

Mobile Gamification-based Language Learning in Mongolia

Toward a Participatory Learning Model



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ACRONYMS

BYOD	Bring Your Own Device
FGI	focus group interview
FL	foreign language
ICCE	International Conference on Computers in Education
ICT	information and communication technologies
MALL	mobile-assisted language learning
mCSCL	Mobile Computer-Supported Collaborative Learning
MIU	Mongolian International University
PD	professional development
SL	second language
SNS	social networking service
UNESCO	United Nations Educational, Scientific and Cultural Organization

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PREFACE

Mongolia, a rapidly developing country in Asia, has been facing several issues in the quality of education brought by rapid modernization and urbanization in the last two decades. The extreme climate and the recent economic crisis have created a unique emergency situation in which people in the rural area have been abandoning the nomadic lifestyle and moving to the capital city in search of better schooling for their children. This recent phenomenon has also been heavily influencing Mongolia's public education system where schools are congested, and the quality of learning may be compromised.

This study aims to address the education quality issues under the research theme of "Digital Game-Based Learning." The research team explored a digital learning solution that integrated gamification (i.e., use of game-related elements in non-game contexts), social media, and mobile devices to design and implement a participatory style language learning model in Mongolia. The rationale for this digital learning approach is that a packaged model with pre-defined content would not be a sustainable solution in developing countries in the long term; such solutions often rely on the expertise of international researchers and consultants. Beyond the content-delivery model of language learning, this sub-project explored how to motivate and empower learners in the developing world to participate in social learning environments where they can exchange ideas and generate learning content that is meaningful and relevant to them.

This sub-project involved researchers from South Korea, Singapore, and Mongolia with strong support from the Mongolia

International University and the teacher researchers who implemented the designed intervention.

This report presents the trajectory and key findings from the one-year research implementation in Mongolian public schools. It contains concrete stories about how the team conducted the teacher capacity building workshop which provided continuous support for teacher professional development and designed the English lesson activities for students in three schools in Ulaanbaatar. To address the equity issue in education, the team intentionally selected two schools located in the Ger district. Overall, this research demonstrates that the potential of adopting and sustaining digital learning innovations in Mongolian public schools can be enhanced when the solution leverages upon existing resources and cultural practices and when continuous efforts are made for building local teachers' pedagogical knowledge and skills.

This study was conducted under the Digital Learning for Development (DL4D) project of the Foundation for Information Technology Education and Development (FIT-ED) of the Philippines. As part of the Information Networks in Asia and Sub-Saharan Africa (INASSA) program of the International Development Research Centre (IDRC) of Canada and the Department for International Development (DFID) of the United Kingdom, DL4D aims to improve educational systems in developing countries in Asia through testing digital learning innovations and scaling proven ones.

Cher Ping Lim
DL4D Network Lead

ABSTRACT

The researchers aimed to design and implement a participatory model of mobile-assisted language learning (MALL) in order to enhance English education experience in public schools in Mongolia. In particular, the researchers sought to examine three research questions concerning the implementation of digital learning innovations in developing contexts or resource-poor areas: (a) localization and customization, (b) quality and equity, and (c) sustainability. The whole implementation progressed through the following three phases: Phase 1 - baseline study, Phase 2 - teacher professional development, and Phase 3 - intervention implementation. The main research intervention took place in the three public high schools in Ulaanbaatar with three teachers (two 10th-grade and one 6th-grade teachers) and their students (N=67). The proposed solution for digital learning focuses on the integration of gamification (i.e., use of game-related elements in non-game contexts), social media, and mobile devices to design and implement a participatory style language-learning model.

The researchers collected multiple sources of data such as the student perception survey, English proficiency test, and interviews with students and teachers. Overall, the results indicate that the digital learning solution made positive impacts on both the cognitive and affective dimensions. The test results provide the empirical support that the students who participated in the main research intervention were able to improve their English competency, especially in reading. In addition, the teachers' pedagogical approaches showed a shift from content-centered to participation-centered methods. In conclusion, this study demonstrates that the potential of adopting and sustaining digital learning innovations in Mongolian public schools can be enhanced (a) when the solution leverages the existing resources and cultural practices, and (b) when continuous efforts are made for building local teachers' pedagogical knowledge and skills.

Keywords: *gamification, social media, mobile learning, English learning, Mongolian education, localization*

I. INTRODUCTION

1.1 Research Context

Mongolia, a rapidly developing country in Asia and the implementation site of this research project, has been facing several issues in the quality of education. Mongolia has achieved several indicators of basic education goals such as universal primary education (100%) and literacy rate (98%) (UNESCO, 2014), but is now facing new challenges brought by rapid modernization and urbanization since its political democracy has emerged in the 1990s. The fall of the Soviet Union, the extreme climate, and the recent economic crisis have created a unique emergency situation in which people in the rural area have been abandoning the nomadic lifestyle and moving to the capital city. This recent phenomenon has also been heavily influencing Mongolia's public education system. Many nomads also head to the capital in search of better schooling for their children (Kingsley, 2017). Due to the insufficient number of public schools which can accommodate the rapidly increasing student population in Ulaanbaatar, most students have to share school buildings and can only receive, on average, four hours of education a day.

1.2 Goal

This research program aims to address the education quality issues above under the research theme of "Digital Game-Based Learning" concerning the emerging challenges that Mongolian public education has been facing. The main goal of this research program is to investigate how gamification and social media can be incorporated into the design of an effective MALL program in Mongolian public schools in order to promote effective contextualized learning experiences. The proposed solution for digital learning focuses on the integration of gamification (i.e., use of game-related elements in non-game contexts), social media, and mobile devices to design and implement a participatory style language learning model in Mongolia.

1.3 Research Questions

Our research questions are threefold:

- **RQ 1 Localization and Customization:** What are the critical factors for localizing the gamification-based social learning with mobile so that Mongolian students can learn English effectively?
- **RQ 2 Quality and Equity:** How and to what extent does the model of gamification-based social learning with mobile improve the students' learning outcome in Mongolian public schools? What are the essential components of professional development for English teachers in Mongolia to upgrade their pedagogical content knowledge?
- **RQ 3 Research Sustainability:** What are the critical components for the sustainable adoption of gamification-based social learning with mobile as a new mode of digital learning in Mongolia?

The main goal of this research program is to investigate how gamification and social media can be incorporated into the design of an effective MALL program in Mongolian public schools, in order to promote effective contextualized learning experiences.

II. OBJECTIVES

This study was implemented in Mongolia to deliver a new model of mobile-assisted language learning to teachers and students. The researchers believed that a packaged model with pre-defined content would not be a sustainable solution in developing countries in the long term since such solutions often rely on the expertise of external researchers. Beyond the content-delivery model of language learning, this project explored how to motivate and empower learners in the developing world to participate in social learning environments where they can exchange ideas and generate learning content that is meaningful and relevant to them. Two general objectives guided this project:

Objective 1: To deliver a participatory model of MALL to improve English teaching methods and learning experience in public schools in Mongolia.

Objective 2: To go beyond didactic and decontextualized language learning experience through the mobile gamification-based learning solution.

As visualized in Figure 1, the mobile gamification-based learning solution includes three critical components towards the overarching goal of “participatory learning”:

- **Mobile as a delivery medium:** Students and teachers with mobile devices can access and use learning content and resources whenever and wherever they need them.
- **Social media for connected learning:** The proposed digital learning solution leverages on the affordances of social media to provide opportunities for the connected social learning experience.
- **Gamification for playful and participatory learning:** Meaningful gamification strategies were designed and implemented to encourage and sustain active teacher-student interaction during the process of learning, thereby creating a culture of participatory learning.

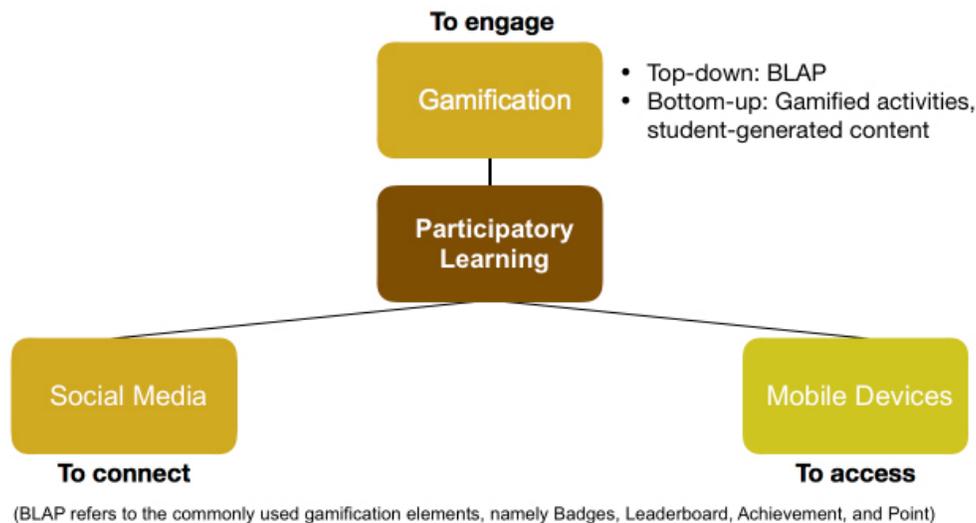


Figure 1. Proposed digital learning solution

The researchers believed that a packaged model with pre-defined content would not be a sustainable solution in developing countries in the long term since such solutions often rely on the expertise of external researchers. Beyond the content-delivery model of language learning, this project explored how to motivate and empower learners in the developing world to participate in social learning environments where they can exchange ideas and generate learning content that is meaningful and relevant to them.

