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Can Digital Natives Level-Up in a Gamified Curriculum?

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The compulsion to include games and game related mechanism in education is great among educators who want to engage and motivate today's students and the latest buzzword in this domain is gamification. However, without a thorough understanding of what a gamified curriculum looks like, how it can best be applied and why it might engross students, it cannot be effectively applied. This research examined a gamified course curriculum structure and evaluated its use in two university level subjects. The objective was to gauge student enjoyment and engagement with a heavily gamified curriculum and to understand the aspects that make the practice useful in education. Exploratory factor analysis of the dataset revealed the possibility of a six dimensional model of curriculum gamification worthy of future study.

Keywords: gamification, curriculum, game-based learning, engagement.

Introduction

Computer game players willingly devote many hours problem-solving and honing their skills within the context of games (Gee 2003). McGonical (2011) supports this, citing studies in which players willingly spend between 17 and 22 hours per week in the massively multiplayer online game World of Warcraft. This amounts to some 50 billion collective hours in the game with players paying for the pleasure. McGonical calls this feeling blissful productivity. It is this blissful productivity in student behavior that is the holy grail of the educator. In an attempt to elicit this in students, educators are always seeking a new pedagogy or technology that might engage and immerse their students. Computer games became one of these foci when Prensky (2003) coined the term 'digital native' and promoted games-based learning as a playful way to engage the new generation of students who have grown up with games and technology. Sometime after the entertainment computer game boom in the 1980s, in the mid-1990s educators were getting excited about the potential of *edutainment* (Hogle, 1996) or *educational games* as a way of mixing the youth engaging technology of the day with educational content. The push for edutainment was mostly unsuccessful, due to a lack of foresight in both educators and game designers who thought the simply addition of educational content with existing game mechanics would *just work*. Following this in the mid-2000s *edutainment* matured into purpose built *serious games* (Sawyer, 2007) and quickly found their place in the military, health and business domains. Today, the latest buzzword surrounding the use of games for motivation and engagement is *gamification*.

It has been suggested gamification can also be used in the classroom to invigorate the curriculum with competition, leaderboards and other awards providing students with recognition resulting in positive work attitudes (EDUCAUSE 2011). However, it could be argued that these mechanisms are nothing that hasn't been used in the classroom and other training environments for many years. Using leaderboards, having in-class competitions and the giving out of rewards have been implemented by teachers for decades. The curriculum may not have been structured as gamification, under the current definition, however elements of it have always existed. Indeed gamification is an example of an extrinsic reward system; the pedagogical effects having long been the subject of vigorous debate (Bruner 1977). The points and reward systems of gamification are little more than a modern application of the token economy (Kazdin & Bootzin 1972). Token economies are applied for a wide variety of reasons usually for behavior management of psychiatric patients, school children and others. In the system, tokens are given out for good behavior and can be exchanged for rewards when enough are accumulated.

Sheldon (2011) describes the gamification of his classroom as a meta-world in which students have avatars, with personalized fantasy names, compete in teams named guilds, complete quizzes and exams (known as defeating monsters), do reading assignments (quests) and accumulate experience points (XP). The XP are exchanged for grades at the end of the semester. He aligns all of the normal classroom activities with terminology and tasks in typical role-playing games (RPG). Sheldon's work however, provides little analysis of the outcomes from teaching in this way other than student course evaluation surveys.

There has been much literature published in recent times pertaining to the use of gamification in the classroom inciting engagement among students. However, there is very little quantitative evidence describing or supporting its use. Furthermore, in addition to adding another playful layer atop the existing curriculum, it is not known if

gamification helps or hinders student learning and progression. The motivations behind this study are two-fold. First it presents a simple gamified curriculum structure in response to the author's colleagues asking, "What does it look like?" The objective being to take an existing university level course and apply a points system to each and every student activity from attending lectures to working on assignments and taking exams. Second, it provides a preliminary analysis of student attitudes towards a gamified curriculum and suggests a possible quantified model based around student attitudes.

This paper begins with an examination of some popular gamification mechanics. Next, the curriculum designed for use in the study is presented. This is succeeded with an analysis of the curriculum's first use in two university level courses with respect to student attitude and course outcomes. Finally, suggestions for how gamification can enhance the curriculum and directions for future work are given.

