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An Investigation of the Influence of Intrinsic Motivation on Students' Intention to Use Mobile Devices in Language Learning

Yanyan Sun
East China Normal University

Fei Gao
Bowling Green State University, gaof@bgsu.edu

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Abstract

This study examines the relationships among intrinsic motivation, critical variables related to technology adoption, and students' behavioral intention in Mobile-assisted language learning (MALL). To test the hypothesized model through a path analysis, 169 survey responses were collected from undergraduate students who were foreign language learners of English in a Chinese research university. The results indicated that although intrinsic motivation did not have a direct influence on students' behavioral intention in MALL, it had a positive influence on students' behavioral intention through the two intervening variables, perceived usefulness and task technology fit. Perceived ease of use, however, was not associated with students' behavioral intention directly, nor was it predicted by intrinsic motivation. The findings suggested proper instructional design that is aligned with and supports the language learning task was important to increase students' behavioral intention to adopt mobile devices for language learning.

Introduction

The rapid development of mobile technologies enables new ways of learning by providing flexible access to various learning resources and fostering communication regardless of time or space (Cheon et al., 2012; Kukulska-Hulme, 2009). Mobile devices not only emerge as facilitating tools in formal education but also are used to support self-directed learning in informal settings (Chen & Kessler, 2013). In second/foreign language education, research on mobile assisted language learning (MALL) has been receiving increasing attention (Vavoula & Sharples, 2008). Mobile technologies have been used to deliver formal classroom-based or computer-based language learning contents (e.g. Abdous, Camarena & Facer, 2009; Abdous, Facer & Yen, 2012; Jolliet, 2007) as well as to support new ways of language learning such as collaborative projects (e.g. Murphy, Bollen & Langdon, 2012; Kim, Kim & Seo,

2013) and cross-cultural communication (e.g. Comas-Quinn, Mardomingo & Valentine, 2009; Shao, 2011).

In MALL, motivation is an important factor. A strong positive association between motivation and students' performance has been supported by a large body of research (e.g. Biggs, 2014; Pintrich, 2004; Wolters, 1998). In second/foreign language acquisition, motivation drives students to learn and be persistent in the learning process (Dörnyei, 1998; Oroujlou & Vahedi, 2011). In technology-rich language learning environments, motivation has a positive association with students' learning behavior. Ushida (2005) found that, in online language courses, motivated students tended to practice their language skills more often and in a more productive way. In addition, Liu and Chu (2010) reported a positive relationship between students' test scores and their motivation when using a mobile game in an English listening and speaking course.

Given the importance of motivation in language learning, it is considered as an important variable that measures the effects of learning via mobile technologies. For example, Yamada et al. (2011) used smart phones to deliver instructional video clips to improve business English learners' listening proficiency; Lin, Kajita and Mase (2007) designed a mobile story-based system for Japanese kanji characters learning; Lan, Sung and Chang (2007) developed a mobile-device-supported peer-assisted learning system for collaborative English reading.

While the importance of motivation in technology-assisted language learning is

well-recognized, in most studies, motivation was examined to determine the effectiveness of MALL or the relationship between motivation and students' performance such as tests scores. Whether motivation affects the adoption of mobile technologies in language learning, however, still remains unexplored. In addition, though previous literature consistently identified the positive correlation between motivation and student learning in technology-supported environments, the mechanism of how motivation exerted such influence is rarely understood.

The goal of this study is to understand both whether and how a specific type of motivation –intrinsic motivation could influence students' intention to adopt MALL. To explore their relationships and mechanism, the MALL process is considered as a specific type of educational technology adoption in this study. We adopted two widely accepted technology adoption frameworks, technology acceptance model (TAM) (Davis, 1989) and task technology fit (TTF) model (Goodhue & Thompson, 1995). Intrinsic motivation was identified as an antecedents of the TAM (e.g. Lin & Huang, 2008; Abdullah & Ward, 2016) and an important construct that influences the antecedent of the TTF model (e.g. Dishaw & Bandy, 2002; Lin & Huang, 2008). Based on the results of previous studies, we proposed a theoretical model to understand the specific role of intrinsic motivation in MALL and tested its validation via survey results. The findings may provide insights on the instructional design of language learning activities facilitated by mobile technologies.

Literature review and hypothesis development

Behavioral intention is defined as an indicator of "how hard people are willing to try" and "how much of an effort they are planning to exert" (Ajzen, 1991, p. 181) on a certain behavior. It reflects people's willingness and motivation to perform the behavior, and a positive relationship is confirmed between an individual's intention and his/her actual behavior (Venkatesh & Davis, 2000; Venkatesh, Morris & Ackerman, 2000). In the study, we examined students' intention but not their actual behavior because not all students had experience in adopting MALL. According to Ajzen (2002), behavioral intention is a proximal predictor of actual behavior.