First, in order to go beyond the content-centric model of language learning, this research program explored the use of gamification strategies to design participatory social learning experiences. It adopts the notion of meaningful gamification, which can be defined as “the use of game elements to help someone find meaning in a non-game context, and is, therefore, a tool to help people learn through changing their perspectives on life” (Nicholson, 2012). The focus is to find the right balance between gamification and social learning and turn the experience into the design of effective language learning in a developing country. Furthermore, the inclusion of social media in this digital learning solution was informed by two reasons. First is the view that language learning is fundamentally a social process (Gee, 2004). The idea of being connected through social media can be powerful to foster active participation among learners and create learner-generated content beyond the linear way of delivery.

Second, the baseline study with Mongolian students revealed that most students use social media through mobile phones and

social media has established itself as an important channel for communication and socialization among them.

Finally, following three key attributes of mobile technologies are particularly relevant for those in developing countries who have difficulty in accessing education and information: 1) widespread and increasing use of mobile technology, 2) its relative affordability, and 3) portability (UNESCO, 2013). For these reasons, it is believed that mobile technologies can function as the main medium to break down the barriers faced by students who have limited access to language learning opportunities in developing countries. In Mongolia, it was also reported that 93% of the total population own mobile devices (Zhu, Lee, Do, & Ishdorj, 2016), confirming the potential of mobile as the most accessible tool for learning.

III. REVIEW OF RELATED LITERATURE

3.1 Mobile-Assisted Language Learning

The key objective of language learning should be developing the learners' fluency and accuracy of the language use or self-expression and communication in daily lives (Kang, 1995). Nevertheless, second language (SL) or foreign language (FL) learners are typically hindered by the lack of a natural environment that offers adequate opportunities for them to apply the target language for authentic communication purposes (i.e., 'learning by doing') (Wong, King, Chai, & Liu, 2016). Thus, most of the SL/FL learners are solely relying on language learning in classrooms to pick up the target language. Nevertheless, such classes are typically dominated by teacher-centric, behaviorist-oriented pedagogy (Plank & Condliffe, 2011) where language knowledge is compartmentalized into pre-packaged materials to drill the learners.

The proliferation of the web and mobile technologies is triggering language educators to rethink existing teaching and learning approaches (Donaldson & Haggstrom, 2006). MALL, the intersection of mobile learning and computer-assisted language learning, opens up the opportunity for language learners to extend their learning trajectories beyond the walls of the traditional classroom. Adhering to its most salient characteristic of 'language learning assisted through the use of a handheld mobile device' (Chinnery, 2006; Shield & Kukulska-Hulme, 2008), the trend of the MALL designs has nevertheless been shifting from content-based (mobile devices as language learning content delivery tools, e.g., Dias, 2002; Thornton & Houser, 2005) to pedagogy- and/or interaction-oriented (such as the use of ubiquitous sensing of physical objects for context-aware learning of vocabulary on a mobile device, e.g., Beaudin, Intille, Munguia Tapia, Rockinson, & Morris, 2007; Ogata & Yano, 2004; mobile apps to support and guide learners in interacting with native speakers in authentic situations, e.g., Anderson, Hwang, Hsieh, 2008; Ogata, Hui, Yin, Ueda, Oishi, & Yano, 2008).

Such a trend shift in the MALL field is indeed congruent with recent educational scholars' call for redesigning decontextualized learning into cross-contextual learning (Rudman, Sharples, Lonsdale, Vavoula, & Meek, 2008). When language learning is

cross-contextual (e.g., interweaving formal and informal spaces, individual and social learning settings, and physical and digital realms), the iterative trajectory of language learning-application-reflection as advocated by Little (2007) would ensue (e.g., learning in the classroom, application of what has been learned in daily life, and reflection of how language has been applied through peer review in physical or online learning communities), thus continually improving individual learners' language knowledge and skills.

3.2 Social Media for Learning

Social media, which plays an important role in the life of the youth for both communicative and creative activities, has the potential to situate and support language learning in more authentic social contexts (Kukulska-Hulme, Traxler, & Pettit, 2007; Yunus, Salehi, & Chenzi, 2012). Social media can also support user-generated activities in which students share everyday life situations with meaning-making processes across time and context. Leveraging its communicative nature, social media has been widely used for educational purposes (Gikas & Grant, 2013). Mazer, Murphy and Simonds (2007) found that social media helps promote students' motivation and increases positive interaction among students in classrooms. Some of the most popular social media platforms include Facebook, LinkedIn, and Edmodo. Facebook has especially been widely used to enhance student interactions in and out of classroom settings (Ghani, 2015) and promote students' involvement (Bugă, Căpeneață, Chirasnel, & Popa, 2014). In addition, the platform has been utilized as an institutional tool (Hunter-Brown, 2012).

Mobile social media, the fusion of social media and mobile technology, has become a viable tool to facilitate and sustain a learning trajectory. In particular, mobile social media provides a 24/7 online social space that mediates cross-contextual self-expression (through individual learners' creations on social media) and communicative (activities through peers' replies and interactions) activities. Henceforth, social media could provide affordances to design for a seamless integration between in-class guided participation and autonomous, socialized learning in the learners' daily lives. Two reported examples come from Joseph, Binsted, & Suthers (2005) and Hasegawa, Ishikawa, Shinagawa, Kaneko, & Mikakoda (2008). Both studies empowered the

learners to create and contribute to vocabulary learning contents in the form of photos or videos taken with their handheld devices in their daily lives, which illustrate individual words that they have learned. Going beyond vocabulary learning, Pemberton, Winter and Fallakhair (2009) also developed Cloud-Bank, a system that enables international students in the UK to collect, annotate, and tag intriguing language- and culture-related contents found in everyday lives and share them with an online community.

In Asia, two Singapore-based MALL projects “Move, Idioms!” (Wong, Chin, Tan, & Liu, 2010; Wong, 2013) and MyCLOUD (Wong, Chai, Aw, & King, 2015; Wong, King, Chai, & Liu, 2016) have genuinely transformed and connected classroom-based participatory learning of language knowledge and skills with learners’ day-to-day authentic social media creation. Subsequently, such learner-generated content fostered further peer learning and social interactions through the reply feature. The low-stakes (not graded) social media spaces became a ‘brave new world’ for the young learners to tinker with their ideas and learn a language without the fear of overt academic consequences. According to Wong et al. (2016), 37 students who participated in such a MALL-based Chinese as L2 learning trajectory over a year gradually developed their propensity to proactively and spontaneously create meaning through interacting with their living spaces. This resulted in the retrieval of a greater diversity of the learned vocabulary and the application of the language in 1,043 social media items which they created, particularly the use of significantly more “less frequent words” (which are typically more difficult words) in the informal physical context, as compared to those from the formal or online contexts.

3.3 Game or Gamification-Based Learning

Another line of studies seeks to infuse game or gamification elements into MALL designs. For game-based learning beyond behaviorist mobile games that drill learners (e.g., recognizing words), there were mobile games rooted in the notion of mobile Computer-Supported Collaborative Learning (mCSCL) in which either individual Spanish syllables (Zurita & Nussbaum, 2004) or Chinese character components (Wong, Boticki, Sun, & Looi, 2011) were assigned to individual gamers’ mobile applications; and the gamers needed to negotiate with their peers that acquired the other syllables or components to form teams that will constitute legitimate Spanish words or Chinese characters. Meanwhile, Holden and Sykes (2012) developed “Mentira”, an augmented reality game that requires learners to converse with fictional characters in Spanish concerning a murder case. The conversations are a portion of a partly-fictional, geographically situated narrative. Each choice of where to go, what to say, or what to do can trigger an event or could give the player an item to carry on with the game. A similar location-based English learning

game, HELLO, was reported in Liu and Chu (2010), which requires college students to carry out learning tasks that utilize the target language in the campus.

Regarding gamification, Nicholson (2012) suggests that, so far, the use of game elements focused mainly on external motivation with reward-based systems. The BLAP gamification refers to the acronym of the four commonly used reward-based elements: Badges, Levels and Leaderboards, Achievements, and Points. Nicholson, however, cautioned against the excessive use of BLAP gamification elements, especially when the essential goal is to change human behaviors and attitudes in the long term. This review of the existing literature indicates that gamification-based learning research in the Asian context is still at the early stage and that only a few research studies have been conducted (e.g., Boticki, Baksa, Seow, & Looi, 2015; Liu & Chu, 2010; Su & Cheng, 2015). For instance, Boticki et al. (2015) examined how gamified learning experiences unfolded across multiple locations over a one-year period and unpacked how primary school students in Singapore participated in the gamified mobile learning platform across formal and informal settings.

3.4 Emerging Challenges in Mongolian Education Systems

In this section, the authors review research studies concerning the challenges that Mongolian education has been facing in recent years, and how the potential of digital technologies, particularly the use of mobile and social media, can be utilized to improve the current situation. The nomadic culture of Mongolia and the rapid shift towards urbanization since the 1990s have demanded changes in teaching and learning approaches to improve the overall quality of education. The school infrastructure, however, is far from being satisfactory. Inheriting the Russian school structure, a single school building in Mongolia tends to include all students from primary to upper secondary. Generally, the Mongolian secondary education system consists of combined schools that include primary, lower secondary and upper secondary education in a single institution (UNESCO, 2009). Many schools in Mongolia, especially those in rural areas, are overpopulated and operate 2 to 3 shifts a day to accommodate the increasing population of school-aged students.

