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Fostering an English Teaching Environment: Factors Influencing English as a Foreign Language Teachers' Adoption of Mobile Learning

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Abstract. The role of mobile technology has significantly increased and been emphasized in English education. However, research investigating EFL teachers' attitudes and behaviors related to mobile technology has been limited in descriptive aspects of the technology, leading to misunderstandings about EFL teachers' needs. Furthermore, many prior studies have examined various aspects of electronic learning (e-learning) and technological developments of mobile learning (m-learning) in English education from the learners' perspective. Therefore, this study proposed a research model that empirically examines behaviors of EFL teacher's' m-learning acceptance by using Fred Davis's Technology Acceptance Model (TAM) as the research framework. As external variables, this research model includes instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy, influencing the perceived usefulness of TAM. Structural Equation Modeling (SEM) with the data of 189 EFL teachers was used to analyze causal relationships between external variables and TAM variables. The results provide evidence that supports the tested hypotheses. The implications of the findings suggest a new direction for future studies on m-learning.

Keywords: mobile learning, EFL teacher, English education, computer-assisted language learning.

1. Introduction

Mobile phones and the growing accessibility of other portable and wireless devices have been moving the paradigm of technology-supported classrooms. The usage of such mobile technologies turns out to be well associated with learning aims, including improving student retention and achievement, supporting level-differentiation of learning, and reaching learners who would not otherwise have the chance to participate in education (Kukulska-Hulme *et al.*, 2009). Understandably, pervasive acceptance of technology by EFL teachers is required for realizing the technology-enriched English teaching/learn-

ing standard. A great deal of effort has also been devoted to comprehending how mobile technologies deal with both traditional and innovative ways of teaching and learning, showing the integration of mobile application across various learning tasks (Naismith *et al.*, 2004; Kukulska-Hulme and Traxler, 2005) as well as stressing the most significant emerging concerns (Sharples, 2006).

However, it is difficult to define mobile learning (m-learning) because the field is undergoing rapid evolution. Mobility needs to be understood not only in terms of spatial movement, but also in terms of the ways such movement may enable time-shifting and boundary-crossing (Traxler, 2009).

Technology is now an integral part of our surroundings. Learners tend to move between using desktop computers, mobile devices, and touch-screen displays in public places, often for different parts of a learning task. Interactions facilitated by mobile devices are intermingled with direct, face-to-face interactions. In other words, m-learning draws our attention to mobility – not just the fact of mobility, but its influences as well, which might embrace different methods of dividing up one's time and crossing boundaries (Kukulska-Hulme, 2009).

With proper devices, mobile learners can participate in various activities to extend their learning and enrich them with new possibilities. In addition, the effective use of technology-supported teaching enhances students' comprehension and retention of course materials because suitable technology can enable teachers to become increasingly active in preparing, presenting, describing, and transferring knowledge, thus nourishing, inspiring, and advancing learners' improvements (Sharples *et al.*, 2009). Teachers have an impact on learners' intellectual development, value systems, and attitudinal beliefs, including those concerning technology. However, previous studies (e.g., Jung, 2009) associated with m-learning have focused on the learners' perspective. Thus, what is missing in the current literature on m-learning for English learning is an investigation of teachers' attitudes and behaviors related to m-learning, particularly their intention to use and actual usage of m-learning for English teaching.

Given the increasing popularity and use of mobile devices for English learning and their critical role in existing language-learning studies, it is important to examine the key variables in teachers' adoption of m-learning for English. Therefore, the main goal of this study is to propose a research model based on the well-known technology adoption theory – the Technology Acceptance Model (TAM) proposed by Fred Davis (1989) – to examine some of the key variables that have a positive impact on the perceived usefulness of m-learning and the relationships between TAM variables in the context of English teachers' perspectives. To accomplish this, this study incorporates five variables (instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy) that positively influence one of TAM's variables, i.e., perceived usefulness, into the research model.

The present study's approach to English teachers' adoption of m-learning is unique in that the proposed research model can offer new insight into various factors affecting English teachers' perception of the usefulness of m-learning as a new educational paradigm.

2. Literature Review

2.2. *Definitions of M-Learning*

Electronic-learning (e-learning) and m-learning have become particularly key concepts of the education technology revolution. However, the two terms are not always used correctly, as there are some misunderstandings about the differences between them and where they overlap. E-learning refers to electronically supported learning and teaching of any kind. It does not necessarily require either a computer or an internet connection but only the use of electronics. Thus, learning a language using software, for example, or watching an educational television program is a form of e-learning. However, the introduction of the internet was the real facilitator of numerous vital developments in e-learning, and many materials and courses now include internet-based activities such as cooperative online learning or interactive educational resources. On the other hand, m-learning refers to learning using portable devices, which allows learners to learn in diverse contexts rather than being restricted to a classroom or desk. M-learning is a subset of e-learning because it uses electronics, but it refers far more specially to handheld devices and portable technology. The advent of handheld wireless devices such as iPads, tablets, and mobile phones expands the potential applications of the concept.

The main characteristics of m-learning, such as permanency, accessibility, immediacy, interactivity, and situating of instructional activities are summarized and introduced by Ogata and Yano (2005). Part of the challenge in arriving at a single definition of m-learning is related to the fact that it is obvious that not only technology but also learners can be mobile. M-learning supports both formal learning within the classroom and informal learning outside the classroom. Sharples *et al.* (2009) define m-learning as the processes of coming to know through exploration and discussion across various situations among learners and interactive technologies. Kukulska-Hulme *et al.* (2009) explain that such learning experiences cross spatial, temporal, and/or conceptual borders and involve interactions with fixed technologies as well as mobile devices. They emphasize that weaving interactions with mobile technology into the fabric of pedagogical interaction that develops around them becomes the focus of attention. The term "m-learning" is related to e-learning and educational technology that focuses on learning contexts with mobile devices. Sharples *et al.* (2009) define m-learning as a process of coming to know through conversations across multiple contexts among people and personal interactive technologies with a focus on contexts. M-learning is any sort of learning in which learners have learning opportunities with mobile devices not at a fixed, predetermined location. In other words, using mobile devices, learners can learn anywhere and at any time (Crescente and Lee, 2011).

