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6-18-2013

# Understanding Student Perceptions of Game Elements to Develop Gamified Systems for Learning

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### Recommended Citation

Cheong, Christopher; Filippou, Justin; and Cheong, France, "Understanding Student Perceptions of Game Elements to Develop Gamified Systems for Learning" (2013). *PACIS 2013 Proceedings*. 202.

<http://aisel.aisnet.org/pacis2013/202>

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# UNDERSTANDING STUDENT PERCEPTIONS OF GAME ELEMENTS TO DEVELOP GAMIFIED SYSTEMS FOR LEARNING

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## Abstract

*As a precursor to the development of a gamified system to improve learning outcomes, we investigate the perception of important stakeholders, namely learners, on gamification in learning. However, as gamification is a relatively new approach/term, we neither assume that learners are knowledgeable about it nor do we attempt to explain the term in detail to them. Instead, we focus on common elements between gamification and learners' gaming experience, to determine how learners perceive these game elements. This understanding of learners' perception on the matter will aid in the later development of a gamified system for learning.*

*In this work, we survey 51 undergraduate IT students to obtain their perceptions on game elements such as points, leader boards, player profiles, progress bars, and achievement badges. We then analyse the responses and suggest how these game elements can be used in a gamified system for education.*

*It was found that undergraduate students have a positive perception of gamification and are interested in its use for learning. They expect that gamification will make classes more interesting and will improve the learning environment. Students also believed gamification would be beneficial by assisting them to improve their understanding of course material.*

*Our results also indicate that points and leader boards promote competition, and that points and player profiles (which includes the tracking of performance statistics) can be used to provide users with performance feedback. Students perceive progress bars as motivators to complete tasks while achievement badges are perceived to motivate task mastery. Given these results, we recommend that gamified learning systems should have a strong focus providing different types of feedback to learners, especially feedback related to progression.*

*Keywords: gamification, learning, education, student perspective, game elements*

# 1 INTRODUCTION

Due to the ubiquity of games and the uptake in playing games, researchers have investigated the application of games to domains other than pure entertainment for quite some time. Gamification is a recent trend that involves the incorporation of game elements into non-game applications or domains. That is, the use of elements from games to “gamify” things such as systems or activities. This emerging concept has been applied in domains such as marketing for some time, and is being increasingly applied to learning (Landers & Callan, 2011; Lee & Hammer, 2011; Muntean, 2011).

One objective of gamifying learning is to stimulate the same motivation and engagement that gamers have towards games in learners toward education. By increasing learner motivation and engagement, it is envisaged that learning will improve.

Gamification, however, is not a simple process and can be quite complicated to implement correctly. It is not simply a matter of adding common game elements, such as points, badges, and leader boards, to existing processes or systems. That is a very shallow approach of gamifying existing systems and, in fact, this has vilified gamification and led it to be derisively termed “pointsification” (the addition of points to processes or systems) (Robertson, 2010).

Three important aspects of properly implementing gamification are to understand the target audience (i.e., the “players”), determine what these players should do (e.g., the objective of the activity/system), and use the appropriate game elements to motivate the players to act (Aparicio, Vela, Sánchez, & Montes, 2012; Werbach & Hunter, 2012). In the case of learning, students are the “players” in the system and, thus, to be able to successfully gamify learning for improved motivation and engagement, it is necessary to understand students and their perspective on this matter.

The work reported herein forms part of a larger study in which student perspectives on game elements were obtained and analysed, and the results were used to design, develop, trial, and evaluate a gamified multiple choice quiz software tool, named Quick Quiz. However, in this paper, we focus our discussion on students’ perspectives of game elements and gamification. Specifically, we investigate a group of undergraduate students studying business information technology to obtain details about their game experience, their expectations of gamification in education, and which gaming design elements they believe will make learning more enjoyable. We then analyse their responses and provide some recommendations for the gamification of learning.

## 2 BACKGROUND

In this section, we provide background material necessary to appreciate the context of our work. Specifically, we discuss (1) gamification, games and learning, (2) motivation, and (3) game elements.