Specific to English education, recognizing the importance of English as a global language, the Mongolian government has reformed the education policies to increase school hours devoted to the English curricula (Cohen, 2005). In 1995, the Ministry of Education and Science decided to include English in the formal curriculum. In 2006, the Ministry of Education announced “The Mongolia Education Master Plan 2006-2015”, which aimed to standardize the English education curriculum in secondary schools. The standardization progress, however, has been slow

due to administrative complexities. Currently, the curriculum reform has been performed for secondary education, and its slow process led to the situation in which teachers and students are left without the revised curriculum and textbooks.

Overall, while there are policy actions taken to improve basic education conditions, the quality of English education remains to be a challenge. For instance, many university students cannot read and speak English proficiently even after finishing the secondary education curriculum (Cohen, 2004; World Bank, 2014). The fundamental issue lies in the quality of language lessons and in the quality of teachers' competencies. In-service English teachers in Mongolia have been placed to teach English without proper teacher training, and many of them had been former Russian teachers who were converted to English teachers due to the curriculum changes. Another concern with quality education is the achievement gap between public and private schools. In Mongolia, teachers who lack the right qualifications often go to teach in public schools, which worsens the students' learning opportunities.

3.5 Potential of Digital Learning in Mongolia

With this backdrop of the challenges that the Mongolian education system has been facing, this research proposed the digital learning solution that integrates gamification, mobile, and social media to promote participatory language learning in public schools. In particular, the researchers selected mobile and social media based on their easy access and acceptance among students and teachers in Mongolia. Firstly, mobile devices carry considerable benefits to be a learning tool in developing contexts. Given that learning can occur anywhere, whenever people encounter questions or want to share their knowledge, mobile technology enables learners to communicate seamlessly (Sharples, Taylor, & Vavoula, 2005), and stay connected in unstructured learning spaces outside classrooms. Gopalan, Karavanis, Payne, & Sloman (2011) conducted a study that examined the use of smartphones for e-learning in rural areas of Africa and India, and it successfully provided students with opportunities to access learning from their respective locations and at a flexible time.

Secondly, mobile usage has increased rapidly in recent years, especially in the Asia-Pacific region (ITU, 2013). In Mongolia, 93% of the total population owns mobile devices (Zhu et al., 2016). It was also reported that Mongolian teenagers use cell phones more frequently than any other media types. Teenagers' cell phone ownership in Mongolia is 92% in rural areas, 93.5% in semi-urban areas, and 98% in urban areas (World vision, 2014). MALL, which incorporates mobile technology in language learning, can be considered as an effective solution to lower the barriers of time and space for language learning (Miangah &

Nezarat, 2012). Leveraging the affordances of mobile devices such as affordability, connectivity, and multi-functionality, MALL can be a useful pedagogical approach in developing countries where technical infrastructure is not well-established.

In addition to mobile devices, social media appear to be the most-widely used media in Mongolia. About 74% of the Internet users are actively engaged in social media, as they are free and open to everyone, are communicative, are prone to building communities of interest, and allow people to stay connected (Zhu et al., 2016). Facebook has been ranked as the most used social media platform among the Mongolian youth population (World Vision, 2014). Some existing research provides compelling evidence that social media can open up new possibilities for learning purposes in under-resourced areas. For example, studies conducted in Malaysia (Bugha et al., 2014), rural Africa, and India (Gopalan et al., 2011) have demonstrated that the use of social media as a part of English Education created positive results in the quality of education, especially enhancing access to education for those who are physically unable to attend the school and increasing the teacher-student and student-student interactions. In addition, using Facebook for English education has resulted in students' increased interaction towards learning (Bugha et al., 2014) and team working skills (Ghani, 2015).

Leveraging the affordances of mobile devices such as affordability, connectivity, and multi-functionality, MALL can be a useful pedagogical approach in developing countries where technical infrastructure is not well-established.

Besides the impact on student learning, digital learning solutions such as mobile and social media can be useful for teachers. In Mongolia, the demand to improve the quality of teaching through proper training is immense. Some prior research conducted in developing countries suggests the possibility of utilizing mobile devices for teacher training. There has been teacher development training in the UNESCO Teacher Development with Mobile Technologies Project in Africa (UNESCO, 2015), which aimed to enhance distance learning through mobile devices. In Bangladesh, Grönlund and Islam (2010) conducted a research study that employed mobile devices and other interactive tools to increase teacher-student interaction and to decrease the number of times teachers spend on face-to-face interactions. The integration of live lessons and SMS-based learning also received positive feedback from both teachers and students.

IV. METHODOLOGY

4.1 Overview: Research Activities and Data Collection

This research program was implemented with the students and teachers in public secondary schools located in Ulaanbaatar, Mongolia. As shown in Figure 2, the whole implementation progressed through the following three phases:

Phase 1 (Baseline study)

The researchers collected baseline data that helped enhance their understanding of the status of English education in public schools, and the use of mobile and social media among Mongolian youth. They administered the baseline survey instrument to 388 high school students.

Phase 2 (Teacher PD)

The main goal of the second phase was to provide teachers with opportunities for professional development (PD) to learn about the use of digital technology for teaching and learning. The team organized PD workshops for both pre-service teachers at Mongolian International University (MIU) and in-service teachers from various schools in the capital city area. They collected various data such as surveys, English proficiency test results, and focus group interviews (FGIs) with selected teachers.

Phase 3 (Intervention implementation)

During Phase 3, the researchers implemented digital learning solutions in three public secondary schools. Three teachers (two 10th-grade and one 6th-grade teacher) were chosen from the previous teacher PD workshop in Phase 2 to participate in the research intervention. During the intervention, the team collected data from various sources, including questionnaires, English proficiency test results, classroom observations, Facebook postings, and interviews with students from three separate classes.

On the whole, mixed research design including both qualitative and quantitative data was employed to address the research questions. Various data types from multiple sources including the perception survey results, English proficiency test results, observation recordings, and interviews were collected. Table 1 provides a summary of research activities and collected data for each phase. More details on data collection and respective research activities are presented in the subsequent sections.

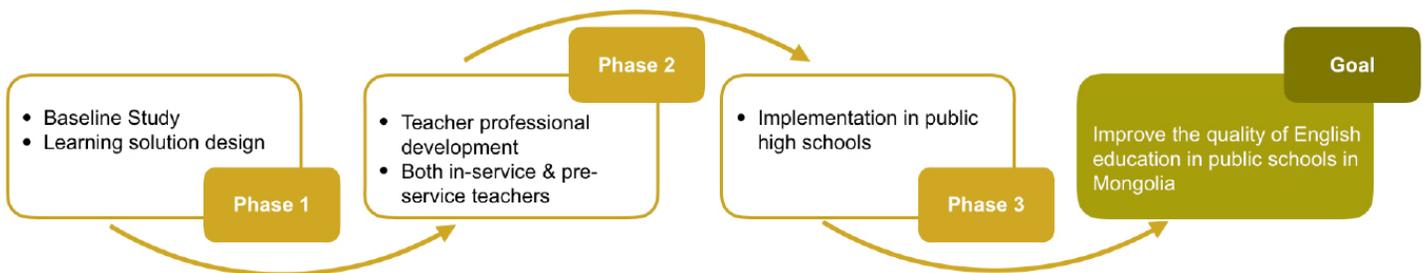


Figure 2. Research Phases and Main Activities

Table 1. Research activities and data collection

Phase	Period	Activities	Collected Data	Participants
Phase 1	April 2016	Baseline study Expert interview	<ul style="list-style-type: none"> • Survey • Interview 	<ul style="list-style-type: none"> • 388 high school students • 3 experts
	May 2016	Pre-service teacher workshop	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • 12 pre-service teachers
Phase 2	June - July 2016	In-service teacher workshop	<ul style="list-style-type: none"> • Survey (pre & post) • English proficiency test • FGI 	<ul style="list-style-type: none"> • 22 in-service teachers
Phase 3	October 2016 - January 2017	Intervention Implementation	<ul style="list-style-type: none"> • Survey (pre & post) • English proficiency test (pre & post) • Teacher interview • Student interview • Classroom observations • Facebook postings 	<ul style="list-style-type: none"> • 3 teachers & 67 students from 3 schools

4.2 Phase 1: Baseline Study

The researchers administered the baseline survey to 388 students at the College Fair that took place in Ulaanbaatar on 22 April, 2016. The purpose of the survey was to collect baseline data regarding the current status of mobile learning, social media, and English education among the Mongolian youth. Participants varied from 9th-grade to 12th-grade students from various high schools in the Ulaanbaatar area. In addition, three education experts were interviewed to better understand the current situation of English education and the potential of applying digital technology solutions in Mongolian public schools. One expert was the president of the English Education Society in Mongolia who had extensive experience in teaching English, initiating curriculum reform, and training teachers. The other two experts were Japanese researchers who have been conducting the research project on using ICT for teacher training in rural areas of Mongolia. The interviews were semi-structured to allow flexible exchanges of the ideas between the researchers and the experts.

4.3 Phase 2: Teacher Professional Development

Teacher professional development workshops were organized for both pre-service and in-service teachers. First, in the gamification workshop for pre-service teachers, twelve MIU students majoring in English Education learned about how gamification elements could be applied in the design of meaningful learning activities in English education (e.g., board game design).

Secondly, for in-service teacher PD, the workshop titled “Facilitating Student Learning with Digital Technology” was held at MIU from 28 June to 4 July 2016. Twenty-Seven English teachers from various regions, including the city-center area in Ulaanbaatar, sub-urban areas near Ulaanbaatar, and rural areas, participated in this four-day workshop that was designed to help Mongolian teachers improve their competency in English teaching (see Figure 3). Through the preliminary study, it was confirmed that Mongolian English teachers often feel they lack in pedagogical knowledge and skills to integrate digital technology into their teaching practices. The teacher workshop, led by the research team, covered various topics and activities related to the meaning and application of gamification, using social media to design learning activities and hands-on activities where groups of teachers collaborated to design games to teach English topics. Certificates were given to all teachers who successfully completed the four-day workshop. After the workshop, the teachers completed the survey regarding their teaching experience and took the English proficiency test. A focus group interview (FGI) was also conducted with six teachers who were intentionally identified based on the school types and locations. The FGI was a semi-structured one, which allowed free exchanges of ideas and opinions among the participants. The interview questions included the current status and challenges of teaching English in public schools, their experience with teacher PD, and their perceptions about applying digital technology to teaching and learning.



