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Can Gamification Bring Long-term Effects for Elementary Students' Learning?

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ABSTRACT

Gamification is known to facilitate learner's engagement and motivation. However, whether gamification has positive longterm effects on students' learning habits and interests remains an under-explored topic in education. This study, in examining learners' performance on a gamified e-learning platform named *Reading Battle*, aims to analyse the long-term effects of gamification on primary school students' reading literacy. Twenty-nine elementary school students in Hong Kong, 14 of whom were female, and 15 others were male, participated in this mixed method study which includes questionnaires and semistructured interviews. Findings reveal that gamified pedagogies did have durable positive impacts on children's reading literacy, particularly on their reading interests, habits, abilities and emotional states. This study concludes that gamified learning tools can facilitate literacy development in children over a longitudinal scale, and the results of this study provide insights for future researchers and educators.

KEYWORDS

Gamification, Reading literacy, e-Learning, Motivation, Engagement.

INTRODUCTION

Gamification in learning is an emerging trend of research. Deterding and others (2011) define gamification as "the use of game design elements in non-game contexts" (p.9). Domínguez (2013) refines that definition further as "incorporating game elements into a non-gaming software application to increase user experience and engagement" (p.381), which emphasizes the goal of advancing users' experience and engagement. Numerous works of gamification research in different education domains point to various degrees of positive impacts on overall learners' experience, such as increasing motivation and engagement (Mekler et al., 2013), improving performance (Liu et al., 2017), and fostering social connection (Alomar et al., 2016). From these studies, a consensus seems to form around the notion that gamification can engage learners deeply in learning activities.

Behind learners' engagement to a task, one cannot begin to see a full picture of it without studying motivation. To understand learners' motivation better, a well-known theory in the field called the Self-Determination Theory (SDT), conceived by Ryan and Deci in 1980, may provide a fuller picture on how learners learn and engage themselves in a task (Calder & Staw, 1975; Deci, 1971). According to SDT, learner's motivation is driven extrinsically by their "performance [to] an activity in order to attain some separable outcomes [i.e. contingent rewards in most cases]" (Ryan & Deci, 2000, p.71). This contrasts with intrinsic motivation, another side of motivation driven by innate psychological needs. According to Ryan and Deci, intrinsic specifically refers to "doing an activity for the inherent satisfaction of the activity itself", suggesting personal desires at work in finishing a task (Deci, Koestner, & Ryan, 2001). Relating SDT to gamification study, scholars have tried in designing a learning platform in which learners are stimulated to learn out of personal desires than extrinsic rewards. Others like Buckley and Doyle (2016) further look into this as to whether the platform will help sustain long-term engagement.

Although many studies indicate that gamification provides a bevy of positive effects on learners with the most prominent one being increased learning engagement and motivation (Tsay, Kofinas, & Luo, 2018), most of these studies were operated under the context that the research sample was studied under a designated period of time. Only a handful would study their samples on a longitudinal scale, asking such questions as 'In post-tests, could the effects be self-sustainable? If so, what educational values, benefits and significance can be extricated from study like this?' Pertaining to the domain of learners' attrition, many scholars criticize that the post-test effects of gamification, characterized by ranking and rewards, only encourage extrinsic motivation and discourage intrinsic motivation, a zero-sum game in essence (Hanus & Fox, 2015). They argue that without elements of gamification (e.g., scores, rankings, and rewards), learners will retrogress to the starting point of their learning, thereby not only is the value of their research participation diminished, the potential effects of gamification are also trivialized (Deci et al., 2001). This seems to deviate from the original intent of applying gamification to learning in the first place.

Against that backdrop, this study seeks to understand, evaluate and critique/mitigate that divergence of perspectives through a gamified e-learning platform. By studying how students used the platform to learn English, this study hopes to delineate any possible links between gamification and learner's motivation and engagement. At the end of the day, when those links are made clear, gamification can point to new learning alternatives for students who learn English as a second or foreign language.