### 2.1 Gamification, games, and learning

Gamification is a practice that is currently receiving increasing interest (Deterding, Sicart, Nacke, O’Hara, & Dixon, 2011). Its concept is to use elements from games, which are well-known for motivating and engaging players for lengthy periods, and apply them to non-game contexts in order to re-create that same motivation and engagement for other purposes (Deterding, 2012). It is particularly useful for encouraging desirable behaviours. Examples of gamification include applications such as Foursquare<sup>1</sup>, which awards users points to “check-in” (i.e., users use the Foursquare app on their smartphones to report they are at a particular location). Other examples include apps such as:

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<sup>1</sup> [www.foursquare.com](http://www.foursquare.com)

EpicWin<sup>2</sup>, in which users get points for completing items from their to-do lists, and Fitocracy<sup>3</sup>, in which users get points for exercising.

One possible use of gamification is its application to learning, particularly when there is a lack of motivation and engagement by students. The application of games to better motivate and engagement learners is not new. “Serious games,” games for serious purposes, have been used in domains such as: the military, business, and education (Deterding, Dixon, Khaled, & Nacke, 2011). However, the use of serious games in education is quite different to the use of gamification in education. Serious games refer to full-fledged games, such as a complete virtual environment with avatars, as opposed to gamification, which refers to the use of game elements, such as progress bars, points, etc. to achieve a non-game outcome. That is, the gamification of learning incorporates game elements into the learning process for increased motivation and engagement, which will lead to improved learning.

The application of gamification in learning is becoming increasingly important as learners are no longer as engaged with traditional teaching approaches as they once were. A number of studies have found game-based learning to be more interesting for learners (Kapp, 2012). The gamification of learning can assist students to develop problem-solving and higher order thinking skills (Kapp, 2012).

## 2.2 Motivation

There are a number of theories about motivation, however, in this work, we limit our discussion to motivation theories that focus on engagement. That is, theories that focus on why individuals choose to act or engage. Motivation can be broadly categorised as intrinsic or extrinsic. The categorisation is based on the source of the motivation. Intrinsic motivation originates from within the individual (e.g., authentic motivation such as a personal interest) whereas extrinsic motivation is from outside the individual (typically regulated by external factors, such as rewards). Intrinsic motivation is the more powerful of the two because it is authentic and self-driven and is not controlled or influenced by external factors. It usually results in enhanced performance, persistence, and creativity (Deci & Ryan, 1991; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997).

The Self-Determination Theory (SDT) is a meta-theory that explains motivation. It is composed of two sub-theories, the Cognitive Evaluation Theory (CET), which explains intrinsic motivation, and the Organismic Integration Theory (OIT), which details extrinsic motivation (Ryan & Deci, 2000). CET states that two psychological needs, competence and autonomy, can enhance (intrinsic) motivation (Deci & Ryan, 1991). Both psychological needs are required to improve intrinsic motivation (Fisher, 1978; Ryan, 1982). Thus, for intrinsic motivation to improve, individuals must both experience competence (e.g., in the form of positive feedback for an action performed) and autonomy (e.g., self-determined behaviour).

OIT describes different types of extrinsic motivation (external, introjected, identified, integrated) and the factors that promote them. These types of extrinsic motivation vary along a continuum of causality, ranging from external to internal. Individuals are able to internalise external regulation, which progresses from purely extrinsic motivations to more intrinsic ones (Fisher, 1978; Ryan, 1982; Ryan & Deci, 2000), i.e., the causality becomes more internal. An increase in internalisation of extrinsic motivation generally leads to more desirable results such as increased engagement and better performance (Ryan & Deci, 2000). In regard to education, this leads to lower student dropout (Vallerand & Bissonnette, 1992), higher quality of learning (Grolnick & Ryan, 1987), and better teacher ratings (Hayamizu, 2002). Thus, the internalisation of extrinsic motivation is clearly a desirable feature.

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<sup>2</sup> [www.rexbox.co.uk/epicwin](http://www.rexbox.co.uk/epicwin)

<sup>3</sup> [www.fitocracy.com](http://www.fitocracy.com)

Internalisation of extrinsic motivation is facilitated when there are social supports for feelings of relatedness (Ryan & Deci, 2000). For example, children who feel cared for by their parents have more internalised motivation (Ryan, Stiller, & Lynch, 1994).

Another theory about motivation is Flow theory (Csikszentmihalyi, Kolo, & Baur, 2004). This theory suggests that when in a state of flow, optimal learning experiences can occur. Flow is an immediate subjective experience, which is characterised by: (1) being highly focussed, (2) a loss of self-consciousness, (3) having clear goals and ambitions, and (4) a sense of control over one’s actions and environment (Csikszentmihalyi, 2000).

Flow theory and SDT both explain motivation, however, Flow represents immediate motivation while SDT explains ultimate goals, or more long-term motivation (Eccles & Wigfield, 2002).