Figure 3. Teacher professional development workshop

4.4 Phase 3: Intervention Implementation

4.4.1 Participants. The main research intervention took place from October 2016 to January 2017 with three teachers (two 10th-grade and one 6th-grade) and their students (N=67). Table 2 shows the breakdown of the participants in the experimental and control groups. The selection of the three teachers, who also completed the teacher PD from June to July 2016, was made taking into consideration, the regional variation and the academic system in the Mongolian public schools. The three selected schools cover both the Ulaanbaatar city-center area and the Ger district, and both the lower secondary and upper secondary grades. One teacher was teaching 6th-grade students (School A) and two teachers were teaching 10th-grade students (Schools B and C).¹ Each teacher selected one class on a random basis to be the experiment group and another class of

the same grade as the control group. All three classes were non-advanced classes, and the number of hours of English classes per week varied depending on the school policies. Students in School B (n=28) studied English for 4–5 hours per week whereas those in School A (n=22) and School C (n=17) studied English for 3 hours per week.

The selection of control group classes was made randomly through the discussion with the teachers. At School C and School A, since the teachers were teaching two different classes of the same grade at different schedules, naturally one class became an experimental group and the other the control group. At School B, however, the teacher was teaching only one 10th-grade class. Thus, another 10th-grade class taught by a different teacher became a control group. In summary, at School C and A, the same teacher taught both the control and experimental group, while at School B, the two groups were taught by two different teachers.

Table 2. Research participants

	Grade	Age	Location	Number of Students	
				Experimental (N=67)	Control (N=53)
School A	6th	10 – 11	City-center	22	20
School B	10th	16 – 16	Ger district	28	21
School C	10th	15 – 16	Ger district	17	12

¹ Pseudonyms were used for the names of schools, teachers and students' names to ensure confidentiality throughout the report.

4.4.2 Technical Set-up. A BYOD (Bring Your Own Device) approach was used where students used their own cell phones to complete the learning activities. This decision was made based on the baseline survey results where the researchers found that most high school students own smartphones or a feature phone, and have access to mobile devices at home. For a small number of students who did not own a smartphone, the teachers provided a smartphone or encouraged sharing of the device among the students. To support the Internet connection in and out of school, the researchers provided the students and teachers in each class with cellular data cards that allowed Internet access for 24 hours on average depending on the carrier they use (twice a week). Students did not express any difficulty accessing the Internet after being provided with data cards. Prior to the intervention implementation, permission was obtained from the school principals and the parents. In addition, since the research activities heavily involved the use of mobile phones and social media, a cyber-wellness program was conducted in each school to increase students' awareness about the responsible use of digital technology and appropriate net-etiquettes.

4.4.3 Invention Design. Figure 4 visualizes interweaved relationships among the three main components in the digital learning solution proposed in this research project. The idea central to this design framework is to create a participatory language-learning environment where students with mobile phones can learn English through contextualized social learning processes. Mobile devices and social media (i.e., Facebook), hence, play critical roles to make this design work in and out of class. The baseline study conducted in Phase I revealed that 97% of the students used Facebook, which confirmed that Facebook is the most commonly used social media channel in Mongolia. Leveraging the existing media practices among the Mongolian youth, the research team decided to create Facebook groups as the main online learning platform. This social media became a central learning place supporting a diverse range of teaching and learning activities.

The challenges in the intervention were in unpacking meaningful gamification strategies that fit in the context of the three school sites. As the research goal was to promote learner-centered participatory learning, the researchers attempted to avoid a high reliance on point-based reward systems. Instead, more attention was paid to design meaningful gamification strategies in order to encourage and sustain active interaction among students and teachers during the process of learning, thereby creating a culture of participatory learning. To guide the overall process of designing learning activities, the research team created the Gamification Design Matrix (see Table 3), which functioned as a useful mechanism for both design and evaluation. The Gamification Design Matrix maps the dimension of participatory learning with the various levels of gamified activity design. The participatory learning dimension included the five core principles essential for English language learning derived from the socio-cultural learning perspectives:

- **Authentic learning:** Learning language should be situated and contextualized in authentic contexts. Authentic learning reflects the importance of real-world context to mediate learners' meaning-making process. Authentic learning activities include learning authentic expressions used in real-life contexts, using appropriate expressions for meaningful communication, and practicing communicating skills in authentic situations.
- **Communication and collaboration:** Social interaction including communication and collaboration is foregrounded as the context where learners can enhance their communicative skills by using oral and written languages with peer learners both in formal and informal settings.
- **Linking learning within and beyond classroom:** Learning language should be seamless by linking formal and informal learning experiences. Communicative goals are best

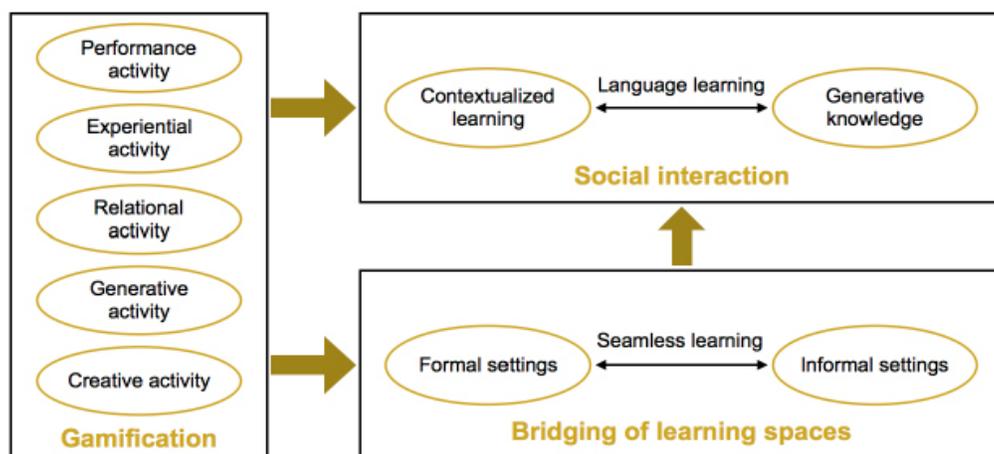


Figure 4. Design framework for participatory English learning

achieved by giving due consideration to using languages in real-world contexts, for fluency and not just accuracy, to give students opportunities to apply their knowledge and skills learned within the classroom to the situations and problems in the real world.

- **Multiple language skills:** Language is not the sum of many discrete parts. Students need to learn a new language as a whole communication skill involving listening, speaking, reading, and writing. To encourage multiple language skills, design activities emphasize the interrelationship of the four skills and the integration of two or more of these skills.

Furthermore, the other dimension of the design matrix included the various gamified activities. With the differing levels of structures (e.g., well-defined vs. ill-defined), the types of activity design range from a performative activity (simple & well-defined problems) to a creative activity (high-level ill-defined problems):

- **Performative activity:** a simple activity with fixed answers that students can perform
- **Experiential activity:** an authentic activity that students need to experience or is based on students' prior experiences
- **Relational activity:** a social activity that promotes interaction and collaboration among students
- **Generative activity:** a complex activity with no fixed answers that require students to generate ideas
- **Creative activity:** an activity that requires students' creative problem-solving skills and artifact creations

Table 3. Gamification design matrix for participatory English learning

Gamified Activity Dimension	Participatory Learning Dimension			
	<i>Authentic learning</i>	<i>Communication and collaboration</i>	<i>Linking learning within and beyond the classroom</i>	<i>Multiple language skills</i>
<i>Performative activity</i>				
<i>Experiential activity</i>				
<i>Relational activity</i>				
<i>Generative activity</i>				
<i>Creative activity</i>				

4.4.4 “Teachers as Co-designers” for Continuous Capacity Building. To support the three teachers’ capacity building in pedagogical design, the researchers adopted the “teachers as co-designers” approach (Cober, Tan, Slotta, So, & Könings, 2015) where the research team at MIU organized bi-weekly meetings with the teachers throughout the intervention period to co-design lesson activities and to reflect on the lesson implementation. For gradual scaffolding, the research team took more initiatives at the early phase of lesson design, and then gradually shifted the ownership to the teachers. The team encouraged the teachers to apply the Gamification Design Matrix when planning lesson activities. For the latter part of the research implementation, all the lesson plans and activities that were designed by the teachers and the MIU research team provided informative feedback for improvement.

4.4.5 Implementation. To connect both in and out of the classroom using social media and mobile, the project team

designed a variety of gamified activities to be implemented in each class. The gamification mechanism included both top-down and bottom-up participation mechanisms. The team defined “top-down mechanism” as reward-based gamification strategies including leaderboard, badges, and level systems, while “bottom-up mechanism” means gamification strategies that promote users’ intrinsic motivation. They emphasized both the quantity and the quality of the students’ participation by proving and announcing the Gamification Scores on the Facebook group page. Since Facebook does not offer proper features for the point-reward system, the team had to calculate the points for each student’s participation manually. At the end of the semester, the three students who accumulated the highest gamification scores were awarded prizes.

