Gamification’s role as an Assessment and Learning Tool in Education

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Abstract

Gamification is a new and upcoming trend that is predicted by many to further enhance the field of educational technology in the new millennium. The use of gamification has fared well in the corporate world and is gradually transcending into the educational arena. The usage of game elements such as points, badges and leaderboard can assist in keeping the students not only motivated but also engaged to the teaching and learning process in the school. As learning and assessment come hand in hand as a knowledge acquiring process in a classroom, therefore it should be identified whether gamification can be truly utilized as via the form of an assessment and learning tool in the teaching and learning process. This paper will discuss about the repercussions of using gamification as an assessment and learning tool based on the review of several studies.

Keywords. Gamification, educational technology, game elements

1 Introduction

Constant changing landscape of education has brought the introduction of many innovations in educational technology. One such innovation is gamification; the use of gaming elements in non-gaming context. These game elements are points, badges and leaderboards, elements that usually exist in video games. Although Nick Pelling was credited with coming up with the term back in the 1990’s, gamification only came into prominence in the late 2011, in the world of technology via the arrival of social networks and web-based marketing (Rughiniș, 2013). For example, the loyalty points achieved when buying flight tickets or the badges received when we constantly post in a social networks or online forums. This has proved fruitful in other fields, but its fullest potential has yet to be harnessed in the educational technology field.

Learning and assessment come hand in hand as a knowledge acquiring process in a classroom. Implementation of games or game elements into education is another task all together. By carefully designing a game with structured learning activities and embedded formative assessment, designers risk creating a game that does not interest students (Walker & Shelton, 2008). Furthermore, requiring a teacher to dynamically administer formative assessment to students as they work during games may not be realistic, especially in games students can explore in a non-linear path (Walker & Shelton, 2008). In implementing assessment into game based learning environment is still at its early stages and is said to be time consuming (Chin, 2009). Subsequently the reliability of these assessments is being questioned by several researchers. Therefore, gamification can help tackle this issue as it only requires the use of game elements as opposed to creating a whole game system. Although, ensuring the reliability of a gamification based learning and assessment system will depend on creating a meaningful gamification.

2 Foundations of creating a Meaningful gamification

The concept of meaningful gamification was introduced by Nicholson, (2012) through a user-centered exploration. A meaningful gamification will succeed if it puts the needs of the users first over the needs of an organization. When this occurs, users will have a positive experience which results in a longer-term and deeper en-
A research by Morrison & DiSalvo, (2014) whose theoretical research on Khan Academy found that the web based gamification system addressed the issues of short-term engagement and keeping users involved and progressing to more difficult tasks. It is noted to have missed critical motivational components in utilizing external rewards without matching them to the underlying exercises makes an empty gamification experience and instills a negative feeling in the users. A meaningful gamification involves “adding elements of pure play to the system”: not just scoring systems. Thus missing the notion of meaningful gamification, where it is user-centered. Though Khan Academy has included gaming elements, it has not managed to create desired motivational effect. It is concluded the successful gamification of the site can be achieved by altering the implementation of the badges and points system by allowing more well-defined goals and expanding the social aspects of the gaming elements.

3 Games and Assessment

Assessments can be used for either formative or summative purposes (Black and Wiliam, 1998). When used for summative purposes, assessments provide information for such activities as grading or certification (Black and Wiliam, 1998). When used for formative purposes, assessments provide information directly to students to inform them of the adequacy of their learning and performance, and to provide direction for improvement (Black and Wiliam, 1998). Formative assessment consists of learning activities in which students perform actions (e.g., respond to questions) and receive feedback regarding the quality of their actions (Shute and Ke, 2012). Whether an assessment is formative or summative has to do with its purpose. Formative assessment is designed to inform students of the adequacy of their learning process and what can be done to improve learning (Shute and Ke, 2012). Black and Wiliam, (1998) distinguished between two types of evidence that can be collected during formative assessment: purposive and incidental evidence. Purposive refers to evidence collected through the deliberate provision of assessments to students. For example, a teacher in a face-to-face class may ask students questions to ascertain whether they understand a concept just covered in class. Incidental refers to evidence that is “spontaneously and continuously generated” (Black and Wiliam, 1998). Formative assessment can be either administered by a teacher or embedded within a game. A formative assessment strategy often administered by teachers employs debriefing sessions (Delacruz, et al., 2010; Delacruz, 2011). After using the game for a day, students need to respond to the questions either orally or in writing to their teacher, and are given feedback accordingly. Teachers often use rubrics to guide their assessment in such debriefing sessions. Providing rubrics directly to students is another way to provide formative assessment for students (Delacruz, et al., 2010; Delacruz, 2011). With such rubrics, students can either self-assess or assess the performance of peers. If scoring rules for the game are tied to learning goals, then tying the rubric to scoring rules can make assessment transparent (Delacruz, et al., 2010; Delacruz, 2011). By carefully designing a game with structured learning activities and embedded formative assessment, designers risk creating a game that does not interest students (Walker and Shelton, 2008). But requiring a teacher to dynamically administer formative assessment to students as they work during games may not be realistic, especially in games students can explore in a non-linear path (Walker and Shelton, 2008). Thus, designing formative feedback that is effective in guiding students’ learning, while still creating an engaging game, is difficult. To help guide that process, the role of feedback and student mindfulness is explored in the next sections.