METHODS

The gamified e-learning platform employed in this study is Reading Battle (RB). To test this platform, the current study asks: *What are the long-term effects of using RB?* In answering that question, four sub-questions are devised:
Sub-question one (SQ1): What are the implications of the RB on students' reading interests?
Sub-question two (SQ2): What are the implications of RB on students' reading habits?
Sub-question three (SQ3): What are the implications of RB on students' reading abilities?
Sub-question four (SQ4): What are the implications of RB on students' reading motivation? ***Sampling***

Reading Battle (RB) is a gamified learning platform that contains questions derived from over 500 children's storybooks. Aimed to strengthen the reading comprehension abilities of Hong Kong primary school students, the platform administers mid- and post-reading activities for them (Chu et al., 2014). To explore the long-term educational effects of RB on children, we randomly sampled active users who performed well on RB (i.e. over 100 storybooks read) and who stopped using it for more than six months. These filters could help point to a longitudinal pattern of learners' skills and performances previously concealed from educational game developers and researchers. Based on these, twenty-nine participants, comprising 14 female students and 15 male students from four primary schools in Hong Kong, were scrutinized for further study.

Data Collection and Analysis

A mix-method approach was used when collecting data (Creswell & Clark, 2017). Semi-structured interviews with follow-up questionnaires were administered. Modelling on the Intrinsic Motivation Inventory (McAuley et al., 1989), the questionnaires were further adapted for RB based on PIRLS 2011 Analytical Framework (Mullis et al., 2009) and Wang and Guthrie's study (2004). The Interview protocol and questionnaire with students can be accessed by: goo.gl/LRaeZN. Quantitative data from the questionnaires were assessed on a six-point Likert scale, designed around three time periods (i.e. before using RB, during RB and after using RB). All data collected during the interviews and from the questionnaires came only after students finished RB for more than six months. The goal of this process was to provide a grace period between research participants and their perceived levels of self-improvement. Participants' feedbacks were analysed separately based on PIRLS 2011: one in which quantitative data collected through the questionnaires were evaluated by mean and standard deviation (SD) across the three time periods, and the other in which qualitative data from interviews were transcribed into both Chinese and English.

RESULTS AND DISCUSSION

SQ1: Implications of RB on Students' Reading Interests

Participants reported that their reading interests were stimulated when using RB, and remained high after they stopped using RB, compared to prior using RB (see Table 1). Several participants mentioned that prior to using RB, they thought reading was only for time-killing and that they hated to read. "I didn't expect to learn anything from a book before", top scorer [WHCLC] stated during the interview. "I found RB helpful for me to complete my homework as it provides a wide range of book choices. For now [i.e. after he stopped using], I think books can help me find the answer most of the time, so I still think it is important to read even though I don't use RB anymore". Another top scorer [WH-CNH] answered, "Before using RB, I didn't really think reading is important and reading is just for people that are very bored. But since I started using it, I wished to read more books and sometimes I indulge myself deep in the book and feel really enjoyable". Most of the participants had

	Reading Enjoyment *M (SD)*	Think Reading Important *M(SD)*

	Reading Frequency *M (SD)*	Breadth of Reading *M(SD)*

Before using RB	3.26(1.09)	3.45(1.21)
During using RB	5.12(0.75)	5.03(0.87)
After using RB	4.86(0.92)	5.07(0.88)

Table 1. Reading Interests Differences in Three Periods.

Before using RB	3.95(1.07)	2.62(1.05)
During using RB	5.48(0.63)	4.79(0.86)
After using RB	4.83(1.14)	4.28(1.13)

Table 2. Reading Habits Differences in Three Periods.

similar feelings towards RB in the sense that after they used the e-learning platform, they began to realize that reading is interesting and that their love for reading has only just blossomed. This affirms the notion that e-learning platform can heighten reading interests over a sustained period.