### 2.3 Game elements

“Game elements” can be defined as “elements that are characteristic to games” (Deterding, Dixon, et al., 2011). These game elements, however, can be complex as they are not just visual elements such as progress bars. Although a detailed investigation is outside the scope of our work, we discuss some existing literature on what game elements are and explain what we mean when we refer to game elements in this work.

Game elements can be classified on various levels of abstraction. Some examples of concrete elements are those that are typically seen in games, such as badges and leader boards, while more abstract examples are time constraints and styles of games. Table 1 shows a particular classification of game elements based on a review of the literature.

Level	Description	Example
Game interface design patterns	Common, successful interaction design components and design solutions for a known problem in a context, including prototypical implementations.	Badge, leader board, level
Game design patterns and mechanics	Commonly reoccurring parts of the design of a game that concern gameplay.	Time constraint, limited resources, turns
Game design principles and heuristics	Evaluative guidelines to approach a design problem or analyze a given design solution.	Enduring play, clear goals, variety of game styles
Game models	Conceptual models of the components of games or game experience.	MDA; challenge, fantasy, curiosity; game design atoms; CEGE
Game design methods	Game design-specific practices and processes.	Playtesting, playcentric design, value conscious game design

Table 1. Levels of game design elements (reproduced from (Deterding, Dixon, et al., 2011))

An alternative perspective is the division of game elements into three categories: dynamics, mechanics, and components. Similarly to the previous classification, these categories are also divided based on levels of abstraction. Table 2 presents a description and examples of these categories. Each of the mechanics provides a way to implement one or more dynamics in a game and, similarly, components are tied to one or more of these higher-level elements.

Category	Description	Example
Dynamics	High-level aspects of game that have to be considered and managed, but not directly implemented into games.	Constraints, emotions, narrative, progression, relationships
Mechanics	Processes that engages players by moving actions forward.	Challenges, competition, cooperation, feedback, rewards
Components	Specific forms of mechanics or dynamics.	Achievements, avatars, badges, levels, points, teams

Table 2. Categories of game elements (based on (Werbach & Hunter, 2012))

Given these two perspectives on game elements, the commonality is that they are classified or categorised based on levels of abstractions (Table 1 presents from concrete to abstract, while Table 2 presents from abstract to concrete).

Gamification is not simply about the use of game elements. It also contains aspects of game design, game techniques, and game thinking, which are all important. The player's experience is not solely affected by the game elements, but rather by the interaction of all of these aspects and how well they meld into the objectives of the gamified activity or system. This "melding" is achieved through the appropriate use of the aforementioned game design, game techniques, and game thinking. However, as our work is a preliminary attempt to understand learners' perspectives on this matter, we limit the boundary of our research to the most concrete of game elements. That is, those categorised as "game interface design patterns" in Table 1 or "components" in Table 2.

### 3 METHOD

The main aim of the study is to understand undergraduate students' perception of game elements in order to inform the development of gamified learning systems or activities. Undergraduate students were targeted as they are the largest game-playing demography in tertiary education (Brand, Borchard, & Holmes, 2009). Our research was undertaken as a precursor to the development of a gamified system for learning. As students are important stakeholders in this system, it is important to obtain their perception on the matter.

In the following sub-sections, we describe the paper-based survey questionnaire we employed, the participants, and our data collection process.

#### 3.1 Questionnaire Survey

The survey instrument contained two sections. In the first section, participants were required to answer questions about their demographic details and game playing experience. The majority of questions in this section were multiple choice questions and participants were to simply select the best answer. Where appropriate, participants were able to select an "other" option in which they could elaborate upon unlisted options.

The questions in the second section of the questionnaire were about participants' attitudes towards gamification and their opinion on how useful particular game elements (such as points, leader boards, progress bars, etc.) could be in making non-game systems enjoyable. The questions related to attitude towards gamification were multiple choice questions with an "other" option to add unlisted options. Participants were required to answer questions about the game elements by selecting their usefulness on a 11-point Likert scale (1 – 10, and "N/A") and were also able to provide justification for each of their selection.

At the end of the questionnaire, participants were given the opportunity of elaborating or clarifying any of their answers and to provide any additional comments.

### 3.2 Participants

Undergraduate IT students were targeted as they are more likely to play games than postgraduate students and are most likely have a better understanding of games, their various concepts and elements. Participants were sought from four undergraduate IT courses from the same program.

