these tasks. Prizes can also take the form of additional activities, which are unlocked after meeting the conditions of previous goals. Different players will be motivated by different prizes and so will perform activities accordingly, and learners will also vary in this way. Prizes should encourage further engagement, such as setting a research task for the cohort, and should not discourage it, such as being exempt from a test.

Achievements

Achievements are icons displayed publicly on online profiles that highlight activities completed by the person, and allow an individual to keep track of what they have done and to 'show off' to third parties. They can be seen as a combination of the two other mechanisms and have recently become popular in many domains due to their inclusion in popular recent games consoles. Beyond gaming, they have also been used to motivate people to do other activities, such as exercise (Figure 3), complete their share of household tasks (for example, Chore Wars [http://www.chorewars.com]) or maintain brand loyalty (such as FourSquare [http://www.foursquare.com]). A somewhat outdated example of this in education would be the top performing student being made 'head boy/girl' or 'class prefect'. The 'gold star' example would also fit into this reward category.

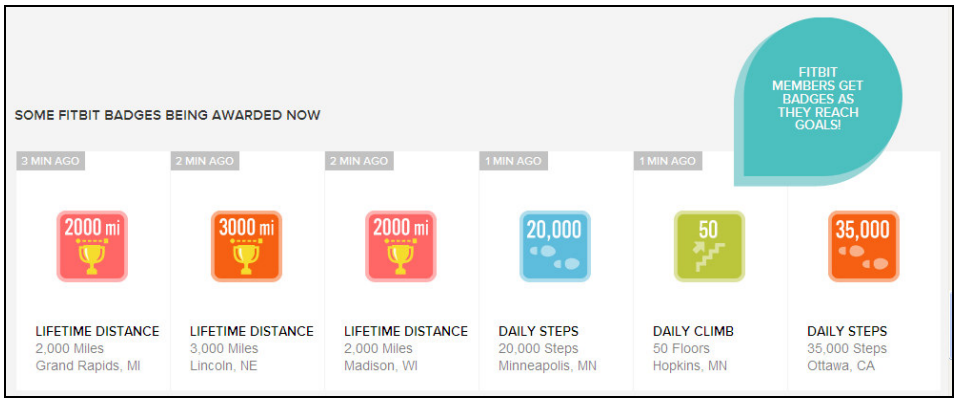

Figure 3: Achievement Badges Awarded to FitBit Users for Exercising (http://www.fitbit.com)

Progress Tracking

As with learning processes, tracking progress toward goals is important within games, because it would otherwise be impossible to identify the remaining tasks required to fulfil the victory conditions. Some of this tracking can be inferred from the reward mechanisms, but this is a very crude measure and many games have ways to quickly identify tasks have and have not been completed, and general play statistics. This method of progress tracking is somewhat analogous to the provision of feedback within education. Good feedback should outline what the learner has done and give guidance on how to improve or advance in the future, and progress tracking within games performs a similar duty by identifying the steps to take in order to make it to the next milestone.

Existing uses of Gamification

One of the most widely-known uses of Gamification is FourSquare, a mobile social networking application that encouraged users to 'check-in' to locations, with the person with most check-ins in the last 60 days being named 'Mayor' of that location. Other features include gaining points for check-ins and completed activities, and receiving 'badges', all of which can be displayed publicly. Many of these features make use of leaderboards to display people's activity, and the main reason for users is a sense of prestige. Some businesses provide additional incentives, such as discounts and gifts to people checking into their location, helping to further encourage consumer loyalty.

Red Critter Tracker (http://redcrittertracker.com) is an online project management system that rewards team members with points and badges for completing tasks and helping others. An organisation could provide further incentives by allowing staff to spend points on desirable items, such as days off or team 'away days'. This software is intended to ensure that people complete the required documentation about their work, particularly in industries such as Web and Software design where such administrative work is often seen as reducing the 'fun' of work.

Crowdrise (http://www.crowdrise.com) is a social fundraising system that also uses points and badges to motivate fundraisers to contribute to charity. Points and badges are displayed on a public profile along with information about the person and the charities they contributed to and support.

Figure 4: Web Development Badges Earned from Mozilla's Webmaker Site.