In the research model, three possible intervening variables between intrinsic motivation and behavioral intention in MALL were conceptualized from two well-accepted models of technology adoption, the technology acceptance model (TAM) and the task technology fit (TTF) model. The three variables are perceived usefulness, perceived ease of use, and task technology fit.

Intrinsic motivation

Intrinsic and extrinsic motivations are two main classes of motivations (Vallerand, 1997). According to Ryan and Deci (2000), intrinsic motivation refers to "the doing of an activity for its inherent satisfactions rather than for some separable consequence" (p. 56), while extrinsic motivation is defined as "construct that pertains whenever an activity that is done in order to attain some separable outcome" (p. 60). The measurements of intrinsic motivation concern learners' free choice (self-determined learning), their perceived interests and enjoyment in learning, and intrinsic

motivation can be maintained or enhanced by both perceived competence and learning autonomy (Ryan & Deci, 2000). Although not always associated with learning achievements, intrinsic motivation is a positive force to influence self-regulated learning (Van et al., 2012; Winne, 1995) and lower the stress in learning (Baker, 2004). Extrinsic motivation, in contrast, relates more with external regulation, introjection, identification, and integration (Ryan & Deci, 2000), and had no association with self-regulated learning (Baker, 2004). In the present study, we intended to explore students' intention to voluntarily adopt mobile technologies for foreign language learning in an autonomous, self-determined learning environment. As a result, intrinsic motivation on language learning was chosen as a possible factor that may influence learners' behavioral intention.

In addition to the differences between intrinsic motivation and extrinsic motivation, when it came to technology adoption for language learning, Stockwell (2013) argued that two distinctive types of motivation may affect the engagement of learners: one is the inherent interest in the technology that drives learners to explore its possible benefits in language learning; and another is the motivation to learn a language, which leads learners to adopt a technology to facilitate language learning (Ushioda, 2013). The first type of motivation focuses more on the technology aspect of motivation while the second type refers to the motivation on language learning. Given that the focus of this study is language learning in mobile-supported environments rather than the technology itself, we chose to focus on the second type

of motivation. That is, we attempted to understand how learners' intrinsic motivation on foreign language learning influences their intention of mobile technology adoption.

Perceived usefulness and perceived ease of use

Perceived usefulness and perceived ease of use are two constructs derived from the technology acceptance model (TAM). Davis (1989) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). The TAM indicated causal relationships between perceived ease of use/perceived usefulness and behavioral intention (Davis, 1989; Adams, Nelson & Todd, 1992).

Perceived usefulness and perceived ease of use have been identified as predictors for technology adoption in different contexts, and their effects varied (Cheon et al., 2012; Lai, Wang & Lei, 2012). Cheon et al. (2012) found both perceived usefulness and perceived ease of use positively influenced students' attitudes, which predicted college students' intentions to adopt mobile learning. Lai et al. (2012) reported perceived usefulness as a direct predictor of students' technology adoption in learning, although the effect was marginal. Park, Nam and Cha (2012) found that perceived usefulness directly affected students' mobile learning attitudes, which was a direct predictor of students' behavioral intention in mobile learning. However, perceived ease of use could not predict students' attitudes nor students' behavioral intention in

mobile learning. The possible reason for the different effects of these two variables in technology adoption may result from students' habits of using technology in learning (Park, Nam & Cha, 2012).

Davis, Bagozzi and Warshaw (1992) argued that both perceived usefulness and perceived ease of use were extrinsic motivational factors that related to the utility value of a system, and factors from intrinsic motivational perspectives should be incorporated in the TAM. Many studies extended the TAM by including intrinsic motivational factors as antecedent to predict perceived usefulness and perceived ease of use. Perceived enjoyment (Ryan & Deci, 2000) was one of the most commonly used factors. Previous research showed that intrinsic motivation had significant impacts on both perceived usefulness and perceived ease of use (Abdullah, & Ward, 2016) in various e-learning environments such as college web-based instruction system (Chen et al., 2013), students' adoption of information and communication technology in learning (Zare & Yazdanparast, 2013), and e-learning system (Al-Aulamie et al., 2012).

In this study, we included both perceived usefulness and perceived ease of use as variables that may be affected by intrinsic motivation and as potential significant predictors for students' behavioral intention in adopting MALL.