The courses from which participants were recruited included: two first year courses, an introductory database course and a programming course, and two second year courses, a business/web development course and a programming course.

### 3.3 Data Collection

From the four IT candidate courses, students were informed of the research project and participated on a voluntary basis. Of the 179 students, 55 survey questionnaire responses were obtained (30.72% response rate). Of those, only 51 were usable as 4 were incomplete.

The demographic details of the participants are presented in Table 3. Although the sample is small, it captures the demography that we are interested in: undergraduate IT students aged between 18 – 21 years old and studying full-time.

Characteristics	Sample	
	Count	%
<b>Gender</b>		
Male	40	78.43
Female	11	21.57
<b>Age Group</b>		
18 – 21	41	80.39
22 – 28	7	13.73
29 – 48	3	5.88
49 – 65	0	0.00
> 65	0	0.00
<b>Mode of Study</b>		
Full-time	49	96.08
Part-time	2	3.92
<b>Student Type</b>		
Domestic	42	82.35
International	9	17.65

Table 3. Demographics of surveyed students

## 4 FINDINGS

The questionnaire responses were analysed along the dimensions of gaming experience, expectations of gamification in learning, and usefulness of game elements. The analysis considered participants' multiple choice answer selections, Likert scale selections, and any justification or comments participants may have provided.

## 4.1 Gaming Experience

The gaming experience of students was investigated to ensure that they were well acquainted with games and their elements. The analysis of this dimension confirms typical beliefs about undergraduate (IT) students being avid gamers.

From the analysis of the responses, it was found that 100% of participants have played computer games previously. Of the students surveyed, 74.50% played computer games at least once per week with 35.29% playing every day (refer to Figure 1). The most common types of games played are: multi-player (17.71%), shooter (16.57%), adventure (14.28%), and strategy (12.57%) games (refer to Figure 2). Students' most common reasons for playing computer games included: playing with others (29.90%), to relieve boredom (29.90%), and as a source of mental challenge (20.62%) (refer to Figure 3).