Most current examples of gamification make use of badges, images awarded when specific criteria have been met, and are based on the badge concept used, among others, by the Scout Association (http://scouts.org.uk/supportresources/search/?cat=56,135,156). Badges are a record of activity and competency that can be displayed in profiles on web pages to highlight a person's interests and work, though badges currently can usually only be displayed on the website where they were earned. Partly because of this limitation, since 2011 the Mozilla Foundation has been working with partners, such as the Peer2Peer University, to develop a standard method of awarding and displaying badges that would enable people to gather badges from multiple sources and create unique collections for display in different contexts. The Mozilla Foundation is using these 'OpenBadges' in its own educational projects, and Figure 4 shows badges earned for developing the skills to create websites via Mozilla's 'Webmaker' resource (https://badges.webmaker.org/). These would be added to a learner's 'badge backpack' for use as verifiable evidence of learning and self-promotion. They do not replace formal qualifications, but can help to expose acquired skills that may not be obvious from a grade transcript. This idea has influenced Purdue University, which has made badges a major part of a new initiative to provide students with a more comprehensive method of presenting their learning and achievements, and Figure 5 shows how badges are presented in a student's personal 'Passport' profile (Tally, 2012).

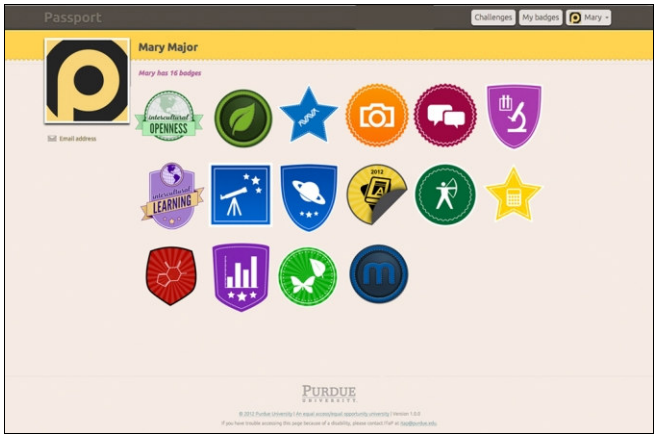

Figure 5: A Student's Badges Displayed in their Purdue University Passport Profile.

Criticism of Gamification

In a review, computer games journalist John Teti (2012) has stated that "[i]nstead of making work rewarding, gamification strives only to make work seem rewarding". Although this was a comment about gamification in the workplace, it has implications for educational uses. The act of gamifying an educational experience alone is not enough to make the experience rewarding, instead it should serve primarily to make something that is already rewarding *more* rewarding – perhaps by encouraging learners to invest more time than they otherwise would.

Gamification seeks to increase motivation by providing *extrinsic* recognition and reward for completing activities, however there is the possibility that such rewards can serve to de-motivate learners with an already high *intrinsic* motivation (Groh, 2012). This psychological concept, particularly evident in gifted children, is called the 'Overjustification effect'. In fact, a negative correlation between extrinsic motivation and academic achievement can sometimes be observed; that is, increased extrinsic motivation, such as rewards, reduces learning and achievement (Lepper, Corpus, & Iyengar, 2005). In order to mitigate the potential negative effects of Overjustification, it is therefore important to make the gamified elements of a learning process optional. This will allow those learners who are already motivated to remain so, and provide motivating elements to the remaining learners.

Another criticism of gamification is that it can encourage addicted or compulsive behaviour among people with relevant personality types (Zichermann, 2011). This could lead to a learner focusing on getting every point, reward, etc. from a past activity to the detriment of new activities and learning. The potential for these issues can be reduced by careful consideration of the design of the gamification elements in the learning activities, such as limiting the time in which awards can be earned.

In a panel discussion, Williams (2012) commented on the use of leaderboards at Microsoft, stating *"… leaderboards are great for people who are really aggressive, hardcore players and they want to get to the top. That can motivate them. At the same time, I'm not that person. I don't do leaderboards. The guy at the top has 500,000 points and I have eight. To me, that's a turnoff.*" In learning situations, this highly public competitiveness could harm the learning and motivation of others by discouraging less competitive, status-seeking learners from engaging. This effect can be reduced by making competition internal rather than external, such as by having learners competing against their own personal best, and being rewarded for improvement rather than absolute achievement.

Thom, Millen and DiMicco (2012) investigated how removing gamification elements from a social networking system in a large organisation would affect levels of interaction and found that, without the extrinsic incentives, participation was dramatically reduced. However, analysis of the comments and posts on the system showed that the overall quality of the interactions was lower when the gamification elements were being used. This suggests that, without careful consideration of the rewards for interaction, gamification can be counter-productive and give tacit approval of distracting and time-wasting activities for some individuals.

