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What Affect Lower Grade Learner's Perceived Usefulness and Perceived Ease of Use of Mobile Digital Textbook Learning System? An Empirical Factor Analyses Investigation in China

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Abstract

Although perceived usefulness and perceived ease of use are two important factors which could directly influence the acceptance of technology and actual usage for digital textbook, less attention has been paid to children's mobile digital textbook usage. Therefore, the purpose of this study is to investigate and empirically validate the perceived usefulness and the perceived ease of use by elementary school students during their usage of digital textbook. For data analyses, two questionnaires were developed using existing scales from prior TAM instruments. The sample of this study included 5,245 elementary school students in China who have experience of using digital textbook. The results indicate that students believe that using mobile digital textbook enhance their study performance, but they believe it is not very easy to use. Besides, gender, grade and parents' attitudes towards mobile digital textbook affect the usage. Gender differences exist only in the perceived ease of use. Male students make less effort in using mobile digital textbook than female students. In addition, the students in lower grades tend to have more positive perspectives on mobile digital textbook than the students in higher grades. Furthermore, mobile digital textbook usage experience (time & frequency) has a significant effect on the students' perceived usefulness. Finally, parents' attitudes towards mobile digital textbook influence their children's perceived usefulness.

Keywords: *Perceived usefulness, Perceived ease of use, Digital textbook, Mobile learning, Primary school students*

1. Introduction

Nowadays tablet computers, such as iPad and Android Pad, equipped with a high-resolution color display, have become popular personal digital devices. Among these technologies, digital textbook has been one of the most potentially popular learning tools [1, 2]. Digital textbook have characteristics such as contextualization, personalization, externalization, flexibility, accessibility, and so on [3]. Due to these functions, digital textbook have shown a great potential in enhancing students' study performance [4].

However, performance gains are often obstructed by learners' unwillingness to accept and use available systems [5, 6]. Among the variables that may influence system use, many previous research suggested that learner's perceived usefulness and perceived ease of use play importance roles in effecting the usage of technology system [7-9]. Due to digital textbook's innovation as a teaching and learning tool, academic interest in digital textbook occurs only recently, and there is little research on its application in teaching. In particular, research that addresses elementary students' perceived usefulness and

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perceived ease of use of mobile digital textbook learning are still very limited, and more empirical studies are needed to further examine students' acceptance of digital textbook.

2. Aims of Study

This study aims to fill the existing research gap through an investigation of elementary school students' mobile digital textbook system usage. The purposes of this study are two folds: 1) to develop a survey on the perceived usefulness of digital textbook and a survey on the perceived ease of use of digital textbook, and 2) to analyze how students' background variables, including gender, grade, digital textbook usage (time & frequency), and parents'attitudes to digital textbook, affect students' perceived usefulness and perceived ease of use. The results presented in this paper help institutions adopt digital textbook by overcoming potential obstacles, and hence reduce the risk of failure during implementation. Research findings from this study can also be employed as a basis for further studies of other topics relevant to digital textbook.

The remaining sections of this paper are as follows. First, the characteristics of digital textbook and their impacts on learning are described, followed by an overview of perceived usefulness and perceived ease of use, which are two factors affecting the use of digital textbook. Then, the context of this study is described, followed by a description of the research method and the results. Next, the paper describes the lessons learned and a set of recommendations for instructors who would consider adopting digital textbook in their teaching. The limitations of the study are analyzed and presented conclusions are made at the end of the paper.

3. Characteristics of Digital Textbook and Their Impacts on Learning

Digital textbook are typically equipped with sound, animations, and games that can be activated by readers [10]. Digital textbook have the following key characteristics [11]:

- Contextualization: In order to scaffold and enhance students' reading comprehension, the multimedia and interactive controls are developed based on the particular context with regard to the students' needs (*e.g.*, embedded multimedia, spoken text, hotspots, and user control interactivity).
- Personalization: The students can make personal records during the learning process in order to meet their individual requirements, and these records are context dependent and integrated with the digital textbook (*e.g.*, e-annotation and bookmarks, content searching, and learning process tracking).
- Externalization: The students are able to give external form to what they are thinking and feeling while learning ubiquitously, in order to extend their social interactivity (*e.g.*, notes sharing, home-school links, portability, and ubiquity).

