

CS310 Final Report

The Use of Gamification and Analytics in Higher Education

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1 Abstract

Gamification and analytics are becoming increasingly popular in many facets of everyday life. They are making a big impact in primary and secondary education, driven by the increased use of internet enabled devices in the classroom. This project looks at how this can be translated to higher education, and what role the traditional gamification personality types might have in this field.

2 Key words

Gamification, Classroom analytics, Higher education, Flipped classroom

3 Introduction

Having becoming an increasingly influential forces in the marketing world over previous years, this report focusses on the educational uses of gamification and analytics. The benefit of integrating these techniques into primary and secondary education was clear from the onset, but there has been less enthusiasm for their use in higher education. This report will assess the usefulness of the aforementioned techniques in the higher education sector, and what form they might take when used to greatest effect. The main body will explore the application of the traditional Bartle personality types used in gamification, with particular interest in how useful (or not) they might be in directing teaching and learning.

Gamifications recent discovery has meant that far less has been done to incorporate developments on it into the current education system than might be possible at some future point in time. The project starts with a look at how these techniques are being integrated into the current primary and secondary education sectors successfully, and well as analysing some of the opportunities that have been missed. Moving on to Higher education, after examining current work the differences between the two sectors in the context of the applications of gamification and analytics will be investigated. Once it has been established that the fields are sufficiently different that copying over implementations from primary and secondary education will bear little fruit, a rational appraisal of more effective applications will be had. It is important to take a through

look at the current state of education before considering the possible impact of game personality types as they provide an important frame of reference for what is quite a specific part of the solution.

4 Background

4.1 What is Gamification?

It seems an obvious fact of life that work is dull, and play is fun. Many attempts have been made to change this, but they have largely been met with little success. Over the past few years, gamification has been slowly blurring the lines of what is considered to be ‘work’ by moving it towards practises and behaviours that would normally be associated with play. This has all come out of a field of study which is fairly young, the term having only really gained popularity in late 2010, as shown in figure 2. Coupled with the advanced user tracking and analytics offered by modern technology, it has begun to dominate the way in which we interact electronically, with services like Facebook and Foursquare being prime examples.

At its core, it is the idea of taking the elements which have made traditional games provided fun and entertainment for all of human history, and using them to transform everyday tasks which many find less interesting. While the results so far of gamified experiences are very promising, with many use cases reporting exponential increases in customer attraction and retention [9], there are some ethical questions raised due to the fact that gamification often takes the form of operant conditioning [7]. While manipulating users in order to stimulate learning is often lauded as being virtuous, using it to sell products and make a profit might not. This will be explored more in section 15.

4.2 How does it work?

The success of gamification in driving engagement has underlying roots in psychology, with gameified experiences being able to satisfy more psychological needs than what might normally be considered ‘work’. For example, the feedback mechanisms which typify these experiences, such as progress bars, badges and the awarding of in-game points, help fulfil the need for competence which self determination theory identifies as a core need experienced by all human beings [8]. Players are compelled to complete game actions in order to feel capable, and challenges often use time investment as the principal measure of worth. Traditional games tend to confer rewards and status based on skill, which can alienate a large proportion of the player base who fall outside the top performers. In this way all players feel as if they can succeed if they play the game for long enough, or regularly enough.

As mentioned above, a key part of the psychology behind gamification is that of operant conditioning. Introduced as a concept by B.F. Skinner, it focuses on conditioning organisms to perform tasks that they would not normally undertake. In his experiments, Skinner would place pigeons in boxes and reward them with food whenever they pushed a button in their cage. If every push of the button resulted in a reward, the birds would stop pecking as soon as the food stopped being dispensed. He found that when rewards were awarded on a semi random basis, the animals would continue to peck at the buttons long after the food was gone [7]. This form of conditioning is used to great effect in many forms of gambling, and is the reason gamblers will continue to insert coins into machines in the hope that they might get that elusive win. Indeed,

it seems counterintuitive that reducing the frequency of rewards might actually increase uptake by users. It turns out that chasing a win or payoff with slim odds is for more exciting than completing an action with a known reward. In fact, it may well be that the act of achieving a rare reward is motivation in itself, even if there is no real world value attached to it. Thus operant conditioning is used to keep users playing even after the activity has ceased to be fun.

4.3 High profile usage of gamification

As gamification expands more and more into everyday life, each sector is asking the question of how they can keep up. To a certain extent, a change of thinking is required. Increasingly it is becoming a question of why should people be expected to stop having fun in order to learn, watch an advertisement or communicate? [9] Or, put more bluntly, why would they? The rise of gamification has meant that other forms of experience are less effective than they once were, just by virtue of the new competition. What follows are a pair of case studies of gamification employed by high profile organisations to serve as a practical example of what exactly gamification and analytics mean in the context of the modern day, and proof of how effective they can be when used to their full potential.