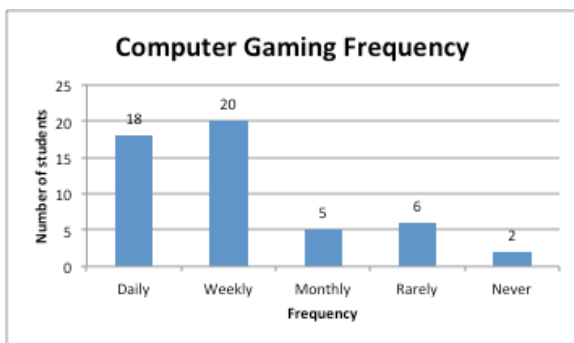


Figure 1 Computer gaming frequency

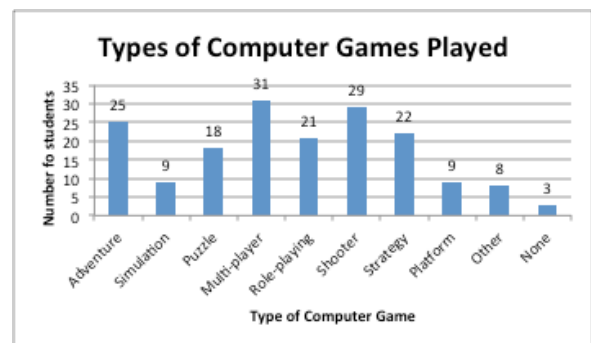


Figure 2 Types of computer games played

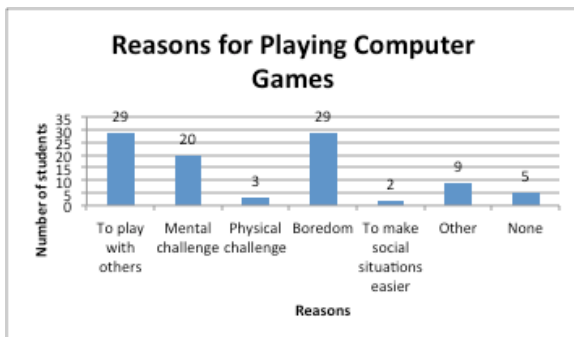


Figure 3 Reasons for playing computer games

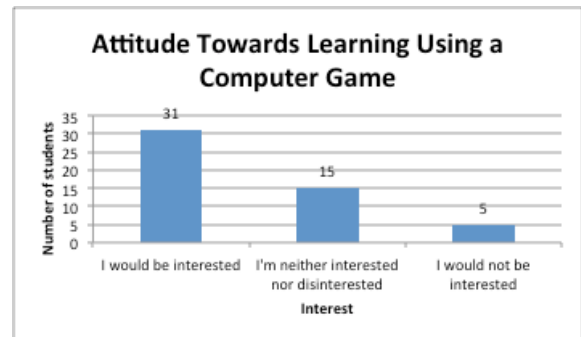


Figure 4 Attitude towards learning using a computer game

Nearly half the students surveyed (49.00%) have played some sort of educational game. Analysis of respondents' comments showed that the majority of educational games they have played were related to learning mathematics and typing. A significant amount of students were in favour of using a computer game for learning (60.78%), while 29.41% were indifferent, and 9.80% were not interested (refer to Figure 4).

From these results, it is evident that undergraduate students are experienced with games, desire social interaction within games, and are open to the use of games in learning. The desire for social interaction with others through games is apparent as participants favour multi-player games (i.e., games that have a strong social element) and their strongest motivation for playing games is a combination of playing with others and boredom relief.



## 4.2 Expectations of gamification in learning

The majority of students (80.39%) have not heard of the term “gamification” previously. However, when asked about how they felt about gamification in education, after being given a minimalist explanation of the term (“the addition of game elements to systems or activities that do not normally have any game-like features”), 53.33% of respondents stated they found it to be an exciting idea, 36.67% stated they would be comfortable with it, and 10.00% would be anxious about it (refer to Figure 5).

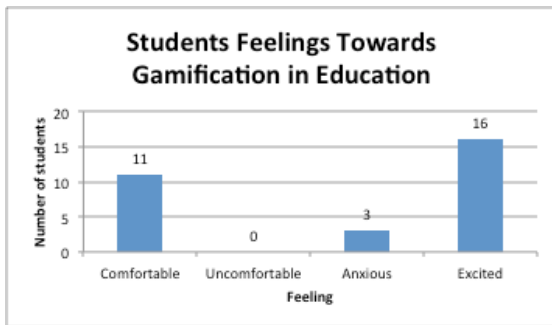


Figure 5 Student feelings towards gamification in education

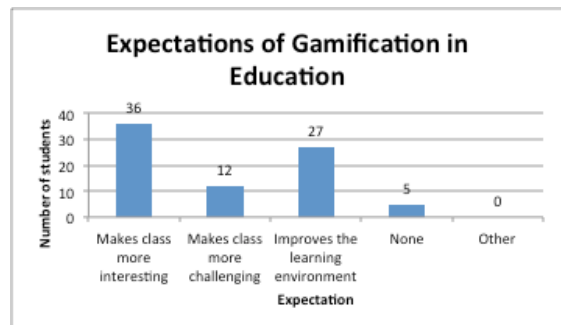


Figure 6 Expectations of gamification in education

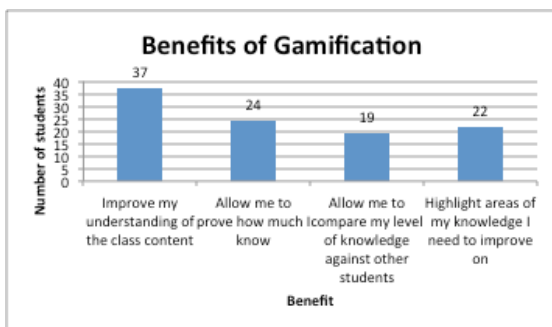


Figure 7 Benefits of gamification

Those who know of gamification have mainly read about it on the Internet (including gaming sites). One student heard of it at work, “I work for a digital marketing company and learnt about it there as a marketing strategy,” and two students encountered the term in their final years of secondary school, “studied it in IT in Year 11” and “[know of it] through Year 12 media studies. I studied issues the media creates in society. Gamification was one issue.”

The majority of students (93.75%) have positive expectations of gamification in education (refer to Figure 6). Many believe its use in education will make classes more interesting and improve the learning environment. One student stated that with gamification in education, “people may actually show up to class,” while another believed that gamification would increase participation in class, “if there are other benefits [to attending class] then there are more incentives to participate.” The first comment is related to dropping student attendance in classes while the second is related to better motivating and engaging students not only to attend, but to also participate.

