

# Development and Testing of a Mobile Game for English Proficiency Among Filipino Learners

Monica MORENO<sup>a\*</sup>, Dominique Marie Antoinette MANAHAN<sup>b</sup>, Marika Gianina FERNANDEZ<sup>b</sup>, Michelle BANAWAN<sup>b,c</sup>, Jose Isidro BERAQUIT<sup>b</sup>, Marie Rianne M. CAPARROS<sup>b</sup>, Philip CACERES<sup>b</sup>, Walfrido David DIY<sup>b</sup>, Lean Rimes SARCILLA<sup>b</sup>, Francesco AMANTE<sup>b</sup> & Ma. Mercedes T. RODRIGO<sup>b</sup>

<sup>a</sup>Department of Education, Ateneo de Manila University, Philippines

<sup>b</sup>Ateneo Laboratory for the Learning Sciences, Ateneo de Manila University, Philippines

<sup>c</sup>Department of Information Technology, Ateneo de Davao University, Philippines

\*[mmoreno@ateneo.edu](mailto:mmoreno@ateneo.edu)

**Abstract:** This paper presents the testing and development of *Learning Likha*, an English language-based digital game for Filipino learners from 9- to 12-years old. The game focuses on the literacy skill of noting explicit details while incidentally learning about Filipino culture. In an in-vivo pilot test, we measured student comprehension and engagement. We found that the students who performed better and had greater confidence enjoyed using the software but were less engaged than those who performed more poorly.

**Keywords:** digital games, English proficiency, second language learning, reading, comprehension, engagement, motivation, Filipino learners

## 1. Introduction

Filipino graduates averaged a Common European Framework of Reference of Language (CEFR) score of B1, which indicated that they have proficiencies lower than the CEFR B2 proficiency target set for high school graduates in Thailand and Vietnam (Romero, 2018). To improve English proficiency, language teaching must develop skills not only in speaking and writing, but also in listening, viewing and reading. Technology-enhanced Language Learning (TELL), through digital games, has been shown to improve language skills such as listening and pronunciation, vocabulary and grammatical accuracy (Sykes, 2013). One such example is the use of narrative-centered digital games (NCDGs). These are multimodal texts that contextualize educational content and problem solving with interactive story scenarios. Story features (believable characters, rich settings and immersive plots) are combined with digital game environments (interactivity, rewards and immediate feedback) to help motivate learners solve meaningful problems (Rowe, Mott & Lester, 2012). Motivation is conceived as a set of beliefs about oneself, and task interest (Eseryel, Law et al, 2014). If a game-based learning environment can maintain and enhance a player's motivation despite challenges associated with problem solving, then according to the Self-Determination Theory (SDT) (Ryan & Deci, 2000), learners would engage in more gameplay, and exert more effort to complete more tasks, an indicator of *engagement* (Eseryel, Law et al, 2014).

According to the Narrative-Centered Learning Theory, narrative can help motivate learners in two ways: first, learners are transported through text to another time and place that is real to them; and second, learners themselves perform the narrative. As they interact through the narrative, in-game choices and feedback require players to consider cause and effect, develop a rationale for moves, and experience emotions. Narrative has been found to aid in comprehension (Laurillard, 1998), and act as a navigational aid in multimedia environments (McLellan, 1993). Thus, NCDGs have enormous potential for ESL learning, particularly because in-game texts are among the most popular reading materials for young people (Williamson, 2009). To move through an English-language digital game, players must listen to English as a spoken language, read English print, and interpret images.

The broad purpose of this research undertaking (described in Ocumpaugh et al. 2018) is to develop applications that assist students with English language learning. We specifically target

underprivileged students from public schools in the Philippines, as proficiency in English can increase economic opportunities (see Errighi, Bodwell, & Khatiwada, 2016; Viscondi, 2012). Although English is one of the Philippines' two official languages, up to 40% of 6th grade Filipino students have average to poor mastery of the language. This paper attempts to describe the design and development of *Learning Likha* and analyze the relationship between comprehension and engagement scores from an in-vivo pilot test. The paper's research questions are:

- 1) What is the relationship between English comprehension and game engagement and intrinsic motivation?
- 2) What is the relationship between English comprehension and game engagement features and in-game behaviors?

## 2. Game Design

*Learning Likha* is a narrative-centered English-language digital game intended for Filipino public school students between 9 to 12 years old. The game's goal is to develop students' English comprehension; in particular, the literacy skill of noting explicit details through reading, listening and viewing. A secondary goal is to expose learners to a variety of indigenous Filipino musical instruments.

