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Meeting the "Digital Natives": Understanding the Acceptance of Technology in Classrooms

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ABSTRACT

The past few decades have witnessed the rapid development of information and communication technology around the world, as well as continuing efforts to introduce technology into K12 schools. To gauge the success of integrating technology into classrooms, how end users, including teachers and students, accept and use technology while overcoming a new kind of digital gap needs to be investigated. To better assess the integration of technology into the classroom experience, the current study aimed to understand the difference between teachers and students' acceptance of technology. The participants in this study were chosen through stratified random sampling in Shanghai. A research model with related factors compiled from literature on technology acceptance was used to collect data. The results indicated that the differences between teachers and students with regard to technology lie in how they utilize technology and how important they perceived it to be. The results of this study may help us better understand new millennium learners and provide them proper classroom technology products.

Keywords

ICT-integration, Digital natives, New millennium learners, Digital immigrants, Technology acceptance

Introduction

Information and communication technology (ICT) has been introduced into K12 schools since the late 1990s with the expectation that it can transform education and facilitate students' learning in China (Gu & Ouyang, 2008; Zhang, Fang, & Ma, 2010) and other countries (Hew & Brush, 2007). Like other IT application areas, the success of technology integration into classrooms depends on how end users, including teachers and students, accept and use technology. A better understanding of the benefits, barriers, and other factors affecting the end users' acceptance of technology would be helpful in providing them with the proper support, services, and tools.

Studies on technology acceptance and its associated factors in the area of IS and end-user computing have proliferated, and a variety of theoretical models have attempted to explain the determinants of individual acceptance and use of information technologies. In these studies, however, little attention has been paid to end users of technology in classrooms, where the impact of technology depends on both the teachers and students who use it. Between these two groups, a new kind of digital gap is emerging.

Current students are more knowledgeable than their teachers when it comes to ICT. Given this phenomenon, Prensky (2001) coined the terms "digital natives" to describe students and "digital immigrants" to describe teachers. Today's students have also been called the "Net Generation" (Oblinger & Oblinger, 2005) and "new millennium learners" (Pedró, 2007). These students have been raised in a digital environment that has shaped how they think, behave, and act. Therefore, the nature of technology usage in and out of schools and the acceptance of technology between digital natives and digital immigrants are presumably radically different.

The present study seeks to understand how the two groups of end users differ in technology usage in and out of school, as well as their respective attitudes toward it. Literature related to the success, failure, and barriers to ICT integration from the perspective of the end users was initially reviewed. The constructs from technology acceptance models and IT success literature were then compiled. Empirical data were gathered to find the differences among various situations. Given that the technology integrated into classrooms is designed by teachers for the benefit of students, knowing the difference of technology acceptance among teachers and students could help in the development of classroom technology products that cater to digital natives.

Literature review

Conditions that do not support the integration of ICT can be considered barriers. In their efforts to examine the current barriers related to the integration of technology in the curriculum of K12 schools, Hew and Brush (2007) analyzed existing empirical studies of technology integration from 1995 to spring 2006 in the United States and other countries. Of the six categories of barriers that were examined, at least two were related to teachers' behavior: the lack of specific knowledge and skills about technology integration, and attitudes and beliefs toward technology. The link between these types of barriers was constructed as well. For instance, teachers' attitudes and beliefs are affected by their knowledge and skills. Bingimlas (2009) similarly reviewed the literature of technology integration in science education. He found that although teachers had a strong desire for integrating ICT into education, they encountered many barriers, one of which was the lack of confidence and competence, or having negative attitudes and inherent resistance. Again, the barriers are somehow inter-related. These studies indicate that teachers' experiences, attitudes, and competence are vital to the success of ICT integration.

Like the role teachers play in the integration of technology, students are also actors in ICT integration in the classroom. Academic commentators argue that the computer is the "children's machine" (Papert, 1993), and that the ICT integration in classrooms is done for the kids (Selwyn, 2003). As mentioned earlier, new millennium learners are not only more skilled and adept at using ICT than their teachers; they have also been shaped by it (Prensky, 2001; Oblinger & Oblinger, 2005; Pedró, 2007) in terms of their patterns of thinking and communication, notions of learning, needs for control, and even their personal and social values. For instance, multitasking is taken for granted by new millennium learners as a normal social practice.