Students felt positively about the use of gamification in education; 53.33% were excited about it. The most common expectation of gamification is that it will increase student interest in class (45.00%), followed by improvements to the learning environment (33.75%). The most commonly anticipated

benefits of gamification in education by students were an improvement to their understanding of course content (36.27%) and determining their own knowledge (23.53%).

### 4.3 Usefulness of game elements

In the “game elements” section of the questionnaire, students were given 6 common game elements and were asked to rate the usefulness of each element (on an 11-point Likert scale; 1 – 10 and “N/A”) based on its ability to make a system more enjoyable. Students were also asked to provide justification for each of their ratings.

As we wanted to obtain students’ general thoughts about these game elements, we did not present them in the context of a particular game. Instead, students were provided with short descriptions and answered the question without any pre-conceived notions. From the ratings, descriptive statistics about the game element ratings were calculated, and are presented in Table 4.

Game Elements	Min.	Mean	Median	Mode	Max.	Std. Dev.
Point system	1	8.23	9	10	10	2.13
Leader boards	1	7.89	8	10	10	2.28
Profile	1	8.11	8	10	10	2.13
Teams	1	8.83	10	10	10	1.78
Progress Bars	5	8.63	9	10	10	1.37
Achievement Badges	1	7.91	8	10	10	2.04

Table 4. Descriptive statistics of game element usefulness

The overall result shows that the sample of students surveyed thought positively of all the game elements’ usefulness in making a system more enjoyable. In fact, given the mode of 10 for all of the game elements, the maximum of 10 for all the elements, and the high mean and median values, it seems that participants believe that all the game elements are useful.

There is quite a bit of variation in the ratings of the game elements. The elements with the least variability (in order of least to most) are: progress bars, teams, and achievement badges. Interestingly, progress bars received the highest minimum rating (5) compared to all other elements (they all received a minimum rating of 1). It would appear that progress bars would be one of, if not the most, useful game element to increase enjoyment in the use of a system as it has the highest minimum value, the second highest mean, the (equal) second highest median, the (equal) highest mode and the least variability in the set of responses.

In the following sub-sections, we discuss the participants’ justification and comments about each of the game elements.

#### 4.3.1 Point system

The point system was described to students simply as the accumulation of points for things done in a game. Comments about the use of points in gamifying a system indicated that students most commonly thought of it as a competitive aspect, e.g., “without score then no competition. It will be boring.” Others thought of it as a feedback mechanism about their performance, “it is always good to see how well you do, and competition is also good,” “keep track of performance,” “keep track of progress.” One student also suggested that it could be used “to determine your place on the social hierarchy.”

Some students associated it with the context of learning, “Vital. It’s the proof a student can show about their knowledge.” Conversely, another student did not believe that scoring many points meant that one learnt a lot, “getting a high point may not necessary [sic] mean you may score well on the subject grade [sic].”

#### 4.3.2 Leader boards

The leader board was described as the ranking of players in the game. A leader board builds upon the point system, and, naturally, the students' comments reflected that. The leader board comments focused on competition, e.g. *"compete [with] each other," "strive to be the best," "find your competitors," "see how good you are compared to others."*

One student pointed out, *"your [sic] not here to compete, your [sic] here to learn."* This is the same student who mentioned that scoring points is not necessarily indicative of learning. Other students felt that those who did not perform well may not enjoy such game elements, *"lower performing individuals wouldn't really like it,"* although, some believed that the leader board would better motivate those individuals, *"could be a double-edged sword but if you have scoring, you have a leader board. [It] creates competition and they [lower performing individuals] will do better."*

#### 4.3.3 Player profile

The description of the player profile provided to students also included the tracking of playing statistics. More students stated they would find it useful as feedback for their own benefit: *"only for my own analysis," "interesting for each player to know their stats," "keep track of yourself,"* and *"helps give players feedback of their progress."* One student believed it could be used for social display and recognition, *"this is awesome, can show off your profile"* while two students related it back to learning, *"see where we are according to knowledge"* and *"important that each student has their profile to show others/teachers. Always good to look at total stats and look back for historical analysis."*

#### 4.3.4 Teams

Teams were described as the ability to play the game together with others (including human and/or computer players). Comments for this game element re-asserted the fact that students are social beings. They did not like playing alone, *"sometime play by self [sic] is boring"* and *"obviously, playing alone is boring,"* were keen on team work, *"it's enjoyable playing in teams, preferably with human players," "team work is good, goes without saying"* and *"improves cooperation,"* and even related it to real life, *"team work, communication, collaboration are critical life skills."*

