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Conference or Workshop Item:

Chua, Alton Y.K., Banerjee, Snehasish orcid.org/0000-0001-6355-0470 and Pee, LG (2015) An m-learning game for the study of humanities. In: IEEE Conference on e-Learning, e-Management and e-Services, 24-26 Aug 2015.

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An m-Learning Game for the Study of Humanities

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Abstract—**Unlike the hard sciences, the study of humanities has not adequately leveraged on technologies such as mobile learning and serious games. Hence, this paper introduces SingaRacer, a mobile learning game to study humanities, specifically, history and culture. The ways in which users might perceive its prospect both as a game as well as an educational application was examined. For this purpose, SingaRacer was evaluated through a user study comprising 52 participants. Their intention to use SingaRacer was generally promising. Implications of the findings are highlighted.**

Keywords—e-learning; m-learning; serious games; pedagogy; behavioral intention; humanities; history; culture

I. Introduction

Recent years have witnessed a paradigm shift in the pedagogical model from passive to active learning. Instead of passively listening to lectures, active learning requires students to engage in meaningful learning activities. This in turn helps improve the effectiveness of their learning process [1].

One way to realize active learning is through the use of mobile devices, known also as mobile learning (m-learning) [2]. Lying at the intersection of mobile computing and e-learning, m-learning unites individualized learning with anytime and anywhere learning [3, 4]. Another way to introduce active learning entails the use of games. Such games with purposes that extend beyond entertainment are known as serious games [5]. In particular, applications that unite m-learning and serious games (hence-forth, m-learning games) are increasingly considered appropriate to promote engagement and enjoyment in learning [6, 7].

Interestingly, most m-learning games focus on teaching and learning of the hard sciences [8, 9, 10]. However, their potential is yet to adequately spill over into the study of humanities, which mostly relies on traditional and didactic pedagogical models. In fact, the use of technology remains a backwater in most humanities departments across the globe [11]. The inherent aversion to technology could make tech-savvy individuals nonchalant toward learning humanities. Nonetheless, the use of technology coupled with game elements might help improve their learning experience.

Given the potential of m-learning games to enthuse tech-savvy individuals about the study of humanities, the objective of this paper is two-fold. First, it aims to introduce the conceptual prototype of SingaRacer, an m-learning game to study humanities. As a test case for investigation, SingaRacer specifically helps users learn the history and the culture of Singapore, a city-state in Southeast Asia. Second, this paper attempts to examine the ways in which users hailing from the IT background might perceive the prospect of SingaRacer as a game and as an educational application.

The paper is significant on two counts. First, it develops a theoretical framework that underpins the design of m-learning games to study humanities. Drawing from related studies [12, 13], the framework includes three principles: learning, motivation and usability. The prototype of SingaRacer is designed by adhering to these principles. Second, this paper explores the possibility of studying humanities—in particular, history and culture—through an m-learning game. A user study was conducted in which 52 participants had hands-on experience of using the SingaRacer prototype. Thereafter, a questionnaire seeking both quantitative and qualitative responses was administered to understand participants' perceptions about the application. The findings offer useful insights for teachers as well as educational game designers.

The paper proceeds as follows. Section 2 reviews literature on the design of m-learning games. Section 3 gives the design overview of SingaRacer. Section 4 describes the methods for its evaluation, while Section 5 presents the results. Sections 6 and 7 offer a discussion and a conclusion respectively.

II. Literature Review

Mobile technologies, and in particular, mobile games are increasingly being used to support learning [10]. After all, they help users acquire knowledge by engaging in active learning through gameplay. However, designing m-learning games remains a challenge [14]. Most m-learning games tend to focus on the hard sciences [8, 9, 10] whereas those for the study of humanities are conspicuously rare. Designing an m-learning game such as SingaRacer was hence a daunting task.