Gamification Mechanics

The following list, while not exhaustive, is a set of the most popular strategies employed by games that have migrated across into other domains.

Points

People play games to earn points. The winner of a game is determined by comparing the total points of all players. Points are the rewards accumulated during gameplay when a player achieves a particular goal. Points can be found in use in the banking system in which customers are aligned to reward programs that allow for the accumulation of points for each dollar spent on a credit card. Frequent Flyer schemes, offered by airlines, are also an example of a point system.

Levels

Many computer games contain levels. A level represents a discrete subdivision, story chapter, a set of challenges or set of resources in a game world. Players progress from lower levels to higher levels through the collection of points. When the number of points reaches a set threshold, the player goes on to the next level. As a player progresses through the levels, they become harder. A player's character may also become more powerful as they ascend the levels. Moving from one level to another is known as leveling up.

Leaderboards

Keeping a list of high scores in a game is reminiscent of the old arcade and digital pinball machines that display a list of player nicknames and their scores proudly on the main display while the game is not being played. This leaderboard acts as a challenge to others while encouraging top scorers to keep playing in order to maintain their status.

Badges

Badges are the visible recognition of completed challenges. They exude status and provide recognition for positive effort. In games badges are given out when a player successfully completes an activity or gathers sufficient resources. According to Antin & Churchill (2011), badges have five purposes in social psychology. First, they assist players with goal-setting by revealing all the activities and challenges available in a particular system. Second, they encapsulate information about a player's interests and expertise providing others with summative knowledge about reputation and status. Third, badges affirm a player's status within the system as well as advertising it to others without explicit bragging. Next, they provide instruction about the types of challenges and activities available to a player by embodying the social norms of a system and exemplifying highly valued behaviors. Finally, badges bind a group of users together around a set of shared experiences by providing a sense of positive group identification.

Quests

In games a quest is a small challenge a player attempts as part of the larger game, taking players on a journey through gameplay and story narrative. Role-playing games are well known for having numerous quests. For example, in Bethesda's Skyrim the player can select from hundreds of quests. While the ultimate goal of the game is to determine why after so many years the dragons have returned to wreak havoc on the citizens of a mythical land, the players can take themselves off the main narrative track to explore dungeons and hunt down

buried treasure to accumulate extra points. The player does not have to complete all the quests in Skyrim to complete the game, however, the quests give the player extra points and experience they would not otherwise have. Of course not all games structure quests in this way. Some quests are compulsory and some are not.

Social Engagement Loops

Another mechanism used frequently in gamified experiences is viral marketing. This method derives from what is called a social engagement loop. In this loop, a person is constantly engaged and reengaged with a core product. It begins with a motivating emotion that leads to re-engagement followed by a social call to action then a reward. The objective of the reward is to emotionally motivate and hence complete the loop. For example, the structure of YouTube exhibits a social engagement loop. A person connects by creating and uploading their own videos thus emotionally connecting them with the site. The person is reengaged when others start to recommend their video to others. The social call to action occurs through the ability to post comments on others videos and the rewards are by way of video ratings and channel subscribers. This in turn motivates more video uploads and the loop continues.

This is a brief examination of just some of the mechanics used in gamification and of all the mechanics the most likely few to seem familiar to educators. At first consideration one might think the education systems is already designed in a gamified manner. However, more in-depth analysis reveals some key differences.

Is Education Already Gamified?

Given the game mechanics outlined in the previous section it is not difficult to see how gamification and the education system align. Students receive points for completing assessments, levels based how these points add up at the end of the semester and are given a variety of badges and placed on leaderboards according to their academic success. Quests are the many challenges, problem-solving activities and assessment faced and social engagement is a natural part of being in a class. However, Smith-Robbins (2011) argues that if education is already gamified it is certainly a weak example. Education systems may be structured, on the surface, as a gamified experience, however they differ greatly as students can misunderstand the game they are playing. Gamified experiences are much more engaging as they make fully transparent the goals, points, status and levels. A player knows where they stand at all times and what they need to do next. In the education system, assessment items are not all weighted equal. Early assessment items are given lower weights assuming they require less subject knowledge to complete. Often final exams are worth extraordinarily large weights. In addition, the time and knowledge required to complete assessment items do not necessarily align with the individual marks given. Furthermore, one assignment worth 15% might be marked out of 100 while another assignment worth 25% might be marked out of 50. Compared with the transparency of a gamified points and level system, academic grading is confusing and overly complicated.