The devices used in m-learning can range from mobile phones and handheld computers to MP3 and MP4 players, digital cameras, gaming consoles, and notebooks. M-learning emphasizes mobility, interacting with portable technologies, and learning that reflects a focus on how society and schools can accommodate and support an increasingly mobile population. Using mobile tools for creating learning aides and materials

becomes an important part of informal learning. In addition, mobile technology allows learners to be accessible from virtually anywhere. Further, m-learning, like other forms of e-learning, is collaborative. Sharing is almost instant among everyone using the same content, which leads other users to respond with immediate feedback and tips. M-learning also brings strong portability by replacing textbooks and materials with small RAMs filled with personalized learning contents. In addition, it is simple to apply m-learning for a more real and enjoyable experience.

2.2. *Mobile Assisted Language Learning (MALL)*

The growing number of possible technological applications has led to a wide range of mobile language learning programs, from mini-lessons to full courses. The number of language teachers who are able to create MALL content has also increased, due largely to its attractiveness, the demand for it, and content generation tools that simplify the production steps with templates and functions. MALL now serves not only as a crucial source of language teaching for learners but also as a support for the retention and exploitation of language skills. With participating mobile technology–based activities, learners are able to apply their linguistic knowledge in various contexts. Enhancing language teaching through MALL enables language learners to experience dynamics not available through the traditional classroom.

Among the most noted characteristics of MALL is ubiquitous access to learning anytime and anywhere. Compared to classroom or e-learning, learners do not need to be in a classroom or at a computer to access learning materials. This allows them to go over language skills just before or just after a conversation in the language they are learning. Handheld devices also create new dynamics for collaborative learning, as learners can share the language learning process in small synchronous groups (Nah *et al.*, 2008).

Joseph and Uther (2009, p. 16) point out several key implications for MALL from the various theories:

(a) present material at the level, or just beyond the level, of the learner's current ability;
(b) create authentic task based learning;
(c) scaffold interaction with others;
(d) connect with learner's existing knowledge schemas;
(e) present both visual and verbal information in tandem;
(f) allow learners the choice of modality;
(g) give learners advance preparation.

While mobile technologies offer many benefits (e.g., flexibility, low cost, small size, and user-friendliness), there are some drawbacks, such as small screen size, limited presentation of graphics, and dependency on networks (Albers and Kim, 2001; Huang *et al.*, 2012). Regardless of such limitations, Thornton and Houser (2005) underscore that mobile devices can, undoubtedly, be effective tools for providing language-learning materials to learners. This view is supported by a number of research studies. For example, Kukulska-Hulme and Shield (2008) offer an important outline of MALL asking

whether and how mobile devices support collaborative practice in speaking and listening. Furthermore, the potential value m-learning has been widely realized (Sharples, 2000; Attewell, 2002; Leung and Chan, 2003). Mobile devices enhance learning experiences by enabling communication, learning on-the-move, and use on an "anytime and anywhere" basis (Hardless *et al.*, 2001; Roschelle, 2003). For example, EFL learners frequently use tablet PCs or mobile phones to find linguistic information. Accordingly, several researchers have begun to explore the potential of mobile devices for language teaching (Malliou *et al.*, 2002; Godwin-Jones, 2004; Tan and Liu, 2004).

Godwin-Jones (2004) indicates how mobile and wireless technologies offer opportunities for language and cultural learning. He developed a wireless system called RAFT that students can use in the field. RAFT helps learners store and recover information regarding their field trips on a mobile device and share it with other learners. Godwin-Jones suggests that it could be used for cultural and language learning by learners who are on a trip abroad, for example, to conduct interviews with native speakers and then share the data. Similarly, the AD-HOC project (Malliou *et al.*, 2002) aims to develop a mobile language learning environment to facilitate self-directed learning. The AD-HOC system acts as a tutor that teaches linguistic and cultural knowledge through the use of multiple media presentations (e.g., text, sound, picture, and video). The language learning environment offers representations of contextualized, authentic, real-life situations for different levels of competency and within different thematic fields (e.g., business travel, young travelers, etc.).

Thornton and Houser (2005) also developed several innovative projects using mobile phones to teach English at a Japanese university. One focused on providing vocabulary instruction by Short Messaging Service (SMS) to explore usability and learning issues. The results indicated that the SMS students learned over twice the number of vocabulary words as the Web students and, further, that they improved their scores by nearly twice as much as students who had received lessons on paper. Students' attitudes were also measured. The vast majority preferred the SMS instruction, wished to continue such lessons, and believed it to be a valuable teaching method.

Kiernan and Aizawa (2004) investigated whether or not mobile phones are useful language learning tools and explored their use in task-based learning. In their study, upper and lower level Japanese university students were placed into three groups: PC email users, mobile phone email users, and mobile phone speaking users. They were given a pre-test, three narrative tasks, three invitation tasks, and a repeated post-test. While all the face-to-face speaking users completed these tasks in the time provided, only two pairs of PC email users and one pair of mobile phone email users completed the tasks. The face-to-face speaking users had significantly faster performances, and the mobile phone email users had the slowest performances; however, the latter were not significantly slower than the PC email users. These differences were attributed to the relative speed of typing versus speaking, and the relative speed of typing on mobile thumb pads versus keyboards.

Additionally, Norbrook and Scott (2003) suggest that portability and immediacy, rather than localization, are the essential motivating factors in mobile language learning. The Speak My Speak project investigates the use of SMS as a communication tool between

adult English language learners and native English tutors. Norbrook and Scott conclude that using SMS in language learning is feasible and promising. Students reflected on texts they sent and received and were active in constructing the content of communication (Markett, 2003). A project conducted in Taiwan developed a mobile-based (PDA) interactive language learning environment for elementary schoolchildren learning English as a second language. The activities aimed to help the students learn listening, reading, and writing skills. For example, a scenario to teach words for body parts provides each word's pronunciation and spelling when the user clicks on the image of the body part. Evaluation showed a positive response from learners and indicated that the use of mobile devices can significantly increase student motivation and interest (Tan and Liu, 2004).