For this reason, this paper draws from related studies in order to develop a theoretical framework underpinning the design of m-learning games for the study of humanities. Prior studies suggest that as learning continues to become more student-centered and ubiquitous [3], m-learning games need to support diverse avenues for knowledge acquisition [6]. Besides, they should be designed to incorporate features such as challenges and rewards to trigger motivation for gameplay [6, 12]. Additionally, m-learning games are required to be usable in order to obviate steep learning curves [13]. Therefore,

the framework developed in this paper specifically identifies three design principles: learning, motivation and usability.

A. Learning

The learning principle refers to the extent to which m-learning games could promote knowledge acquisition. For the purpose of this paper, three factors that could promote knowledge acquisition were identified. These include outdoor learning, learning by teaching, and discovery-based learning.

First, outdoor learning entails knowledge acquisition that is not limited by the boundaries of classrooms. It is desirable for m-learning games to integrate fieldwork into the virtual game environment in order to improve users' learning experiences [15]. Especially for subjects such as history and culture, outdoor learning could help enliven the context [16].

Second, learning by teaching represents a pedagogical model with students becoming their own teachers [17]. It stems from the helper therapy principle—when an individual helps another, not only the helpee but also the helper is benefitted [18]. Hence, m-learning games might improve learning experiences by offering provisions for users to teach others.

Third, discovery-based learning encourages users to explore in order to acquire knowledge. Knowledge acquired through inquiry is retained longer compared with that gained from passive methods of reading or listening [19]. Discovery-based learners tend to be more independent and superior in problem-solving skills vis-à-vis passive learners. Therefore, m-learning games that facilitate discovery-based learning might be well received.

B. Motivation

The motivation principle refers to the extent to which m-learning games could entice users to get engaged in the game environment. For the purpose of this paper, three motivational factors that could promote game engagement were identified. These include flow, challenge and reward.

First, flow is a state whereby an individual gets highly absorbed and immersed in an activity [20]. To achieve the flow state, m-learning games need to strike a balance between skills and challenges [21]. Flow is known to be significantly related to users' intentions to use e-learning applications [22].

Second, challenge is an essential element to motivate learning. Users should be exposed to progressive challenges so that they are continuously encouraged to expand their skills [23]. Besides self-challenges, m-learning games could also promote challenge-based learning through competitions among users [24]. Such a challenging environment not only promotes effective learning but also enhances users' gratification [12].

Third, a reward system is essential to maintain users' positive gaming experience. Regardless of platform or genre, most games require users to complete goals to earn rewards [25], which can come in several forms such as emotional, monetary, ranks or points. Provision of rewards could enhance users' experiences with m-learning games.

C. Usability

The usability principle refers to the extent to which m-learning games could be widely used by users without having to undertake too steep learning curve. For the purpose of this paper, three factors that could render m-learning games usable were identified. These include perceived ease of use, perceived usefulness, and perceived enjoyment.

First, perceived ease of use refers to the degree to which users believe that a given system is user-friendly, and is usable with minimal effort [26]. In the present context, it is a measure of the extent to which users of m-learning games believe that the applications could be used with reasonable efforts. When users need not invest too much effort in using an m-learning game, they are likely to use it [14].

Second, perceived usefulness refers to the degree to which users believe that using a given m-learning game would improve their learning experience [13]. Prior research suggests that perceived usefulness of information systems promote trust [27], which in turn is positively correlated to usage intentions [28]. Thus, when m-learning games are perceived to be useful, steepness of the learning curve might not appear too daunting.

Third, perceived enjoyment is the degree to which users believe that a given m-learning game offers adequate fun and enjoyment [26]. It often contributes to users' positive attitude toward a target system [29]. Perceived enjoyment is in fact a crucial antecedent to adoption of new applications [30]. The developed theoretical framework is summarized in Table I.