#### 4.3.5 Progress bars

Progress bars were described as the use of graphics to indicate levels of completion. They relate to the extent of work completed (or to be completed) to accomplish a task. Students were in favour of it, *"graphics are far better than text. More interesting and player engaging"* and *"easier to see."* Some thought it may be both motivational and interesting, *"visual aids motivates [sic] the user and makes [sic] it more interesting,"* and others related it to goal achievement, *"closeness to goal"* and *"levelling up!"*

#### 4.3.6 Achievement badges

Achievement badges were described as badges awarded as recognition for accomplishments in a game. Students generally thought they would better motivate players: *"Great idea, makes you want to keep playing until all are achieved"* and *"adds another source of motivation."*

One student admitted that although he/she was not particularly fond of it, it might be useful for motivating more advanced players, *"Probably personal taste, [I] don't love it particularly but it gives the advanced students things to work at."*

## 5 DISCUSSION AND RECOMMENDATIONS

The analysis of the findings is discussed and student perceptions about the various game elements are elaborated upon in this section. Furthermore, we provide some recommendations about how these game elements can be applied in gamified systems or activities for education.

### 5.1 Discussion

The responses to the game experience section of the survey showed that the sample of participants was appropriate as they all had computer game experience. The responses also confirmed the view that the majority of undergraduate IT male students play computer games regularly.

Although only 49.00% of participants have previously played educational games, 60.78% of participants would be interested in learning using a game (only 9.80% would be against it; refer to Figure 4). This is supported by a recent survey that found that 55% of people would be interested to work for an organisation that increased productivity through the use of games (Saatchi & Saatchi, 2011). In our results, the interest in gamification is higher and this may be because the sample was predominantly composed of a demography known to be keenly interested in games. The responses also revealed that participants were particularly in favour of social interactions in games as “multi-player” was the type of game most commonly played. Additionally, the primary reasons given for playing games is “to play with others” (29.90%) and boredom relief (29.90%). This further indicates students’ preference for social interaction and also an interest in being better engaged.

The majority of participants are interested in learning using a computer game, however, in regard to gamification, few have heard of the term. Subsequent questions in that part of the questionnaire further queried their potential attitude towards gamification (e.g., feelings towards gamification in education and expectations of gamification in education). As students have not yet experienced gamification in their learning activities, it seems that they do not fully understand what gamification is. Thus, from the comments participants provided (some believed the research was to result in the development of massively online multiplayer game for education and were very excited about it), it would seem that participants equated gamification with using games in education. To that end, their responses reveal that most participants were comfortable or excited about the use of games or gamification in education, and that they expect it to make classes more interesting and improve the learning environment.

Although there is a distinct difference in definition between gamification and games, this is important from the perspective of the designer, who creates a system with game elements (and not a full-fledged game), but not from the perspective of a user, who uses the gamified system and may experience it as a proper game (Deterding, Dixon, et al., 2011). From the perspective of an undergraduate student (i.e., a user), the distinction is neither apparent nor important as long as the gamified system creates an environment in which the learning process is interesting. That is, in practice, whether games or game-like systems are used to create interesting and motivating learning activities is unimportant. The importance is the impact the activities have on the learners: they motivate and engage students to learn.

The analysis of responses regarding the expectation of gamification in learning revealed that, in addition to being in favour of it (53.33% of participants were excited about it), students expect that gamification will increase their interest (45.00%) and improve their understanding. That is, they expect the approach to be better engaging, and this will lead to improved learning.

The game elements chosen in the questionnaire (point system, leader boards, player profile, teams, progress bars, and achievement badges) can be classified as “game design interface patterns” (Deterding, Dixon, et al., 2011) or game “components” (Werbach & Hunter, 2012). These were chosen as they are concrete, generic and common enough that they transcend games and gamification.

That is, whether they are used in games or in gamification, their purposes typically remain the same. Thus, even if the participants were unclear about the distinction between games and gamification, their answers to these questions are valid.

Although all the game elements were highly rated, the progress bars and teams stood out. As with other game elements, they had high means, medians, and modes, but they had the least variability (refer to Table 4). The interest in progress bars may indicate a certain preference for obtaining feedback while the “*teams*” element reinforces the desire for social interaction.

From the game elements listed in the questionnaire, a number of them were related to feedback. These include: point system, leader boards, progress bars, and achievement badges. However, participants perceived the type of feedback provided by each element to be different.