Another way in which education differs from gamification is in collaboration and competition. As Smith-Robbins (2011) eloquently states:

> If the goal [of education] is intellectual growth, then classmates and faculty are teammates. If the goal is to beat the system and earn more money, then classmates are competition and faculty are obstacles to be overcome.

In many universities students are given final grades that must align with a bell curve. Numerous checks, balances and extra weights are often applied to ensure this is the case. This system places all classmates in the category of competition as their results are certain to impact on a student's position on the curve and it could mean the difference between failing or passing. In contrast however, a gamified experience places no such restrictions on players. It might be that player's scores form a bell curve, but player's are free to accrue points and level up irrespective of what other player's are doing. If gamification is to work in the classroom it should not add an extra layer of complexity over the top of existing grading systems. In addition, it should not cheapen the learning experience or trivialize the educational content. What follows is the outline of a gamified curriculum. The traditional assessment and marking system is dispensed with and all student activity allows for the accumulation of experience points (XP).

A Gamified Curriculum

For this study the curricula of two undergraduate subjects were restructured; Game Design and Logic (GAME11-140) and Animation (MMDE13-340), at Bond University, Australia. Grades and assessment

weightings were replaced with XP, a weekly classroom team-based game of Jeopardy was added and a leaderboard integrated with the students' Blackboard logins. The assessment plan, breaking down every student activity into XP, was presented at the beginning of the semester. It included compulsory and non-compulsory items that attracted maximum possible totals of 525 and 300 XP respectively. Students were required to achieve at least 50% of the XP for each type in order to be considered for a passing grade. XP was attributed to each assessed item at a rate of 5 XP for every 2 hours of expected student effort.

Non-Compulsory Activities

Non-compulsory activities were only available for a week at a time. These included lecture and tutorial participation and theoretical and practical challenges. Students would pick and choose from the non-compulsory items throughout the semester. The XP attributed to the non-compulsory was assigned on a pass/fail basis in which a student completing the activity satisfactorily received the full XP. Non-satisfactory or no completion resulted in 0 XP. Each completed non-compulsory activity was worth 5 XP up to a maximum total of 300 XP. While it was possible for students to accumulate over this, they were informed it would always be rounded down to 300 as a maximum. Participation at lectures and tutorials also counted for XP. At the beginning of each lecture students were divided into small teams and a game of JustJeopardy, quiz software developed by the author, based on the television show Jeopardy, was played. A large game board, as shown in Figure 2, was projected onto the whiteboard and teams selected. The teams took turns picking and answering the questions for points. The questions contained in the game board were based on the content of the previous lecture. Every student received XP for playing and the winning team received a bonus 2 XP.

(a) (b)

Figure 2 JustJeopardy (a) The JustJeopardy game board showing categories along the top and coloured buttons for selecting a question. The numbers on the buttons indicate the number of points they are worth. The questions worth more points are believed to be more difficult, but not always. On selecting a button, the question appears as shown in (b). An answer is selected by clicking on the button with the chosen answer. The lecturer operates the game from a computer in the lecture room hooked up to a projector. As each team has a turn, the score appears across the bottom of the game board.

To achieve the XP for tutorial participation, students were required to turn up and complete the set activities for each session. This involved working on a step-by-step project with specialized software in the computer laboratory followed by a challenging applied task extending the project. The theoretical and practical questions were posted on Blackboard after the lecture and the deadline for the student's answers was before the lecture the next week. Theoretical questions required students to carry out research beyond content provided in the lecture and practical questions asked students to complete an applied exercise. The theoretical questions were made competitive in that they were posed to give more incentive to students completing them earlier. For example, after the lecture on the history of animation in MMDE13-340, students were asked to write a short biography on a technical pioneer of the animation industry who was not mentioned in the lecture. No two students were allowed to write about the same person. All student answers were posted into the same blog to ensure other students could see which pioneers had already been written about. Students posting first had the advantage of a larger pool of pioneers from which to select. The later a student left the exercise, the more they would have to research to find someone who had not been mentioned. Practical questions asked students to complete an activity using skills and knowledge obtained from the tutorials. For GAME11-140 it would be to program with specific algorithms explained in class or extend a given game program. For MMDE13-340 it included small 3D

modeling or animation tasks.