The teachers posted the activities, assignments, and important announcements for both individuals and groups on the Facebook group page created for each class. While Facebook was

promoted for both in-class and out-of-class activities during the initial phase of the implementation, it was found that using Facebook in class often significantly disrupted the teaching pace, causing some classroom management issues. Based on consultations with the teachers, the team decided to move the Facebook activities entirely for after-class use where student completed those activities at home or other places. Facebook group pages were monitored by the research assistants (assigned for each class), who also played an important role in providing any facilitation and support that the teachers and students needed (e.g., answering questions, posting useful resources, etc.).

Table 4 presents the implementation schedule in each class with the topics and learning activities. Due to space constraints, some exemplary cases of the gamified learning activities implemented in each class with brief descriptions are provided. As elaborated

earlier, these activities were designed based on the Gamification Design Matrix and the teachers chose the types of activities that would best suit their students' learning objectives and the nature of topics.

To connect both in and out of the classroom using social media and mobile, the team designed a variety of gamified activities to be implemented in each class.

Table 4. Implementation schedule in each class

No.		6th-Grade	10th-Grade
1st class 1/12/2016	<i>Topic</i>	Let's count	Family and ancestors
	<i>Grammar</i>	There is, there are, ordinal numbers, months, in/on	Present Perfect/Past simple
	<i>Type of activity</i>	Authentic and cooperative	Authentic and cooperative
	<i>Activity</i>	Ancestry game: Find ancestry to guess when the teacher uploaded one of the family members in Chigghis khan family.	Family game: Get into groups of five and make an imaginary family. Assign roles to each member, describe your family and attach a group photo.
2nd class 2/12/2016	<i>Topic</i>	Let's count	Experience about secondary and high school
	<i>Grammar</i>	Months, in/on, preposition	Present Perfect/Past simple
	<i>Type of activity</i>	Performative and authentic	Authentic, co-construction, and collaboration
	<i>Activity</i>	Birthday: Find your character by birthday and write a sentence about you and a friend. Use prepositions "in/on".	Write and tag: Write a text about your secondary and high school experience. Mention one student from your class. Mentioned student continues the chain.
3rd class 8/12/2016	<i>Topic</i>	Let's count	My hobby
	<i>Grammar</i>	Jobs, possessive pronouns, use	Expressions explaining hobby
	<i>Type of activity</i>	Authentic, generative, co-construction and collaboration	Generative and relational
	<i>Activity</i>	Find a mate: On a photo of all students of the class standing in line, find yourself and your friends and comment on their position.	Hobby: Describe a hobby without naming it. Look at each other's pictures and post at least one comment to guess the hobby. The winner will be the student's picture with most comments.

Table 4. Implementation schedule in each class (cont'd)

No.		6th-Grade	10th-Grade
4th class 9/12/2016	<i>Topic</i>	That's mine	Clothing now and then (Difference between old and modern clothes)
	<i>Grammar</i>	Describe different jobs, present simple tense	Look, feel, seem + like
	<i>Type of activity</i>	Generative, link-learning and beyond classroom, authentic	Generative activity, co-construction and collaboration, creative activity
	<i>Activity</i>	My dream job: Write about your future dream job and attach a photo.	Clothing shop role play: Roleplay shopping and talk with each other about what clothes you are looking for. SIZE, COLOR, use the TRY ON phrase.
5th class 15/12/2016	<i>Topic</i>	That's mine	Sizes and measurement for clothes
	<i>Grammar</i>	Use regular, irregular verbs, use adverbs, use linkers	Shoe size, waist size
	<i>Type of activity</i>	Generative, authentic, co-construction, and collaboration	Performative and authentic
	<i>Activity</i>	Find yours: On a photo which has all students' belongings, answer questions given by the teacher.	Materials and patterns: Classify the materials in the photo into two groups: by pattern and by material.
6th class 16/12/2016	<i>Topic</i>	That's mine	Mongolian traditional clothes
	<i>Grammar</i>	Past simple tense, make up stories, use when a/an + adjective	Passive voice
	<i>Type of activity</i>	Generative and authentic	Experiential, generative, and authentic
	<i>Activity</i>	My story: On a picture that shows a day of different people, describe the picture and write your own story using a/an + adjective form.	My traditional clothing: Upload a picture of you wearing traditional Mongolian clothing and answer questions by the teacher.
7th class 22/12/2016	<i>Topic</i>	Animals body	Clothing around the world
	<i>Grammar</i>	Superlative, comparative sentences	Made of as subject, made from
	<i>Type of activity</i>	Performative and authentic	Authentic and generative
	<i>Activity</i>	My day: Describe your day according to the picture, make sentences and include animals.	Around the world: Choose a country and write a paragraph about their clothing.
8th class 23/12/2016	<i>Topic</i>	Animal's body	Differences of Mongolian and Korean transportation
	<i>Grammar</i>	Describing animals	Similar and different form
	<i>Type of activity</i>	Authentic, generative, creative, and multiple language skills	Multiple language skills, co-construction/ collaboration and generative
	<i>Activity</i>	Video activity: Watch the video lesson and introduce your favorite animal.	Help foreigner: Help Minhwi (RA), a foreigner who wants to travel to Mongolia during her winter vacation. What kind of transportation can she travel to? Let me advise her.

Table 4. Implementation schedule in each class (cont'd)

No.		6th-Grade	10th-Grade
9th class 29/12/2016	<i>Topic</i>	Animal's body	Mongolian transportation of past and now
	<i>Grammar</i>	Name parts of the body, use adjectives for descriptions	Active and passive forms of present, past passive
	<i>Type of activity</i>	Performative and authentic	Generative and creative
	<i>Activity</i>	Mix and match: Match the parts of the body to the animals on the photo.	Plan your trip: Use a map to create your own travel plan including transportations.
10th class 5/1/2017	<i>Topic</i>	Animals body	Transportation around the world
	<i>Grammar</i>	Use singular and irregular plural nouns	Singular and plural nouns
	<i>Type of activity</i>	Performative	Generative, co-construction and, collaboration
	<i>Activity</i>	Grammar game: Create sentences following the picture in the chart. Observe correct use of grammar.	Transportation riddle: Solve the transportation-themed riddle and write your answers.

Below are the descriptions of the representative learning activities in Facebook.

10th-grade:

- **Video making activity:** The activity required students to divide themselves into groups of two or three to make their own video and post it on the Facebook group (see Figure 5). This activity received the most amount of positive feedback from the students. During the post interview, students from both 10th-grade classes enthusiastically agreed that they would like to do more video-making activities and that they noticed some improvement in their English speaking by performing this activity. Since most students have had very

little experience in speaking English, they expressed that this activity gave them a meaningful opportunity to practice their speaking skills. (Type of activity: co-construction and collaboration, link learning, generative, and creative activity)

- **Shop assistant role play activity:** The activity was invented by Baigalmaa, a teacher who posted the picture of a clothing shop (see Figure 6). Students joined the role play by commenting the type of clothing they wanted to try on from the picture, their size, and other requests. The teacher replied to the comments. (Type of activity: authentic activity, co-construction, and collaborations, generative activity)



Figure 5. Facebook post from the video making activity



Figure 6. Facebook post from the shop assistant role-play activity

6th-grade:

- *Using everyday tools for learning:* The teacher took a photo of everyday things that students use for class and posted it with a task (see Figure 7), which incorporated grammar learned in class. Questions included “Who is this?” and “What are these?” (Type of activity: authentic learning, generative activity)



Figure 7. Facebook post from the everyday tools activity

Overall, the students showed the most enthusiasm and engagement towards creative and collaborative activities, and participation was highest in the generative and authentic activities.

4.5 Data Collection and Analysis

4.5.1 Student Perception Survey. A pre-test survey was developed to measure the students’ perceptions of digital learning experiences. As shown in Table 5, the instrument included three themes: (a) motivation for learning English; (b) learning via a mobile device, and (c) learning via various ICT tools. In the post-test survey, additional items were added to

measure the students’ level of satisfaction with the learning activities on Facebook. For data analysis, SPSS was used to test any statistically significant differences between the pre-test and the post-test survey responses across the three classes.

4.5.2 English Proficiency Test. To measure how much students improved their English proficiency, the team developed the test items adapted from the Primary TOEFL Test. It was decided to use the same test items for both the 10th-grade and 6th-grade students after discussing with the three teachers who confirmed that there were no significant differences between the two groups in terms of their English proficiency skills. When crafting test items, the researchers paid particular attention to measuring the students’ level of English competency. For content validity, two experienced teachers reviewed the test items and made any necessary changes. The pre-test aimed to ensure that the students in the experimental group and control group were equivalent to their level of English proficiency. The pre-test included 23 multiple-choice items: 8 items for listening and 15 items for reading. The post-test contained the same items from the pre-test along with some slight modifications in wording and item-sequencing, in order to minimize the test-retest effect. In the post-test, the researchers also developed additional 15 items that closely measure what the students have learned in class during the intervention (e.g., vocabulary and expressions covered in the English lesson activities). For data analysis, the researchers used SPSS to test any statistically significant differences between the experimental groups and the control groups. Both descriptive statistics and inferential statistics (e.g., t-test, ANCOVA) were performed.