Task technology fit

The model of Task Technology Fit (TTF) is defined as "the degree to which a technology assists an individual in performing his or her portfolio of task" (Goodhue

& Thompson, 1995, p. 216). It intends to explain how technology adoption is influenced by both the nature of the task and the technology (Wu, Yen & Marek, 2011). The TTF provides an alternative explanation of users' intention in technology utilization to TAM by emphasizing the effects of the task characteristics. According to the TTF model, the more supportive a technology is to users' specific tasks, the higher the perceived task technology fit, and the higher the technology utilization. (Goodhue, Klein, & March, 2000; Lee & Lehto, 2013).

Several empirical studies tried to explain users' choices in technology adoption using both the TTF and the TAMs. Dishaw and Strong (1999) combined variables in the two models and found that extending TAM with TTF constructs provided a better prediction of the technology utilization than using either model alone. Researchers integrated core constructs in the TTF model to the TAM to explain users' behavior in various activities such as consumer e-commerce (Klopping & McKinney, 2004), online-auction task (Chang, 2008), and YouTube for procedural learning (Lee & Lehto, 2013).

Similar to perceived useful and perceived ease of use, task technology fit was also considered as an extrinsic motivational factor in technology adoption because it related closely to external goals (Kim et al., 2010; Kim et al., 2013). Although the relationship between intrinsic motivation and task technology fit has not been directly studied, self-efficacy, a positive predictor of intrinsic motivation (Bandura, 1986; Bandura, 1997), was considered as an antecedent in the TTF model (e.g. Dishaw &

Bandy, 2002; Lin & Huang, 2008). In this case, we included the core element of TTF in our research model and assumed that it had influence on students' behavioral intention in adopting mobile devices for language learning as well as acting as an intervening variable between intrinsic motivation and students' behavioral intention.

Research model and hypotheses

Based on the literature, the researchers proposed a theoretical path model to illustrate the predictable relationships among intrinsic motivation, perceived usefulness, task technology fit, perceived ease of use, and students' behavioral intentions to adopt MALL (Figure 1). In this model, MALL refers to students using mobile devices for English learning. It can take a variety of forms, including using translation apps, reading online English articles, listening to English podcasts, or playing English learning games. The single-directional arrows indicated hypothesized causal effects between the two variables. For example, the single-directional arrow from motivation to behavioral intention indicated motivation was expected to affect behavioral intention. E1to e4 in the circles are endogenous variables that account for the measurement errors of the model. The hypotheses illustrated by the figure are:

Hypothesis 1. Intrinsic motivation positively influences students' behavioral intention to adopt MALL.

Hypothesis 2. Intrinsic motivation positively influences students' perceived usefulness (of mobile devices) and the perceived usefulness is positively associated with their intention to adopt MALL.

Hypothesis 3. Intrinsic motivation positively influences students' task technology fit and the task technology fit is positively associated with their intention to adopt MALL.

Hypothesis 4. Intrinsic motivation positively influences students' perceived ease of use (of mobile devices) and the perceived ease of use is positively associated with their intention to adopt MALL.

Hypothesis 5. Task technology fit positively influences students' perceived usefulness and perceived ease of use (of mobile device).