Aside from the different thinking patterns shaped by intensive ICT usage and the various notions of communication and social lifestyles, there are contradictions emerging from contrasting practice in and outside schools (Pedró, 2007). All of these pose challenges to education as well as to ICT integration in the classroom. Research shows that digital students can get more access to ICT at home than in school (Russell, Bebell, & O'Dwyer, 2003; Pedró, 2007). Home access to ICT was found to be substantially related to students' Internet skills (Kuhlemeier & Hemker, 2007). In addition, a positive conditional relationship with computer use for education and communication at home was found with international student PISA data (Fuchs & Wößmann, 2004). Therefore, the ICT-related behavior outside of institutional settings should be included in the research of digital natives.

As a generation-wide and growing phenomenon (Pedró, 2007), the above general characteristics of digital students have been identified in different investigations around the world. In-depth studies also found that the digital native is by no means an identifiable generation defined solely by age (Bennett & Maton, 2010; Brown & Czerniewicz, 2010); they possess a diverse range of technology skills and preferences (Kennedy et al., 2010; Pedró, 2007; Hofferth, 2010; Li & Ranieri, 2010); their traits are situated and by no means shared across the entire generation (Brown & Czerniewicz, 2010; Sánchez et al., 2011).

The notion of digital native–digital immigrant dichotomy itself will not be addressed in this study, which has gained pervasive discourse without consensus in academic community (e.g., Salajan, Schönwetter, & Cleghorn, 2010; Waycott et al., 2010). Yet the discontinuity that exists between the new millennium students and their teachers is a fact that can be easily observed. This very discontinuity will be the focus of the current investigation, the purpose of which is to guide reconsideration of both the methodology and content appropriate when educating digital natives with ICT integration, both in and outside of institutional settings.

Research framework

This study tries to provide evidence-based understanding about the extent and nature of the barriers to ICT integration from the perspective of technology acceptance, which can be defined as the users' intention and/or the actual usage of technology. A number of studies have examined the factors that influence user acceptance. In reviewing these studies, we compiled four constructs that have been frequently mentioned as the predictors of ICT acceptance: *outcome expectancy*, *task-technology fit, social influence,* and *personal factor.*

Beliefs on technology use: Outcome

Users' acceptance of technology was predicted from their internal beliefs and attitudes on their usage, which was measured with perceived usefulness and perceived ease of use in the technology acceptance model (TAM) (Davis, 1989; Venkatesh et al., 2003). It is the usefulness in this model that most strongly predicted the actual use of a technology. In the information system literature, this construct has been addressed as perceived usefulness, relative advantage, performance expectancy, and outcome expectancy in a number of IT acceptance models (Venkatesh et al., 2003), and has been empirically verified as the most important predictor of technology usage (Venkatesh et al., 2003; Kim, Jahng, & Lee, 2007; Lee, 2010; El-gayar, Moran & Hawkes, 2011).

Beliefs on technology use: Task fit

The task-technology fit (TTF) is the degree to which a technology assists an individual in performing his or her tasks (Goodhue & Thompson, 1995; McGill & Hobbs, 2008). This construct has been addressed as effort expectancy in the technology acceptance literature (e.g., El-gayar et al., 2011). Only when the IT application meets the task requirements of users will it have a positive impact on their performance. The assumption of TTF is that users accept technology due to its potential benefits, such as performance improvement, regardless of their attitude. By integrating TTF, Dishaw and Strong (1999) proposed an extended technology acceptance model that is likely to provide a better explanation for IT usage.

Social influence

From the social psychology viewpoint, the dominant social factor is a kind of social norm defined as the "perceived social pressure to perform or not to perform a behavior" (Ajzen, 1991). Lewis, Agarwal and Sambamurthy (2003) suggested and empirically verified that the perceived social influence from referent others has a significant positive influence on individual beliefs about the usefulness of technology. Similarly, recent studies have found that social influence positively and significantly affects IT utilization (Thompson, Compeau & Higgins, 2006; Kim et al., 2007). Extensions to the TAM likewise introduced social norm as an important construct related to beliefs about the usefulness of technology (Venkatesh et al., 2003). The construct of social factors is therefore introduced in our research model to take consideration of both in and out of school ICT usage.