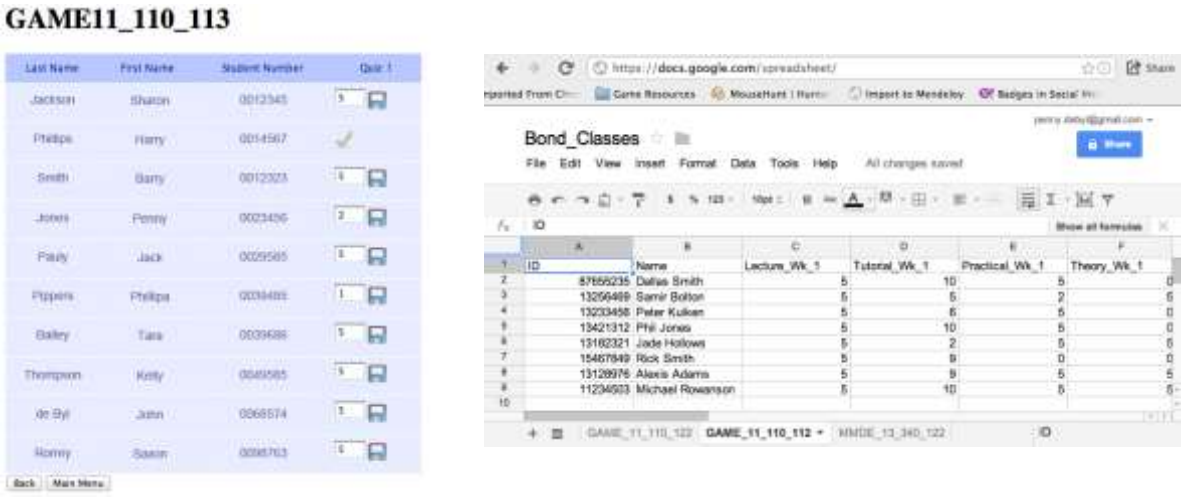
Just before the next lecture the questions were closed and students could no longer achieve these XP. From time to time, unbeknown to the students, some more challenging, non-compulsory questions included bonus XP. This would allow them to make up any previously missed XP due to missing a lecture, tutorial or question failure.

Compulsory Activities

The compulsory activities included assignments and exams the students had to attempt. For these, each had to be attempted and submitted for marking in order for the student to be considered for a passing grade. There were 3 assignments and 2 exams in each subject. The assignments were worth 25, 50 and 150 XP in turn. The mid semester exam was worth 100 XP and the final exam worth 200 XP. Each exam contained a theoretical and practical element. The theoretical part consisted of questions taken from the JustJeopardy game and the practical part involved students in a hands-on exercise to complete programming challenges or create 3D models and/or animations.

The Leaderboard

After each class, the lecturer and/or tutor would update a simple online database with the XP accumulated during the corresponding activity. The first iteration of the gamified curriculum used a teacher managed database and website for data entry as shown in Figure 3 (a). For the second iteration it was decided to introduce a freer and more intuitive format by way of a spreadsheet which the teacher did not have to self-manage. In this case, Google Docs was chosen as shown in Figure 3 (b). For the non-compulsory activities, updating the XP was a matter of selecting the item in the online form and clicking on the ticks next to the student's name. For compulsory items, the XP would be entered manually as it was possible for partial marks to be awarded.



(a) (b)

Figure 3 The web interfaces for the leaderboard database. (a) The original self managed interface and database, (b) The new version using Google Docs,

XP data going into the database would then be made instantly available on the student's leaderboard when they logged into Blackboard. The leaderboard, shown in Figure 4, is written in PHP and hosted on an external website. A short JavaScript program references it when the course homepage is loaded inside Blackboard. The student's Blackboard id is securely sent to the PHP program that extracts their XP from the database and draws the graph. The graph shows each student their total XP, the minimum, average and maximum for the class as well as the grade cutoffs. Students cannot see each other's totals.