A relatively rare example of learner-led mobile language learning activity is reported by Song and Fox (2008), who tracked advanced learners of English to see how they were using a mobile device to support and extend their learning in self-directed ways, especially to build their knowledge of vocabulary. The initial idea came from the researchers, but the students who volunteered to take part in the study were happy to devote a great deal of time to the project and pursue their own goals. They were highly motivated learners who were willing to define their own language needs and to select resources, tools, and communication methods. The study shows how the mobile device helped them to communicate word meanings with other students and their lecturers outside the classroom. Other studies have analyzed mobile technology applications in language acquisition in general terms (e.g., Rosell-Aguilar, 2007; Fallahkhair *et al.*, 2007; Petersen and Markiewicz, 2008; Cheng *et al.*, 2010). These studies indicate positive attitudes towards mobile technology use and suggest better outcomes in language proficiency.

However, as compared to the studies discussed above, very little attention has been paid to the variables involved in EFL teachers' use of technology for language teaching. This research can have a crucial impact on teachers, when, for example, they are encouraged to design language learning activities adopting mobile devices for mobile learners, as this can facilitate higher language proficiency. In the broader context of how technology use is changing, we need to look at what motivates people to adopt technology in formal and informal learning environments. Nevertheless, there is a lack of empirical studies providing concrete evidence on which variables influence EFL teachers to integrate mobile technology into their teaching contexts.

2.3. *Research Framework: Technology Acceptance Model (TAM)*

Several models have been used to investigate the adoption of technology in various contexts. User acceptance of technology has been an important field of study for over two decades now. Although many models have been proposed to explain and predict the use of a system, Davis's (1989) TAM has captured the most attention in the information systems community (Chuttur, 2009). A number of studies focusing on the adoption of mobile services in general situations have their roots in TAM.

The model is originally designed to predict users' acceptance of information technology and usage in a social context. TAM proposes that when users are presented with new

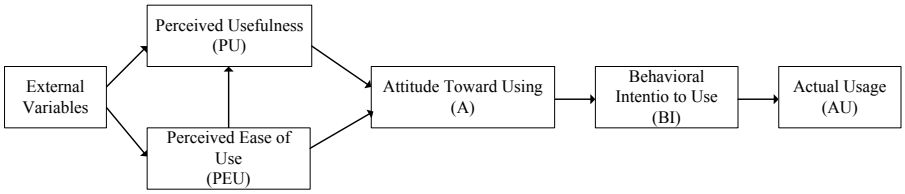

Fig. 1. TAM proposed by Davis (1989).

technology, a number of factors affect their decision about how and when they will use it, particularly the following:

- Perceived usefulness (PU) – The degree to which a person believes that using a particular system will enhance his or her job performance.
- Perceived ease of use (PEU) – The degree to which a person believes that using a particular system will be free from effort.

As an explanation of attitudes and intention to use a specific technology, TAM has become a widely applied model of user acceptance and usage. In some studies, the attitude segment is excluded to make the adoption process simple. A number of meta-analyses on the TAM have demonstrated that it is a valid, robust, and powerful model for predicting user acceptance (Lule *et al.*, 2012). In this study, TAM is used as the research framework to understand EFL teachers' intentions toward and use of m-learning.

3. Research Model and Hypotheses

3.1. *Research Model*

Fig. 2 describes the proposed research model with hypotheses. As shown in Fig. 1, the model introduces the rationale for including several external variables in the analysis of EFL teachers' perception of m-learning's usefulness, which then leads to their intention

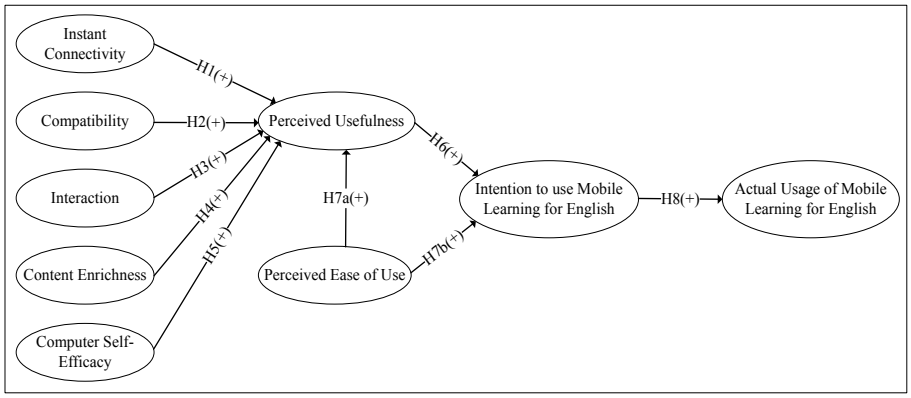

Fig. 2. Research model with hypotheses.

to use and actual use of m-learning. Prior studies have proposed a wide range of research models by using the TAM for a better understanding of users' acceptance of new technologies in various contexts (Pookulangara and Koesler, 2011). However, few researchers have examined the effects of various external variables on EFL teachers' behavioral intention to use m-learning. Thus, this study measures EFL teachers' perception of m-learning's usefulness by considering the following five dimensions: instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy.

3.2. *Hypothesis Development*

The first construct in the research model is instant connectivity, defined as the degree to which m-learning offers EFL teachers uninterrupted, instant connections to the network, thereby enabling them to acquire teaching materials whenever they need (Ku *et al.*, 2009). That is, instant connectivity implies communication and connectivity in English teaching environments at anytime, anywhere. The increasing proliferation of mobile devices and networks has enabled EFL teachers to acquire and connect to teaching materials and instruction unconstrained by time or place. In particular, teaching and instruction via m-learning system are now considered to be an innovative teaching method for various applications and skills (e.g., English dictionaries, games, and English proficiency) for both EFL teachers and learners. Because of m-learning's characteristic of instant connectivity, EFL teachers can increase the usefulness of their teaching. Prior studies identified a significant positive relationship between instant connectivity and perceived usefulness in different contexts of technologies (e.g., Jung, 2009). Thus, to examine whether the relationship is valid in m-learning for EFL teachers, Hypothesis 1 is proposed:

> Hypothesis 1: *Instant connectivity has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Compatibility is the degree to which m-learning is perceived as being consistent with the existing English teaching practices, values, needs, and experiences of EFL teachers (Chau and Hu, 2002). It has been considered to be an important determinant increasing users' perception of usefulness in many contexts of technology adoption. For example, Chau and Hu (2002) and Venkatesh and Davis (2000a) found that compatibility appeared to have a strong and direct influence on perceived usefulness, implying that decisions about usefulness in English teaching are affected by EFL teachers' perception about how well the use of m-learning matches prior compatible experiences and teaching styles. Most previous studies point to a positive association between compatibility and perceived usefulness (e.g., Chau and Hu, 2001; Chen *et al.*, 2003). However, this relationship has not been examined in the context of m-learning from EFL teachers' view. Thus, Hypothesis 2 is proposed:

> Hypothesis 2: *Compatibility has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Prior research dealing with language education in m-learning environments (e.g., Khan and Vega, 1999) has identified interaction in language learning as a crucial fac-

tor affecting the perceived usefulness of m-learning from both learners' and teachers' perspectives. In this study, interaction is defined as a unit of activity conducted by EFL teachers in order to establish a better and useful English learning environment. Kannan *et al.* (2001) claim that m-learning is much more likely to facilitate interaction than other technology-based learning environments because in m-learning, communication between learners and teachers and between learners and the learning materials consists of continuous interaction. EFL teachers can use their own set of teaching materials and service frameworks without the restrictions of certain frames by using mobile devices, thereby increasing their perception of m-learning's usefulness in English teaching. Thus, Hypothesis 3 is proposed:

Hypothesis 3: *Interaction has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Content enrichment implies that EFL teachers are provided various teaching materials and information from the m-learning environment. Because of the unique characteristics of m-learning, including the openness of teaching and learning information from the web, it provides various types of teaching materials. Pollara and Kee (2011) claim that various learning and teaching materials and their availability make technology-enhanced language learning environments such as m-learning environments more useful than other types of environments. In fact, EFL teachers need to use a variety of teaching materials to deliver more efficient and effective English teaching, not simply use one teaching material. Furthermore, such rich teaching contents can be used at any time and anywhere, making m-learning more useful than other English teaching environments. Therefore, Hypothesis 4 is proposed:

Hypothesis 4: *Content enrichment has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Another external variable in the research model is computer self-efficacy, defined as EFL teachers' confidence in their knowledge and skills to successfully teach English using m-learning technology. This confidence has a considerable impact on users' perception of the usefulness of certain technology in a wide range of activities (Bandura, 1995). In addition, Compeau and Higgins (1995) defined computer self-efficacy as the universal belief that users have capabilities to use computer technologies to complete certain tasks. Based on these definitions, this study defines computer self-efficacy as the degree of EFL teachers' confidence in making successful use of m-learning for teaching.

EFL teachers who use m-learning for teaching and instruction can be considered educational innovators; they often have a considerable passion for and in-depth knowledge of new teaching environments that can be used as teaching tools. Therefore, EFL teachers who can better understand new technologies, such as m-learning, are more likely to have a higher perception of the usefulness such technologies. Prior studies on computer self-efficacy in various technology-enabled learning contexts (e.g., Lee and Lee, 2008) have verified that it is positively related to perceived usefulness. However, no studies have examined the impact of computer self-efficacy on EFL teachers' perception of the usefulness of m-learning. Thus, this study provides an empirical analysis of

the effects of EFL teachers' computer self-efficacy on their perception of m-learning's usefulness in the context of English teaching. Hypothesis 5 is proposed:

Hypothesis 5: *Computer self-efficacy has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Two beliefs described in TAM – perceived usefulness and perceived ease of use – have been examined in many contexts in research on the adoption of technology. Many prior studies (e.g., Chuttur, 2009) found that perceived usefulness has a direct significant effect on behavioral intentions. The relationship between perceived usefulness and behavioral intentions is based on the idea that users build intentions to employ in certain behaviors (e.g., technology adoption or use) if they believe that the behavior can improve their learning performance (Davis, 1989). Kim (2008) claims that perceived usefulness has a strong positive influence on an individual behavioral intention. This suggests that EFL teachers may use m-learning to facilitate their teaching and exploit the possibility of attaining better teaching performance through the implementation of m-learning. Thus, this study proposes Hypothesis 6 to examine whether this relationship is valid in EFL teachers' adoption of m-learning.

In addition to perceived usefulness, perceived ease of use has a direct impact on perceived usefulness (Celik and Yilmaz, 2011) because the less the effort that is required for individuals to learn new technology, the more likely they are to view it as useful for enhancing their task performance. Furthermore, prior studies (e.g., Venkatesh, 1999; Cha, 2011) have found both direct and indirect relationships between perceived ease of use and behavioral intentions. However, these valid relationships have not been examined in the context of EFL teachers' adoption of m-learning. Therefore, Hypotheses 7a and 7b are suggested.

Finally, m-learning is a moderately new phenomenon in language education even if mobile technology has been used for many years in different sectors of society. Because m-learning as a new technology in education is dependent on the behavior of EFL teachers, understanding its perceived usefulness and ease of use may be useful for predicting EFL teachers' intentions and actual behaviors toward it. Previous studies have demonstrated the effects of individuals' behavioral intention on the actual usage of a certain technology (e.g., e-commerce, m-commerce, and social networking sites). It would be interesting to know whether this relationship is valid in m-learning contexts as well. Thus, Hypotheses 6 to 8 regarding of the relationships between TAM variables are proposed:

Hypothesis 6: *Perceived usefulness has a positive effect on EFL teachers' intention to implement m-learning.*

Hypothesis 7a: *Perceived ease of use has a positive effect on the perceived usefulness of m-learning for EFL teachers.*

Hypothesis 7b: *Perceived ease of use has a positive effect on EFL teachers' intention to use m-learning.*

Hypothesis 8: *EFL teachers' intention to use m-learning has a positive effect on their actual use.*

4. Research Methodology

4.1. *Development of Measurement Variables*

The measurement items were adopted from previous research. Then, each item was modified to include m-learning as the technology to be evaluated. For example, the items to measure instant connectivity and compatibility were drawn from Ku *et al.* (2009) and Slyke *et al.* (2007); interaction and content enrichment items were adapted from Vlachos and Vrechopoulos (2008) and others; computer self-efficacy items were adapted from Thatcher and Perrewe (2002) and Lee *et al.* (2009). Finally, items to measure the TAM variables were developed by adapting and amalgamating measures from several sources (e.g., David, 1989; Kim, 2008). All items were measured using a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

After the initial development of the measurement items, their face validity was examined by soliciting input from professors in English education fields and academic researchers at several universities. These professionals provided feedback and comments on the length and clarity of each item. Table 1 lists the measurement items with their relevant literatures.