Personal factors

As a study seeks to understand end user technology usage in and out of school, the construct of personal factors is introduced by necessity in the model. Following the interpretation of the individual level factors of technology usage from Lewis et al. (2003), the personal factors include computer self-efficacy and personal innovativeness with technology. Self-efficacy is defined as the belief in one's capability to perform a particular behavior, it influences decisions about what behaviors to undertake, how much effort it entails, and what emotional responses would be produced (Compeau, Huff & Higgins, 1999). It is widely recognized as one of the explanatory factors that influence end users' IT usage (Compeau et al., 1999; Lewis et al., 2003; Bandy, Strong & Dishaw, 2006). Personal innovativeness pertains to the degree to which an individual is willing to try out any new information technology (Agarwal & Prasad, 1998). As the most proximate influence on an individual's cognitive interpretation of information technology, computer self-efficacy and personal innovativeness have been empirically verified as associated with positive technology use (Lewis et al., 2003; Thompson et al., 2006).

Methodology

The target population of the current study is composed of K12 students and teachers in Shanghai. As the most developed metropolis in China, Shanghai has the highest rate of home ICT ownership, with 93% households having computer access whereas 77% having Internet access in 2010 (Li, 2011). Moreover, Shanghai is the leader when it comes to introducing ICT into schools, with 100% of the schools connected to the Internet, and with a computer-student ratio of 3:1 (Cai & Yuan, 2010). The goal of the present study is to investigate Shanghai users' patterns of

ICT usage, find the difference if it exists, and present suggestions toward a more effective ICT integration in instruction. Data were gathered through surveys, interviews, and school visits. The findings reported in this study are based on the first stage of the questionnaire. The methods of this surveying phase are presented in the following sections: sample and sampling technique, development of instruments, and data analysis.

Sample

Stratified random sample technique was used in this study. First, five districts including two urban and three suburban districts were sampled according to the proportion of all the 19 districts in Shanghai. In each district, five schools were sampled, within which the numbers of primary, middle, and higher schools were counted according to the proportion in the named districts. Ninety students and ten teachers in each school were randomly sampled. Table 1 shows the details of the samples.

Table 1. Demographic information of samples

Type	Grade	Gender	Years of service	Years of ICT use	Number of Samples	Valid
Teacher	Primary100 Middle 89 High 60	Male 60 Female175	⩽3 : 28 3-5:16 6-9:27 10-12:26 13-15:27 16-18:29 ⩾18:96	⩽3: 13 3-5:24 6-9:84 10-12:75 13-15:32 16-18:11 ⩾18: 9	252	249
Student	Primary 637 Middle 976 High 548	Male 1054 Female 1097	N/A	⩽3: 608 3-5:990 6-9:402 10-12:108 ⩾13: 46	2307	2161

Instruments

The survey items in the present study were developed by adapting instruments from previous studies. Ten items were developed to measure the *outcome expectancy*, of which seven were adapted from Venkatesh et al. (2003), McGill and Hobbs (2008) and Thompson et al. (2006); meanwhile, the other three items were tentatively added to measure the expectancy of learning interest and retention. *Task-technology fit* was measured with five items adapted from McGill and Hobbs (2008), covering the aspects of work compatibility, ease of use, and information quality. *Social influence* was measured with five items adapted from McGill and Hobbs (2008) and Thompson et al. (2006). The items referred to the participants' beliefs on whether the organization or other individuals want them to use the information technology. *Personal factor* was measured with seven items from two aspects: four items of computer self-efficacy were adapted from Venkatesh et al. (2003), whereas the other three items of personal innovativeness with ICT were from Thompson et al. (2006).The wording of questions for the teacher version and the student version was adjusted to suit each context. Except for the construct of individual factors, the items of the other three constructs were measured both for inside and outside school usage. All of the items were measured using a 7-point Likert scale ranging from "strongly agree" to "strongly disagree." A sample of items from these scales can be found in Table 2.

The responses to the survey were subjected to factor analysis to verify the constructs for inside and outside use of both teachers and students. The Statistical Package for the Social Sciences (SPSS V.16) and its principle components analysis method was used to extract the relevant number of factors, and Varimaxrotation was used to achieve simple structure. The factors with salient loadings were subjected to verify the constructs in the research model. The constructs in the research model were updated accordingly, and the final scores on each construct were calculated with the mean of its constituent items. Table 2 shows the questionnaire items for students about their classroom ICT usage and their factor loadings on the constructs. The reliability was estimated using Cronbach's coefficient alpha.