4.5.3 Focus Group and Individual Interviews. The semi-structured interviews were conducted with the teachers and the students before and after the intervention period. As shown in Tables 6 and 7, interview protocols were developed around the research questions to gain an in-depth understanding regarding the students’ and teachers’ perspectives on the digital learning experience they had during the intervention period. The

Table 5. Student perception survey

Factor	Sample Items
Motivation for learning English (14)	<ul style="list-style-type: none"> • I believe I will receive a good grade in English class. • If I can, I want to get better grades in English class than the other students.
Learning via a mobile device (4)	<ul style="list-style-type: none"> • I like to make sentences or write paragraphs in English with a mobile phone. • I can change and improve my English sentences or paragraphs with a mobile phone.
Learning via various ICT tools (7)	<ul style="list-style-type: none"> • With the use of technology, I can take initiative to search for English learning content online. • I would like to do English homework on the computer and mobile phone.
Satisfaction with the learning activities on Facebook (17)	<ul style="list-style-type: none"> • Facebook provides and shares a wide variety of resources and learning materials. • The use of Facebook helps student group work (collaboration).

interviews include (a) the pre-intervention and post-intervention FGI with the selected students from each school site (six times in total) and (b) the individual interviews with the three teachers who participated in the main research intervention (three times in total). The interviews took place at the participant's school site and lasted for about an hour each. The research team conducted

the interview sessions in English, which were later translated to Mongolian by the research assistant. The interview sessions were video-recorded and transcribed for qualitative analysis where the researchers identified major themes based on the interview protocols.

Table 6. Student FGI protocol

Theme	Pre-intervention	Post-intervention
Learning language	<ul style="list-style-type: none"> • How do you study English when you are alone? • Are English classes at school interesting? What is interesting? What is not interesting? • How do you think English can be interesting in school? • What are the skills (reading, listening, speaking, writing) in English that you feel difficult to learn? • When do you feel that learning is effective? 	<ul style="list-style-type: none"> • What is the most memorable in your English class this term? • Were you satisfied with the English class this term? What was satisfactory or unsatisfactory? • Do you think your English skills have improved this term? What do you think is the most improved among reading, listening, speaking, and writing?
Social media	<ul style="list-style-type: none"> • How is your experience using SNS (e.g., Facebook)? • How can you use SNS (e.g., Facebook) to learn English in class or outside of class? 	<ul style="list-style-type: none"> • What do you think about the learning activities on Facebook? • What did you like the most about learning in Facebook? Did you face any difficulties? • Do you think learning in Facebook actually helped you learn English better? • What do you think about using Facebook in your English class next term? • Do you think you will continue to connect to the Facebook group after another grade? If not, why?
Game	<ul style="list-style-type: none"> • Do you like to play games? If so, which games do you usually play? • When do you usually want to play games? • In class, have you ever learned English with games? If so, what games are available for learning English in your class? 	<ul style="list-style-type: none"> • How hard have you been involved in English classes this semester? Why? • What games did you play in your English class? Which games do you remember the most? Why? • What did you learn through the game? Do you think the game is beneficial? • What did you like best about playing during class? What was the worst? • Do you think using games really helps learning English? • How do you feel about using games in other English classes?
Mobile learning	<ul style="list-style-type: none"> • When and how do you use your mobile device for learning? • How do you think learning with a mobile device can be effective? 	<ul style="list-style-type: none"> • Have you ever used a cell phone during class? If so, for what reasons? If not, why? • Was there any difficulty in accessing and connecting? Have you ever been hurt by your parents (social support) or found it inconvenient to use the internet (economic environment)?

Table 7. Teacher interview protocol

Categories	Items
Localization and Customization	<p>At the class level</p> <ul style="list-style-type: none"> • Did you have any problems when you were teaching classes with gamification? What was the most challenging? What kind of support do you need more of for localization of this digital learning in Mongolia? • Concerning mobile technology, how were you able to use your mobile phone in the classroom? To what extent? Why? • How was the students' participation in the Facebook group activities? What did they like the most about? Did they face any problems? If so, how did you solve the problem? <p>At the school level</p> <ul style="list-style-type: none"> • What did other teachers at your school think about this digital learning solution? Positive or negative? • Is there is any particular support that you need from the school to do this digital learning solution? How did the school support and infrastructure affect your teaching this semester? <p>At the national level</p> <ul style="list-style-type: none"> • Do English teachers in Mongolia receive the sufficient guidelines on the national curriculum from the Ministry of Education? • Do you think that English education will be more emphasized in Mongolia? If so, what support from the government will be necessary? • Do you think that the English education environment in Mongolia is suitable for gamification-based learning? Why?
Quality and Equity	<ul style="list-style-type: none"> • Do you think game-based learning contributes to improving the quality of education? If so, what particular features and how? • How do you think you can use mobile learning to improve the quality of education? • Do you personally believe that gamification-based learning with mobile devices contributes to improving the quality of education in the Mongolian public schools? How and why?
Sustainability	<ul style="list-style-type: none"> • Are you willing to do this digital learning in the next semester? If so, why? If not, why? • Can the Facebook group be sustainable with students' voluntary participation? What factors would be needed to sustain social learning in Facebook? • What should be done to improve the sustainability of this digital learning solution? What kinds of support are important at the school and at the government level?

V. KEY RESEARCH RESULTS AND FINDINGS

5.1 Student Perception Survey

Four areas of the students' perceptions were measured and analyzed in the survey. They were: (a) motivation for learning English, (b) learning via a mobile device, (c) learning via various ICT tools, and (d) satisfaction with the learning activities on Facebook. Since the survey was conducted with items that are specific to the research intervention, the researchers did not include the control groups for comparison. Instead, they compared the student scores in the pre-survey and post-survey for the four areas included in both surveys. Table 8 presents the descriptive statistics measured for each main area. The motivation for learning English, learning via a mobile device, and learning via various ICT tools was analyzed using the corresponding sample t-test. Satisfaction with the learning

activities on Facebook was analyzed by a sample t-test because only a post-test was conducted. Since there were noticeable increases in all three factors between the pre-survey and the post-survey, a t-test was conducted to compare statistical differences between the two survey responses. As seen in Table 9, the results indicated that the differences between the pre-survey and post-survey were statistically significant in the three factors: motivation for learning English ($t=19.00$, $p<.01$); mobile learning ($t=14.58$, $p<.01$); and learning via ICT ($t=23.52$, $p<.01$). Table 8 presents the descriptive statistics and t-test results for each class. All the measures were statistically significant between the pre-survey and post-survey, except the "Learning via various ICT tools in School A.

Table 8. Descriptive statistics and t-test results (all three classes, N=67)

	Pre-survey		Post-survey		t	p
	Mean	SD	Mean	SD		
Motivation for learning English	1.81	0.52	4.11	0.47	19.00 *	0.00
Learning via a mobile device	1.94	0.64	4.02	0.63	14.58 *	0.00
Learning via various ICT tools	2.07	0.38	3.90	0.40	23.52 *	0.00
Satisfaction with the learning activities on Facebook	—	—	4.17	0.53		

* $p < 0.05$

The results indicated that the differences between the pre-survey and post-survey were statistically significant in the three factors: motivation for learning English ($t=19.00$, $p<.01$); mobile learning ($t=14.58$, $p<.01$); and learning via ICT ($t=23.52$, $p<.01$).

Table 9. Descriptive statistics and t-test results (separated by class)

		Pre-survey		Post-survey		t	p
		Mean	SD	Mean	SD		
Motivation for learning English	School A	1.53	0.44	4.31	0.38	14.96*	0.00
	School B	1.83	0.52	4.04	0.53	11.68*	0.00
	School C	2.08	0.47	4.01	0.40	9.16*	0.00
Learning via a mobile device	School A	1.95	0.60	4.23	0.64	8.62*	0.00
	School B	2.02	0.68	4.07	0.66	8.33*	0.00
	School C	1.82	0.63	4.35	0.57	8.30*	0.00
Learning via various ICT tools	School A	2.03	0.31	3.87	0.35	16.30	0.00
	School B	2.05	0.38	3.85	0.37	18.37*	0.00
	School C	2.18	0.47	4.02	0.50	8.27*	0.00
Satisfaction with the learning activities on Facebook	School A	—	—	4.19	0.54		
	School B	—	—	4.09	0.53		
	School C	—	—	4.27	0.53		

* $p < 0.05$

5.2 English Proficiency Test

One of the core objectives of this study was to examine the effectiveness of the proposed mobile gamification-based learning solution with regard to how much it improved the students' English competency. Table 10 presents the descriptive statistics results for the experimental group and the control group in their pre-test and post-test scores.

The researchers performed ANCOVA using the post-test scores as the dependent variables, and the pre-test scores as the covariate in order to compare the level of achievement between the experimental group and the control group. Chi-square test result was 19.793 ($p > 0.18$), which revealed no reliable differences in the distribution of pre-test result. The homogeneity test result showed that the pre-test scores of the two groups were homogeneous ($F = 1.082, p \geq 0.05$) and that

ANCOVA could be applied. Table 11 summarizes the ANCOVA results. It was found that the total post-test scores of each group were not significantly different ($F = 1.73, p > 0.05$). However, the analysis indicates different results for each domain area. In the listening area, there was no significant difference between the experimental group and the control group ($F = 0.75, p > 0.05$). On the other hand, the post-test scores for the reading area were significantly different between the two groups, implying the treatment effect ($F = 4.88, p < 0.05$). The experimental group's scores were significantly higher than those of the control group. Additionally, the advanced-level test revealed that the experimental group's mean score ($M = 6.81$) was significantly higher than that of the control group ($M = 5.56$) ($F = 3.94, p < 0.05$). Therefore, it was concluded that the gamified learning through social media had a significant positive impact on improving the students' English learning, with the exception of listening skills. Tables 12-14 show the ANCOVA results for each class.