4.3.1 Case Study: Orkut

An early example of the power of gamification can be seen in Orkut, the social networking site which was developed by Google in early 2004. Orkut was different from other social networks available at the time in that users had profiles operating on three different levels. Information provided by users was divided up into personal, professional and social, but more interestingly, Orkut would provide a list of demographics about the current user population [5]. It was one such demographic that began a completely unexpected phenomenon in Brazil. In an attempt to climb to the top of the perceived leaderboard, blogs and posts started appearing all over Brazilian internet sites urging others to join [9]. By June 2004 the number of Brazilian users had surpassed those from the United States to take the top spot on the usage demographics. What had begun as an interesting statistic had motivated thousands of people to become invested in a product to such an extent that Orkut's domination of the Brazilian social network scene did not end until December 2012 when Facebook finally wrested the crown from the Google network [3].

4.3.2 Case Study: TODO

5 Definitions

It is important to define some of the key terms that will be used in this report. Terms like gamification and analytics are often bandied around by lots of different parties who all mean similar but subtly different things. Indeed, the way in which these terms have been used thus far has been somewhat unclear. For the remainder of the document, the undermentioned should be referred to as a definitive explanation of what is meant by the following technical terms:

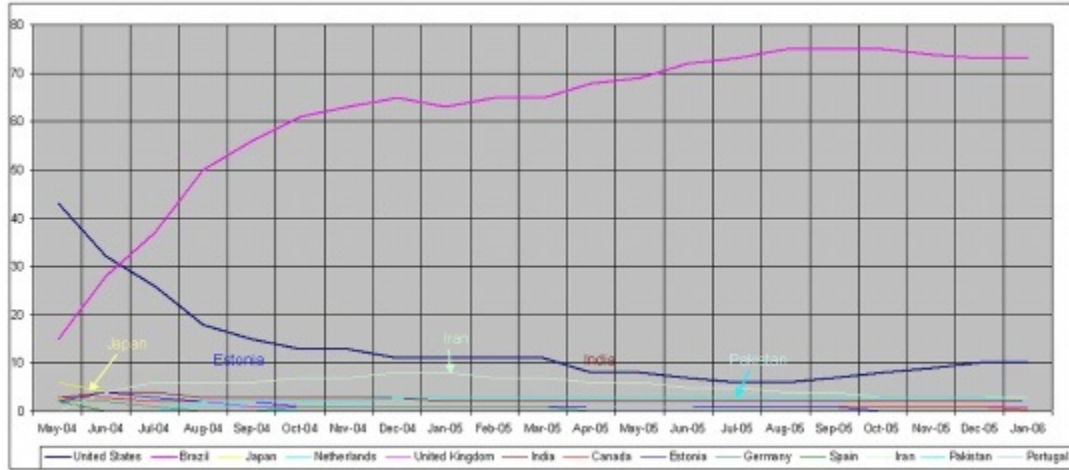


Figure 1: Orkut usage by country, shown for the top ten nations among the user population. Data from May 2004 to January 2006 [5].

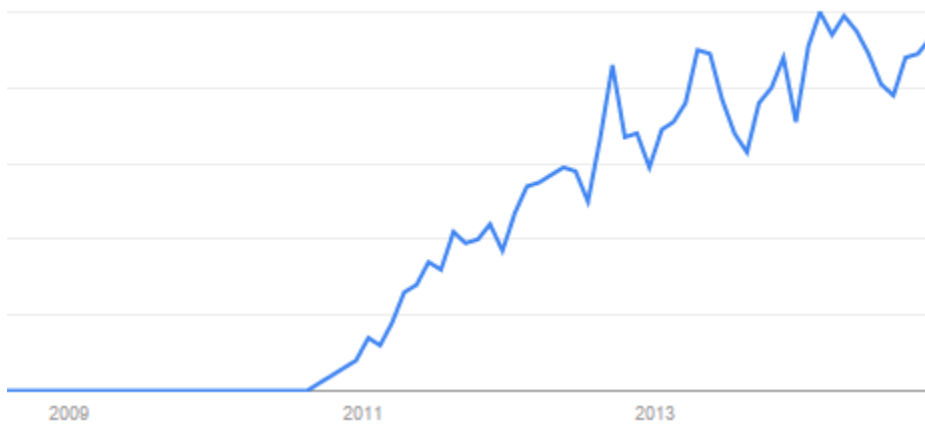


Figure 2: Usage of the term 'gamification' by month as a proportion of the total number of Google searches for gamification, from 2009 to the present day [6].

5.1 Gamification

A commonly accepted definition of gamification is that it is ‘the use of game design elements in non-game contexts’ [4]. This is a good in that it makes clear the distinction between games and gamified activities, but what exactly counts as either can often be left unclear. This is difficult as it is near impossible to pin down where one stops and the other begins, and is likely to increase as game elements are further incorporated into everyday activities. Indeed, this seems to suggest that rigorously defining what is and is not a game is of less value than originally anticipated. Here, a game [man, play and games put on hold].

Game elements also need to be outlined in a little more depth. For the purposes of this project, they will be taken to mean those elements of game systems which compel users to play because they are engaging or fun. Alternatively put, the focus is on the mechanics that make games interesting and keep users coming back as opposed to graphical techniques or the platforms they reside on. Beyond this, further definition carries the risk of splitting hairs, and does not add much to the discussion.