Table 2. Items and their factor loading for students in classroom ICT usage

Questionnaire Item	Component			
	OE(α =.931)	PF (α =.857)	TTF (α =.875)	SF (α =.824)
Using ICT in class increases my learning efficiency.	.793	.198	.154	.187
Using ICT in class enables me to study better.	.784	.212	.140	.153
I find the ICT in the classroom useful in my learning.	.738	.179		.169
If I use ICT in class, I can learn better and more quickly.	.728	.257	.222	.104
Using ICT improves the quality of my learning in class (eg. more focused)	.723	.196	.273	.201
Using ICT can improve my interest in learning.	.699	.206	.317	.139
Using ICT can help me keep a longer focused learning state.	.649	.176	.385	.193
Using ICT can help me remember the learning content more firmly.	.599	.221	.425	.154
I can complete the task using ICT even if no one around to tell me what to do.	.187	.751	.195	.189
I can complete the task using ICT even only with the built-in help (such as a tutorial).	.205	.746	.283	.113
I can complete the task using ICT if I had enough time with the technology provided.	.190	.744	.246	
I can complete the task using ICT if I can get help when I am stuck.	.245	.739	.157	.167
My classmates use a lot of ICT in or out of class.	.189	.619	.210	.163
I would use ICT for fun or for other needs outside the classroom.	.187	.565	.246	.142
I am in the first group to use ICT in learning.	.156	.503	.100	.494
ICT is compatible with all aspects of my tasks.	.315	.319	.676	.204
It is easy to get ICT to do what I want it to do.	.194	.424	.659	.147
ICT fits well with the way I like to work.	.307	.342	.658	.160
I can access ICT whenever I need it.	.189	.336	.628	.240
ICT in class is easy to use.	.360	.330	.562	.105
Using ICT inside the classroom contributes to the interaction between my teacher and I/my classmates and I.	.499	.183	.548	.216
In-class use of ICT makes it easier to understand the teachers.	.480	.181	.542	.182
My teachers expect me to use ICT in the classroom.	.264	.119	.366	.710
My parents expect me to use ICT in the classroom.	.269	.259	.168	.671
I seldom try new technology in my study before I see other students using it.		-.102		-.624
My school expects me to use ICT in the classroom.	.291	.125	.432	.594
People whose opinions I value and trust expect me to use ICT in my learning.	.261	.463	.227	.492

Note. OE: outcome expectancy; PF: personal factors; TTF: task-technology fit; SF: social factors

In addition, ICT use duration and frequency, in-class and outside of school, for both teachers and students were measured to approximate the actual degree of IT use. The current study did not target a particular technology. Rather, ICT was used as a generic term to cover all kinds of contemporary technologies. This definition of technology was provided in the questionnaire. The score was obtained by employing a Likert-type scale ranging from "never" to "very frequently." The duration of technology usage for inside and outside school was measured using a Likert-type scale time ranging from "three years or less" to "19 years or more."

Data analysis and results

Students' ICT usage

The list of contemporary technologies students are using is quite long. Except for standard office package applications and the typical educational software such as Geometer's Sketchpad, students have much more opportunities to use various technologies outside the school than in the classroom. Detailed percentile breakdowns of the most frequently used technologies in two settings could be found in Figure 1.

In general, students have a longer experience in using ICT at home than in school. Almost 70% of them have been using ICT for three years or more, whereas their classroom use is approximately 40%. On the other hand, when comparing the frequency and time of ICT usage, students use ICT more in the classroom than outside the school (M = 2.52, SD = 0.68 and M = 1.94, SD = 0.72 for in and outside use). Pairwise T-test showed that this difference is significant (t = 2.087, p = .000).

Within the three grade levels, significant differences in ICT usage were found both in and outside the school. Post hoc of ANOVA test revealed that pairwise differences existed among all the three grades. In terms of in-class ICT usage, high school students had a higher in-class ICT usage than middle school (mean difference = .243, p = .000) and primary school students (mean difference = .386, p = .000); on the other hand, middle school students had a higher in-class ICT usage than primary school students (mean difference = .386, p = .000). The same pattern of differences emerged in terms of outside-school ICT usage. The mean differences between high school students and middle, primary, and between junior and primary school students were 0.477 (p = .000), 0.205 (p = .000), and 0.272 (p = .000), respectively. These differences were confirmed when the ANOVA test was conducted within these age groups. Differences were also found between girls and boys. For in-class ICT usage, that of girls was significantly higher than the boys' (p = .000); meanwhile, for outside-school ICT usage, that of boys was significantly higher than the girls' (p = .000).