TABLE I. THEORETICAL FRAMEWORK ON THE DESIGN OF M-LEARNING GAMES

Principles	Factors	Descriptions
Learning	Outdoor learning	Knowledge acquisition beyond classrooms [15, 16]
	Learning by teaching	Students become their own teachers [17, 18]
	Discovery-based learning	Learning through exploration and inquiry [19]
Motivation	Flow	Individuals are immersed in the learning process [20, 21, 22]
	Challenge	Learning through self-challenges and competition with others [23, 24]
	Reward	Rewards are essential to maintain positive gaming experience [25]
Usability	Perceived ease of use	Users' belief that a given application is user-friendly [14], [26]
	Perceived usefulness	Users' belief that a given application improves learning experience [27, 28]
	Perceived enjoyment	Users' belief that a given application offers fun and enjoyment [29, 30]

III. DESIGN OVERVIEW OF SINGARACER

SingaRacer is an m-learning game prototype that allows users to learn about the history and the culture of Singapore. The name entails two parts: "Singa" that stems from Singapore, and "Racer" that denotes its racing genre. It was developed on an Apple iPad.

SingaRacer requires users to role-play as virtual travellers racing around Singapore by time as well as space to various cultural and historical attractions. Users progress through three stages: Backpacker, Traveller and SingaRacer. In each stage,

users compete among themselves to earn SingaCoins, and rise up the leaderboards. As hinted by the racing genre, the smaller the time taken to complete a task, the higher the rewards.

Backpacker is the first stage in which users commence their race (Fig. 1). Locations, maps and directions are provided to backpackers to help them navigate. Historical and cultural information about the places of attractions is also provided. When users reach a designated spot on the virtual map, they are required to check-in. Before check-out, users are required to answer quizzes so as to earn SingaCoins.

Fig. 1. The first stage (Backpacker) of SingaRacer.

On gaining sufficient SingaCoins, backpackers are promoted to the rank of travellers. In the Traveller stage, users encounter periodic challenges in the form of quizzes about places they had already visited in the game. Users are required to enter the correct answers within a given time frame (Fig. 2).
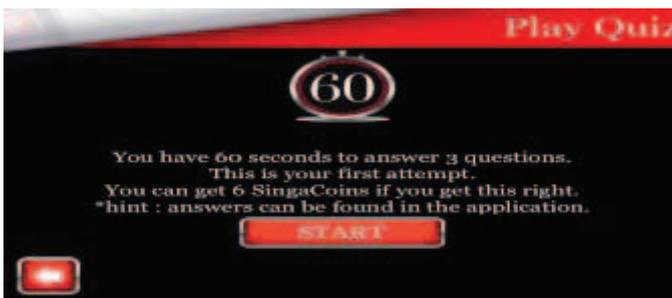
Fig. 2. The second stage (Traveller) of SingaRacer.

SingaRacer is the final stage that is unlocked once users have earned enough SingaCoins. Besides exploring the history and culture of Singapore, SingaRacers are allowed to submit challenges for others (Fig. 3). They can also share information on Singapore's history and culture. Information approved by administrators are made available for other users.

Fig. 3. The third stage (SingaRacer) of SingaRacer.

Besides rank promotion, SingaCoins are also used by users in the SingaRacer stage to participate in Travel Board Games. To promote fun, there are three board classes, namely, Economic, Business and First class (Fig. 4).
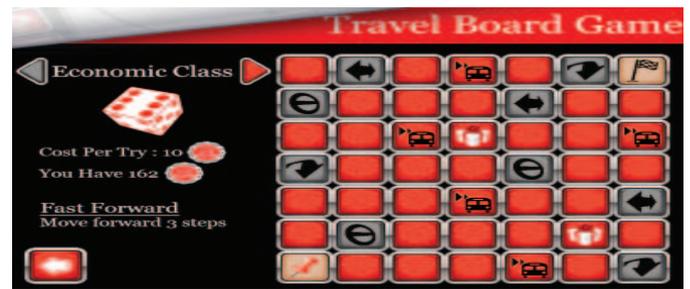

Fig. 4. Travel board games promote fun in SingaRacer.