Gamifying Education

This paper has outlined some of the key concepts and criticisms of gamification and shown how it is used in different domains. However, learning is something of a special case compared to many of the other examples listed. This is primarily because it is an activity with well-defined outcomes and requires more than token effort from the learner – whereas some of the other uses of gamification require little more than visiting a particular place regularly. Gamification, as a process which creates participatory learning experiences, is particularly suited to active learners and active learning. Yet, it can also provide a framework to encourage the use of different types of resources that target other learning styles, such as by incorporating audio, images and text into a single experience.

When deciding whether to gamify a learning activity/process it is necessary to consider some questions first:

Is motivation actually a problem?
This first, and most important, question needs to be answered before considering gamification. Learners could appear unmotivated when the actually issue is something else, such as the activity is too difficult/easy or they do not see the relevance of it. If these are the underlying cause of the problem then they should be addressed by learning design, rather than through gamification. Incorporating game-mechanics with an educational activity or process is non-trivial and cannot replace good learning design; therefore, it is essential that the pedagogy and level of the activity are appropriate before adding extra layers of complexity through gamification.

Are there behaviours to encourage/discourage?
Gamification is frequently used to provide incentives to modify specific behaviours, such as by encouraging group work or discouraging interruptions and distraction. This particular use can be effective, but it may not result in long-term changes without continued incentives.

Can a specific activity be Gamified?
One of the key concepts of gamification is 'Goal-focused activity' and this works best when there are clear 'checkpoints' in an activity that can be used by the learner to establish their progress and identify remaining tasks. This feature is often evident in good learning design, however there may be situations when this concept conflicts with the required learning outcome.

Am I creating a parallel assessment route?
It is important that gamification elements such as leaderboards and points are completely divorced from the formal assessment of learning, and that the learners understand this to be the case. Gamification should only be used to increase motivation and should not be another mechanism by which to grade learners. It is not a paradox that the person at the top of the leaderboard might also be the lowest achiever in formal assessments, but it would suggest that the gamification choices need to be refined.

Would it favour some learners over others?
While some learners would likely be motivated by having their activities gamified, others would be de-motivated by it. If this is likely to have an impact, it is necessary to ensure that those who would be adversely affected can ignore the gamification aspects – such as by making the rewards and tracking optional.

What rewards would provide the most motivation for learners?
Different rewards will provide different levels of motivation to different learners and therefore the reward(s) should be carefully planned in order to ensure that they would motivate everyone. For example, points could be earned and a 'price list' of different rewards could be used so that individuals can work towards something that interests them.

Will it encourage learners to spend disproportionate time on some activities?
Depending on the individual learners, it may be necessary to set limits on the gamified aspects of some activities, such as time or point limits, in order to discourage the learners from spending too long on particular tasks.

Are rewards too easy to obtain?
Rewards should be desirable by the learners and one of the ways to ensure desirability is through the creation of artificial scarcity (Glover et al., 2012). In order to encourage motivation, rewards should be achievable with a sufficient level of effort, but not so easily that all learners acquire it. This is particularly so when using online badges, because their zero-cost nature encourages them to be distributed too liberally.

Only after answering these questions should the implementation of gamification be considered.

Gamification in e-Learning

Gamification lends itself particularly well to e-learning because the necessary data for tracking progress is more easily collated, though it is important to remember that the process can be used on classroom teaching just as effectively. Engagement levels in e-learning activities are often lower and studies have shown that, while those with high intrinsic motivation are typically as engaged as they would be with face-to-face learning, the opposite is true for learners with low intrinsic motivation (Rovai, et al., 2007). Adding simple game features could encourage unmotivated learners to be more engaged in their own learning process and interactions with other learners. An advantage here is that existing associations between computers and games can be harnessed to encourage productive work; this may be more difficult in physical learning spaces, such as classrooms, because the idea of 'play' is the antithesis of the seriousness that is normally associated with these spaces. However, this latent association between computers and games has the potential of encouraging unwanted actions by the learners unless there is strong initial direction and the intentions of the game aspects have been clearly articulated.

Virtual Learning Environments (VLEs) and Learning Management Systems (LMSes) make an ideal location for the implementation of gamification. This is because they typically contain all of the functionality required to support activities, resource sharing, and collaboration, as well as providing methods to track a learner's progress and interactions. In some systems, manual analysis of this data might be necessary; however, the recent interest in personalised learning has resulted in most of the major platforms implementing features that can be harnessed to gamify learning. Sarah Thorneycroft (University of New England, Australia) has shown how the basic features of a Moodle VLE can be used to support gamification (http://www.youtube.com/watch?v=1rNfPyPCSi8). This could be further enhanced by making use of other features, such as using quizzes to assess the person's learning, or requiring a vote in a poll prior to moving to the next level (set of resources). When the learner has completed enough activities, or demonstrated a specific competency, a badge could be awarded automatically and displayed on their profile.