As can be seen in Table 2, the questionnaire items load onto four factors that are presumably related to students' use of ICT both in and outside the classroom. This could preliminarily verify the four constructs in the research model. However, there are two items originally developed to measure *outcome expectancy* on the *task-technology fit* for in-class use, and one item originally developed to measure *outcome expectancy* on *task-technology fit.*

The mean scores for each of the four factors were calculated, and the scores both for inside and outside classroom usage were subjected to the pairwise T-test. The results showed significant differences in student perception toward the usefulness of ICT inside and outside the classroom (t = 3.917, P = .000). Obviously, students had higher expectancy for in-class ICT usage (M = 5.589, SD = 0.991) than outside school (M = 5.5286, SD = 0.999). Social influence that affects ICT usage was also significantly different between inside and outside classroom usage (t = 3.466, p = .001); outside usage was affected more by social influence (M = 5.344, SD = 1.073) than that of in-class usage (M = 5.304, SD = 1.08). Task-technology fit did not exhibit any difference between inside and outside ICT usage.

Within the different grades, the ANOVA test showed a significant difference in *outcome expectancy* for in-class ICT usage (F = 10.79, p = .000). Both middle and primary school students held higher expectancy for ICT in classrooms than their counterparts in high school (mean difference = 0.175, p = .003; mean difference = 0.263, p = .000, respectively). Both middle and primary school students perceived a better task-technology fit than their counterparts in high school, both for in-class and outside ICT usage. Social influence for in-class ICT usage exhibited significant differences between middle and high school students. Moreover, significant differences only existed because of personal factors. In general, no significant differences were found between primary and middle school students. In addition, boys were influenced socially for their ICT usage both in and outside the school more than girls (p = 0.021 and 0.005, respectively); however, no differences in *outcome expectancy,* perception of *task-technology fit,* and *personal factors* existed between the gender groups.

Teachers' ICT usage

The technology that teachers most frequently used in classrooms consists of office programs, such as Microsoft Office and WPS. Teachers also used multimedia heavily. Video was used most frequently (67.07%) compared to other media programs (30.52%). Except for technologies of class preparation, the next most frequently used technologies outside class are those for social connection. Details of the percentile breakdowns of the types of technologies that teachers use could be found in Figure 1.

In general, teachers used ICT more in classrooms than outside of school (M = 3.40, SD = 0.77 and M = 2.95, SD = 0.87 for in and outside use). The pairwise T-test showed that this difference is significant (t = 9.345, p = .000). The grade levels that teachers taught did not exhibit any difference for ICT usage in or outside the school, which was discrepant from the perception of students especially for in-class ICT usage. No gender difference toward ICT usage was found. Differences in in-class ICT usage were found within the groups of teachers with different service years. Teachers who have served less than five years used ICT less in the classrooms compared to their counterparts from all the longer service year groups. With regard to outside-school usage, no significant difference was exhibited between the different service groups.

A similar factor analysis was carried out for the teachers' questionnaire. The same pattern turned out, with four factors extracted as important to teachers' ICT usage outside the school, which could also preliminarily verify the four constructs in the research model. However, three factors were extracted when the same factor analysis was conducted for the data of in-class ICT usage, where the items of task-technology fit and those of personal factors were loaded on the same construct. These constructs were interpreted as personal factors in such a way that the perception of task-technology fit may be taken for teachers' self-efficiency and competence of ICT in classroom integration.

The mean scores for each of the factors were calculated, and the scores both for inside and outside classroom use were subjected to the pairwise T-test where it was feasible. Unlike the perception of students, teachers had a significantly higher expectancy for the usefulness of ICT outside of class than what was integrated into their instruction ($t = 7.244$, $p = .000$). The comparison of social influences affecting their inside and outside school ICT usage was likewise significantly different. Apparently, teachers' in-class ICT integration was affected more by social influence ($M = 5.117$, $SD = 0.726$) than that of outside school usage ($M = 5.028$, $SD = 0.759$).