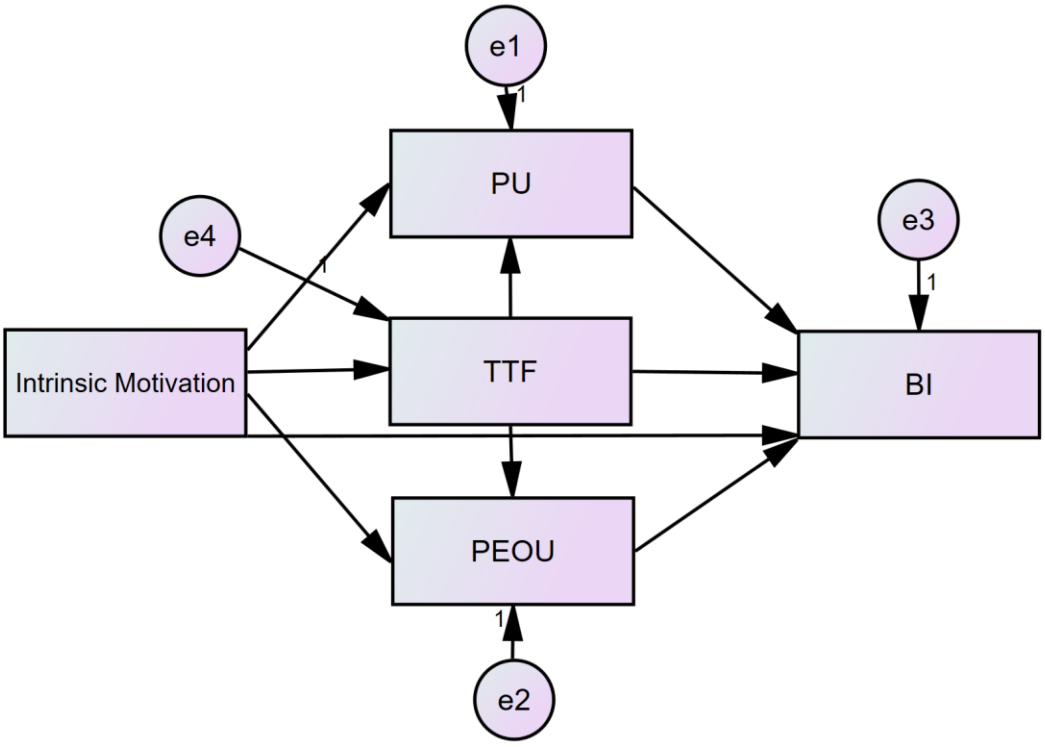

Figure 1. Path Diagram for the initial model.

Note: PU = Perceived usefulness; TTF = Task technology fit; PEOU = Perceived ease of use; BI = Behavioral Intention

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Method

Sample

Participants in the study were 169 undergraduate students majoring in education in a large, comprehensive research university in east China. In China, English is a required foreign language course for undergraduate students in all universities. Non-English majors need to pass the National College English Test to graduate. As a result, all undergraduate students are foreigner language learners of English who take English courses on a regular basis.

The study used the convenience sampling method to collect data. Surveys in hard copies were distributed to all undergraduate students majoring in educational technology, early childhood education and teacher education, and they responded on a voluntary basis. The survey consisted of three parts. The first part contains questions on the time participants spent using mobile devices for different types of tasks. The second part contains items measuring the constructs included in the research model (see the Appendix). Finally, demographic information was collected at the end of the survey. To avoid misunderstanding of survey questions due to participants' varied language proficiency levels, the survey was translated into students' first language, Mandarin, prior to the distribution. In total, 205 surveys were distributed and 179 responses were collected. Ten were removed from the data because of missing responses.

In the 169 valid responses, 20.71 % (N = 35) of the participants were male and

79.29% (N = 134) were female. The age of the participants ranged from 17 to 23. All participants owned smart phones (iPhone, Android phone or Windows phone), and 70 (41.42%) of them had tablets (iPad, Android pad or Surface).

Table 1 presents students' self-reported daily time spent on different activities via mobile devices. The survey results indicated that most students spent some time on activities via mobile devices on a daily basis, though there was a small number of students who did not use mobile devices as often. The most popular activity was social networks. All students spent time on social networks via their mobile devices every day and 98.8% (N = 167) of them spent between 11-30 mins to more than three hours.

Table 1

Students' daily time spent on different activities via mobile devices (N = 169)

	Reading news N (%)	Checking emails N (%)	Playing music N (%)	Playing games N (%)	Watching movies N (%)	Shopping N (%)	Social Networks N (%)
No use	12 (7.1%)	10 (5.9%)	2 (1.2%)	56 (33.1%)	9 (5.3%)	2 (1.2%)	0 (0%)
Rare use	32 (18.9%)	72 (42.6%)	9 (5.3%)	40 (23.7%)	46 (27.2%)	26 (15.4%)	1 (0.6%)
5-10mins	38 (22.5%)	60 (35.5%)	19 (11.2%)	12 (7.1%)	5 (3.0%)	40 (23.7%)	1 (0.6%)
11-30 mins	49 (29%)	24 (14.2%)	53 (31.4%)	20 (11.8%)	23 (13.6%)	44 (26.0%)	24 (14.2%)
31-60 mins	29 (17.2%)	2 (1.2%)	41 (24.3%)	20 (11.8%)	43 (25.4%)	34 (20.1%)	36 (21.3%)
1-2 hours	4 (2.4%)	0 (0%)	25 (14.8%)	10 (5.9%)	34 (20.1%)	19 (11.2%)	55 (32.5%)
2-3 hours	4 (2.4%)	1 (0.6%)	9 (5.3%)	6 (3.6%)	5 (3.0%)	2 (1.2%)	17 (10.1%)
More than 3	1	0	11	5	4	2	35

hours	(0.6%)	(0%)	(6.5%)	(3.0%)	(2.4%)	(1.2%)	(20.7%)