The overall design of SingaRacer adheres to the principles of learning, motivation and usability. With respect to learning, outdoor learning is promoted in SingaRacer by encouraging users to check-in at the places of historical and cultural importance. The application also allows users to physically check-in at places using global positioning system (GPS). Learning by teaching is promoted by allowing users in the SingaRacer stage to input information as well as challenges for others. Discovery-based learning is also promoted as SingaRacer encourages users to explore the history and the culture of the places on their own.

With respect to motivation, flow is managed by the three stages of the game in order to offer users a balance between skills and challenges. Challenge is enhanced progressively throughout the game through periodic quizzes. The SingaCoins and the three classes of board games comprise the reward system in SingaRacer.

With respect to usability, perceived ease of use was promoted in SingaRacer through simplicity of the interface design. To promote perceived usefulness, the application was made rich in historical and cultural information about Singapore. Gaming elements such as role-playing, quizzes, and board games seek to enhance perceived enjoyment.

IV. METHODS TO EVALUATE SINGARACER

A user study was conducted to examine the prospect of SingaRacer as a game as well as an educational application. A total of 52 participants (20 females, 32 males) in the age group between 21 and 40 years took part in the evaluation. They were graduate students in a large public university in Singapore. All participants were proficient in using smart phones, and played online games regularly. They mostly hailed from the IT background. This was necessary to examine the prospect of SingaRacer among individuals, who might not be inherently enthusiastic about the study of humanities.

The evaluation was conducted in three stages. In the first stage, the prototype of SingaRacer was introduced to the participants. To help them get acquainted with the application, the usage scenarios of the application were demonstrated using a pre-compiled deck of slides. In the second stage, participants were requested to play each of the three stages of SingaRacer for a minimum of 10 minutes. They had to virtually check-in to

at least three different places of cultural and historical significance (the GPS feature was not functional in the prototype). In the third stage, a questionnaire seeking both quantitative and qualitative responses was administered.

The questionnaire included three segments. The first contained questions on demographics such as age group and gender. The second contained 13 items seeking quantitative responses on a 5-point scale (1 = Strongly Disagree, 5 = Strongly Agree). In particular, items 1 to 3 measured the extent to which SingaRacer promoted learning (sample item: 'Playing SingaRacer allows me to learn history/culture.'), items 4 to 7 measured the extent to which it enhanced motivation (sample item: 'The different stages in SingaRacer arouse my interest to continue playing.'), items 8 to 10 measured the extent to which it was usable (sample item: 'I find SingaRacer easy to use.'), and items 11 to 13 measured participants' intention to use SingaRacer (sample item: 'I intend to use SingaRacer in future.'). The individual items were aggregated to create the composite indices for learning (3 items), motivation (4 items), usability (3 items), and intention to use (3 items). The third segment of the questionnaire complemented the numerical responses with open-ended comments. In particular, participants were asked to comment on the features of SingaRacer that they liked and disliked. Feedback for further improvement was also solicited.

For data analysis, multiple linear regression was used to investigate the extent to which learning, motivation and usability (the three independent variables) of SingaRacer were related to participants' intention to use the application (the dependent variable). Besides, participants' responses to the open-ended questions were inspected by two coders to identify the underlying themes.

V. Evaluation Results for SingaRacer

Table II summarizes the results for the quantitative data analysis. All the three independent variables, namely, learning, motivation and usability, as well as the dependent variable of intention to use met the condition for internal consistency reliability (Cronbach's Alpha > 0.7). The regression analysis revealed that motivation (β = 0.57, $p < 0.001$) and usability (β = 0.28, $p < 0.05$) of SingaRacer were positively related to participants' intention to use the application. However, no significant relationship was detected for learning (β = 0.08, $p > 0.05$). Overall, the model was statistically significant, and accounted for about 69% variability in the dependent variable (F = 34.90, $p < 0.001$, R^2 = 0.69, Adjusted R^2 = 0.67).