Comparison of ICT usage between students and teachers

The differences in the frequently used ICT between students and teachers can be found in Figure1. In general, the variety of frequently used technologies in-class was much less than that of the outside, office software and media players has almost dominated. Students have many more ICT choices outside the school than in the classroom. In terms of the types of ICT used, students used more types than teachers did.

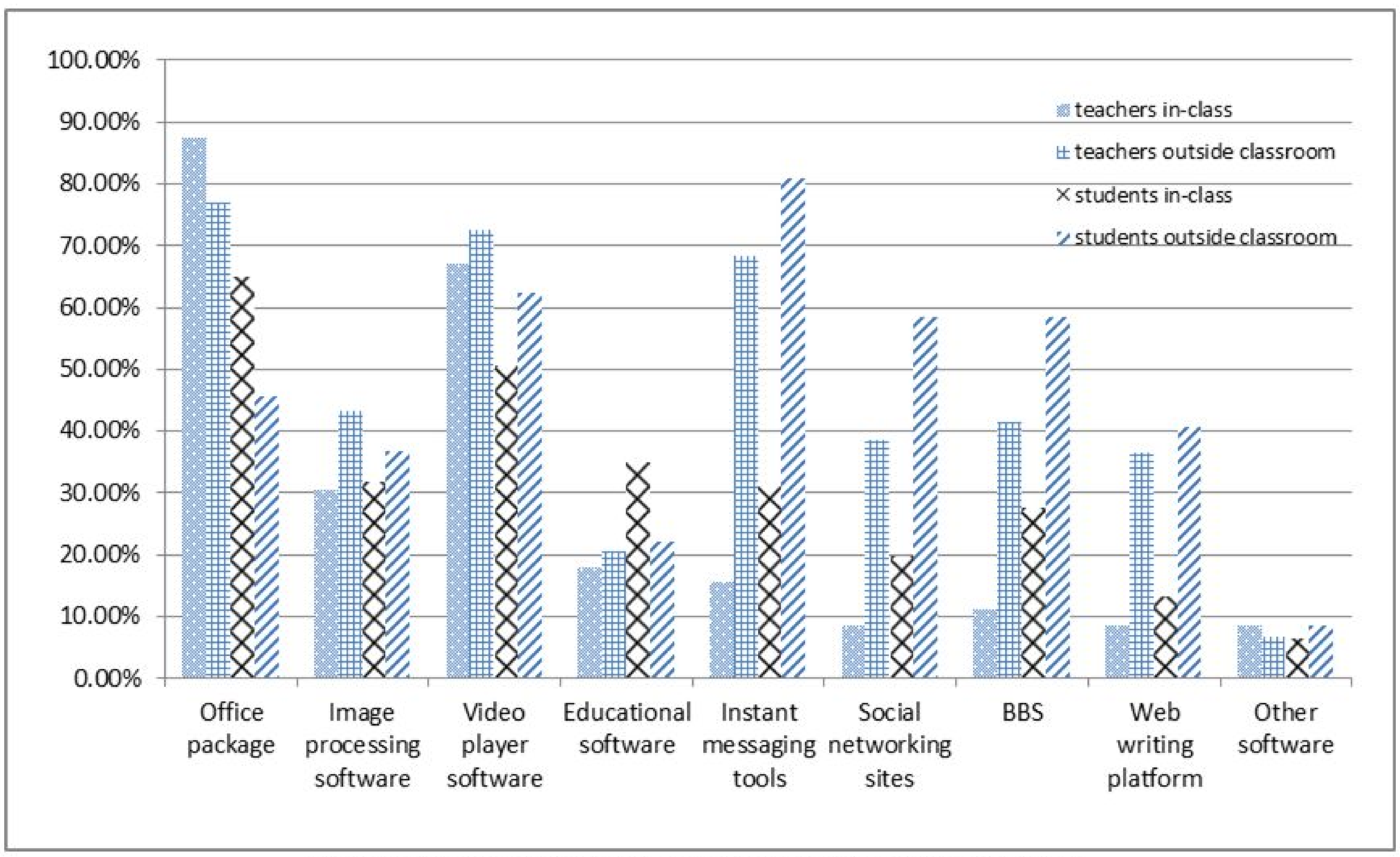

Figure 1. The percentile breakdowns of used technologies

With regard to the difference in duration and frequency of ICT usage between student and teacher groups, the independent T-test revealed that whether ICT was used in or outside the classroom did not matter; teachers' use exceeded that of students ($t = 20.01$, $p = .000$ and $t = 17.01$, $p = .000$ respectively). The different expectations of teachers and students when it comes to ICT in-class and outside were mentioned previously. When comparing the expectations between the two groups, teachers had significantly higher perceptions on the usefulness of ICT outside of class ($M = 5.80$ versus $M = 4.89$, $t = 16.995$, $p = .000$), whereas there was no significant difference for in-class