Measures

The survey instrument contained 7 points Likert-scale items asking students to rate statements on intrinsic motivation, perceived usefulness, task technology fit, and perceived ease of use, and their behavioral intentions to use mobile devices to learn English as a foreign language (7 = Strongly agree, 6 = Agree, 5 = Somewhat Agree, 4 = Neutral, 3 = Somewhat disagree, 2 = Disagree, 1 = Strongly disagree). The 7 points Likert-scale was selected because it can provide the same answer quality (Dawes, 2008) but a better data distribution (Finstad, 2010) than the 5 points Likert-scale. The measurements of perceived usefulness (5 items), task technology fit (4 items), perceived ease of use (4 items), and behavioral intention (2 items) were adapted from previous studies (Davis, 1989; Goodhue & Thompson, 1995). Intrinsic motivation was measured by 11 items adapted from the Intrinsic Motivation Inventory (IMI). The IMI was originally developed by Ryan (1982). McAuley, Duncan and Tammen (1989) improved the original survey and confirmed its reliability and validity. The survey design was consistent with Ryan and Deci's (2000) definition of intrinsic motivation. Based on this definition, we selected three subscales from McAuley, Duncan and Tammen's (1989) IMI survey to measure participants' intrinsic motivation, which are interests/enjoyment, efforts and importance, and perceived competence.

Analysis

The study conducted the basic descriptive statistical analysis and the path

analysis using IBM SPSS Statistics 23 and AMOS 23. The descriptive statistical analysis included calculating means, standard deviations, and the reliabilities of the survey items using Cronbach's Alpha. Path analysis, a form of multiple regression that can determine whether a multivariate set of observable variables fit a hypothesized model, was conducted to examine the causal relationships among the variables in the initial model (Kline, 2005).

Results

Table 2 shows the descriptive analysis of variables based on a 7-point of Likert scale. Overall, the results indicated that students' average ratings were positive on intrinsic motivation (M = 4.43, SD = 1.02), perceived usefulness (M = 5.04, SD = 0.91), task technology fit (M = 5.04, SD = 0.97), perceived ease of use (M = 5.35, SD = 0.86), and behavioral intention (M = 5.70, SD = 0.98). Reliability of survey items was calculated. All variables had a Cronbach's alpha value greater than .80, which indicated excellent (intrinsic motivation = 0.92, perceived usefulness = 0.91, task technology fit = 0.92) or good (perceived ease of use = 0.88, behavioral intention = 0.86) internal consistency (Nunnaly, 1978).

Table 2
Means, standard deviations, Cronbach's alphas, and correlations among variables.

Variables	M	SD	Reliability (# of items)	1	2	3	4	5
				Correlations (p)				
1. Intrinsic motivation	4.43	1.02	.92 (11)	--	.041 (.010)*	.186 (.000)**	.041 (.050)	.011 (.589)
2. Perceived	5.04	0.91	.91 (5)		--	.329	--	.216

usefulness				(.000)**		(.024)*
3. Task Technology fit	5.04	0.97	.92 (4)	--	.146 (.000)**	.229 (.000)**
4. Perceived ease of use	5.35	0.86	.88 (4)		--	.050 (.491)
5. Behavioral intention	5.70	0.98	.86 (2)			--

*p < 0.05, **p < 0.001.

Table 2 also presents correlations among intrinsic motivation, technology adoption variables, and behavioral intention. The results showed intrinsic motivation was positively related to perceived usefulness, task technology fit, perceived ease of use and behavioral intention. Perceived usefulness and perceived ease of use were positively related to behavioral intention. Task technology fitness was positively related to perceived usefulness, perceived ease of use and behavioral intention.

A path analysis was conducted to determine the causal effects among variables. The analysis indicated that the initial model presented in Figure 1 was not consistent with the empirical data. Some paths were not significant at the .05 level. More specifically, the three non-significant paths were intrinsic motivation on perceived ease of use, intrinsic motivation on behavioral intention, and perceived ease of use on behavioral intention. A revised model that dropped the non-significant paths is presented in Figure 2. In the revised model, all path efficiency was significant at the .05 level.