5.2 Analytics

The other component to the project is analytics, with a focus on online learning platforms. In this context analytics refers to feedback systems which collect data on various facets of the learning process. Crucially, they must provide information which can then be used to improve the process further and better understand the dynamics of class makeup and teaching styles, under analysis by either the system itself or a human analyst. This is to provide some differentiation from software which merely reports back statistics such as student or class scores, with no extra dimension by which the effectiveness of the setup as a whole can be bettered.

Tracking and comparing different sets of statistics in this way shows correlations that might otherwise be missed. Singling out these links is the key to effective improvement of higher education. It is not required for the purposes of this definition that the analysis be automated and carried out by the system itself. In many small scale implementations, such as the one used for this project, the resources available preclude the development of such an advanced piece of software. Indeed, implementing a prototype smart learning platform would be financially expensive for many institutions, and excluding them would have a negative impact on the data that could be obtained.

In the research carried out for this report, the correlation between Bartle’s gamer personality types and individual learning styles was assessed, with the view of recommending how they might fit in to a more optimal model of gamified higher education. The software developed for the project uses preliminary content with pre-defined Bartle weighting to gauge a users gamer type. As required by the paragraph above, this can be combined with other data in order to answer the questions set forth by the project. It does not matter that the data in question is collected offline.

6 Literature Review

Before continuing it is important to undertake a review of previous and current literature in the field, in order to properly frame the underwritten findings and analysis. This will begin by broadly assessing past

	Cultural Forms	Institutional Forms	Corruption
AGON (Competition)	Sports	Economic competition and competitive examinations	Violence, Will to power and Trickery
ALEA (Chance)	Lotteries and Casinos	Speculation on the stock market	Superstition, astrology, etc.
MIMICRY (Simulation)	Carnival, Theatre, Cinema and Hero worship	Uniforms and Ceremonial etiquette	Alienation and Split personality
ILINX (Vertigo)	Mountain climbing, Skiing, Tightrope walking and Speed	Professions requiring control of vertigo	Alcoholism and Drugs

Table 1: Caillois’s mapping of play types to social life [2]

research in the field of gamification as a whole before moving on to the more specific field of higher education. Also included will be an assessment of papers relating to Bartle’s gamer types and how they might be linked with learning styles.

6.1 Gamification

Scholars have been writing about games and their relationship with sociology for centuries, and this review will begin by examining *Man, Play and Games* by Caillois [2]. Caillois begins by attempting to pin down what exactly he means by a game, and how they can be classified. He concurs with the view expressed above in that this is a difficult task given the wide diversity of games. While most of the book focuses on more traditional games and forms of play, of particular interest is the chapter on the corruption of games in the then modern world. By beginning to draw parallels between the behaviours exhibited in games and the behaviours exhibited in real life, his work can help us to understand which areas of our subject matter might be more easily gamified, and the potential pitfalls we should aim to avoid if this is not done with a due amount of care. Table 1 shows the relationships Caillois claims exists between play types and where they can be found.

No study relating to gamification would be complete without an assessment of ‘Hearts, clubs, diamonds, spades: Players who suit MUDs’ by Bartle [1]. Written in 1996, it introduces the concept of four gamer personality types which allow players to be classified and catered for accordingly. While the paper lays the groundwork for classifying users by their observed behaviours in-game, its approach is not very granular, and is often quite a blunt way of grouping people.

6.2 Higher Education

7 Primary and Secondary Education

8 How is Higher Education Different?

9 Higher Education

10 Bartle Personality Types

11 Methodology

12 Findings

13 Evaluation

14 Conclusion and Further Work

15 Legal, Social, Ethical and Professional Issues

16 Background Texts

References

- [1] Richard Bartle. Hearts, clubs, diamonds, spades: Players who suit muds. *Journal of MUD research*, 1(1):19, 1996.
- [2] Roger Caillois and Meyer Barash. *Man, Play, and Games*. Freedom Press, 1961.
- [3] comScore. *Facebook Blasts into Top Position in Brazilian Social Networking Market Following Year of Tremendous Growth*. 2012. <http://www.comscore.com/Insights/Press-Releases/2012/1/Facebook-Blasts-into-Top-Position-in-Brazilian-Social-Networking-Market> [Accessed 18/01/2015].
- [4] Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke. From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, pages 9–15. ACM, 2011.
- [5] Suely Frago. Wtf a crazy brazilian invasion. *Proceedings of CATaC*, pages 255–274, 2006.
- [6] Google. Relative interest in gamification between 2009 and 2014. <http://www.google.com/trends/explore#q=gamification&date=1%2F2009%2072m&cmpt=q> Accessed [09/11/2014].

- [7] Karl M Kapp. *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons, 2012.
- [8] Andrew K Przybylski, C Scott Rigby, and Richard M Ryan. A motivational model of video game engagement. *Review of General Psychology*, 14(2):154, 2010.
- [9] Gabe Zichermann and Joselin Linder. *Game-based marketing: inspire customer loyalty through rewards, challenges, and contests*. John Wiley & Sons, 2010.