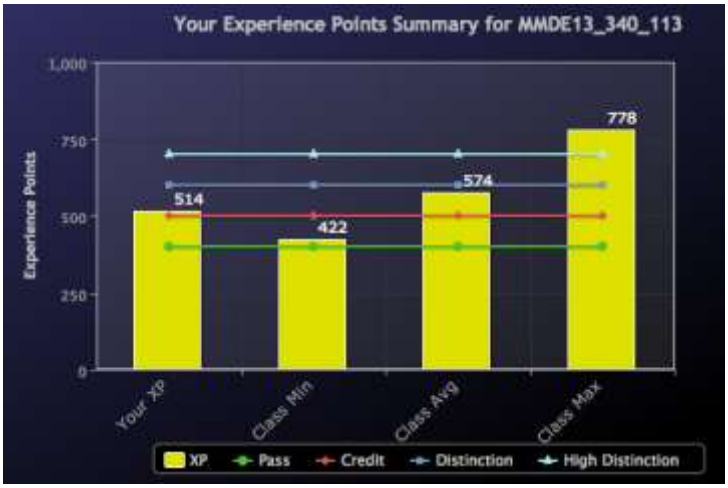


Figure 4 The Leaderboard

Methodology

The study included two classes of undergraduate students enrolled GAME11-140 and MMDE13-340; 22 students in total. The classes were run with the exact same structure as outlined in the previous section. At the end of the semester all students were surveyed to establish the effect the course structure had on their engagement as well as address the gamification of education concerns of student patronization and over complication of learning and teaching. Many of the questions were inspired and adapted from the National Survey of Student Engagement (www.nsse.iub.edu). The survey consisted of 16 questions measured on a 5 point Likert scale: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. Two items (indicated with * in Table 1) were reverse-coded to anchor positive attitudes in the same direction across all questions.

Results and Analysis

Internal consistency was assessed using Cronbach's α (e.g. Cronbach, 1951) on all 16 items resulting in acceptable internal consistency ($\alpha = 0.74$). To explore the dimensional structure of the survey, the items were examined for multidimensional scaling structure using exploratory factor analysis. An important issue affecting the quality of factor analysis, according to MacCallum et al. (1999) is overdetermination or the ratio of factors to variables. In this case, the ratio is 3.2. This meets with their requirements. However, this is an exploratory study and these results should be treated with caution. Nevertheless, they reveal a potential multidimensionality worthy of further exploration in future research. Consistent with the exploratory framework, Principle Components Factor Analysis was used with minimum Eigenvalues (EV) for each factor set at 1.0; Varimax Method was used to force orthogonal rotation so that individual survey items were forced onto unique factors. The loadings for this factor model are presented in Table 1.

Casewise deletion was unnecessary with this sample because all participants completed all items. Five factors were produced in 11 iterations using this method. Using face-validity, the following labels were assigned: Playfulness (EV=4.4, h2=0.28), Comparative Pedagogy (EV=3.0, h2=0.19), Instrumentalist (EV=2.0, h2=0.12), Status (EV=1.5, h2=0.09) and Performance (EV=1.1, h2=0.07). Subsequent internal consistency tests support the multidimensional structure. To reduce this number of variables for future studies and to adequately represent the domain exploratory factor analysis was undertaken. Emerging from the data were five scales; Playfulness (a = 0.79, items = 3), Comparative Pedagogy (a = 0.77, items = 4), Instrumentalist (a = 0.85, items = 3), Status (a = 0.67, items = 3) and Performance (a = 0.54, items = 3).