Table 1

Measurement variables

Construct	Item	Wording	Reference
Instant Connectivity	ic1	M-learning service is accessible at any time and place	Ku *et al.* (2009)
	ic2	M-learning service enables me to confirm my teaching for students in real time	
	ic3	M-learning service provides real-time and updated information about English learning I am willing to use	
Compatibility	com1	M-learning is completely compatible with my current teaching environment	Slyke *et al.* (2007)
	com2	I think that using m-learning fits well with the way I like to communicate and teach students	
	com3	M-learning fits into my teaching style	
Interaction	int1	I can interact with other English language learners and materials through m-learning	Chae *et al.* (2002), Koivumaki *et al.* (2008), Vlachos and Vrechopoulos (2008)
	int2	M-learning facilitates simultaneous, real-time communication for both English learning and content providers	
	int3	M-learning facilitates mutual communication between English language learners and content providers	
Content Enrichment	cn1	M-learning offers a good variety of English learning materials	Vlachos and Vrechopoulos (2008)
	cn2	M-learning offers the most updated English learning materials	
	cn3	M-learning offers accurate and relevant English learning materials	

Continued in next page

Construct	Item	Wording	Reference
	I could do my job using m-learning if...		
Computer Self-Efficacy	cse1	There was no one around to tell me what to do	Thatcher and Perrewe (2002), Lee *et al.* (2009)
	cse2	I had never used the system or service like it before	
	cse3	I had used a similar system or service (e.g., e-learning) like this one before	
Perceived Usefulness	pu1	Using m-learning should enable me to accomplish my tasks more quickly	David (1989), Kim *et al.* (2010)
	pu2	Using m-learning should increase my productivity	
	pu3	I find m-learning useful for my English teaching	
	pu4	M-learning should improve my English teaching experience	
	pu5	M-learning should enhance my English teaching experience	
Perceived Ease of Use	peu1	I find it easy to get m-learning to do what I want it to do	Davis (1989), Chau and Hu (2002)
	peu2	I find m-learning easy to use for English teaching	
	peu3	Learning to interact with m-learning is easy for me	
	peu4	My interaction with m-learning is clear and understandable	
Intention to Use M-Learning for English	iu1	I intend to use m-learning for my English class	Davis (1989), Chau and Hu (2002)
	iu2	I intend to use m-learning for my English teaching	
Actual Usage of M-Learning for English	au1	How many times have you used m-learning for English teaching?	Davis (1989), Kim (2008)
	au2	How many hours per week do you spend on m-learning for your English teaching?	
	au3	How frequently do you use m-learning for English teaching?	

4.2. *Data Collection*

To test the research model, data were collected through a survey of EFL teachers in Korea. A total of 199 questionnaires were collected, but 10 were discarded because of missing or inappropriate responses.

The respondents were EFL teachers at middle and high schools. Their average age was 42.4 years (range from 29 to 51 years), and 57.14% were female. The respondents were most likely to use the following mobile devices: tablet PC (42.86%), laptop computer (34.92), and smartphone (20.63%). The participating EFL teachers used m-learning for various learning contents. Among them, reading (35.45%) was the most frequently used learning content, followed by listening (20.63%), English exam (19.05%), writing (16.40%), and speaking (7.41%). In addition, 52.91% reported that they had used m-learning for more than 5 years, and 30.16% and 16.93% for 3 to 5 years and less than 3 years, respectively. Table 2 shows the demographic characteristics of the respondents.

Table 2
Demographic characteristics

Demographic category		Frequency	Percentage
Age	Under 30	12	6.35%
	30–39	79	41.80%
	40–49	83	43.92%
	50+	15	7.94%
Gender	Male	81	42.86%
	Female	108	57.14%
Mobile devices for English education	Smartphone	39	20.63%
	Laptop	66	34.92%
	Tablet PC	81	42.86%
	Other	3	1.59%
Learning contents (Multiple responses)	Speaking	14	7.41%
	Writing	31	16.40%
	Listening	39	20.63%
	Reading	67	35.45%
	Exam	36	19.05%
	Others	2	1.06%
Experience using m-learning for teaching	Less than 3 years	32	16.93%
	3 to 5 years	57	30.16%
	More than 5 years	100	52.91%
Total responses			**100.0%**

5. Results

5.1. *Validation of the Measurement Model*

The validity of the measurement items was assessed using AMOS 7.0. To demonstrate the validity of the measurement items, three validity tests were conducted: overall fit, convergent, and discriminant validity. First, the overall fitness between the characteristic of the measurement items and that of the data was tested to purify the measurement model. The overall fit was decided by commonly used indices: the normed fit index (NFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), relative χ^2 (χ^2/ df), and root mean square of approximation (RMSEA). The threshold for each index is as follows: NFI, GFI, and CFI should be greater than 0.9, AGFI should be greater than 0.8, and RMSEA should be less than 0.05 (Bentler, 1990). In addition, the value of χ^2/ df should range from less than 3 to 5 (Goodhue, 1995).

The initial results of the overall fit test with all measurement items (29 items) indicated a poor fit to the data (n = 189). Two indices, GFI (0.84) and AGFI (0.76), were below the acceptable levels. Thus, the measurement items were modified based on the results of the modification indices (MI). MI indicated that two items, pu1 and peu 3,

had a cross-loading issue. This misspecification implies that pu1 and peu3 measured not only the constructs that they were designed to measure, but also other constructs, for example, interaction and content enrichment. Thus, the overall fit was reevaluated after pu1 and peu3 were excluded.