VLEs and LMSes sometimes also include peer rating mechanisms that can be used for gamification purposes. The Blackboard Learn VLE allows learners to rate each other's contributions to a discussion forum and these ratings could be collated and translated into points on a leaderboard, or learners with consistently high ratings could be given a prize or badge. This example serves two purposes, it encourages learners to contribute to online discussions and it also attempts to ensure that the discussion is focussed and of good quality. The long-running online discussion site, Slashdot (http://slashdot.org), uses a similar mechanism for rating contributions ,with posters earning 'Karma points' which help to increase the default visibility of their posts, and increase the overall quality of the debate.

The Peer2Peer University (P2PU), mentioned earlier in this paper, is a free online 'university' and provides a place for anyone to create or study on a Massive Open Online Course (MOOC). Unlike a traditional educational institution, there are no certificates or qualifications issued to learners who complete the course, and so there is no way of evidencing the learning that took place on the MOOC. P2PU is working with Mozilla to implement OpenBadges in order to verify learning and skills acquisition, for example, a 'Certified Networked Teacher' badge (https://p2pu.org/en/badges/certified-networked-teacher/) can be earned by completing the assessments in a specific MOOC and leads to eligibility for more advanced MOOCs and badges.

Gamification can also be easily adapted to use other learning technologies, such as Personal Response Systems (also known as Electronic Voting Systems, Classroom Clickers, Student Response Systems, etc.). In this case, it would be possible to track how many correct responses each learner makes and award points on a leaderboard. This would have the advantage that, if the leader's reward at the end of the course is something desirable to most of the learners, it will encourage learners to attend classes and vote on the questions. Gamification has been used with economics students at Pepperdine University and business school students are Pennsylvania State University to encourage students to engage with online quizzes (Educause, 2011)

The concepts can also expand to encompass complex tasks using multiple technologies in the same activity. For example, posts to a blog, edits to a wiki, contributions to a social bookmark list, assisting other learners in a chat session could all be worth points on the leaderboard. By varying the points gained for each task over the course of the activity it would be possible to guide learners through a set of tools, without limiting their freedom to be creative. This usage would cause the gamification elements to promote cooperativeness and sharing instead of competitiveness and 'selfishness', and encourage learners to be willingly involved in a wider range of tasks than they might otherwise.

These examples have outlined some ways in which gamification can be integrated with e-learning. The concepts are broad enough that most types of learning activity can be gamified, meaning it is possible to experiment on a small scale in order to identify what would and would not work in a given situation.

Conclusion

Gamification is a concept that can be used to make learning more engaging, but it should not be viewed in isolation to other tools and methods. There are many opportunities to implement the concepts of gamification within learning, both in traditional learning environments and, especially, in their electronic counterparts. However, to encourage meaningful learning experiences requires considerable thought about what is appropriate for the learners and the context. This is essentially the same as designing learning activities more generally, and gamification should be considered during this same design stage.

Yet, gamification is not a panacea, it can do little to make low quality materials, activities and experiences more engaging or meaningful. However, it can provide additional motivation to ensure that learners fully complete activities and, with careful consideration of the implementation, can encourage 'good' behaviour and discourage 'bad' behaviour. The principles of gamification are chiefly derived from computer games and therefore are a good fit for learning processes and activities that have some online element, such as being managed by a Virtual Learning Environment, but they can also be applied to non-electronic contexts.

There are many different game elements that can be used to gamify learning, and there is some skill in determining which are appropriate for a particular group of learners and activity and which are not. Many examples of gamification make use of easily quantifiable values, such as number of posts in a forum, but it is important to make use of qualitative measures too, such as ratings by other learners, in order to encourage high-quality interaction. The main consideration when assessing whether gamification could be of benefit for a group of learners is the level of intrinsic motivation. If this is high, then providing extrinsic motivation through rewards has the potential to *de*-motivate the learners, and gamification would not be appropriate in this case.

Finally, rewards need to be achievable and desirable in order to provide sufficient extrinsic motivation, but scarce enough that there is a sense of pride and accomplishment in receiving one; therefore, as a reward for reading this

paper, you have earned the 'Gamification, Gamification, Gamification' badge (Figure 6). A digital version of the badge is available at http://badg.us/en-US/badges/claim/cfwcvk.

Figure 6: Reward for Reading this Paper –
'Gamification, Gamification, Gamification' Badge

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