Much of digital textbook' attractiveness lies in its support for contextualization, personalization and externalization. It is these functions that have made it attractive to educators. digital textbook have broadcasted applications in education to support effective English learning [12], book reading [13], developing intelligent tutoring systems [14], vocabulary, story comprehension and word reading [15], collaboration [16] and content visualization [17]. Previous studies have been focusing on the study of functionalities of digital textbook, while little study focuses on the investigation of factors affecting the acceptance of digital textbook systems.

4. Perceived Usefulness and Perceived Ease of Use that Affecting the Use of Digital Textbook

Despite digital textbook's apparent usefulness in learning, the use of them in learning is not always successful [17]. Given the considerable benefits that digital textbook would

appear to offer, it would seem very important to understand what influences the acceptance and use of digital textbook so that educators may improve the likelihood of success when introducing or refining the use of digital textbook in their courses.

Lots of studies have investigated digital textbook learning system's potential for improving learners' study performance [18-20]. But performance gains are often obstructed by learners' unwillingness to accept and use available system [21, 22]. The studies by Davis (1989), Liaw (2008), Lam (2009), Shroff (2011) explored variables such as perceived usefulness, perceived ease of use, attitudes towards usage and behavioral intention to use that may influence system use [23-26]. In addition, among the variables that may influence system use, previous research suggests learner's perceived usefulness and perceived ease of use that are especially important [27-32]. Therefore, investigating students' digital textbook perceived usefulness and digital textbook perceived ease of use might be critical prerequisites for digital textbook learning activities.

Comparatively, more studies have explored the relationships between learners' perceived usefulness and perceived ease of use towards digital textbook and other device. For example, Shroff, Deneen and Ng (2011) found that perceived ease of use had the most significant influence on perceived usefulness [33]. In other words, if learners are willing to adopt a system, they will tend to focus on the usefulness of the technology itself. Therefore, these studies [34, 35] also showed that learners' perceived usefulness and perceived ease of use regarding information technology have been important issues in educational research.

5. Methods

5.1. Subjects

The unit of analysis in our research is the individual student of digital textbook learning system. The population of interest is individuals who use it for their studies.

The data are gathered by means of a questionnaire. We use the website wenjuan.com as a tool to deliver the questionnaire. The survey data for this study are collected during November 2013 to January 2014. Overall, 7905 usable questionnaires are received. In order to use effective data to do the analyses, three steps are taken:

1. Delete questionnaires with lost data;
2. Delete questionnaires with "never use digital textbook's responses for digital textbook" usage frequency survey;
3. Delete questionnaires with all the same answers for each item (*i.e.*, All items are marked as "strongly agree").

After filtering, there are 5245 questionnaires left.

5.2. Instrument

The instrument comprises three sections: demographic information, perceived usefulness, perceived ease of use survey and three open-ended semi-structured research questions.

The first section gathered demographic information about students, such as age, gender, grade levels, as well as with usage frequency, time, primary place of digital textbook, and parents' education backgrounds.

The second section is about perceived usefulness and ease of use. To assess the students' perceived usefulness and ease of use of digital textbook learning system, this study develops two instruments: the digital textbook perceived usefulness survey and the digital textbook perceived ease of use survey.

A five-point Likert-type scales ranging from (1) "strongly disagree" to (5) "strongly agree" is used to answer the questions in the questionnaire. As it is considered important to keep the time taken to complete the survey to a minimum. Besides, to decrease the

difficulty of completing the questionnaire, we use a five-point Likert-type, as it is for primary school students. A lot of previous studies indicate that this is a common method for measuring, which is easy to understand [36-39].