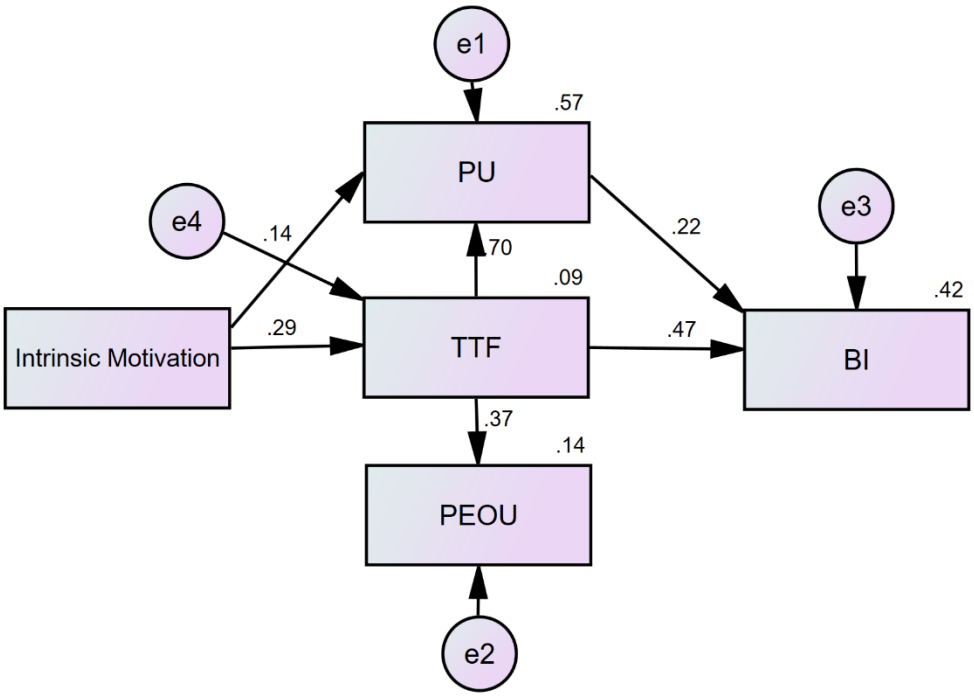

Figure 2. Path Diagram for the revised model, including path coefficients.

Note: PU = Perceived usefulness; TTF = Task technology fit; PEOU = Perceived ease of use; BI = Behavioral Intention

Chi-square of Minimum Discrepancy Test (CMIN) of the revised model was non-significant (Chi-square = 1.203, p = .273, df = 1), which suggested a good fit of the model (Hu & Bentler, 1998). The Normal Fit Index (NFI) was .996 and the Comparative Fit Index (CFI) was .999, which also suggested that the revised model fit the data well. According to Schumacker and Lomax (2004), a NFI value greater than .95 indicated an excellent model fit. Root Mean Square Error of Approximation (RMSEA) was .035, which was lower than .05 and indicated an ideal model fit (Steiger, 1990).

In the revised model, the determinant of behavioral intention with the largest

casual effect was task technology fit (.47), followed by perceived usefulness (.22). Forty-two percentages of variance in behavioral intention was explained by the model, which means the model including its factors can explain 42% of the variation in student behavior intention to adopt MALL. Meanwhile, intrinsic motivation had a positive influence on task technology fit (.29) and perceived usefulness (.14). Task technology fit had a positive influence on perceived usefulness (.70) and perceived ease of use (.37). Approximately 42% of variance in behavioral intention, 9% of variance in task technology fit, 57% of variance in perceived usefulness, and 14% of variance in perceived ease of use was explained by the model.

Discussion

Hypothesis 1. Intrinsic motivation positively influences students' behavioral intention to adopt MALL.

The results showed no significant direct association between intrinsic motivation and students' behavioral intention. Thus, Hypothesis 1 was rejected, which indicated learners' interests/enjoyment, perceived competence or self-reported efforts in English language did not have a direct influence on the adoption of mobile technologies in language learning. A possible reason could be that even highly motivated English language learners may not be necessarily eager to adopt mobile devices as language learning tools, as they might have already been used to other alternative ways of language learning. In addition, concerns about using mobile devices for the purpose of learning, such as adopting MALL would intrude their personal space (Stockwell,

2008), may prevent even intrinsically motivated learners to adopt mobile technologies in language learning. As a result, English language learners who are intrinsically motivated do not necessarily intend to adopt mobile technology for English learning.

Hypothesis 2. Intrinsic motivation positively influences students' perceived usefulness (of mobile devices), and the perceived usefulness is positively associated with their intention to adopt MALL.

Hypothesis 3. Intrinsic motivation positively influences students' task technology fit and the task technology fit is positively associated with their intention to adopt MALL.

Although intrinsic motivation was not directly associated with students' behavioral intention in MALL, the results indicated that it indirectly affected students' behavioral intention through perceived usefulness and task technology fit. Thus, hypothesis 2 and 3 were accepted. The association of intrinsic motivation with task technology fit was stronger than that with perceived usefulness. The results indicated that students' intrinsic motivation on language learning had positive influence on their attitudes towards the usefulness as well as the task technology fit in MALL.

