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Gamification, Digital Game-Based Learning and Serious Games a Critical Literature Review

Rebecca Ly (University of Sydney)

Abstract

Over the last two decades gamification, digital game-based learning and serious games are areas that have been widely researched. And yet, in spite of this, the literature on gamification, serious games and digital game-based learning indicates a high degree of disagreement on the definitions for these aforementioned terms. This paper aims to tackle this issue by placing such terms on a continuum which illustrates the degree of overlap which exists between gamification, serious games and entertainment games. Following this, the researcher will observe how the continuum works in practice. More specifically, previously existing research conducted by Humberstone & Ly (2016) on browser and native applications for the Bring your own Device (BYOD) classroom will be applied to the continuum. Such applications will be assessed for their "gamefulness", thereby confirming the relevance of this continuum.

Introduction

Scholastic research in "gamification", "serious games" and "digital game-based learning" (DGBL) has accelerated over the course of the last decade (Hamari, Koivisto, & Sarsa, 2014). Since these terms are relatively new, there has been a level of disagreement over the usage and definitions of such terms (Derterding et al, 2011; Kapp, 2012). In addition to this, Bring Your Own Device (BYOD) is an approach to integrating ICT. This approach has begun to gain popularity in educational institutions today (Kobayashi; Kong & Song, 2015). As the name suggests, it is a solution which allows all students to bring their own device (or a device that they have access to) into the classroom to use in their learning. This sort of arrangement allows students to learn with any digital technology they bring to school (Kobayashi; Kong & Song, 2015), instead of prescribing a limited number of devices that the institution will support. The following paper will review the currently existing literature which attempts to define the terms gamification, serious games and DGBL. The author has synthesized and balanced the definitions of the terms found in the literature and will outline them, as a way to state the axioms. These definitions will then be problematized in relation to one another, and for the purposes of clarity a solution will offered by situating such terms on a newly defined Reality, Gamification, Serious and Entertainment Games (RGSEG) continuum. This paper is informed by existing research conducted by Humberstone &

Ly (2016) which assessed the compatibility of browser and native applications for institutions adopting BYOD in music education through software content analysis. Software applications identified in the prior research will be positioned on the RGSEG continuum, following an inventory which measured to show the relevance of gamification, serious games and DGBL to browser and native applications designed for music education.

Defining the Terms

Defining Game and the Magic Circle

Huizinga (1955) proposes that games exist within a game space or an environment known as the "magic circle" (p. 10) Certain conditions exist inside this particular space which have been listed below:

- Role playing (for example, the player could be a goal-keeper or a potion maker)
- rules
- voluntary participation
- rituals with *special meaning* (for example, in the realm of reality, kicking a ball into a goal does not have much meaning, however in a game of soccer, or within the "magic circle", such activity is rewarded with a point)
- non-seriousness, in other words, the accomplishments or rewards gained from participating inside the magic circle do not translate to acquiring financial, social or cultural capital outside of the game space

In Huizinga's writings, the magic circle is very often juxtaposed against the realm of reality.

Defining "Gamification"

"Gamification" refers to the placement of game elements (badges, points, levels and leaderboards) into non-game related contexts (Derterding et al., 2011; Kapp, 2012; Robson et al, 2015). Gamification has been used in education and training, marketing, management, leadership and health and fitness (Hamari et al., 2014). Very often, tasks and activities are gamified due to the assumption that everyday activity such as checking emails, completing coursework, exercising or attending staff meetings are mundane, arduous and boring (Hamari, 2015). Thus, it can be difficult to motivate oneself to engage in such activity. In contrast, it is easy to find the motivation to play games, thus game elements are implemented, and gamification emerges to motivate the player to *want* to engage in the aforementioned activities (Buckley & Doyle, 2014; Deterding, 2012; Hamari, 2015; Seaborn & Fels, 2015). Gamifying something does not make it a game. A very common example of gamification exists in retail loyalty-based reward systems. Loyalty-based systems operate by rewarding the consumer (or in gamification terms "the player") with points for purchasing particular goods and/or services. When enough points are acquired, the player may redeem a reward, which may be a free coffee or a holiday. In the realm of music education, gamification has been utilised to improve formative and summative assessment, as well as to increase engagement and motivation inside the classroom (Hein, 2014). This is evident in the fact that a

great number of drilling applications exist to enforce basic concepts related to music theory: examples of this will be provided later in the paper.