After the two items were deleted, the revised measurement model was reevaluated. The results for Model 2 indicate a good fit (NFI: 0.93; GFI: 0.91; AGFI: 0.88; CFI: 0.97; RMSEA: 0.032). Finally, χ^2/ df was 1.92, which was less than the recommended value of 3.0, indicating that the characteristic of the data well explained the characteristic of the measurement items. Table 3 shows the results.

Then, convergent validity was assessed using individual items loading and reliability. To demonstrate convergent validity, individual items should have loadings exceeding 0.7 in terms of their expected constructors (Chin, 1998). The results of individual item loading indicated that the value of all loadings exceeded the threshold, implying that the survey items were sufficient for measuring each construct individually. Furthermore, Cronbach's alpha was used to test reliability. According to Teo *et al.* (1999), Cronbach's alpha should exceed 0.7 for sufficient construct reliability. The results indicated that Cronbach's alpha ranged from 0.79 to 0.96, exceeding this threshold. Table 4 presents the results for item validity and reliability.

Finally, discriminant validity was assessed using the average variance extracted (AVE). Discriminant validity tests whether there is a lack of a relationship between measurement items that theoretically should not be related. To demonstrate, the square root of each construct's AVE should exceed its correlation with any other construct (Fornell and Lacker, 1981). As shown in Table 5, the correlation for each construct in the horizontal and vertical columns did not exceed the square root of its AVE (the bolded value in the diagonal), demonstrating sufficient discriminant validity.

5.2. *Structural Model Assessment*

Structural equation modeling (SEM) using AMOS 7.0 was used to test the proposed hypotheses. SEM produces two pieces of crucial information – the estimate of standardized path coefficients (β) and the squared multiple correlations (R^2) for each endogenous construct. Both are an indication of how well the structural model can predict hypothesized relationships. The standard path coefficients suggest the strength of the causal relationship between two constructs, whereas R^2 measures the percentage of the variance explained in the endogenous variable by the exogenous variable in the model (Wixom and Watson, 2001).

As shown in Fig. 2, the results support all the hypotheses. The five external variables, instant connectivity (H1), compatibility (H2), interaction (H3), content enrichment (H4), and computer self-efficacy (H5) had significant positive effects on perceived usefulness. In addition, the relationship between TAM variables had significant positive effects in m-learning content. First, instant connectivity had a significant positive effect on perceived usefulness ($\beta = 0.37$, $p < 0.01$), indicating support for H1. Second, compatibility had a significant positive effect on perceived usefulness. The path coefficient between these two constructs was 0.25 at $p < 0.05$, providing support for H2.

Table 3
Summary of fit indices for the measurement model

Model	NFI	GFI	AGFI	CFI	χ^2/df	RMSEA
Initial model	0.90	0.84	0.76	0.95	1.73	0.049
Revised model	0.93	0.91	0.88	0.97	1.92	0.032
Recommended value	≥0.9	≥0.9	≥0.8	≥0.9	≤3.0	≤0.05

Table 4
Results for construct validity and reliability

Construct	Item	Mean	SD	Factor Loading	Cronbach's Alpha
Instant Connectivity	ic1	5.57	0.52	0.76	0.84
	ic2	4.85	0.54	0.91	
	ic3	4.91	0.65	0.81	
Compatibility	com1	5.34	0.71	0.87	0.79
	com2	5.68	0.53	0.81	
	com3	4.92	0.51	0.75	
Interaction	int1	5.00	0.68	0.88	0.82
	int2	5.14	0.57	0.91	
	int3	5.15	0.61	0.81	
Content Enrichment	cn1	5.44	0.52	0.81	0.86
	cn2	6.08	0.76	0.80	
	cn3	6.00	0.54	0.89	
Computer Self-Efficacy	cse1	5.37	0.51	0.89	0.89
	cse2	5.91	0.66	0.91	
	cse3	6.23	0.48	0.81	
Perceived Usefulness	pu2	5.37	0.62	0.95	0.92
	pu3	6.21	0.79	0.81	
	pu4	6.43	0.62	0.94	
	pu5	6.20	0.71	0.89	
Perceived Ease of Use	peu1	5.86	0.36	0.80	0.93
	peu2	6.11	0.57	0.85	
	peu4	6.25	0.85	0.81	
Intention to Use M-Learning for English	iu1	6.08	0.53	0.91	0.96
	iu2	5.50	0.81	0.90	
Actual Usage of M-Learning for English	au1	6.06	0.57	0.87	0.91
	au2	6.43	0.64	0.92	
	au3	6.54	0.45	0.94	

Note: pu1 and peu3 were excluded after the fit of the measurement model was tested.
SD = standard deviation.

Table 5
Discriminant validity

Latent variable	IC	COM	INT	CE	CSE	PU	PEU	IU	AU
1. Instant Connectivity	**0.83**								
2. Compatibility	0.42	**0.81**							
3. Interaction	0.36	0.27	**0.87**						
4. Content Enrichment	0.21	0.25	0.23	**0.84**					
5. Computer Self-Efficacy	0.35	0.30	0.28	0.27	**0.87**				
6. Perceived Usefulness	0.26	0.21	0.24	0.38	0.36	**0.90**			
7. Perceived Ease of Use	0.45	0.34	0.28	0.39	0.48	0.30	**0.82**		
8. Intention to Use M-Learning for English	0.24	0.33	0.27	0.40	0.32	0.23	0.48	**0.91**	
9. Actual Usage of M-Learning for English	0.38	0.34	0.24	0.27	0.26	0.28	0.19	0.34	**0.91**

Note: The square root of the AVE is indicated along the diagonal in bold type.

Third, interaction and content enrichment had significant positive effects on the perceived usefulness of m-learning English for teachers. The standardized path coefficients between these two constructs and perceived usefulness were 0.42 ($p < 0.01$) and 0.36 ($p < 0.01$), respectively, providing support for H3 and H4. Finally, computer self-efficacy had a significant positive effect on perceived usefulness ($\beta = 0.47$, $p = 10.43$), providing support for H5. This finding suggests that English teachers who implement m-learning perceive it as useful due to the five abovementioned unique characteristics of the m-learning environment. Among the five external variables, computer self-efficacy had the largest impact on the perceived usefulness of m-learning from English teachers' perspective.