ICT integration. Likewise, the different impacts of social influence on ICT use in and out of classrooms were earlier reported. When comparing the influence of social factors between the two groups, teachers were affected more than students by social influence, both for in-class integration and outside of class usage ($t = 5.147$, $p = .000$ and $t = 4.005$, $p = .000$).

In terms of the difference of personal factors between students and teachers, results showed that students had higher self-efficiency and confidence in using ICT than teachers ($M = 5.59$, $SD = 0.97$ versus $M = 5.25$, $SD = 0.96$; $t = 5.209$, $p = .000$).

Factor analysis preliminarily tested the constructs related to ICT usage in the research model, while those factors have different effects on in-class integration and outside school usage for teachers and students. Knowing how these factors could predict overall ICT usage as well as the ICT integration into class and outside the school would be informative. Linear regression was used to determine how those factors could explain usage. Data for students and teachers were collapsed to conduct a linear regression test for overall ICT usage in and outside of class. The results showed that the most powerful predictor is the personal factor, getting beta = 0.201 ($t = 6.371$, $p = .000$) for in-class ICT usage and beta = 0.217 ($t = 6.552$, $p = .000$). Although task-technology fit yielded a similar coefficient for in-class and outside ICT predicting (beta = 0.188, $t = 4.759$, $p = .000$ and beta = 0.186, $t = 5.262$, $p = .000$, respectively), outcome expectancy and social influence obtained radically discrepant results: for in-class situations, social influence explained ICT usage significantly (beta = .082, $t = 2.843$, $p = .005$) but not for outside situations. Outcome expectancy explained ICT usage outside the school significantly (beta = .070, $t = 2.190$, $p = .029$) but not for in-class use. These results were echoed in separate regressions with teacher data and student data, where the personal factor is the most powerful predictor; outcome expectancy can only predict the outside ICT use, and social factors only predict the in-class ICT usage.

Discussion and conclusion

Keeping in mind the fast growth of the digital-native phenomenon in the student population, the current study attempted to determine whether the ICT used in-class designed by digital immigrants for the benefit of digital natives meets the expectations of students and complies with their established ICT practice. The findings reported in this study focused on the current situation of the end users' acceptance of ICT both used in-class and outside the school, the differences in the influencing factors, namely, their attitudes, the self-efficiency and competency toward ICT, and how the ICT usage of student and teacher groups is affected by those factors. The discussion of the findings is as follows.

First, the findings of this investigation present evidence of the characteristics of digital natives in Shanghai, both in terms of their perceptions of ICT currently integrated into classrooms and outside the school, as well as the differences between them. As a growing and generation-wide phenomenon (Pedró, 2007), digital students have been scrutinized in previous studies on subjects such as their general characteristics (Pedró, 2007), their different types of ICT usage (Kennedy et al., 2010), and their competency in ICT skills (Li & Ranieri, 2010). The findings of this investigation confirm that the digital native is a complicated phenomenon (e.g., Salajan et al., 2010; Kennedy et al., 2010), indicating that in terms of the duration and frequency of ICT usage, students do not use more ICT than teachers do; in terms of the years of ICT usage and the types of ICT being used, students exhibit the typical "native" characteristics of high percentage of early adoption of ICT. Our findings also echo the claim that students can get more ICT access at home than in school (Russell et al., 2003; Pedró, 2007) in terms of the variety ICT used.

The findings of this investigation present a complex pattern of differences of ICT usage between different groups and different settings. These differences need to be explained by a combination of factors, such as classroom control, and learning tasks that need ICT. The findings show that students are not using as much ICT as their "immigrant" teachers, and that they are not using as much ICT at home as in class. Meanwhile, within the different grade groups, the grade level is positively correlated with reported ICT usage. It is easy to attribute the low usage in the classroom to the teacher's control; on the other hand, it could be quite complicated to account for the low usage outside the school when home ICT access is not an issue for most students. The most plausible reason could be that there are only a few learning tasks assigned to students to use ICT at home. Further information is needed to verify if the higher grade teachers might be assigning more learning tasks that need ICT access and lead to the higher reported home ICT usage for higher level students than that of the lower levels.