*Learning Likha* uses narrative to establish the setting and the initial motivation; Likha and her band need their instruments to play music at a town fiesta. The band has five members and hence needs five indigenous instruments: a *babendir* (a single brass gong on a stand), a *gandingan* (a set of four gongs), a *dabakan* (a type of drum), an *agung* (a pair of gongs), and a *kulintang* (a set of 8 small gongs). From a map scene, the player chooses one of Likha's band mates. A spoken and written dialogue between Likha and the band mate describes the shop where the instrument can be found. The audio is supplemented by images and text on the game screen which contain the descriptive details about the shop. A notepad on the upper right corner contains key details that describe the shop. Once the player selects the correct shop, the shopkeeper and Likha engage in spoken and written dialogue about what the instrument looks like. The player selects the instrument from among three options and receives feedback whether the choice is correct or wrong. The game ends when all instruments are found.

## 3. Data Collection

We tested *Learning Likha* on 59 learners in Grades 4, 5 and 6 from two state elementary schools (Schools A and B) in Quezon City, the Philippines. The learners' mean age was 10.49 years ( $SD = 1.040$ ). The participants were divided into groups of 10.

At the start of each session, students were given a survey form that measured their attitudes towards English language usage and access to technology. The form asked students to indicate their levels of agreement (strongly disagree to strongly agree) with statements about their attitudes and usage of English, such as "I want to learn to speak and read in English", and "Learning English is important." After the answered forms were collected, the learners played the *Learning Likha* game. Then, to measure engagement and motivation, the players answered the Game-Based Learning (GBL) Engagement Metric (Chew, 2017) and the Intrinsic Motivation Inventory (IMI) (Ryan, 1982). Both questionnaires were adapted for *Learning Likha* and had both English and Filipino translations. Examples of adapted questions were:

- I enjoyed playing *Learning Likha* very much. (Adapted from the IMI item: "I enjoyed doing this activity very much.")
- When we are playing *Learning Likha*, I feel interested. (Adapted from the GBL Learning Engagement Metric item: "When we are working on the activity, I feel interested.")

The players ended the session by answering an English comprehension test with 16 multiple choice questions and 4 open-ended questions to determine how many of the narrative's details they remembered.

### 3.1 Data features

The data collected were as follows: the English comprehension total score and the GBL Engagement Metric subcomponents, the IMI subcomponents, the attitudes and usage of English survey, and the interaction logs (tap count). Table 1 presents the description of each data item.

Table 1

*Description of features used for data analysis*

Feature	Definition
Total Score	Number of items correct on the English comprehension test divided by highest possible score.
Tap Count	Number of times a learner tapped the screen of the phone while playing the game.
Enjoyment	Enjoyment is a subcomponent of the IMI. It is the sustained interest of the learner while playing the game.
Effort	Effort is a subcomponent of the IMI. It refers to the learner's self-reported estimate of how much effort and importance was placed in completing the game.
Perceived Competence	Perceived competence is a subcomponent of the IMI. It refers to the learner's perception of their own competence in completing in-game tasks.
Emotion Engagement	Emotion engagement is a subcomponent of GBL Engagement Metric. It refers to the learner's physiological state, e.g. bored or having fun, while playing the game.
Cognitive Engagement	Cognitive engagement is a subcomponent of the GBL Engagement Metric. It refers to the learners' experience of conceiving strategies and linking the activity to prior knowledge and skills.
Behavior Engagement	Behavior engagement is a subcomponent of the GBL Engagement Metric. It refers to the actions a learner does which signals attentiveness to the game and engagement. This includes listening to instructions and problem solving.
Attitude towards English	Includes the learners' motivation, degree of ease experienced, enjoyment they feel when learning English, and their actual usage of the spoken English language amongst their social circles.

## 4. Analysis

### 4.1 RQ1: English Comprehension Scores vs. Engagement and Intrinsic Motivation

Of the 59 participant data points gathered, four were identified as outliers using Box Plot analysis, Mahalanobis distance analysis, and leverage hat analysis. These four were removed from the data set. To explore the relationship between English comprehension scores and engagement and intrinsic motivation, data was analyzed by obtaining a series of Pearson's product-moment correlation coefficient ( $r$ ). Results showed that the reported engagement of a participant did not indicate any relationship with the participant's English comprehension score ( $r = .003$ ,  $n = 54$ ,  $p = .980$ ). Intrinsic motivation as measured by the IMI did not indicate any relationship with engagement ( $r = 0.78$ ,  $n = 54$ ,  $p = .078$ ) and English comprehension total scores ( $r = -.036$ ,  $n = 54$ ,  $p = .796$ ). As shown in Table 2, the English comprehension total score had no significant relationships with any of the subcomponents of engagement and intrinsic motivation.