Table 10. Descriptive statistics

Variable	Group	N	School	Pre-test		Post-test	
				Mean	SD	Mean	SD
Listening	Experimental	22	School A	3.77	1.19	3.64	1.89
		28	School B	4.50	1.59	4.00	0.98
		16	School C	4.56	1.50	4.13	1.20
	Control	20	School A	2.85	1.26	3.64	1.17
		21	School B	3.33	1.77	4.19	1.10
		12	School C	2.92	1.16	3.50	1.31
Reading	Experimental	22	School A	6.68	1.70	7.86	1.64
		28	School B	8.61	2.79	9.31	2.05
		16	School C	7.38	2.18	11.47	2.29
	Control	20	School A	7.40	1.98	8.09	2.11
		21	School B	7.48	2.04	7.88	1.82
		12	School C	5.50	2.46	7.42	2.87
Advanced-level	Experimental	22	School A	—	—	8.18	2.17
		22	School B	—	—	5.81	2.03
		17	School C	—	—	6.35	2.05
	Control	21	School A	—	—	8.47	1.74
		14	School B	—	—	1.71	1.68
		9	School C	—	—	4.77	2.33

* $p < 0.05$

Table 11. ANCOVA results of post-test (all three classes)

Test	Type III SS	df	Mean Square	f	p
Post-test	16.18	1	16.18	1.73	0.19
- Listening	1.20	1	1.20	0.75	0.38
- Reading	26.23	1	26.23	4.88	0.02 *
- Advanced-level test	33.72	1	33.72	3.94	0.05 *

Table 12. ANCOVA results of post-test (school A)

Test	Type III SS	df	Mean Square	f	p
Post-test	12.02	1	12.02	1.42	0.24
- Listening	1.89	1	1.89	0.87	0.35
- Reading	4.37	1	4.37	1.27	0.26
- Advanced-level test	11.25	1	11.25	3.41	0.07

Table 13. ANCOVA results of post-test (school B)

Test	Type III SS	df	Mean Square	f	p
Post-test	7.54	1	7.54	1.26	0.26
- Listening	0.97	1	0.97	0.89	0.35
- Reading	13.95	1	13.95	3.36	0.07
- Advanced-level test	111.58	1	111.58	30.48	0.00 *

Table 14. ANCOVA results of post-test (school C)

Test	Type III SS	df	Mean Square	f	p
Post-test	74.46	1	74.46	6.38	0.01 *
- Listening	0.19	1	0.19	0.13	0.72
- Reading	67.29	1	67.29	10.34	0.00 *
- Advanced-level test	8.85	1	8.85	1.71	0.20

* $p < 0.05$

5.3 Interview Analysis Results

In this section, the authors present the results of the interview analysis concerning the perceptions of the students and teachers who participated in the research intervention on their digital learning experiences. Through the constant comparison method, the researchers identified three main themes (localization, teaching and learning outcomes, and sustainable

adoption) and several sub-themes for each respective factor (see Table 15). It should be noted that the researchers synthesized the key findings from analyzing both the teacher interviews and the student interviews for a more holistic understanding, by corroborating the interpretations from the two different interview sources.

Table 15. Main themes and sub-themes of interview findings

Main themes	Sub-themes
Critical factors for localization	<ul style="list-style-type: none"> • Internet infrastructure • Curriculum and teaching materials • Teacher professional development
Critical factors for localization	<ul style="list-style-type: none"> • Changes in teaching styles • Changes in student’s perception on learning • Improvement in English proficiency
Sustainable adoption	<ul style="list-style-type: none"> • Technical infrastructure • Teacher facilitation • Government and school support

5.3.1 Critical Factors for Localization

Internet Infrastructure

The most frequently mentioned factor for localizing digital learning innovations in Mongolia was the limited Internet infrastructure in public schools. Most teachers in the FGI showed concerns about using the Internet during class hours:

“If we have the Wi-Fi or Internet connections, we can use social media and Facebook in our teaching. But the network is limited in public schools.” (Teacher from the FGI)

The limited Internet infrastructure affected both the teachers’ and students’ level of motivation for adopting mobile devices and social media for teaching and learning activities. This issue became even more prominent after the intervention. Even though the students were given the mobile data card to help complete the learning activities on Facebook, the limited Internet connection often prevented them from actively participating, as confirmed in the following excerpts:

“I think the Internet connection was the major problem. While we attempted to solve this problem by providing students with the data card, the solution did not

completely resolve the issue. Using the Internet was limited for many students. Some students had constant Internet access whereas some had Internet access for only two hours.” (Teacher B)

“I couldn’t be on Facebook constantly because Unitel (name of the mobile carrier) was limited to 100MB.” (Student from School B)

Curriculum Design and Teaching Materials

Several teachers mentioned the need for better curriculum designs and more teaching resources. Often, the teachers attributed the lack of English education’s quality to the poor design of the national curriculum which hindered many students from developing basic English competency. The issue was also coupled with teacher-centered teaching methods and poorly designed teaching resources, as shown in the following excerpts:

“Students have to learn English from the 5th grade and continue learning English for 8 years. But when they graduate, they cannot speak English... For me, my learning experiences mainly (are) teacher-centered.” (Teacher C)

“Last week, we, the English teachers in the Sukhbaatar districts who teach the 5th-grade, met and discussed the 5th grade textbook. There were so many critiques raised: for example, the textbook does not contain relevant contextual information so it is impossible to give students relevant homework. Then every book has a CD-ROM, but some students cannot listen to the CD because they don’t have a CD player or notebook to play.” (Teacher A)

Among the three teachers, two 10th grade teachers did not even have English textbooks which were being renewed by the Ministry of Education at the time of the interview. They also expressed difficulties in creating lesson plans without proper access to the revised curriculum and textbooks:

“Our 10th-grade students did not have the English textbook. In this case, downloading resources from the Internet takes too much time. Of course, we tried to prepare the lessons as best as we can, but since we did not have the textbook [...] I think we should have a homework database that connects to the class topics.” (Teacher B)

“We do not have the Internet access, printer, or copy machine at all. So if I want to organize any event that uses technology, I need to use my own expenses. While the education policy emphasizes student-centered methods, schools do not provide the teachers with appropriate tools to work toward the student-centered pedagogy.” (Teacher C)

Teacher Professional Development

Teachers constantly expressed the need for enhancing the quality of teacher training programs. All three teachers have previously actively participated in teacher professional development programs provided by the government, non-profit organizations, and the foreign institutes. While they had positive experiences with the teacher PD programs delivered by foreign institutes and agencies, their satisfaction with the PD programs by the government was relatively low:

“I feel like while the government provides many seminars for teachers, they are not so efficient. I attended the teacher PD program offered by the Canadian institute every summer. I found it highly effective and beneficial to teachers. We learn various kinds of teaching approaches about how to teach English...” (Teacher B)

“Our pedagogical knowledge is lacking; for example, we don’t know many interesting methods or ways to make the class more interesting.” (Teacher C)

Despite the PD workshops in which they had participated, the teachers considered integrating new pedagogical ideas into their teaching practices to be still challenging:

“The most difficult part was finding new and creative ideas. After the MEGA skills workshop, I realized that teachers lack in that area a lot.” (Teacher A)

“I realized that it is difficult to create homework and activities that are interesting to all the students, because they have different interests [...] Since [the intervention] was new, we did not have such experience.” (Teacher B)

5.3.2 Teaching and Learning Outcomes

Changes in Teaching Styles

During the post-intervention interview, the teachers reported some changes in their own teaching styles and expressed enthusiasm for self-improvement:

“I have changed my teaching styles. When I taught the grammar lessons, I used the games and many new ideas.” (Teacher B)

“It definitely changed my teaching styles. First, I realized that I need to improve my competency. Second, I realized that I could use time outside of class for student learning. I think that time should be used wisely, so I am giving students some homework to do after class. And I am trying to use gamification for teaching and am searching for new ways to implement my lessons.” (Teacher C)

Changes in Students’ Perceptions Towards Learning

Activities and homework in Facebook mostly involved group work that required collaboration among the students. It appears that such social learning experience influenced the students’ perceptions towards learning and impacted their interests and engagement in the learning process:

Often, the teachers attributed the lack of English education’s quality due to the poor design of the national curriculum, which hindered many students from developing basic English competency.

"I liked making videos with friends. It was difficult but we really enjoyed it. We spend hours to make 30-second video." (Student from School A)

"With the use of Facebook activities, the classroom lessons became easier to understand." (Student from School B)

It was also interesting that the use of social media affected students' attitudes towards homework and made them more aware of the contents learned. Since most students were active Facebook users, their routine of checking instant notifications naturally increased the level of participation in the gamified learning activities:

"Facebook helps us to understand English topics better and to express better ideas because [Facebook] is like a continuing class." (Student from School C)

"In the past, we used to procrastinate our homework until the last moment. From this semester, we waited for homework to be posted in Facebook." (Student from School C)

Some students also mentioned that the authentic photos of real-life context uploaded on Facebook helped them make better linkages to the English lesson, instead of learning only through textbook materials:

"I used to not do my homework on time. But now when I scroll the Facebook page, the homework appears on the news feed and prompts me to complete the homework." (Student from School C)

"When we see the photos for vocabulary learning on Facebook, it is much easier to memorize because they are authentic. From textbooks, you cannot get such good visualization." (Student from School B)

Improvement in English Proficiency

Most students reported that they improved their English skills, especially in the areas of vocabulary, grammar, and writing. Some students indicated that the activities on Facebook helped them better understand the lessons given in the classrooms because interactive communication extends the classroom's learning environments:

5.3.3 Sustainable Adoption

Technical Infrastructure

Technical infrastructure such as the lack of Internet in public schools and at the students' homes appears to be one of the main factors affecting the sustainable adoption of digital learning solutions. Teachers expressed concerns on applying digital learning activities when there are students without Internet access at home which may cause unequal learning opportunities:

"Facebook activities increased my vocabulary. Because when I do my homework on Facebook and there are words I don't know, I can ask for help." (Student from School A)