The present study investigated the factors that presumably affect ICT usage for end users, as well as the possible differences between these groups. The four constructs have been verified using the factor analysis approach, except for the teachers' in-class ICT integration. For the ICT usage in different situations, however, these constructs have revealed different perceptions of two user groups.

In general, personal factors are most important for either students or teachers, both in and outside the school. The significantly higher self-perceptions on ICT of students than that of teachers fit the general description of digital students, although teachers in Shanghai have been undergoing training to develop their competency in ICT integration for years (Zhang & Zhang, 2009). In addition, from the findings of the factor loading with teachers' data, we can interpret that teachers perceive technology as a way to meet their tasks as part of the ICT competency. In their perception, self-efficiency and ICT competency are the most important factors in determining their ICT adoption in classroom teaching. This finding echoes other studies focusing on the barriers to ICT integration in the classroom, which frequently find that the confidence, competence, and attitudes of teachers are most vital for successful ICT integration (Hew & Brush, 2007; Bingimlas, 2009).

Similar to the original technology acceptance model (Davis, 1989; Venkatesh et al., 2003) and later related research, the factor of outcome expectancy has been verified as one of the constructs related to ICT usage, which has significantly explained the ICT usage outside the school. By comparing the outcome expectancy between different groups and settings, we learn that students hold higher expectancies for in-class ICT integration than their teachers. The younger the students, the higher their expectancies tend to be. Thus far, we have not yet collected the data on how teachers are in generally integrating ICT into different grades, except those on the most frequently used technologies. Therefore, a tentative interpretation could be that the way in which ICT is being integrated is not complying with "native" students who have already established their ICT practices and habits and therefore their expectations. The fact that students are using much more technologies outside the class than in school may confirm this interpretation. The lower expectations of teachers for in-class ICT integration than the use outside the school confirm that in-class integration of ICT is not fulfilling its potential.

Unlike the positive and significant social influence of ICT usage found in previous research (e.g., Lewis et al., 2003; Thompson et al., 2006), the current study finds that social influence has a radical impact on ICT adoption for in-class integration and outside use for both groups. Inconsistent with the stereotype of digital children who tend to follow their peers in adopting new technologies, although the mean score of social influence is quite high (5.344 and 5.304), we find that social influence does not significantly predict the use of ICT outside of school; rather, it is significant for in-class usage. The same pattern has been found for teachers.

With regard to the most powerful predictor of ICT adoption of users (Davis, 1989; Venkatesh et al., 2003), the findings in the current study are discrepant: social influence together with the teachers' personal factors instead of the outcome expectancy is the significant predictors for in-class ICT integration. This finding deserves further empirical investigation. Although personal factor is readily interpreted as an important determining factor, the role that social influence has on the teachers' adoption of ICT could be interpreted as a kind of "social pressure" that teachers are perceiving in an educational situation where ICT investment keeps growing, and the students' ICT knowledge and skills keep developing.

Although the task-technology fit model assumes that users accept technology due to its potential benefits regardless of user attitude (Dishaw & Strong, 1999), the findings of the present study do not support this idea. Task-technology fit is most likely perceived by teachers as a part of ICT self-efficiency, in a sense that as their ICT competency developing, their perception of task-technology fit increases as well. This has been found in the factor analysis with the teachers' data. Digital children's perception of task-technology fit is generally high ($M = 5.60$ and 5.63) across age and gender groups.

As the first phase of a study that attempts to determine the end-user difference of ICT usage between students and teachers and the related factors, we find that this study shows value in compiling a research model and using that model to compare the end users' behavior and attitudes toward ICT. The results that present the current situations of ICT usage both integrated into classrooms and used outside of schools should also contribute to research toward a better understanding of new millennium learners and to better educate the digital natives with ICT integration. However, there are limitations in this study: First, bias is inevitable due to self-reporting of the subjects, further information is needed to verify the reporting results; second, situated nature of the results is unavoidable, it should be considered in making sense of the current situations of ICT usage. The next step of this study is to gather further data through interviews and school visits to make in-depth interpretations toward some of the preliminary findings presented at this point.

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