In implementing assessment into game based learning environment is still at its early stages and is said to be time consuming (Chin, 2009). Subsequently also the reliability of these assessments are being questioned by several researchers. (Pellegrino, Chudowsky, and Glaser, 2001). Therefore it was suggested by Ifenthaler, Eser-yel, and Ge, (2012) that feedback will allow a self-regulated environment that allows and help in mastery development of the users. This can be more accommodating in the current age of technological advances that allows direct responses based on the users interaction with the learning environment. (Ifenthaler et al., 2012). In differ-
entiating between game scoring, external assessment and embedded assessment, as shown by the Figure 1, game scoring looks into targets and challenges that were overcome while playing the game, and the time needed to achieve the tasks. Meanwhile external assessment is not within the gaming environment and it is achieved through debriefing about the games, causal diagrams, test scores. Finally embedded assessment is through the learners/users behaviour whilst using the games, for example the log data, information trails of the users.

![Figure 1: Types of a game based assessment. Source: (Ifenthaler, Eseryel, & Ge, 2012).](image)

4 Gamification and Assessment

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Thus, an extensive analyses review on other gamification research is needed to see the clear impact of gamification in the context of assessment and learning.
5 Analysis Review

Several latest researches of gamification in the context of assessment and learning was chosen and reviewed to see the purpose of the research and what was analysed throughout their research. Table 1 shows the meta-analysis of these researches.

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<tr>
<th>Title and author</th>
<th>Purpose</th>
<th>Outcome</th>
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<tbody>
<tr>
<td><strong>Gamification for low-literates</strong> Effects on motivation, user experience, and study design (Schouten, Pfah, Cremers, Dijk, &amp; Neerinckx, 2011)</td>
<td>Investigated the effects of the gamification elements of scaffolding, score and hints on the user enjoyment and motivation of people of low literacy</td>
<td>Quantitative results were inconclusive, but post-test interviews showed the limited effectiveness of the gamification elements. Complex questionnaire wordings, high task difficulty, and an improperly situated task environment all contributed to ceiling effects in the influence of scaffolding. Score was found to be ineffective without proper contextualization connecting the numerical score to clearer performance measures.</td>
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<td><strong>Gamifying learning experiences : Practical implications and outcomes</strong> (Domínguez et al., 2013)</td>
<td>Gamification was used in giving the students optional exercises that is meant to help the students grade in the final exams</td>
<td>Reward systems encourage representation of progress within an online educative experience while leader boards inculcate the competitive social mechanisms where the students can compare their progress with other classmates. Yet the system was found to be ominous, as there was no fun factor in competing with others for a rank in the leader board</td>
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<td><strong>In-Game Assessments Increase Novice Programmers' Engagement and Level Completion Speed.</strong> (Lee, Ko, &amp; Kwan, 2013)</td>
<td>To create a storyline based game assessment to improve novice programmers engagement in learning programming</td>
<td>The learners completed more levels, played the game longer, and were faster in regular levels when given assessments. Integrating assessments in a manner that flows with a game’s interactions, is part of the story, appears to keep learners engaged, even when these tasks are still obviously a test.</td>
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<td><strong>CodeSpells : Embodying the Metaphor of Wizardry for Programming.</strong> (Esper, Foster, &amp; Griswold, 2013)</td>
<td>Allowing novice programmer to get used to the programming environment using spells instead of the normal codes</td>
<td>Increased engagement through the spell mechanism creates authenticity.</td>
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<td><strong>Gamification-based assessment of group work.</strong> (Moccozet, Tardy, Opprecht, &amp; Leonard, 2013)</td>
<td>The goal is to create an enabling environment to stimulate learning by peer sharing and formative feedback.</td>
<td>The resulting collaborative learning platform encourages students to contribute and collaborate. It addresses the “free rider” problem by providing an indicator of the student’s individual contribution.</td>
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<td><strong>An Experience Report on Using Gamification in Technical Higher Education.</strong> (Iosup &amp; Epema, 2014)</td>
<td>An attempt to show that gamification can be used to teach technically challenging courses</td>
<td>Passing rate of over 75% at the first attempt. Found that gamification is correlated with an increase in the percentage of passing students, and in the participation in voluntary activities and challenging assignments</td>
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<td><strong>A multilevel analysis of the effects of external rewards on elementary students' motivation, engagement and learning in an educational game.</strong> (Filsecker &amp; Hickey, 2014)</td>
<td>To see whether the immersive educational game can help users from the negative consequences on their motivation and interest in solving ecological-related problems in the future. Also intended to see whether external rewards have positive effects on learning</td>
<td>The results showed that there were no significant differences for motivation level and engagement between control group and the gamified group. Yet the gamified users fared better than the control group when it came to learning. External rewards seemed to have no effect on the student’s motivation and interest yet showed positive effects when it came to learning. The students also showed a deeper understanding of the concepts, topics and processes associated with solving scientific and socio-scientific problems in the performance assessment</td>
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6 Discussions