Defining Serious Games, Commercial Games and Digital Game-Based Learning

"Serious games" refer to digital games which have non-entertainment outcomes. To this end, games designed for education and training or health and fitness are serious games. Thus, *Where in the World is Carmen San Diego* (Nates, 1985) and *Darfur is Dying* (Ruiz, 2006) are all examples of serious games. Converse to serious games are commercial entertainment games, which are games made for entertainment purposes. The term Digital Game-Based Learning (DGBL) was first coined by Prensky (2001) and it refers to learning *through* games. Curiously, the term DGBL has often been used in conjunction with both serious *and* entertainment games.

Issues with Terminologies: Situating the terms on a Continuum

In the previous section the terms gamification, serious games, entertainment games and DGBL were defined in a way that was concise and succinct – as a way to state the axioms. In practice, the definitions of these terms are not always clear. In recent scholarship, it has been acknowledged that it can be difficult to distinguish the difference between serious games and gamification. In his book, Kapp (2012) overcame this issue by referring to *all* serious games as gamification, and he asserted that serious games are ultimately a category that fall under the umbrella term "gamification". Conversely, McGonigal (2012) avoids the term gamification, asserting that it trivialises the idea of using game-thinking to enhance reality. Instead, she prefers to use to term "Alternate Reality Games (ARGs)" referring to them as "games that you play in real life" (p.10). Ian Bogost uses the derogatory term "exploitationware" (2011) to describe gamification, arguing that it is ultimately a gimmick designed to extrinsically motivate users to click or purchase products. His criticism, though, appears to be directed at the commercial usage of gamification. He does not criticise or mention gamification's use in education and training contexts. Critics of the term gamification further describe the term to be frivolous, arguing that gamification already exists in traditional school or work environments (Kirk & Harris, 2011). For example, in the classroom, it can be argued that assessments are ultimately "quests," marks are "points" and that ranking systems are essentially "leaderboards" – thus one can argue that school is already gamified, prompting the question: Where does reality end and where does gamification begin? At times, commercial games designed for entertainment have been used in "serious" contexts (Ferdig & Pytash, 2014; Squire, 2007). For example, the game *Minecraft* (Persson & Bergensten, 2015) was designed for entertainment purposes, but it has been used to teach a great variety of subject areas such as architecture, construction, design, mathematics, and archaeology (Short, 2012).

As previously stated, there are contradictions that arise in regard to the terms "gamification", "serious games" and "entertainment games": rather than categorising games and applications under those three *distinct* categories, a continuum can be applied to illustrate the blurred boundaries that exist between them. On one end of the continuum is the realm of lived reality, and on the other end of the continuum are commercial entertainment games. As shown in Figure 2, next to reality is gamification and adjacent to gamification are serious games.