In this study, the digital textbook perceived usefulness survey adapts the main items from Davis (1989) Perceived Usefulness scale and adds new items. However, the authors mainly use these items, rewriting the term "Electronic mail" as "digital textbook". Moreover, the authors develop 2 additional items, which address the special function of digital textbook for supporting learning.

Hence, the initial version includes 7 items. All of the items are undertaken in Chinese. The translation of items into English is completed by one of the authors, and the remaining authors validate the translation. In addition, the survey items are presented with bipolar strongly disagree/strongly agree statements in a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree).

In addition to usefulness, usage is theorized to be influenced by perceived ease of use. The digital textbook perceived ease of use survey, implement in this study, adapts the main items from Davis(1989) perceived ease of use scale and adds new items. In this study, the authors mainly use these items, rewriting the term "Electronic mail" as "digital textbook". Moreover, the authors develop 2 additional items which address the ease of using digital textbook for supporting learning.

Consequently, the initial version includes 7 items. All of the items are undertaken in Chinese. The translation of items into English is completed by one of the authors, and the remaining authors validate the translation. In addition, the survey items are presented with bipolar strongly disagree/strongly agree statements in a five-point Likert scale, from 1(strongly disagree) to 5 (strongly agree).

The two scales'detailed descriptions are as follows:

1.***The digital textbook perceived usefulness:*** measuring the degree to which a student believes that using digital textbook would enhance his or her study performance.

2.***The digital textbook perceived ease of use:*** measuring the degree to which a student believes that using digital textbook would be free of effort.

Section three of this survey raised three open-ended semi-structured research questions about the use of digital textbook. Inspired by Hall and Higgins(2005)[40] and Sad & Özhan (2012) [41], researchers formulated these three research questions: What do you like the most about having digital textbook for learning?, What do you like the least about having digital textbook for learning?, and What is your ideal digital textbook like?

6. Results

6.1. Demographic and Digital Textbook Use Experience

The sample of this study comprises 5245 first-grade to sixth-grade students (age 7-12 years; consisting of 2623 males and 2622 females) from elementary schools in Shan Dong Province in China, all of them have prior experience of using digital textbook learning system. Among the students, 41.26% use digital textbook for 1-3 months, 58.74% use digital textbook over 3 months. The students' perceived usefulness and perceived ease of use are investigated. The students are from two grade groups: 1321 first, second and third graders (age 7-11 years; *i.e.*, lower-graders), and 3924 fourth, fifth and sixth-graders (age 9-12 years; *i.e.*, higher-graders). Detailed descriptive statistics relating to the respondents' characteristics are shown in Table 1.

Table 1. Descriptive Statistics of Respondents' Characteristics

Measure	Items	Frequency	Percentage
Gender	Female Male	2622 2623	49.99% 50.01%
Age	7-9 10-12	1304 3941	24.86% 75.14%
Grade levels	Low grade(grade 1-3) High grade(grade 4-6)	1321 3924	25.19% 74.81%
digital textbook use frequency	Few times in a term Nearly in every class	2290 2955	43.66% 56.34%
Usage of digital textbook experiences	<3 month >3 month	2164 3081	41.26% 58.74%
Primary place of digital textbook usage	In school Out of school In school equals out of school	2788 1144 1280	53.16% 21.81% 78.19%
Parents' education background	<primary school Primary school Junior high school Senior high school undergraduate >undergraduate	101 999 3794 3242 1695 659	0.96% 9.52% 36.17% 30.91% 16.16% 6.28%

6.2. Factor Analysis

To clarify the structure of students' digital textbook perceived usefulness and digital textbook perceived ease of use, this study apply exploratory factor analysis, and principal component analysis with varimax rotation, to explore the factor structure among these items. KMO' result is 0.932>0.9. An item within a factor is retained only when its loading is greater than 0.50 on the relevant factor and less than 0.50 on the non-relevant factor. Table 2 presents the results derived from the factor analysis method, reveling two factors among the items, namely "perceived usefulness" and "perceived ease of use", which account for 54.810%. The internal reliability (alpha) coefficients of the complete item set is 0.872. Moreover, one of the factor perceived usefulness's alpha coefficient is 0.889 and perceived ease of use's alpha coefficient is 0.481.