Based on the analyses review above, we found that the research carried out by Schouten et al., (2011) discovered that the gamification system they created was ineffective to the participants as they were overwhelmed with the complex questions, tasks and scoring system that they did not understand. The main tasks have to suit the participants to ensure they can understand and enjoy the gamification elements, furthermore as failing at the first hurdle creates a domino effect that makes features such as hints not used by the users. This research further enforced the findings of the research by Nicholson, (2012) whom stated that we need to identify the users need before planning a gamified environment. Meanwhile Domínguez et al., (2013) found that despite the reward system, fun was lacking in the learning experience. There was also lacking interest in going up the leader boards as it did not look into the needs of the users, instead the need of the organization. The research by Lee et al., (2013) stated that the inclusion of assessment as a manner that compensates the storyline of the game not only helped in the assessing the users but also in keeping them engaged were much quicker when given assessments. Integrating assessments in a manner of story created a flow. Another positive gamified research was by Esper et al., (2013) whom found that the users felt as though they were playing a video game, thus exists the need to re-engage and complete any failed tasks before moving to the next stage. The research by Mocozet et al., (2013) managed to come up with a framework to tackle with free-rider in a group and the added task of peer assessment. This research showed that gamification can be used in group based assessments as well. Yet the research talked about the need for the integration of additional gamification components such as badges should be taken into consideration in creating a gamified environment. Iosup & Epema, (2014) found that gamification seems to also foster interaction in the classroom and trigger students to pay more attention to the design of the course. Though the use of Richard Bartle’s player motivation (Bartle, 1996) catered to different student’s skill, yet there was discrepancy between the motivation items and also the researcher’s also did not discuss about which player motivation succeeded or showed the most improvement. Filscker & Hickey, (2014) stated that when it came to external rewards in a technology enhanced environment has a positive effect on learning without having any negative consequences for motivation; as predicted by cognitive evaluation theory. Yet the research found no significance towards motivation and engagement, thus contradicting with other findings of gamification that found improvement in motivation and engagement

7 Conclusions

Based on the findings and discussion above, it can be seen that before creating a gamified environment for the purpose of learning, the level of the student’s motivation and educational tendency needs to be identified. As seen in the research by Schouten et al., (2011) that tried to implement gamification on those who were not up to it. Besides that, it can be concluded that the researcher did not identify the needs of the user first before tackling the issue in hand. This was the same issue faced by Domínguez et al., (2013) whom found that the participants lacked interest on the game elements that was introduced to them. However in the research by Lee et al., (2013); Esper et al., (2013); Iosup & Epema, (2014) and Filscker & Hickey, (2014) that showed there were improvement when it came to learning via using gamification as a tool in assessment and learning. Even if the research by Esper et al., (2013) stated that with increased engagement towards the system, the speed of completing the gamified tasks was compromised as they were too engaged until they do not wish to proceed to the next task until the current task was completed. Consequently, this affected the time factors in undertaking an assessment, but it proved that the participants were immersed and in the zone, that they did the task until completion. This showed that gamification as an assessment and learning tool, can contribute to improvement of cognitive, engagement and motivation despite no research managing to achieve all the elements successfully. Therefore, further research is needed to find a suitable framework that can successfully create a gamified system capable of improving cognitive, motivation and engagement elements.

References


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