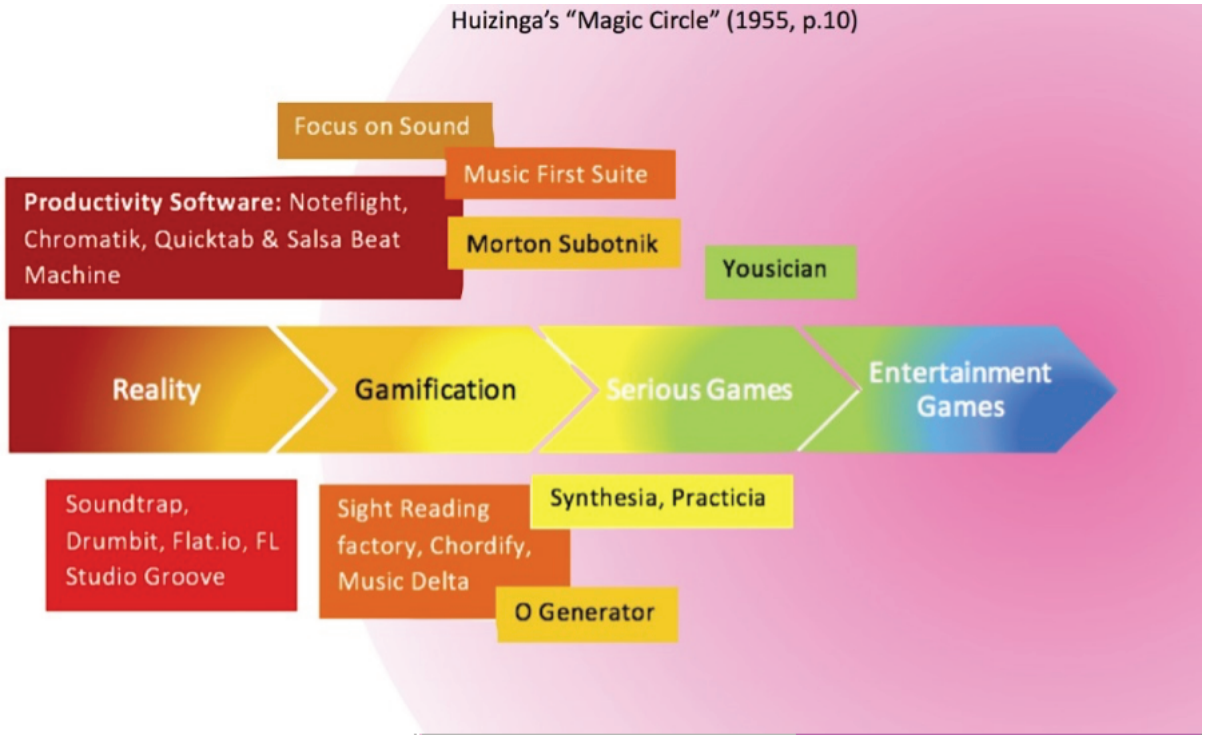

Figure 1. The Reality, Gamification, Serious and Entertainment Games (RGSEG) continuum from reality to commercial entertainment games, also showing several leading software titles blurring across definitions on the continuum.

The more a user (or player) moves to the right of the RGSEG continuum, the closer he or she is to the Huzingarian idea of the aforementioned "magic circle" (1955, p. 10). In fact, it can be argued that at the extreme right end of the continuum, the player is completely immersed in the magic circle. Contrary to this, if the player was closer to the reality/gamification end of the continuum, then he or she would experience reality with particular game-like elements. This can be exemplified in the case of loyalty cards, because in many instances loyalty programs do not make spending a game, however the gameful mechanics of points, rewards and levels make the activity of shopping game-like (Werbach & Hunter, 2012; Zichermann & Linder, 2013). Moreover, the player does not assume another role and the outcomes are in fact "serious." As stated above, previously existing research differentiates DGBL from gamification. In practice, this can lead to confusion as gamified applications are at times referred to as games (Birch, 2014). This continuum offers a new way to understand gamification, serious games and entertainment games.

Bring Your Own Device, Bring a Browser and Native Applications

In schools, BYOD refers to the educational policy that allows students to bring any digital mobile device into the classroom (Stavert, 2013; Thomas, O'Bannon, & Bolton, 2013). Prior to the growth of BYOD, it was not uncommon for students to use school-owned devices for the duration of the lesson, which in turn limited the students' opportunities to develop their technological skills outside of the classroom (Wong & Looi, 2011). BYOD mitigates this issue as it allows the student to use their own device (Wong, 2012). Although a great number of digital devices exist in today's modern world, the technologies are by no means homogenous (Nykvist, 2012). "Bring a Browser" (BaB) was a term coined by Steven Heppell

(2012) and it attempts to mitigate the issue of hardware and operating system diversity in the BYOD classroom. BaB, as the title suggests, ensures that learning happens exclusively on a browser, on any operating system and native applications refer to applications which work on any operating system.