Table 1 Factor loadings for the factor analysis of the identified scales

Item	Playfulness	Comparative Pedagogy	Instrumentalist	Status	Performance	Mean (n = 21) 1= strongly agree	SD
1. I prefer the XP structure for grades in this class to the way grades are calculated in my other classes.		0.66				1.7	0.85
2. I prefer begin able to see my exact grade status on the XP chart on a day by day basis as opposed to not knowing what it is until the end of the semester				0.50		1.4	1.07
3. Getting XP for weekly theory and practical challenges made me do more out of class work for this course than my other traditionally run courses.		0.78				2.0	0.80
4. The structure of the course encouraged me to research and learn about related content I might not have otherwise explored.		0.58				2.1	0.85
5. I found the XP structure for course grading condescening. *			0.91 *			3.5	1.29
6. I would not mind my XP status being visible to other students. *				0.83 *		3.2	1.30
7. I prefer my XP status to be visible only to me.				0.82		2.3	1.35
8. I checked my XP status for this course more than I check mark/grade status in my other courses.		0.82				1.5	0.68
9. I found the weekly Jeopardy game useful in revising course content.	0.82					1.6	0.97
10. Getting weekly XP for the Jeopardy game encouraged me to turn up to class.	0.86					1.4	0.68
11. I felt the course structure added unnecessary complexity to the course distracting me from my studies.			0.88			3.5	0.98
12. The weekly Jeopardy game in class encouraged me to participate with other students.					0.54	1.7	0.72
13. I only do extra weekly exercises and study if I know it contributes directly to my grade.					0.59	2.2	0.93
14. I am only interested in passing the course. Any higher grade would be a bonus.			0.81			3.8	1.12
15. I want to get the highest grade possible.					0.75	2.0	1.07
16. The weekly Jeopardy game in class encouraged me to participate more in class than I usually would.	0.75					12.0	0.97

* reverse-coded

Discussion

An underlying problem with predicting whether a new pedagogical approach will be successful is largely due to an understanding of student attitudes, reaction and behaviour. Through an attempt to understand and in turn modify student behaviour, pedagogy can reach students on a whole new level. Gamification works because it addresses fundamental human desires such as reward, achievement, status and altruism. While these too are the needs of students there are also other elements within the student psyche that contribute to the level at which they are engaged and immersed in a curriculum. The analysis in this study has revealed five dimensions contributing to student responsiveness to a gamified curriculum; playfulness, comparative pedagogy, instrumentalist, status and performance.

A description of these five dimensions as it relates to the study follows:

- Dimension 1: Playfulness. These questions related to student attitudes toward the Jeopardy game used in classroom for content revision, attendance and class participation. The game brought the fun factor and friendly competition into the classroom. This factor accounted for most of the variance (28%). The question with the highest loading related to Jeopardy encouraging lecture attendance and the second using Jeopardy for revision. These questions appear to reflect the students' acceptance and motivation toward using games for learning and teaching.
- Dimension 2: Comparative Pedagogy. This factor suggests student interest and acceptance of other teaching methodologies. It accounted for 19% of the total variance. The relationship between curricula structure

appears to be characterised by the XP grading structure, how it motivated students to complete their homework and the checking of their total XP. The question loading highest on factor was "I checked my XP status for this course more than I check mark/grade status in my other courses."

- Dimension 3: Instrumentalist. This factor accounted for 12% of the variance. Loading highest on this factor was "I found the XP Structure for the course condescending." Followed by "I found the course structure added unnecessary complexity to the course distracting me from my studies." The third loading was "I am only interested in passing". All of these questions suggest the XP structure as instrumental in course progress.
- Dimension 4: Status. These questions relate to student grades and the visibility thereof. This factor accounted for 9% of the total variance. The highest loaded question on this factor was "I would not mind my XP status being visible to other students." followed by "I prefer my XP status to be visible only to me. " and "I prefer begin able to see my exact grade status on the XP chart on a day by day basis" respectively. This factor suggests student interest not only in their grade and standing in the class but also in having timely information about this status.
- Dimension 5: Performance. This factor suggests student attitudes to their overall performance in the class including class participation and completing homework. There are three loadings on this factor, the highest being "I want to get the highest grade possible." The second highest was "I only do extra weekly exercises and study if I know it contributes directly to my grade." followed by "The weekly Jeopardy game in class encouraged me to participate with other students."