TABLE II.   Results for the Quantitative Data Analysis

Variables	Mean ± SD	Cronbach's Alpha	Regression Coefficients
Learning (3 items)	12.52 ± 1.36	0.73	0.08 (p > 0.05)
Motivation (4 items)	16.09 ± 2.30	0.87	0.57 (p < 0.001)
Usability (3 items)	12.52 ± 1.29	0.77	0.28 (p < 0.05)
Intention to use (3 items)	11.63 ± 1.70	0.80	-

Based on responses to the open-ended questions, most participants seemed to like SingaRacer as an m-learning game to aid the study of Singapore's history and culture. For instance, participant 10 found it useful "*to learn cultural and history elements of Singapore.*" Concurred participant 15, "*SingaRacer allows to understand Singapore history in an interesting way.*" Numerous participants appreciated the ways in which SingaRacer motivated users through rewards. In particular, participant 6 stated, "*I like the point system. Gives me motivation to go on and win.*" The usability of SingaRacer was generally viewed favorably. Several participants commented that the application was "*easy to use,*" "*simple*" and "*handy.*"

In terms of dislikes, some participants did not like the historical and the cultural information. For instance, participant 3 stated, "*History things not my interest.*" Likewise, participant 8 indicated, "*The topic may not be of much interest to adults.*" Although most participants appreciated the challenges, participant 17 commented, "*Some challenge questions may be too difficult.*" A few participants criticized the unattractiveness of the game environment. For example, participant 15 indicated, "*Background too plain,*" while participant 20 complied, "*Interface not attractive enough!*"

There were two key feedbacks to improve SingaRacer. The first calls for personalization. For example, participant 34 suggested, "*Allow scope to personalize for different skill levels such as kids, novices, experts.*" The second calls for use of multimedia content. For example, participant 42 suggested, "*Have more images, animation, audio and video to make it more attractive.*"

VI. Discussion

Two main findings are gleaned from this paper. First, the intention to use SingaRacer was generally promising. This suggests that m-learning games could be a viable option to promote the study of humanities. In particular, participant 27 stated, "*Very innovative app – can come handy for tourists.*" In fact, participant 13 went to the extent of suggesting, "*approach Singapore tourism board for funding.*" As suggested in prior studies [20], [22], [25], the design principle of motivation was positively related to users' intention to use SingaRacer. For example, participant 29 stated, "*The ability to learn history and culture through a mobile device is convenient, motivating…*" Thus, m-learning games should incorporate features of flow, challenge and reward to motivate users to play. Furthermore, consistent with prior studies [13], [27], [29], the design principle of usability was positively related to users' intention to use SingaRacer. For example, participant 10 indicated, "*Information is simple and easy to read, fun way to learn*" while participant 42 described the interface as "*clear simple and neat.*" Hence, m-learning games should promote ease of use, usefulness and enjoyment in order to attract substantial user base.

Second, even with the use of m-learning games, creating interest in the study of history and culture remains a challenge. Although learning principles of outdoor learning [15], learning by teaching [17], and discovery-based learning [19] were incorporated in SingaRacer, the positive relationship between

learning and intention to use remained statistically non-significant. It is known that the study of history and culture might not be interesting and engaging, in particular to individuals with the IT back-ground [16]. To instill interest, m-learning games such as SingaRacer might certainly help provided they conform to the design principles of motivation and usability. However, the very nature of history and culture studies might still somewhat serve as a bottleneck to users' intention to adopt such applications. Hence, it is no wonder participant 8 indicated, "*The topic may not be of much interest...*" Such a sentiment was echoed by participant 17, "*Some challenge questions may be too difficult. The difficulty of question should be well-balanced so that not to lose interest in users.*" These participants seem wary of studying humanities-related topics regardless of the pedagogical approach. Nonetheless, future studies could examine the extent to which factors such as learning propensity as well as prior knowledge (with history and culture) might moderate the relationship between learning and intention to use applications such as SingaRacer.