Methodology

In earlier research, Humberstone & Ly examined the compatibility of various browser-based and native applications for BYOD programs in music education. The information was coded against particular sub-categories (learning experiences) relevant to music education, namely composition, performance and musicianship. More importantly, the research categorised the how compatible each application was on a variety of different operating systems, along with the compatibility of various hardware devices (MIDI keyboard and audio input) on such operating systems.

The prior research did not assess the relevance of gamification, serious games and DGBL in the tested browser and native applications, but it is important to consider gamification and DGBL in reference to those published results: Marc Prensky (2001), the technologist who coined the term "DGBL" emphasised this importance by acknowledging that "(DGBL) meets the needs and learning styles of today's and the future generation of learners" (p.10). A high number of music video games and gamified music applications exist in the market today but there is little research that delves into the use of gamification or DGBL in music education (Birch, 2014; Gower & McDowall, 2012; Hein, 2013, 2014; Williams, 2012). This article attempts to bridge this gap in the literature.

Employing quantitative content analysis (Rourke & Anderson, 2004), an inventory containing four questions which reflected the aforementioned Huzingarian definition of gaming was created:

1. Is the outcome of the game:
    1.1. Serious
    1.2. Non-serious
    1.3. Serious and non-serious
    1.4. Other
2. Does the program contain rituals with special meaning?
3. Does the player (or user) assume another role?
4. Are there rules on how the program is to be used?

The same inventory featured a list containing a wide number of game elements which were based off Karl M. Kapp's list of game elements (2012). The elements were listed as follows:

- Goals
- Rules
- Competition
- Time Constraints
- Reward structures
- Feedback
- Levels
- Narrative
- Avatars and game-like aesthetics
- Re-playabiliy

This checklist assesses the degree to which an application is gamified. The inventory was designed to instil confirmability (Bresler & Stake, 2006) in the theory of the aforementioned continuum. One point was given to each "yes" answer in the questions section (this refers to only questions two, three and four), and similarly, one point was to every checked item in the checklist. Both authors of the previously mentioned research (Humberstone & Ly, 2016) filled out the inventory (one inventory per application, each researcher assessed each application). Once all the inventories were completed, the authors discussed the results, noting discrepancies, however, the scores indicated that the researchers mostly agreed on factors related to the gamefulness of each application. The points that were acquired from the completion of each inventory were summed then averaged to produce a score which numerically represented where the application(s) would best be placed on the continuum. The placement of such applications would thus be contingent on the aforementioned Huizingarian list of factors which defined a "game". An application traverses the continuum by answering "yes" to the three aforementioned questions as well as acquiring items from the gamification checklist (e.g. reward structures, competition/cooperation, re-playability), the numerical scores worked to measure where the application was best placed on the continuum.

Findings – How the continuum is applicable to browser and native apps for music education

As shown in the figure, *Noteflight* (2016), *Chromatik* (2016), *Quicktab* (2016) and *Salsa Beat Machine* (2016) feature playback options and they are ideal for the BYOD classroom since they are compatible across a high number of operating systems. However, they are by no means gamified – the user does not assume another role, the outcomes are serious and there are no rituals with special meaning. Thus, these applications would be best placed on the "reality" end of the continuum. Software titles which scored a low (0.25) rating included: *Soundtrap* (2016), *Drumbit* (Santos, 2016), *Flat* (2016) and *FL Studio Grove* ("FL Studio Groove," 2016). In the prior research (Humberstone & Ly, 2016), these were categorised as "productivity software" (software used to assist a person in arranging, composing or producing music). Again, these software titles feature playback options which can be argued to be a form of "feedback" – although, unlike a game, this kind of feedback is neutral in the sense that it does not indicate to the user whether their actions were "right" or "wrong".