It not unexpected that the major dimension revealed in this gamified domain is playfulness as this is the fundamental underlying principle upon which gamification is found and is very integral in learning environments, first eluded to by Plato (as cited by Pappas 2003) and reiterated by Prensky (2003). Play is not only for the digital natives, but is the essential mechanism through which human understanding develops. Play has been described as the motivation of choosing some rules in order to see what happens when you follow them and the freedom of choice behind them (Araya 2010). In the education system the rules are often difficult to ignore and not dictated by students. In this study however, the curriculum was designed to give students some freedom of choice on the activities that they chose to complete. The Jeopardy game was introduced to add an extra fun factor into the classroom. In the survey the students strongly agreed that the Jeopardy game encouraged them to come to class and helped them with revision. Although it, in itself, is not gamification, it did contribute to the students' XP each week. During one class, a team of students was so thrilled with their win that they stood up, took a photo of the projection of the game and score and posted it to Facebook.

As a dimension in a potential multidimensional model of gamified curriculum, at the two extremes of the Playfulness scale would be students who are very playful and those who are not. If gamification is assumed to be more effective on playful students then it might disengage those who are not. Furthermore, in considering what this dimension might mean learning styles should be examined. Playful learning is described across a variety of learning styles with different strategies for implementing play in each (Rice 2009). This would suggest all students in one way or another are playful. As the very aim of gamification is to engage those who wouldn't otherwise play games, it could be the nature of gamification itself teasing out the playfulness even in those who wouldn't otherwise participate in it. Despite the seemingly extrinsic nature of gamification, play itself is considered an experience with intrinsic motives (Henricks 1999). Hence, the nature of revealing Playfulness as a dimension of gamification suggests this reward system may provide students with acceptable mechanics keyed at deep and independent motivated learning.

If Prensky's (2003) digital native premise is generalized it could be said that educational materials deemed acceptable in the past now fail to engage students who are more attuned to high quality entertainment software, mobile devices and interactive multimedia. The comparative pedagogy factor may demonstrate that students are open to other pedagogical approaches. Although, there has been a large amount of literature criticizing typical lectures they remain the cornerstone of teaching practices at most educational institutions. The long history of technology use in education shows an inclination to use it in the same traditional manner as old technologies even with new media. This methodology neither produces change nor improves education. Gamification of the curriculum does not have the same barriers to implementation found with new technologies, as it is essentially the picking up and dusting off of the token economy. It can be applied without technology. In the questions relating to comparative pedagogy, students agreed with the premise that the gamified structure encouraged them to more out of class work. They also, strongly agreed to being more engaged in checking on the feedback for the activities they had been doing to achieve more XP. This could be due to the fact that every item of student participation in the class achieved XP in contrast to other courses and therefore they had daily and weekly opportunities to gather more XP. This also illustrates the social engagement loop at play with students challenged to submit work, receiving feedback and XP and being motivated to submit more work.

Comparative Pedagogy as a dimension could better help understand the usefulness of a gamified curriculum providing attitudes of students on learning and teaching structure on a scale from those students who thrive in a traditional classroom environment to those who prefer experimental and innovative pedagogy. This then raises the question that while a gamified curriculum may be novel now and effective for students who like experimental learning and teaching environments, what will occur when gamification becomes 'old hat'? Strategies for course completion are also part of the curriculum that encourages student progression. Educators can motivate students by clearly communicating success criteria and depicting success as a realistic objective (Strong et al. 1995). The third factor in this study, Instrumentalist, may suggest student attitudes toward having a clear progression plan are significant. Gamification provides a transparent plan for students to follow breaking each activity down into equally weighted XP. In the curriculum presented herein, each XP equated to two hours of student effort. The students knew if they could demonstrate this effort they would receive points. For the questions constituting this factor, student responses imply the gamified meta-system did not add any unnecessary complexity to the curriculum, nor did they find it condescending. Although the results do not support it, gamification of the curriculum in this way, provides students with a clear step-by-step progression through the course from start to finish.