Table 2

*Correlation coefficients between Total Score, and subcomponents of engagement and intrinsic motivation*

Measure	Correlations	En	Ef	PC	EE	CE	BE
Total Score	Pearson correlation	-.106	.194	-.162	-.136	.071	.064
	Sig. (2-tailed)	.440	.157	.238	.323	.609	.642

*Note.* En = enjoyment; Ef = effort; PC = perceived competence; EE = emotion engagement; CE = cognitive engagement; BE = behavior engagement.

#### 4.2 RQ2: English Comprehension Scores vs. Game Engagement and In-Game Behaviors

We attempted to determine if the participants fell into identifiable, distinct clusters. After normalization using z-transformation, we ran x-means clustering and found that two well-separated clusters exist in the data (See Table 3). From the cluster centroids, we find that Cluster 1 is characterized by students who had lower comprehension scores, lower tap count, less enjoyment and perceived competence, but higher effort and overall engagement. In other words, the students who performed better and had greater confidence enjoyed using the software but were less engaged than those who performed more poorly.

Table 3

#### *X-Means Clustering Results*

	Cluster 0	Cluster 1
Total Score	0.07	-0.06
Tap Count	0.23	-0.21
Enjoyment	0.17	-0.16
Effort	-0.29	0.26
Perceived Competence	0.04	-0.04
Emotion Engagement	-0.79	0.71
Cognitive Engagement	-0.49	0.44
Behavior Engagement	-0.81	0.73
Attitude towards English	-0.53	0.48

A linear regression model was developed to investigate which features exhibited significant relationships with English comprehension and student progress/learning. Using M5 Prime for feature selection, linear regression resulted in:

Total Score =

- + 0.004 \* Tap Count
- + 1.822 \* Behavior Engagement
- - 2.636 \* Emotion Engagement
- + 0.186 \* Enjoyment
- - 0.408 \* Perceived Competence
- + 1.122 \* Effort
- + 0.729 \* Attitude towards English
- + 8.614

Tap count, behavior engagement, enjoyment, perceived competence, and attitude towards English showed no significant relationship with total English comprehension scores. On the other hand, emotion engagement was shown to have a significant inverse relationship with comprehension ( $p=0.038$ ), while effort was seen to have a significant positive relationship with comprehension ( $p=0.047$ ). The linear regression was validated using 5-fold cross validation and resulted in a root mean squared error of 3.138 and an  $r^2$  of 0.080.

## 5. Discussion

In the context of game-based learning, motivation literature suggests that increased motivation during the game results in increased engagement (Ryan & Deci, 2000). The study also assumed that the game's narrative and use of text and audio would aid players' story comprehension and recall of details, as suggested in literature (Laurillard, 1998; Spires, 2015). The results of the analyses did not provide evidence of this claim as we did not find a significant correlation between test scores, engagement or intrinsic motivation. The cluster analysis did help characterize the students further. In one cluster, students with a weaker command of English were less able to find strategies to overcome game challenges, possibly due to the game's English-language content. They perceived themselves to be less competent in overcoming the game's challenges. As a result, they needed to exert more effort in completing the game's tasks and did not enjoy the game as much. In the second cluster, students showed higher final scores and higher perceived competence. It seems that this group of students had a better command of English. These students were able to use the narrative to strategize their moves in the game, perceiving themselves as competent enough to accomplish the game's challenges. This finding supports the theory that narrative aids comprehension (Laurillard, 1998; Spires, 2015). It is interesting that perhaps because of their stronger proficiency in English, the learners in this cluster enjoyed their experiences yet exerted less effort to complete the game. The findings contrast with the Self-Determination Theory (Ryan & Deci, 2000), which ascertains that sustained motivation during gameplay would result in higher engagement. It seems that players who are proficient in the language need less effort to complete the game. It is also possible that students in this cluster were less engaged because they saw the game as a classroom task they were simply required to do.

The regression analysis further showed an inverse relationship between emotion engagement (affect) and reading comprehension, and a positive relationship between effort and comprehension. It implies that the higher the English proficiency, the higher the decrease of emotions felt about the language. Perhaps there is less anxiety about reading or listening to English as one becomes more adept at it. The English comprehension scores are also related to learners' efforts to recall details; the level of expended effort may depend on their adeptness with the language.

## 6. Conclusion

The findings of the study show that while narrative-based digital games have the potential for motivating learners and engaging them in language-driven tasks, the use of educational games designed to improve English proficiency can pose a challenge for ESL learners. The study's results point out two types of language learners: (1) one who struggles in English, perceives oneself to be less competent, enjoyed the game less and exerts more effort in it; and (2) one who is more proficient in the language, perceives oneself as more competent, and enjoys the game but is not as engaged. It also shows that for ESL learners, English comprehension is related to efforts in recalling details and decreased emotional engagement (i.e. anxiety, stress).