VII. CONCLUSION

This paper has introduced SingaRacer, an m-learning game to aid the study of Singapore's history and culture. Its prospect as a game as well as an educational application was evaluated through a user study. Intention to use SingaRacer was generally promising. However, even with the use of m-learning games, creating interest in humanities among individuals with the IT background seems to remain a challenge.

Nonetheless, this paper dovetails the call for multidisciplinary learning so that individuals with the IT background could be exposed to humanities, and those hailing from the humanities background could be exposed to technology. The findings suggest that game designers and educators should incorporate features of learning, motivation and usability to promote users' intention to use educational applications. For the study of history and culture, tourism departments might explore the possibility of using m-learning games. After all, tourists might find historical and cultural information of their forthcoming tour destination interesting. Hence, they might view such applications favorably. Besides, in the context of Singapore, given the government's emphasis on the use of information and communication technologies in pedagogy [31], it might be worthwhile to explore whether applications such as SingaRacer could stimulate the study of history, culture and other humanities-related topics among students.

It should be pointed that this paper has two limitations. First, participants used only a prototype of SingaRacer because a fully functional version was unavailable. This might have limited their evaluation of the application. Second, the number of participants was only 52. Moreover, they were all based in Singapore. Hence, as a future study, the authors wish to evaluate SingaRacer through a larger and a more diverse set of cohorts, who might not have much prior idea about Singapore's history and culture.

This paper offers a few directions for future research. Given the non-significant relationship between learning and usage intention of SingaRacer, additional pedagogy-related research is needed to identify factors that could make the study of humanities more compelling. This paper also calls for scholars to identify even more principles—besides learning, motivation and usability—for the effective design of m-learning games. The hope is that when m-learning games such as SingaRacer incorporate a comprehensive set of design principles, the overall positive gaming experience might stand a chance to substantially outweigh the inherent challenges posed by the study of humanities.

REFERENCES

[1] M. Prince, "Does active learning work? A review of the research," Journal of Engineering Education, vol. 93, no. 3, pp. 223-231, July 2004.

[2] A. König, and D. Bernsen, "Mobile learning in history education," Journal of Educational Media, Memory, and Society, vol. 6, no. 1, pp. 107-123, March 2014.

[3] L.F. Motiwalla, "Mobile learning: A framework and evaluation," Computers & Education, vol. 49, no. 3, pp. 581-596, November 2007.

[4] C. Quinn, "Get ready for m-learning," Training and Development, vol. 20, no. 2, pp. 20-21, 2001.

[5] B.P. Bergeron, Developing Serious Games. Charles River Media: Hingham, 2006.

[6] J. Huizenga, W. Admiraal, S. Akkerman, and G. ten Dam, "Mobile game-based learning in secondary education: Engagement, motivation and learning in a mobile city game," Journal of Computer Assisted Learning, vol. 25, no. 4, pp. 332-344, August 2009.

[7] T.Y. Liu, and Y.L. Chu, "Using ubiquitous games in an English listening and speaking course: Impact on learning outcomes and motivation," Computers & Education, vol. 55, no. 2, pp. 630-643, September 2010.

[8] C.K. Looi, D. Sun, L. Wu, P. Seow, G. Chia, L.H. Wong, et al., "Implementing mobile learning curricula in a grade level: Empirical study of learning effectiveness at scale," Computers & Education, vol. 77, pp. 101-115, August 2014.

[9] F. Martin, and J. Ertzberger, "Here and now mobile learning: An experimental study on the use of mobile technology," Computers & Education, vol. 68, pp. 76-85, October 2013.

[10] J.L. Shih, C.W. Chuang, and G.J. Hwang, "An inquiry-based mobile learning approach to enhancing social science learning effectiveness," Educational Technology & Society, vol. 13, no. 4, pp. 50-62, October 2010.