The analysis also shows that perceived usefulness had a significant positive effect on intention to use m-learning for English ($\beta = 0.43$, t-value 6.80, at $p < 0.01$). Further, perceived ease of use had a significant positive effect on perceived usefulness and intention to use m-learning for English [$\beta = 0.45$, $p < 0.01$, $\beta = 0.39$, $p < 0.01$], respectively. These results provide support for H6, H7a, and H7b, respectively. Finally, intention to use m-learning for English had a significant positive effect on the actual usage of m-learning for English ($\beta = 0.41$, $p < 0.01$), providing support for H8. This result is consistent with the findings of previous studies examining individual behavioral of technology acceptance in various contexts (e.g., Kim, 2008); it suggests that the acceptance of m-learning for English is based on its perceived usefulness and ease of use.

Regarding R^2, all five constructs and perceived ease of use explained about 49.7% of the variance in perceived usefulness. In addition, perceived usefulness and perceived ease of use explained approximately 36.0% of the variance in intention to use m-learning for English. Finally, the construct (intention to use m-learning for English) explained approximately 17.0% of the variance in the actual usage of m-learning for English. Fig. 3 shows the result of the structural model, and Table 6 summarizes the results of the tested hypotheses.

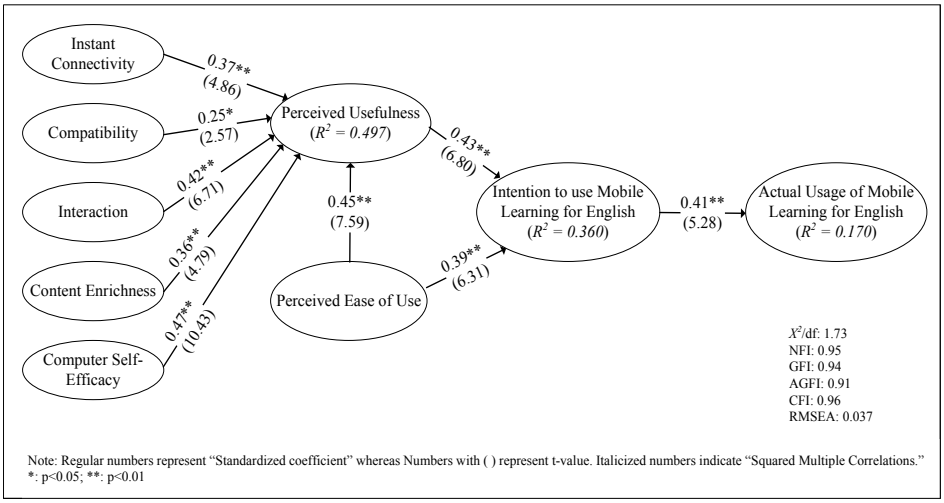

Fig. 3. The Structural Model.

Table 6

Summary of hypotheses test

Hypothesis	Path	Path Coefficient	T-value	Result
H1	Instant Connectivity → Perceived Usefulness	0.37**	4.86	Support
H2	Compatibility → Perceived Usefulness	0.25*	2.57	Support
H3	Interaction → Perceived Usefulness	0.42**	6.71	Support
H4	Content Enrichment → Perceived Usefulness	0.36**	4.79	Support
H5	Computer Self-Efficacy → Perceived Usefulness	0.47**	10.43	Support
H6	Perceived Usefulness → Intention to Use M-Learning for English	0.43**	6.80	Support
H7a	Perceived Ease of Use → Perceived Usefulness	0.45**	7.59	Support
H7b	Perceived Ease of Use → Intention to Use M-Learning for English	0.39**	6.31	Support
H8	Intention to Use M-Learning for English → Actual Usage of M-Learning for English	0.41**	5.28	Support

Note: *: p<0.05, **: p<0.01

6. Conclusions and Discussion

6.1. *Summary of Key Findings*

With the development of information communication technology and wireless technology, m-learning has become a useful tool for many sectors of education, including English education. However, the previous studies on m-learning have focused on descriptive and technical aspects of this new learning environment (e.g., Godwin-Jones, 2004).

Furthermore, learners (students) have been a main focus in m-learning literature. Thus, this study examined EFL teachers' behaviors that explain their reasons for choosing to implement m-learning in their English teaching. This study examined the relationship between five constructs, instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy, and actual usage of m-learning for English through an analysis of its perceived usefulness and perceived ease of use. A total of 189 EFL teachers participated in the study, which used SEM to test the hypotheses.

The empirical findings provide support for all hypotheses. For example, instant connectivity had a significant positive effect on perceived usefulness ($\beta = 0.37$, $p < 0.01$), implying that EFL teachers perceive m-learning as useful because it provides "anytime-and-anywhere" connectivity to teaching resources. Also, compatibility ($\beta = 0.25$, $p < 0.05$) and interaction ($\beta = 0.42$, $p < 0.01$) had significant positive effects on the perceived usefulness of m-learning. These results imply that m-learning not only is compatible with EFL teachers' teaching environment, but also fits well with their teaching style. In addition, EFL teachers find m-learning useful because it facilitates not only simultaneous, real-time communication for both English learning and content providers, but also mutual communication between learners and content providers.

The other two constructs, content enrichment ($\beta = 0.36$, $p < 0.01$) and computer self-efficacy ($\beta = 0.47$, $p < 0.01$), had significant positive effects on the perceived usefulness of m-learning. These results are consistent with those of prior studies (e.g., Pollara and Kee, 2011) implying that EFL teachers want to use various, the most updated, accurate, and relevant learning materials to help improve learners' English ability. In this regard, m-learning is useful because it provides EFL teachers with a wireless networked learning environment, which increases the possibility of obtaining valuable learning materials. Furthermore, EFL teachers who feel comfortable with m-learning technology tend to believe it is more useful simply because they have no difficulty using it. Among the five external variables, computer self-efficacy had the most significant impact on perceived usefulness.