Table 2. Rotated Factor Loadings and Cronbach'sValues for the Two Factors of Digital Textbook Perceived Usefulness and Perceived Ease of Use

Item		Factor1: Perceived usefulness	Factor2: Perceived ease of use
Factor1:Perceived usefulness a=0.889			
3	Using digital textbook enhances my effectiveness on the job.		-
4			-
2	Using digital textbook makes it easier to do my job.	0.792	-
5	Using digital textbook improves my job performance.	0.788	-
12	Overall, I find the digital textbook system useful in my job.	0.784	-
		0.766	
11	The digital textbook makes it easy for you to find the	0.738	-
13	content you need.		-
	The digital textbook provide useful content..	0.736	
14	The digital textbook makes it easy for you to choose what	0.710	-
10	you want to learn.		-
8	I believe digital textbook can assist teacher-learner interaction.	0.685	-
		0.673	
7	Overall, I find the digital textbook system easy to use.	0.669	-
1	My interaction with the digital textbook system is clear and understandable.	0.637	-
	I find it easy to get the digital textbook system to do what I want it to do.	0.631	
	digital textbook enables me to accomplish tasks more quickly.		
Factor2:Perceived ease of use a=0.481			
6	Interacting with the digital textbook is often frustrating.	-	
9	I find it takes a lot of effort to become skillful at using digital textbook.	-	0.747 0.743
Eigen value		6.220	1.453
%Of variance		44.429	54.810

Overall a=0.827, total variance explained is 54.810%.

6.3. Students' Scores on Perceived Usefulness and Perceived Ease of Use

Table 3 presents the students' average total scores and standard deviations on digital textbook perceived usefulness and perceived ease of use. A further examination about mean differences between two scales is presented in Table 4. Students scored on the perceived usefulness are very high (an average of 4.916 per item, *i.e.*, 58.994/12) and the perceived ease of use is relatively low (an average of 2.972 per item, *i.e.* 5.944/2). These results imply that students, in general, believe that using digital textbook would enhance their study performance. The relatively low scores on the perceived ease of use suggest that some of the students might believe that using digital textbook is difficult and needs great effort.

Table 3. Students' Scores on the Subscales of Perceived Usefulness and Perceived Ease of Use

Scales	Items	Possible range	Range(actual)	Mean	S.D.
Perceived usefulness	12	12-70	14-70	58.994	7.776
Perceived ease of use	2	2-10	2-10	5.944	2.406

Table 4. Paired t Tests for the Means of Perceived Usefulness and Perceived Ease of Use

	Mean difference	S.D.	d.f.	t value
Usefulness-Ease of use	53.050	7.488	5244	513.088***

***P<0.001.

6.4. Gender Differences on the Scales

This study further compared male and female students' scores on digital textbook perceived usefulness and digital textbook perceived ease of use. The results of t-tests are presented in Table 5. Table 5 reveals that male and female students' scores on perceived usefulness of digital textbook do not show statistical differences at the 0.05 significance level. It means that digital textbook are useful for both male and female students. In addition, both male and female students perceived similar levels of ease of use of digital textbook, and their low scores suggest that both male and female students suffer difficulty when using digital textbook. However, on the perceived ease of use, male students express statistically more positive attitudes towards digital textbook than female students do.