As a dimension, Instrumentalist would scale students from those who require extreme structure to those that can cope with flexibility and change. According to Skinner & Belmont (1993) teachers can deliver structure through clear communication of expectations, predictability and offering instrumental help and support. They also believe that structure is independent of allowing students autonomy and that high curriculum structure does not mean students do not have freedom of choice in their learning experiences. Autonomy in learning environments is considered to contribute to intrinsic motivation. As with the Playfulness dimension, a Instrumentalist dimension would provide further support to a debate against gamification being purely external. The accumulation and presentation of XP, as it is for the Instrumentalist factor, supports the fourth factor; Status. With the personalized leaderboard being generated whenever the student logs into Blackboard, they could clearly see their ranking in the class. Although other individual student XP was not displayed they could tell if they were the highest or lowest in the class. During one class, two students were comparing each other's XP with one complaining the other had knocked them out of the top spot. The leaderboard also displayed, from the very first week of class, the final grade cutoffs. As students accumulated XP they could see their progress toward the grades. In this study students strongly agreed that they preferred seeing their current grade rather than having to wait until the end of semester. On the questions of whether students would dislike having their XP status currently displayed, the answers were neutral.

The final and most weak factor, performance, is also related to XP. Sadler (1989) argued that in order for students to succeed, they must know 1) what good performance is; 2) how their current performance rates with respect to good performance; and, 3) how to turn their current performance into good performance. Gamified systems make this information available giving players options of ways to gain more points and to reach higher levels. In an education system however, knowing how to better ones self is not that easy. Once an assignment has been completed, if the student receives a poor mark or even fails they do not often get the opportunity to retry for the marks. Indeed in the gamified curriculum presented herein, each weekly opportunity to gain experience points lapsed at the beginning of a new week and compulsory assessment items could only be attempted once. The question then beckons if students are being assessed on their timely abilities or their overall achievement of learning objectives. As Wormeli (2006) states:

> Grading policies such as refusing to accept late work, giving grades of zero, and refusing to allow students to redo their work may be intended as punishment for poor performance, but such policies will not really teach students to be accountable, and they provide very little useful information about students' mastery of the material.

In summary, all revealed factors suggest a strong linkage to the XP mechanic implemented in this curriculum structure. It provides a playful dynamic to the classroom enticing friendly competition and rivalry, it exposes the marking system, offers students goals for which to aim and provides rapid feedback on progression and class ranking. This component of gamification may be nothing more than a modern version of the token economy and with it will bring forth the many opponents of such extrinsic reward systems. On the other hand, it could address a deeper issue embedded into traditional education systems, laying bare the grading system, helping students make sense of it and providing a meaningful comparison of student cohorts from year to year.

Conclusions and Further Work

As the gamification craze inevitably finds its way into the classroom, the way in which it will impact on

learning and teaching is also a concern. In an exploratory paper on Gamification in Education some apprehensions about reducing education to a points and levels system, albeit ironically, are raised (EDUCAUSE 2011). The idea of reorganizing classroom content as a game may trivialize the learning content. While students are left feeling patronized, unsatisfied by winning in these situations and that the course structure is too complex. The study herein goes some way to alleviating the before mentioned fears with respect to its implementation in the classroom. When used as a meta-structure atop existing curriculum it has the potential to engage and motivate students adding elements of play and transparency. This ensures the educational content is not compromised and students aimed at leveling-up do progress toward mastery of the key learning objectives.

The compulsion to include games and game related mechanism in education is great among educators who want to engage and motivate today's students. However, without a thorough understanding of what a gamified curriculum looks like, how it can best be applied and why it might engross students, it cannot be effective. To this end, the research herein, presents a gamified course curriculum structure and evaluation within two university level subjects. The objective being to gage student enjoyment and engagement with a heavily gamified curriculum as well as understanding the factors that may make the practice useful suggesting a multidimensional model of student attitudes that could assist in future gamified practices in education.
One of the assumptions of data reduction as performed on this study is that a large data set is available. However, herein, this is not the case. The data analysis presented is amazingly robust given the small sample size. This justifies further exploration through the data reduction of larger studies. Through additional study a multidimensional model of gamification in education will be proposed. As the research moves forward opportunities to extend the game mechanics within the curriculum will be explored. These will include giving student's earlier opportunities to level-up, giving them more choice on how XP can be achieved and improving the social feedback loop through peer observations and assessment.

Gamification affords the transparency and rapid feedback required to keep students motivated. It is the new token economy worthy of further investigation.

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