Hypotheses 6, 7a, 7b, and 8 assessed the relationship between TAM variables. Perceived usefulness ($\beta = 0.43$, $p < 0.01$) and perceived ease of use ($\beta = 0.39$, $p < 0.01$) had significant positive effects on the intention to use m-learning, implying the more m-learning is useful and easy to use, the higher EFL teachers' intention to use it. Furthermore, its perceived ease of use had a significant positive impact on its perceived usefulness ($\beta = 0.45$, $p < 0.01$). Finally, intentions to use m-learning ($\beta = 0.41$, $p < 0.01$) had a significant positive effect on actual usage. The support of the proposed hypotheses and the strength of the research model suggest that EFL teachers who have a higher intention to use m-learning and who consider m-learning useful and easy to use are more likely to use it. This result is consistent with the findings of previous studies (Davis *et al.,* 1989; Hsu and Lu, 2004).

6.2. *Contributions and Implications*

Understanding EFL teachers' behaviors regarding new technologies in education is an important topic. However, prior studies have focused on the adoption of m-learning

from learners' perspectives. To fill the gap in the research, this study provides an empirical analysis to help explain important variables of EFL teachers who are most likely to engage in m-learning and presents a framework for future research on EFL teachers' adoption of technology. Moreover, given that m-learning is one of the fastest-growing technology-enhanced educational settings that has become an important model for many educators, this study provides valuable insights into the relationship between EFL teachers as well as developers for education systems, serving as valuable guidelines for other educators who are interested in building effective m-learning strategies. Thus, this study provides both academic and practical implications.

A distinctive contribution to the literature on information systems adoption is that this study extends previous research by investigating EFL teachers' acceptance of m-learning with relevant external variables, instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy. In other words, it focuses on the relationship between five validated external variables and perceived usefulness as it pertains to EFL teachers' intentions toward and actual usage of m-learning. Thus, this study contributes to the understanding of some of the key variables predicting ELF teachers' perception of m-learning's usefulness. In addition, the results provide support for the fundamental presumption of TAM and EFL teachers' behavior toward m-learning, proving the validity of TAM as a proper research framework for understanding m-learning users' intentions and actual usage of this relatively new form of technology-enhanced learning.

While learners' e-learning behaviors in language education have been a major focus of research for many years, this study attempts to provide empirical evidence of m-learning adoption from EFL teachers' perspectives rather than those of learners. Finally, this study validates the measures of each variable in the context of EFL teachers' adoption of m-learning. Although this study adopted validated measurement items from previous studies, it modified them to be more appropriate for EFL teachers' perceptions in the m-learning adoption context. Thus, the measurement items in this study can be utilized for future research on EFL teacher's attitudes and behaviors related to m-learning.

In terms of practical implications, the results provide an opportunity for better understanding of the increasing factors involved in EFL teachers' perception of m-learning's usefulness to m-learning businesses, managements, designers, and developers. In other words, businesses that are strategic in their m-learning development should acknowledge that five variables – instant connectivity, compatibility, interaction, content enrichment, and computer self-efficacy – can contribute to their success. Thus, this study can help practitioners evaluate their m-learning development decisions based on the emphasis they place on the different factors influencing the acceptance and behavioral intentions of EFL teachers.

Furthermore, the results suggest that two belief variables – perceived usefulness and perceived ease of use – can explain EFL teachers' m-learning behavior. EFL teachers who have adopted m-learning are likely to have a good understanding of its use through their experience with online or mobile technology. They are likely to perceive that usefulness and ease of use are crucial attributes of any m-learning in language education.

Therefore, m-learning businesses should inform EFL teachers of the usefulness and convenience of their m-learning systems. If an m-learning firm builds and provides instant connectivity to m-learning systems with interactive and various learning materials to EFL teachers, then it may have a better chance of achieving the usefulness of the system. If an m-learning firm provides loyal users with timely and relevant learning materials on important topics through an m-learning system, then it can attract more EFL teachers.

6.3. *Limitations and Future Research*

This study has several limitations that must be noted. First, it was conducted at one point in time and could be strengthened using a longitudinal method to better understand the relationships among variables. Furthermore, the proposed research model included only five unique variables from the literature. Thus, future research might explore new variables to better predict EFL teachers' intention and actual usage of m-learning. This research is further limited by the population of study, resulting in a generalizability issue. In future research, generalizability can be increased by expanding the study to include individuals who represent different countries and cultures. Such a study could help academicians uncover country and culture-specific relationships that were not exposed with this initial study. Finally, this study did not quantify how often or how frequently the respondents made use of m-learning for their language instruction. Therefore, future research should attempt to determine how often users participate in s-commerce and to what extent it drives their purchasing decisions.

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Anglų kalbos mokymo aplinkos skatinimas: faktoriai, lemiantys, kaip mokytojai, kurie moko anglų kaip užsienio kalbos, priima mobilųjį mokymą

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Anglų kalbos mokyme gerokai padidėjo mobiliųjų technologijų vaidmuo. Tačiau tyrimai, nagrinėjantys anglų kaip užsienio kalbos mokytojų požiūrį ir elgesį, susijusį su mobiliosiomis technologijomis, buvo apriboti technologijų aprašymo aspektu, todėl kyla nesutarimų dėl anglų kaip užsienio kalbos mokytojų poreikių. Daugelis ankstesnių tyrimų nagrinėjo įvairius elektroninio ir mobilaus mokymo technologinės plėtros anglų kalbos mokyme aspektus iš besimokančiojo perspektyvos. Šis mokslinis tyrimas siūlo modelį, kuris empiriškai analizuoja anglų kaip užsienio kalbos mokytojų mobiliojo mokymo priėmimo elgesį naudojantis Fredo Daviso technologijų priėmimo modeliu. Šis mokslinis modelis kaip išorinius kintamuosius, veikiančius technologijų priėmimo modelio naudingumo suvokimą, apima tiesioginį ryšį, suderinamumą, sąveiką, turinio pagerinimą ir paties kompiuterio veiksmingumą. Buvo panaudoti 189 mokytojų, kurie moko anglų kaip užsienio kalbos, duomenys ir pritaikytas struktūrinis lygčių modeliavimas siekiant išanalizuoti priežastinius ryšius tarp išorinių ir technologijų priėmimo modelio kintamųjų. Gauti rezultatai gali turėti įtakos naujai tyrimų krypčiai mobiliojo mokymo srityje.