Table 5. Gender Comparisons on the Perceived Usefulness and Perceived Ease of Use

Scale	Gender	Mean difference	S.D.	t	Probability
Perceived usefulness	Male Female	59.058 58.930	7.890 7.660	0.600	0.548
Perceived ease of use	Male Female	6.142 5.746	2.389 2.407	5.972	0.000***

***p<0.001.

6.5. The Role of Digital Textbook Usage Time on the Scales

This study, moreover, analyses the effect of the students' digital textbook usage time on their perceived usefulness of digital textbook and their perceived ease of use toward digital textbook. In this study, digital textbook usage time is defined by the length of time from the time of the student's first usage of digital textbook to that of answering the EPU and EPEU. This study divides the sample students into two groups of different levels of usage time: less than 3 months and more than 3 month. Table 6 shows an analysis of the digital textbook usage time groups, as well as their perceived usefulness and perceived ease of use of using digital textbook.

The t test reveals that digital textbook usage time has a significant effect on the perceived usefulness. It is found that students with more digital textbook usage time tend to have higher scores on the scale of perceived usefulness. And the two groups all get high scores on the perceived usefulness. It means that students believe that using digital textbook would enhance their study performance. In other words, students with more usage time have a positive relationship with digital textbook. In addition, students' digital textbook usage time is not related to the perceived ease of use as well. It means that students' usage time does not change their believes on whether digital textbooks' use is free of effort or not. They all suffer digital textbook usage difficulty. And students in digital textbook usage time less than 3 month hold a relatively more positive attitude at perceived ease of use. It might because they feel novelty about the digital textbook in relatively shorter time.

Table 6. Students'Digital Textbook Perceived Usefulness and Perceived Ease of Use among Groups with Different Digital Textbook Usage Time

Subscale	Usage time groups	Mean difference	S.D.	t	Probability
Perceived usefulness	<3 >3	57.4547 60.0756	8.55348 6.98145	-11.766	0.000***
Perceived ease of use	<3 >3	6.2287 5.7442	2.32534 2.44142	7.277	0.000***

***p<0.001.

6.6. The Role of Digital Textbook Usage Frequency Experiences on the Scales

Table 7 shows that digital textbook usage frequency has a significant effect on both digital textbook perceived usefulness and perceived ease of use. It is found that students with more usage frequency tended to have higher scores on the scale of perceived usefulness. On the contrary, students with more usage frequency tend to have lower scores on the scale of perceived ease of use.

Table 7. Students'Digital Textbook Perceived Usefulness and Perceived Ease of Use Among Groups with Different Digital Textbook Usage Frequency

Scale	Grade groups	Mean difference	S.D.	t	Probability
Perceived usefulness	Few times in a term Nearly in every class	57.2205 60.3689	8.40415 6.94806	-14.495	0.000***
Perceived ease of use	Few times in a term Nearly in every class	6.1528 5.7824	2.29122 2.47937	5.602	0.000***

***p<0.001.

6.7. The Role of Grade Levels on the Scales

In this study, the first, second and third grade students are categorized as lower-graders, while the fourth, fifth and sixth grade students are categorized as higher-graders. This study further compares the possible differences between the lower-grade and higher-grade students on digital textbook perceived usefulness and digital textbook perceived ease of use. The t-test reveals that students' scores on perceived ease of use show significant

differences, as shown in Table 8. It is found that students in the lower grades tend to have statistically higher scores on perceived ease of use than the one in the higher grades. It is plausible that the novelty of digital textbook might make the lower-graders more likely to use them frequently and to have positive perspectives towards them. However, students of different grades do not show different levels of perceived usefulness.

Table 8. Students'Digital Textbook Perceived Usefulness and Perceived Ease of Use among Groups with Different Grades

Scale	Grade groups	Mean difference	S.D.	t	Probability
Perceived usefulness	Lower grade Higher grade	58.8289 59.0499	7.80342 7.76664	-0.894	0.372
Perceived ease of use	Lower grade Higher grade	6.4451 5.7755	2.28405 2.42256	8.814	0.000***

**p=0.01.

6.8. The Role of Parents' Attitude on the Scales

Interestingly, table 9 shows that higher parents' attach importance to students' studies, the higher children's perceived usefulness. On the contrary, the higher parents' attach importance to students' studies, the lower children's perceived ease of use toward digital textbook.