[11] C.L. Borgman, "The digital future is now: A call to action for the humanities," Digital Humanities Quarterly, 2010. Available online at http://works.bepress.com/borgman/233

[12] Y.M. Cheng, S.H. Kuo, S.J. Luo, and R.C. Shih, "The construction of an online competitive game-based learning system for junior high school students," Turkish Online Journal of Educational Technology, vol. 11, no. 2, pp. 214-227, April 2012.

[13] F.D. Davis, "Perceived usefulness, perceived ease of use and user acceptance of information technology," MIS Quarterly, vol. 13, no. 3, pp. 319-340, September 1989.

[14] A.Y.K. Chua, and R.S. Balkunje, "An exploratory study of game-based m-learning for software project management," Journal of Universal Computer Science, vol. 18, no. 14, pp. 1933-1949, July 2012.

[15] B.C. Feinstein, "Learning and transformation in the context of Hawaiian traditional ecological knowledge," Adult Education Quarterly, vol. 54, no, 2, pp. 105-120, February 2004.

[16] J. Fielding, "Engaging students in learning history," Canadian Social Studies, vol. 39, no. 2, 2005. Available online at

http://www.quasar.ualberta.ca/css/Css_39_2/ARFielding_engaging_stud ents.htm

[17] C. Bovill, A. Cook-Sather, and P. Felten, "Students as co-creators of teaching approaches, course design, and curricula: Implications for academic developers," International Journal for Academic Development, vol. 16, no. 2, pp. 133-145, May 2011.

[18] F. Riessman, "The 'helper' therapy principle," Social Work, vol. 10, no. 2, pp. 27-32, April 1965.

[19] J. Bruner, On Knowing: Essays for the Left Hand. Harvard University Press: Cambridge, 1979.

[20] M. Csikszentmihalyi, Flow: The Psychology of Optimal Experience. Harper Perennial: London, 1990.

[21] W. Admiraal, J. Huizenga, S. Akkerman, and G. ten Dam, "The concept of flow in collaborative game-based learning," Computers in Human Behavior, vol. 27, no. 3, pp. 1185-1194, May 2011.

[22] Y.M. Cheng, "Exploring the roles of interaction and flow in explaining nurses' e-learning acceptance," Nurse Education Today, vol. 33, no. 1, pp. 73-80, January 2013.

[23] L.S. Vygotsky, Mind in Society: The Development of Higher Psychological Processes. Harvard University Press: Cambridge, 1978.

[24] R.L. Girmus, "How to motivate your students," 2012. Available online at http://eric.ed.gov/?id=ED534566

[25] R. Koster, A Theory of Fun for Game Design. Paraglyph Press: Scottsdale, 2005.

[26] F.D. Davis, R.P. Bagozzi, and P.R. Warshaw, "Extrinsic and intrinsic motivation to use computers in the workplace," Journal of Applied Social Psychology, vol. 22, no. 14, pp. 1111-1132, July 1992.

[27] N. Mallet, "Exploring consumer adoption of mobile payments - A qualitative study," Journal of Strategic Information Systems, vol. 16, no. 4, pp. 413-432, December 2007.

[28] Y.A. Au, and R.J. Kauffman, "The economics of mobile payments: Understanding stakeholder issues for an emerging financial technology application," Electronic Commerce Research and Applications, vol. 7, no. 2, pp. 141-164, 2008.

[29] C. Anton, C. Camarero, and J. Rodriguez, "Usefulness, enjoyment and self-image congruence: The adoption of e-book readers," Psychology & Marketing, vol. 30, no. 4, pp. 372-384, April 2013.

[30] A. Balog, and C. Pribeanu, "The role of perceived enjoyment in the students' acceptance of an augmented reality teaching platform: A structural equation modelling approach," Studies in Informatics and Control, vol. 19, no. 3, pp. 319-330, September 2010.

[31] Ministry of Education, "MOE launches third Masterplan for ICT in education," 2008. Available online at http://www.moe.gov.sg/media/press/2008/08/moe-launches-third-masterplan.php