SQ2: Implications of RB on Students' Reading Habits

Regarding reading habits, it can be inferred from quantitative data that participants had increased their reading frequency and expanded on the breadth of their reading choices, while they were using RB. These habits extended further than RB (see Table 2). Qualitative findings collected through interviews were consistent with quantitative findings on this aspect. RB had in fact stimulated participants to read more and explore different genres of books. twelve participants in this study admitted that they had only read one type of books they really liked prior to using RB, and that their choice widened immediately after using RB: "During RB, I read from more genre as RB requires. After using RB, I really got to explore a different variety of books. And it is quite nice for RB to recommend different genres of books to us," top scorer [WH-CNH] said. The rest of the top scorers [WH-HCW] chimed in, "During the time when I used RB when one category of books had been completed, I would have to shift to another category in order to complete more challenges". Responses from the interviews confirm earlier findings in questionnaires in that the reading habits formed during RB endure well after respondents stopped using the platform. This may negate the perception that once extrinsic elements like competition and reward are taken away, learners revert back to their pre-test selves.

SQ3: Implications of RB on Students' Reading Abilities

Other than reading habits, quantitative data also shows that participants' reading abilities improved and endured post-RB. Although most participants stopped using RB for at least four months, their perceived reading ability was reportedly higher (M=3.26, SD=0.85) than before (M=4.69, SD=0.75) and during (M=4.76, SD= 0.82) they used RB. In the interviews, participants explained the relation between using this gamified platform and their reading abilities. "I could learn different types of vocabulary [after using RB], which can later be used for my writing", one top scorer [SPS-QYC] mentioned while another top scorer [WH-CNH] said, "I think my reading comprehension is better than before as it further trained me to be more skilled at doing reading comprehension". Some participants [SPMLT-CKL, SPS-LZD] mentioned their test scores in Chinese and/or English reading and writing improved after using RB. This correlation of top performance in RB and language test scores suggests that reading skills, like varied vocabulary, picked up through an e-learning channel can be cross-applied to formal educational contexts.

SQ4: Implications of RB on Students' Reading Motivation

Finally, participants' reading motivation has been tracked throughout their use on RB. As data shows, participants derived feelings of enjoyment, usefulness, competence, curiosity, and challenge from playing RB (see Table 3) and reduced negative feelings like academic pressure and boredom arising from reading (see Table 4). When asked if playing this platform brought about any negative feelings, the majority of participants replied with a 'no'. Many enjoyed playing RB and found that

	Enjoyment *M (SD)*	Usefulness *M (SD)*	Competence *M(SD)*	Curiosity *M(SD)*	Challenge *M(SD)*
Before	3.60(1.05)	3.22(1.10)	3.29(0.84)	3.28(1.00)	2.83(0.89)
During	5.10(0.77)	4.93(0.96)	4.95(0.83)	4.64(0.88)	4.98(0.89)
After	4.98(0.85)	5.02(0.99)	5.02(0.78)	4.38(0.78)	4.57(1.00)

Table 3. Positive Feelings Differences in Three Periods.

	Pressure *M (SD)*	Boredom *M(SD)*
Before	1.67(0.91)	1.91(1.18)
During	1.52(0.91)	1.21(0.43)
After	1.36(0.85)	1.24(0.64)

Table 4. Negative Feelings Differences in Three Periods.

inspiration and amusement they had felt stayed with them post-RB. One top scorer [SPMLT-YHZ] reported that "I felt really happy when I talked with my classmates about the book I read, and when I knew something my classmates didn't know

about". Some participants [SPS-LZD] mentioned that the reason they played RB was mainly because of the sense of satisfaction they could get out of topping the users' ranking and getting rewards. As time went on through post-RB, they developed a yearning for books. This confirms earlier speculations that RB motivates students to continue reading in post-RB settings.

CONCLUSION

For years, people have doubted over whether gamification can facilitate intrinsic motivation and deliver long-term benefits to the learners. Many scholars hold neutral or negative attitudes towards gamification, considering the effects of reward (Deci et al., 2001; Hanus & Fox, 2015). Nevertheless, in this study, Reading Battle has provided compelling evidence that top performers of the e-learning platform have exhibited increased reading interests, good reading habits, improved reading abilities and positive motivations, after they stopped using the platform. These results imply, then, that extrinsic motivation to read has been internalized by the top performers and sustained well over RB tests. Intrinsically motivating students to keep reading, gamification and gamified pedagogies are, at the end of the day, effective in developing one's reading literacy.

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