Table 9 The Role of Parents' Attitude Affect on the Scales

Scale	Attitudes groups	Mean difference	S.D.	F	Probability
Perceived usefulness	attach no importance attach less importance attach importance attach more importance attach great importance	54.667 55.290 55.520 56.025 59.693	2.546 1.372 0.574 0.279 0.117	48.910	0.000***
Perceived ease of use	attach no importance attach less importance attach importance attach more importance attach great importance	7.444 7.258 6.537 6.258 5.852	0.799 0.431 0.180 0.088 0.037	10.699	0.000***

***p<0.001.

7. Discussions

7.1. Students' Perceived Usefulness and Perceived Ease of use Toward Digital Textbook

In this study, perceived usefulness and perceived ease of use instruments are developed with satisfactory validity and reliability measures. By means of these two instruments, students get low scores on "perceived ease of use" and high scores on "perceived usefulness". This result suggests that students believe digital textbook will help them get better performance in their study. ["I like the function of read-aloud of the text in digital textbook, because it can help me know a lot of unknown words. "]. Digital textbook

dramatize the word and may fix children's attention on implicit meanings in the text and so add their understanding of text. In particular, when children have some letter-sound knowledge and have begun to use this knowledge to read words, such experiences may help to extend their word recognition skills[42].

However, students have difficulty in interacting with digital textbook and they need a lot of effort to operate it. In other words, students may have less effort that can be spent on other learning activities. In the open-ended semi-structured research questions section, when asked, "What do you like the least about having digital textbook for learning? "["digital textbook's action is so slow that delay a lot of our class time"]. ["At the very beginning, I feel uncomfortable with digital textbook, because the operation is a little hard"]. The poor technology with slow response time or frequent technical difficulties will definitely discourage students and discourage students from using digital textbook.

What's worse, the cumbersome and difficult digital textbook using procedures put unnecessary stress on students. From an information-processing perspective, the higher the anxiety aroused, the more task performance decreased [43]. Besides, once stress of digital textbook do not emerge, that barrier to digital textbook is reduced and the abilities to use digital textbook effectively improve. Therefore, to increase students' perceived ease of use and further improve the effectiveness of digital textbook, it is important to strengthen education and training to give students better understanding of digital textbook and related technology. Besides, helping students build their confidence in using digital textbook will make the using procedures more enjoyable.

7.2. The Role of Gender Differences

This study investigate the possible differences of perceived usefulness and perceived ease of use toward digital textbook between male and female students, but no significant gender difference is found except a difference in the perceived ease of use toward using digital textbook. That is, the male students need less effort to operate the digital textbook than female students.

One of the reason is that on average male students use digital textbook in a longer time than female students. Besides usage in schools, more male students use digital textbook outside school than female students (26.65% male students use digital textbook outside school and 22% female students use it outside school). It means male students might be more interested in using digital textbook because outside school whether use digital textbook or not is depends on students themselves. Another reason is that there are 5% high educational background of male students' parents (whose education background is bachelor, master, or PHD) and 4% high educational background of female students' parents. As a result, these students' might receive a better adult support than students whose parents's education is low. Therefore, researchers should pay more attention on supporting female students in operating digital textbook for performing the learning-related functions and develop female students' interests in digital textbook.

7.3. The Role of Digital Textbook Usage (Time & Frequency)

In this study, digital textbook usage time shows a significant effect on perceived usefulness. Lam (2009) indicated that students could overcome small technical and procedural challenges during a long period of time using digital textbook. Thus, they can spend more time on learning activities on digital textbook. In other words, the learning activities help students believe that the system can help them perform their study better. In addition, students are all suffer digital textbook using difficulty. And students' digital textbook perceived ease of use has a significant difference due to digital textbook usage time. This finding shows that increasing students' digital textbook usage time may enhance their perceived usefulness and reduce their perceived ease of use.