Music Delta (2016) is a browser application which features information on music composers and musical instruments. It is targeted to younger primary school (elementary) aged students and features informative videos and quizzes which serve to assess the students' retention of the content. The quizzes give students the ability to acquire points as they structure the students' learning and they offer students the opportunity to try again after failing. *Sight Reading Factory* (2016) is another music drilling application and as the name of suggests, it is aimed at improving a learner's sight reading (ability to read and play or sing music notation accurately). On *Sight Reading Factory*, examples are featured and levelled according to their difficulty. *MusicTheory.net* (2016) is an application designed to enforce music theory skills to users. The player can drill themselves in note identification and such drills also feature a timer and keep score of the user's correct answers. Feedback is provided, informing the user of their correct and incorrect answers. However, there are no win or lose states and the player does not assume a role and the activities do not have "special meaning". Both *Sight Reading Factory* and *Music Delta* scored a rating of 0.5 whilst *MusicTheory.net* scored a rating of 1.25. *Morton Subotnick's Music Academy* (2016), which scored a rating of 1.75, is unlike the aforementioned applications in that it is a browser based application designed to teach composition to younger, primary school aged children. It

provides the user with feedback, and many of the activities are levelled, with a user interface design that features game-like aesthetics.

MusicFirst (2016) is an online Learning Management System (LMS) designed specifically for music education, and also a conduit to a range of other integrated browser-based software titles. The application in itself is not gamified, so it sits on the reality side of the continuum. Practicia (2016), which scored a RSEG rating of 3.25 is also a music LMS, designed more specifically for private instrumental teachers and their students. Unlike MusicFirst, gamification features are included in the application, as students can log their practice hours, complete tasks, and accept rewards. Statistics are included, which serve to motivate the students and further provide them with a sense of progress.

The native instrumental performance teaching applications *Synthesia* (Czikszentmihalyi, 1990) and *Yousician* (Chris & Kaipainen, 2015) are placed closer to the serious games end of the continuum. *Synthesia* scored a rating of 3.25 whilst Yousician scored a rating of 4.25. The game is very similar to music rhythm games such as Guitar Hero (Harmonix, Neversoft, Creations, Visions, & FreeStyleGames, 2015) and contains a wide range of gamified elements such as levels, points, win-states, rules, progress bars which show the player's progression, instant feedback, and the ability to try again for an infinite number of times after failing. The aim of the game is to improve the player's piano or guitar playing ability – thus the intention of the game is a "serious" one.

The numerical scores indicate that the majority of the applications appropriate for music education in institutions with BYOD technology policies were closer to the reality end of the continuum. Curiously, the applications that were specifically designed for educational purposes (such as: *Sight Reading Factory, Mort Subotnick's Music Academy, Music Delta, Focus on Sound* and *Practicia*) rated higher scores on the inventory, placing themselves towards the gamification/serious games end of the RGSEG continuum.

Conclusions

This paper does not recommend or advocate for gamification, DGBL or any specific application to be used in the music classroom but it puts forward a model in which educators, scholars and developers can think about DGBL, gamification and serious games. This paper also contextualises browser and/or native applications which are suitable for the BYOD classroom, thereby assessing how relevant gamification, serious games and DGBL might be to music education – it is clear, after analysis of the data that more and more software programs designed for music education purposes *are* becoming gamified, although the majority of the applications were not gamified. From the list of browser and native applications that were analysed, there were fewer applications closer to the entertainment games end of the continuum. Clarification to the terms gamification, DGBL and serious games have been established through the development of the RGSEG continuum which seeks to mitigate issues with regard to defining the aforementioned terms. There is currently a very scarce amount of music educational research that examines the relevance of gamification, serious games and DGBL in ICT supported learning. The continuum establishes a model that can be used in future music educational research and general gamification and DGBL research. Finally, such research encourages educators, scholars and developers to also take a more active approach as designers of their lessons, research and technological development.

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