For the perceived usefulness, this result is consistent with previous studies that intrinsic motivation was positively related to perceived usefulness (Chen et al., 2013; Zare, & Yazdanparast, 2013; Al-Aulamie, et al., 2012). A possible reason might be learners who perceived the learning experience interesting are more likely to perceive MALL to be useful (Venkatesh, 1999). For the task technology fit, the results indicated that intrinsically motivated students are more likely to perceive the mobile

learning environment as suitable for their language learning task. A possible explanation might be students who were interested in language learning would be more willing to spend time experimenting with MALL and thus more likely to find a way to use mobile devices to facilitate their learning tasks.

The results indicated that both task technology fit and perceived usefulness had direct associations with students' behavioral intention. Task technology fit was the strongest predictor of students' behavioral intention, indicating students who felt mobile technologies fit with the language learning tasks were more likely to use mobile devices to learn English. This result is consistent with previous research that technology task fit is a predictor of technology utilization (Goodhue, Klein, & March, 2000; Lee & Lehto, 2013). Echoed with previous studies (e.g. Cheon, Crooks & Song, 2012; Lai, Wang & Lei, 2012), perceived usefulness also had an effect on students' intention to adopt MALL, indicating students who believed mobile devices were useful in English were more likely to use mobile devices in language learning. In general, students' intrinsic motivation indirectly influenced students' intention to adopt MALL through two extrinsic motivational factors, perceived usefulness and task technology fit.

Hypothesis 4 Intrinsic motivation positively influences students' perceived ease of use (of mobile devices), and the perceived ease of use is positively associated with their intention to adopt MALL.

The results indicated that intrinsic motivation was not associated with perceived

ease of use and perceived ease of use showed no causal effect with behavioral intention. Hypothesis 4 was thus rejected. This result is opposite to previous study (Abdullah, & Ward, 2016; Venkatesh, 2000), in which intrinsic motivation was confirmed as a determinant of perceived ease of use in computer use. Participants' familiarity with mobile devices might be a possible reason.

In addition, the result also contradicts Cheon et al. (2012)'s finding that perceived ease of use was a predictor of students' intention to use mobile devices in their course work, but is consistent with Park et al. (2012)'s conclusion that perceived ease of use had no association with students' mobile learning intention.

The inconsistent effects of perceived ease of use on students' behavior intention might result from their habits or familiarity with mobile technologies (Park et al., 2012). In this study, all participants owned a smart phone and nearly half (41.42%) owned a tablet. The self-reported data indicated most students used their mobile devices on a daily basis so they were possibly familiar with the functions of mobile devices. In addition, mobile technologies have developed in recent years with larger screen, faster network access, and more user-friendly interface designs. In the past five years, the drawbacks such as small screens and slow Internet discussed in previous studies (e.g. Cheon et al., 2012) may no longer exist. In this case, perceived ease of use may no longer be a predictor of students' behavioral intention because mobile technologies are considered as easy to use and not an obstacle for most participants.

Hypothesis 5. Task technology fitness positively influences students' perceived usefulness and perceived ease of use (of mobile device).

It is found that task technology fit has a strong positive association with perceived usefulness (.70) and a positive association with perceived ease of use (.37). Thus, hypothesis 5 was accepted. The finding, consistent with previous studies (Lee & Lehto, 2013; Klopping & McKinney, 2004), indicated that students who perceived mobile devices being supportive for their English learning tasks were more likely to believe the technology was useful as well as easy to use.

Conclusion

Mobile-assisted language learning is a rapidly growing form of language learning (Vavoula & Sharples, 2008). Being an important factor in language learning, motivation in MALL has been studied from different perspectives. While most research focuses on exploring specific types of instructional design that may promote students' motivation in MALL, this study contributes to the literature by revealing the relationships among intrinsic motivation, important variables related to technology adoption, and students' behavioral intention towards MALL. The results indicated that although intrinsic motivation did not have a direct influence on students' behavioral intention in MALL, it had a positive mediating effect on students' behavioral intention through the two intervening variables, perceived usefulness and task technology fit. Perceived ease of use, however, was not associated with students' behavioral intention directly, nor affected by intrinsic motivation.

The findings suggest two pedagogical applications in the design of mobile language learning activities. First, proper instructional design, especially the choice and development of mobile learning environments in MALL, is essential to increase students' behavior intention. Building a mobile learning environment that can well support the target learning task in MALL is an effective way to increase the task technology fit. Task technology fit is not only an important predictor of students' behavioral intention but also an intervening variable between intrinsic motivation and behavioral intention. In addition, it has a positive influence on perceived usefulness, which is another predictor of students' intention to adopt MALL.