Similarity, digital textbook usage frequency has a same affect on both students' digital textbooks perceived usefulness and perceived ease of use. digital textbook usage frequency has a significant effect on both digital textbook perceived usefulness and perceived ease of use. Students with more usage frequency tend to have higher scores on the scale of perceived usefulness. On the contrary, students with more usage frequency tend to have lower scores on the scale of perceived ease of use. In other words, they may have been more prone to getting into usage difficulties. In hindsight, a training session including basic usage skills may have made a difference.

7.4. The Role of Grade Levels

Moreover, this study also reveals that the higher grade students tend to believe that digital textbook system is more useful than the lower-grade students. On the contrary, the lower-graders express more positive perspectives on digital textbook, and they believe it is easy to use. However, the data gather from this study is limited in answering the possible generation effect question. More research is needed for a conclusion. For example, a long- term trial study or, if the data is available, a cross-generation comparison would be able to answer the generation effect.

7.5. The Role of Parents' Education Background on the Scales

The parents' attitude toward children's study was associated with students' digital textbook perceived usefulness and perceived ease of use. Parents' attach more importance on their children, the students' score on digital textbook's perceived usefulness might high and the perceived ease of use might low. Parents play key roles in students' learning processes support in either traditional learning or learning with digital textbook.

Prior researches have shown that the encouragement and support that students gain from their supervisors or peers is important in determining how they perceive and use the technology being adopted [44,45,46]. This finding suggests that the attitude and behaviour of parents is very influential. The effects of learning tasks and students' perceived usefulness are influenced by parents' attitudes in digital textbook usage. For example, a less enthusiastic parent or one with a negative view of digital textbook education shall not expect to have students with high perceived usefulness or usage motivation. The effectiveness of digital textbook will be discounted according to the parents' attitude.

8. Limitations

Although this research represents a careful and systemic effort to analyses acceptance of digital textbook, it is not without limitations. First, when developing the instrument for this research, some items of the constructs perceived usefulness and perceived ease of use were adapted from previously validated instruments for use in digital textbook context. Alpha (0.481) was relatively low for the second factor, perceived ease of use. The poor internal consistency of the perceived ease of use may be caused by the relative small number of items (two items) in the factor. Or, maybe the wording of those statements needs further modification. Second, the study focuses on metrics from a specific digital textbook. The variance in different systems is not further investigated. Third, the data sources come from self-reported questionnaires, alternative research methods like interviews or observations could be combined with surveys in future studies regarding digital textbook's perceived usefulness and perceived ease of use.

9. Conclusions

With a 100% response rate, a total of 5,245 valid questionnaires were collected. A factor analysis and t-tests were conducted to study the data. The results can be concluded as the following: First, primary students believe that using mobile digital textbook learning system enhance their study performance, but digital textbook are not easy to use. Second, gender differences exist only in the perceived ease of use. Comparing to female students, male students make less effort in using digital textbook. Third, the students in lower grades tend to have more positive perspectives of digital textbook than do the students in higher grades. Fourth, both digital textbook usage time and frequency have a significant effect on the students' perceived usefulness. Finally, parents' attitudes to digital textbook influence their students' digital textbook's perceived usefulness.

There are two major contributions made by this study. One is that the final digital textbook's perceived usefulness and perceived ease of use have modified the wording of some items in the initial perceived usefulness and perceived ease of use (Davis 1989) by updating or broadening the functions of the digital textbook system. Therefore, the final version of perceived usefulness and perceived ease of use are more suitable than the initial version to examine digital textbook' s acceptance for future studies. The other major contribution is that the sample used in this study is randomly selected in a large scale from the pool; therefore, the results of this current examination are more representative than previous studies.

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