Participants generally viewed the point system as an indicator of self-performance with some relation to competition. Leader boards were seen as both competition and as a mechanism for comparison of performance with others and not just as a ranking mechanism. That is, participants thought of leader boards as a way to determine how much better others were compared to themselves and also as a way to identify who their “*competitors*” are. Although progress bars were seen as mechanisms to provide feedback, they, along with achievement badges, were believed to provide some degree of motivation. In particular, progress bars were seen to be motivational and increase interest through visual displays of current progress. Progress bars were linked with goal achievement and reaching the next level (“*levelling up*”). Thus, progress bars are related to goal (or task) completion. Achievement badges were perceived to provide a different type of motivation. Unlike progress bars, they did not motivate the completion of tasks; rather, they motivated task mastery. This is evident in comments such as: “*makes you want to keep playing until all are achieved*” and “*gives the advanced students things to work at.*”

The high rating of the progress bars may indicate a preference for detailed feedback about progression through learning content or understanding.

The questionnaire responses confirmed typical views about the expectation of games for learning, however, they also revealed a number of insights which can be used to inform the development of gamified systems or activities for learning. This is elaborated upon next.

## **5.2 Recommendations**

Given that students are interested in interacting with others through games, boredom relief, and feedback, gamification may be well suited for learning approaches that include such elements. In particular, gamification appears particularly apt for social constructivism in which students interact with others actively to construct learning artifacts.

Gamified systems and/or activities should also have a strong focus on feedback, which is effective for motivation (Werbach & Hunter, 2012). Different types of feedback should be provided, but feedback about progression seems to be most desirable by students. The progress bar is obviously most suited to display progression. It should clearly indicate what the learner has currently completed and what remains to be completed.

Other game elements can also be used to provide feedback and motivation. For example, if a point system is designed such that points are awarded for something that is relevant to the learner, it provides feedback about the learner’s performance and provides meaningful gamification (Nicholson, 2012). In the context of learning, a point system could award points for correctly completing tasks. A leader board based on these points can then be used to provide students feedback about how they compare to others as an indication of their relative performance. This combination of a point system and leader board can also provide motivation for students. To motivate mastery of tasks, achievement badges can also be used. They may also motivate learners to complete additional or “bonus” material/activities to increase competency.

Game elements such as leader boards and achievement badges should be publicly viewable to all users as they are status symbols or represent the achievement of individual users. One particular issue with this public display of achievement is that some users may feel uneasy about it or even embarrassed if they have not performed well. Two approaches to address this is to either give users the option for their ranking and badges to be publicly viewable or to allow users to use an anonymous display name that does not identify them to others (i.e., not their real name or student number).

## 6 CONCLUSION

The aim of this work was to understand students' perception of gamification and game elements in order to develop gamified systems for learning. The investigation involved surveying students in the first and second year of an undergraduate business IT program. The questionnaire employed enquired about students' gaming experience, their expectation of gamification in education, and their views on the usefulness of particular game elements to increase enjoyment in the use of a gamified system.

The survey confirms the typical belief that undergraduate students are experienced with games (100% of students surveyed have played computer games) and that they engage frequently in the activity (74.50% played computer games at least once per week with 35.29% playing every day).

The results revealed that students' perception of gamification is positive. Although 80.39% of surveyed students have not heard of the term previously, 53.33% found it to be an exciting idea and 36.67% said they would be comfortable with it. Only 10.00% of students said they would feel anxious about it and no student said they would be uncomfortable with it. Most students have not heard of gamification and tend to equate it with games. This also reinforces the fact that to the user (i.e., students in this case), whether games or gamification is used is not important. What is of greater importance is to engage students in game-like systems that motivate them to carry out their learning activities.

Students also believe elements such as point systems, leader boards, player profiles, teams, progress bars, and achievement badges to be useful in creating enjoyment for a game. Overall, students seem to favour the following from a gamified learning system: social interaction, engagement, feedback, and increased learning. These seem to suggest that gamification is particularly suited to learning approaches such as social constructivism and that gamified systems or activities should have a strong focus on feedback.

The most obvious future work is the development of a gamified system for learning to test whether gamification can be used to motivate students to learn. Additionally, the gamified system can also be used to test if these game elements do bring about these hypothesised behaviours.

## 7 ACKNOWLEDGEMENTS

We would like to thank the participants for their involvement in this study.

The research was conducted with ethics approval from the RMIT Business College Human Ethics Advisory Network under register number 1000389.

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