Moving forward, it would be interesting to try *Learning Likha* with different populations. We hypothesize that students of the same age from schools with greater educational resources will be less engaged with the software but will still score well on the comprehension test. Hence, under better-resourced circumstances, the game might be appropriate for lower grade levels. If this is true, then the software would have achieved its purpose of addressing underprivileged learners.

## Acknowledgements

We thank the Ateneo de Manila University: the Ateneo Center for Educational Development, Areté, and the Department of Information Systems and Computer Science. We thank the principals, teachers, and learners of our partner public schools for their participation. We thank Ma. Rosario Madjos. Finally, we thank the Commission on Higher Education and the British Council for the grant entitled *Jokes Online to improve Literacy and Learning digital skills amongst Young people from disadvantaged backgrounds*.

## References

- Alberta Education. (2019). Strand Specific Competencies. Retrieved from [https://www.learnalberta.ca/content/eslapb/communicative\\_areas.html](https://www.learnalberta.ca/content/eslapb/communicative_areas.html)
- Aquino, C. Tan, W., Haarms, R., & Diamante, M. (2017, January). The Philippines' English Proficiency Report Card: Summary of Preliminary Findings (2015 – 2016). Paper presented at ASEAN Tourism Research Association Conference (ATRC) 2017, Singapore. Retrieved from <http://dosen.univpancasila.ac.id/dosenfile/8010211005150529062113September2017.pdf>
- Chew, B. S. (2017, December). An efficient framework for game-based learning activity. In *2017 IEEE 6th International Conference on Teaching, Assessment, and Learning for Engineering (TALE)* (pp. 147-150). IEEE.
- Errighi, L., Bodwell, C., & Khatiwada, S. (2016). Business process outsourcing in the Philippines: challenges for decent work (No. 994945093202676). International Labour Organization (ILO). Accessed: [http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-bangkok/documents/publication/wcms\\_538193.pdf](http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-bangkok/documents/publication/wcms_538193.pdf)
- Eseryel, D., Law, V., Ifenthaler, D., Ge1, X., & Miller, R. (2014). An Investigation of the Interrelationships between Motivation, Engagement, and Complex Problem Solving in Game-based Learning. *Journal of Educational Technology & Society*, 17(1), 42-53. Retrieved from <http://rizal.lib.admu.edu.ph:2087/stable/jeductechsoci.17.1.42>
- Guieb, D.S. & Ortega-Dela Cruz, R. (2017). Viewing Teaching Techniques in Enhancing Viewing Comprehension Skills of Undergraduate Students in Literature. *International Journal of Languages' Education*. 1. 271-279. 10.18298/ijlet.1762.
- Laurillard, D. (1998). Multimedia and the learner's experience of narrative. *Computers in Education*, 32, 229-243.
- McLellan, H. (1993). Hypertextual tales: Story models for hypertext design. *Journal of Educational Multimedia and Hypermedia*, 2, 239-260.
- Ocuppaugh, J., Rodrigo, M. M. T., Porayska-Pomsta, K., Olatunji, I., & Luckin, R. (2018). Becoming Better Versed: Towards the Design of a Popular Music-based Rhyming Game for Disadvantaged Youths. In Yang, J.C. et al., (Eds.) *Proceedings of the 26th International Conference on Computers in Education*. Asia-Pacific Society for Computers in Education.
- Romero, P. (February 22, 2018). Senate to probe declining English proficiency. *The Philippine Star*. Retrieved from: <https://www.philstar.com/other-sections/education-and-home/2018/02/22/1790069/senate-probe-declining-english-proficiency#Y0y9qcde2LAIrFPi.99>
- Rowe J., Mott B., Lester J. (2012) Narrative-Centered Learning Environments. In Seel N.M. (Eds.), *Encyclopedia of the Sciences of Learning*. Springer, Boston, MA.
- Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology*, 43, 450-461.
- Ryan, R., & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78.
- Spires, H. (2015). Digital Game-Based Learning: WHAT'S LITERACY GOT TO DO WITH IT? *Journal of Adolescent & Adult Literacy*, 59 (2), 125-130. Retrieved from <http://rizal.lib.admu.edu.ph:2087/stable/44011231>
- Sykes, J.M. (October, 2013). Technology – Just Playing Games? A Look at The Use of Digital Games for Language Learning. *The Language Educator*. Retrieved from [https://www.actfl.org/sites/default/files/pdfs/TLE\\_pdf/TLE\\_Oct13\\_Article.pdf](https://www.actfl.org/sites/default/files/pdfs/TLE_pdf/TLE_Oct13_Article.pdf)
- Viscondi, K. (2012). Beyond English: the key skills BPOs need. Accessed: <https://www.rappler.com/business/13699-what-key-skills-are-needed-to-work-in-bpo>
- Williamson, B. (2009). *Computer games, schools, and young people: A report for educators on using games for learning*. Bristol, England: Futurelab.