"I actually want to use digital technology. But in terms of Internet access, since students are under different situations, it may be unfair to apply Internet-based activities and to evaluate students based on their participation in such online activities." (Teacher B)



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Moreover, while mobile learning has been used for students with smartphones and motivated them, students without access to smartphones were discouraged from learning and showed relatively low participation rates in the Facebook activities:

“For example, there is a boy Davaadorj. He does not have a phone. When students used own phones, he had to borrow the phone from his siblings. When the siblings were out of town, he was left without access to a phone and got discouraged to do the online activities after that.” (Teacher C)

Teachers expressed concerns about applying digital learning activities when there are students without Internet access at home, which may cause unequal learning opportunities

Teacher Facilitation

Teacher facilitation was another frequently mentioned issue for making digital learning sustainable. Although teachers were positive about maintaining the Facebook group even after the research ended, they were doubtful about promoting active student participation without proper facilitation from teachers, implying that teachers still play a critical role in initiating and sustaining meaningful online learning activities to take place. When asked about the possibility of sustaining the Facebook groups without the teachers' active intervention, the teachers provided the following responses:

“Now during the school break, the Facebook group became very inactive. I think only 1-2 students did their homework during the break. I am unsure but without someone's facilitation, I don't think students can maintain the Facebook group.” (Teacher B)

“I don't think so as the students have own groups and chatting.” (Teacher C)

Government and School System

The teachers frequently mentioned the government policy and school system as potential obstacles for using mobile devices in schools. Currently, many schools officially ban students' use of mobile phones in classrooms. The use of mobile phones is allowed only under special circumstances, like when language teachers allow students to use mobile phones for finding words in the dictionary. In addition, the hierarchical school system seems to be not as conducive to young teachers making autonomous decisions on their teaching practices, which also acts as another hindrance for their adoption of new teaching tools, technologies, and pedagogical approaches:

“There is the official letter from the Ministry to ban the use of mobile. However, for my school, language teachers use mobile phones for the dictionary. It is difficult to ban the use of mobile phones in school completely.” (Teacher C)

“The majority of teachers in my school are old. While I want to bring new ideas to teaching, I often feel constrained due to the hierarchical system in my school.” (FGI)

VI. IMPLICATIONS AND RECOMMENDATIONS

In this research, the authors aimed to design and implement a participatory model of MALL in order to enhance English education experience in public schools in Mongolia. In particular, the researchers sought to examine three research questions concerning the implementation of digital learning innovations in developing contexts or resource-poor areas: (a) localization and customization, (b) quality and equity, and (c) sustainability. In this section, the authors revisit each research question and draw upon relevant policy implications.

Firstly, for localization and customization, this research emphasized the criticality of culturally-relevant and learner-centered approaches when addressing digital learning innovations in Mongolia. In this project, the researchers re-designed various kinds of materials and contents for teaching and learning activities to make them relevant to the local context and to the students' needs. The situation analysis conducted during the baseline study (e.g., learner survey, expert interviews, and examination of the school curricula) greatly enhanced the research team's understanding of the challenges that the Mongolian public school system had been facing, especially in the area of English education. In addition, the decision to utilize mobile devices and social media (i.e., Facebook) was intentionally made to maximize the potential of localizing our digital learning solution. The belief was that the adoption rate by the teachers and the students would increase when the solution leverages the existing technology and media practices, since user acceptance would likely be low and slow if new solutions were introduced.

Secondly, concerning quality and equity, the researchers found some positive impacts that their digital learning solution had on the quality of education, particularly in improving the students' English competency and the teachers' pedagogical knowledge and skills. The digital learning solution aimed to go beyond didactic and decontextualized language learning by utilizing the mobile gamification-based learning solution. To address the equity issue in education, the researchers intentionally selected two schools located in the Ger district. They were able to achieve high levels of student participation throughout the intervention period, and to increase their overall interest towards English learning, as confirmed by the survey results. It is also important to note that the digital learning solution made positive impacts on both the cognitive and affective dimensions. The test results provide the empirical support that

the students who participated in the main research intervention were able to improve their English competency, especially in reading. The researchers attribute this positive outcome to the students' active participation in the gamified learning activities in and out of the classroom settings. In addition, the teachers' pedagogical approaches showed a shift from content-centered to participation-centered methods.

Lastly, regarding the sustainability issue, this study demonstrated that the potential of adopting and sustaining digital learning innovations in Mongolian public schools can be enhanced (a) when the solution leverages the existing resources and cultural practices; and (b) when continuous efforts are made for building local teachers' pedagogical knowledge and skills. As mentioned earlier, the digital learning solution in this research program was designed to utilize the material and cultural resources that are already readily available in Mongolian school contexts. With the use of mobile devices, employing the BYOD approach, and using Facebook where participants were already active users, the researchers were able to minimize technical set-up issues that digital learning initiatives in developing countries might often face. While social media was not the central focus of this research program, the researchers were able to confirm that social media like Facebook, when accompanied by appropriate pedagogical design, holds great possibilities to be participatory learning spaces in developing countries.

Our belief was that the adoption rate by the teachers and the students would increase when the solution leverages the existing technology and media practices, since user acceptance would likely be low and slow if we introduce new solutions.

All in all, the success of this project indicates the viability and effectiveness of extending FL learning, such as English in Mongolia, beyond the classroom. Particularly, there is the need of situating language learners in authentic contexts of social interactions where language learning and language use co-occur and nurturing the sense of “communication with a purpose” to be motivated for FL learning. Proper design of scaffolds and gamification to trigger students’ cross-contextual learning trajectories is still crucial or useful as students would not be able to become self-directed without any external guidance or inspiration. Nevertheless, as the limitations of classroom-only language learning have been recognized by contemporary language learning theorists (e.g., Benson & Voller, 2014; Pica, 1994), ICT opens up opportunities for compensating the lack of a “big environment” (of using English in authentic daily life in Mongolia). A social media space that is gamified and appropriated for such language learning activities may constitute a “niche environment” where English learning and application in and out of the classroom are interwoven, and where Mongolian students can tinker their language use without fear.

Notwithstanding, the continued success of implementing such a “niche environment” would require a targeted teacher’s PD package in place. Such a PD program should not only aim to elevate the teachers’ technical know-how in employing digital media for learning. More importantly, the program should assist the teachers in achieving an in-depth understanding and belief in the critical success factor of L2/FL learning, that is, to facilitate and motivate the students in utilizing the target language in authentic settings. Not only that, the teachers should build capacity in designing such learning environments or learning contexts to accomplish the stated factor. The students should ultimately establish agency and become self-directed language

learners who are actively involved in a learning community where language learning and language use co-occur, with or without teachers’ presence or support. Henceforth, an important implication drawn from this study is that a properly designed, perhaps gamified, social media space may provide the technological affordances for the teachers to kick-start their effort in nurturing such a learning community (a “niche environment”) where students are first, well-scaffolded, and then gradually become empowered to take language learning into their own hands. The researchers envisage a teachers’ PD package to make such a developmental trajectory possible.

This study demonstrates that the potential of adopting and sustaining digital learning innovations in Mongolian public schools can be enhanced (a) when the solution leverages the existing resources and cultural practices; and (b) when continuous efforts are made for building local teachers’ pedagogical knowledge and skills.



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VII. CONCLUSION

The factors affecting the quality of education in Mongolian's public education system include, not only issues coming from the lack of school buildings, teachers, and teaching resources, but also stem from natural environmental factors such as frequent lesson interruption due to harsh climate conditions (e.g., sudden school closure during winter). This research demonstrated that the new model of MALL, with meaningful gamification strategies, could be beneficial to both teachers and students who want to improve their English knowledge and skills.

Some limitations of this study should also be noted. Firstly, the intervention period was rather short (about 3 months) with some interruptions due to the schools' schedules. It is necessary to conduct a future research study with a longer intervention period to examine sustainable impacts after the initial novelty effect is removed. In addition, while the quasi-experimental design was employed to examine the learning effects in the experimental group and the control group, the researchers were not able to collect much detailed information about what had actually happened in terms of teaching and learning activities in the control group. Also in School C, the control group was taught by another teacher, which might have brought in some teacher effects. Lastly, the research instruments (e.g., surveys, English tests) need further investigations to warrant their validity and reliability as the translation issues between English, Mongolian, and Korean could have affected them.

Despite these limitations, the researchers believe that the results from this project can provide valuable insights to both national and international concerns about improving the quality of education. This project can contribute to the national initiative in Mongolia, since preparing the next generation of the workforce who can work in the global economy in a competent manner is key to any country's future success. In addition, this research can inform the larger international concerns regarding the ways to improve the quality of education and teacher competency through locally relevant digital learning solutions.

This research demonstrated that the new model of MALL with meaningful gamification strategies could be beneficial to both teachers and students who want to improve their English knowledge and skills.



Photo Credit: Hyo-Jeong So

VIII. PROJECT INFORMATION AND OUTPUTS

Project website

- In English: <https://dl4den.wordpress.com/>
- In Mongolian: <https://dl4dmn.wordpress.com>

Publications

- Book chapter: "A Systematic Literature Review of Game-based Learning and Gamification Research in Asia: The Synthesized Findings and Research Gap" in *Routledge Handbook on Schools and Schooling in Asia* will be published in 2018.
- Conference paper: "Creating Virtual Classrooms Using Smartphones and Facebook in Mongolia" was presented at the Redesigning Pedagogy International conference in Singapore in June 2017.
- Conference paper: "Language learning with mobiles, social media, and gamification in Mongolia: Possibilities and challenges" was presented at the 25th International Conference on Computers in Education (ICCE) in Christchurch, New Zealand in December 2017.

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