Second, the role of perceived ease of use should be reconsidered in the instructional design of mobile language learning activities. As an important construct in the TAM, perceived ease of use had been confirmed as a predictor of students' behavioral intention in mobile learning in some studies (e.g. Cheon, Crooks & Song, 2012) while in other studies it had no association with students' intention to use mobile technologies in learning (Park et al., 2012). The results of the present study echoed the conclusion that perceived ease of use was not associated with students' behavioral intention in MALL. In addition, contrary to the findings in Venkatesh's (2000) study, the present study indicated intrinsic motivation was not a determinant to perceived ease of use in MALL. In this case, perceived ease of use was the most isolated variable in the revised model. It is possible that perceived ease of use no longer influence students' intention to adopt MALL when they are already familiar

with mobile technologies. The increasing use of mobile devices in daily lives and the fast development of mobile technologies decreases the traditional technical difficulties in MALL. While perceived ease of use used to be an important predictor of students' behavioral intention in using a new technology, its influence may change when students use related or similar technologies in everyday life. Thus, it is important to consider students' familiarity with mobile technologies in the instructional design of MALL process.

This study has a few limitations. First, the research model in this study did not predict students' actual use of mobile technologies in language learning. Future studies that examine the effects of motivation on students' actual use of MALL are needed. Second, this study was based on samples from the College of Education in a single university, where all participants own mobile devices and the majority of them were female. The results may not be generalized to a different population. Future studies on larger, more diverse, and gender-balanced samples are needed. In addition, this study explored factors that affected student voluntary adoption of mobile devices for language learning, where the learning tasks or activities were largely defined by students themselves. The model may or may not apply to situations where students are asked to participate in a specific, well-structured mobile-based learning activity designed to achieve specific learning objectives. Future research is still needed to examine the role of intrinsic motivation in those specific learning scenarios.

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Appendix: Survey items used in the study.

Part I

What kind of mobile devices do you owe?

- iPhone
- Android Phone
- Windows Phone
- Blackberry Phone
- Other Smart Phone (Please specify)
- iPod Touch
- iPad
- Android Tablet
- Other Tablet (Please specify)

Typically, how much time do you spend every day using your mobile devices for the following purposes?

(No use, rare use, About 5-10 minutes, About 11-30 minutes, About 31-60 minutes, About 1-2 hours, About 2-3 hours, More than 3 hours)

- Reading news
- Checking emails
- Playing music
- Playing games
- Watching movies
- Shopping
- Social Networking (e.g. Wechat, QQ, Weibo)
- Other (Optional: please specify if you use mobile devices for other purposes

Part II

Rating scales: Strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, strongly agree

Intrinsic motivation (11 items)

Please rate the following items regarding your motivation for English learning

Interest/Enjoyment

- I enjoy learning English very much
- Learning English is fun.
- I would describe English learning as very interesting.

- I thought English learning is quite enjoyable.

Perceived Competence

- I think I am pretty good at English.
- I felt pretty competent in English.
- I am satisfied with my English language proficiency.
- I was pretty skilled at English language related learning tasks.

Effort/Importance

- I put a lot of effort into English language learning.
- I try very hard to learn English.
- It is important for me to learn English well.

Perceived usefulness (5 items)

How useful do you think that mobile devices is for English learning?

- Using mobile devices improves my ability to learn English
- Using mobile devices for English learning makes learning more accessible
- Using mobile devices for English learning makes learning more fun and engaging
- Using mobile devices for English learning helps improve my English
- Mobile devices are useful for my English learning

Task technology fit (4 items)

In your opinion, would mobile devices work well for you to learn English?

- I think that using mobile devices would be well suited for the way I like to learn English
- Mobile devices would be a good medium to provide the way I like to learn English
- Using mobile devices would fit well for the way I like to learn English
- I think that using mobile devices would be a good way to learn English

Perceived ease of use (4 items)

How easy is it for you to use mobile devices for English learning?

- I don't have any problems learning about the features of the English learning applications/tools on my mobile device(s)
- My interaction with these tools/applications is clear and understandable
- I believe that the English learning applications/tools on my mobile device(s) are easy to use
- I believe that the English learning applications/tools on my mobile device(s) are easy to operate

Behavioral intention

- I will continue using mobile devices for English language learning.

- I will use mobile devices on a regular basis for English language learning in the future.

Part III

Gender
- Male
- Female

Age: ___
Major: ___