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Introducing New Technology to Teachers: A Pilot Evaluation

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Adopting new technology in education seems to become a trend. This study valued such trend and investigated teachers' attitudes and response when a new technology is introduced to them. The results suggested that the introduction of new technology was not straightforward, and teachers' attitude toward the technology played an important role in its successful deployment. The findings of this study provided a preliminary understanding of possible challenges in adopting new technology in educational settings, and suggested that the way how a new technology was introduced in school should be carefully planned to avoid frustrating teachers. A new way of introducing new technology to teachers was also proposed.

Keywords: mobile technology, attitudes, propensity to innovate, evaluation

INTRODUCTION

Educational institutions are witnessing a profound increase in the use and range of technology. With the rapid development of various types of information and communication technology (ICT), researchers use these technologies to explore new and better types of teaching and learning (Thornton & Houser, 2005). Robinson (1994) stated that school administrators should support teachers in understanding the potential of technology by identifying applicable software and hardware. As teachers adopt a new technology for their teaching, Cook et al. (2007) have reported that students like the idea of using a new technology, even if the device does not work exceptionally well for the task they experiment with, because they could really feel that their teachers had tried to do something special for them. Egbert, Paulus, Trena and Nakamichi (2002) mentioned that teacher technology training should focus on newer technologies to help teachers integrate new and advanced technologies into their teaching. Lawless and Pellegrino (2007) also argued that it is critical to ensuring that teachers learn how to make the most effective instructional use of new technologies and adapt their teaching to shifting school environments and increasing diverse student population. Furthermore, Martin et al. (2011) analyzed the evolution of technology trends and forecast the most promising

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technologies likely to become a regular part of education systems. These studies imply that teachers need to be prepared when new technologies become available.

The issues of teachers' adoption and integration of technology have been discussed from various aspects (Chang, Chin, & Hsu, 2008; Davis, Preston, & Sahin, 2009). The aspect taken by the current study is focusing more specifically upon Chang et al.'s (2008) proposal in collaborating with local businesses to support school learning. One of the reasons is that teachers may not have the chances or time to individually explore the educational potential of a new technology, and it may be helpful for businesses to introduce it to them. Another reason is the issue of cost because it is usually too expensive for teachers to develop one for their specific teaching activities. From the teachers' perspective, they only need to think about how technologies can help them with their teaching. From the business perspective, on the other hand, vendors may want to explore the possibility of promoting these technologies in school setting. For example, smart cards have been explored for their possible application in training and learning (Rushby, Twining, Twining, & Devitt, 2008), digital televisions with a caption selection function add a new dimension to language learning (Fallahkhair, Pemberton, & Griffiths, 2007), and iPod and Podcasting assist students' knowledge creation (Harris & Park, 2008; Rosell-Aguilar, 2007). In light of this, Collins and Halverson (2010) summarized a number of prospects and challenges arising from the appropriation of technology into learning and educational practice, and argued that new technology brings radical opportunities but also significant challenges, stressing the urgency of seeking a coherent model for the future of education in a technological age.

The adoption of technology in education has been explored by many researchers in many ways. Dooley, Metcalf, and Martinez (1999) investigated the adoption of computer technology by teachers and provided guidance for teachers' professional development strategies. Zacharia (2003) investigated teachers' attitudes toward the use of interactive computer simulation, as well as the effects on their intentions to incorporate the tools in their own future teaching practices. Venkatesh, Morris, Davis, and Davis (2003) proposed a model, the *Unified Theory of Acceptance and Use of Technology* (UTAUT), to integrate and delineate those factors affecting teachers' adoption of technology. Donnelly, McGarr, and O'Reilly (2011) develop a working framework to describe teachers' level of ICT integration into their practice and the factors underpinning the framework. All these studies raise an important issue of how teachers may be effectively supported, and highlight the need for incorporating mixed strategies for mixed teacher stances on ICT integration. While these most studies use technologies existing in classroom or in teachers' life, the current study focuses on new technologies, especially mobile technology.

The present study follows the idea of the first phase of teachers' technology adoption in Hooper and Riebers' (1995) five-part hierarchical model. In this model, the first phase is familiarization concerning with teachers' initial exposure to and experience with a technology. During such phase, the study investigates the variation of teachers' attitude toward that technology and their propensity to innovate in it. Also, this study tries to find how these teachers perceive the features of this technology in comparison with features assumed by the vendor in order to understand different views of that technology. This understanding may help schools succeed in preparing teachers to adopt new technology.

LITERATURE REVIEW

When being introduced a new device for education, teachers first need to know the device, learn how to use it themselves, and then accept it and think of any innovative practice of learning the device can support. In the first two steps of knowing and learning

the use of a new device, the device should have passed its usability testing, which is an evaluation method used to measure how well users can use a specific tool for its designed functions (Zhang & Adipat, 2005). Hence, these two steps should be a straightforward task. Regarding the third step of teachers' acceptance of a new technology, Teo, Lee, & Chai (2008) stated that even though research has demonstrated the benefits of technology in various fields and pedagogical environments, teachers may or may not accept certain technologies due to personal factors. For example, teachers' positive or negative attitudes affect how the teachers respond to a technology in an instructional setting. No matter how sophisticated and powerful the state of technology is, the extent to which it is implemented depends on teachers having a positive attitude toward it (Huang & Liaw, 2005).

Moreover, teachers' attitudes toward a technology are affected by their skills and knowledge of that technology. Nelson and Cheney (1987) found that training increases users' ability, and their subsequent acceptance of technologies. In Gressard and Loyd's (1985) study of computer attitude scale, a development program designed to provide hands-on experience lowered participants' anxiety and enhanced confidence about computer use. Yildirim (2000) found that teachers who used computers more would tend to develop positive attitudes that promote further use of the computer in their daily teaching tasks. Kneebone, Nestel, Ratnasothy, Kiid, & Darzi (2003) also found that people's anxiety about PDAs might be reduced as they had more experience with the PDAs. Hence, appropriate hands-on training is presumably needed for teachers to improve their attitude toward a new device.

In addition to teachers' attitude, their *propensity* to innovate (Nambisan, Agarwal, & Tanniru, 1999) is also considered. This is because the focus here is on teachers' adoption of a new technology, which should be for the creation of innovative learning practices in school. In this circumstance, teachers need to realize the characteristics of a technology for its innovative use in education. It is the technology cognizance, one of three antecedents of propensity to innovate in technology, which relates to a user's knowledge about the capabilities of a technology, its features, potential use, and cost and benefit (Chou, 2005). That is, in order to have a propensity to innovation, teachers usually need to understand the technology, the tasks involved, and the environment within which the technology will operate (Chou, 2005; Nambisan et al. 1999). Hughes (2005) further stated that the power to develop innovative technology-supported pedagogy lies in the teacher's experience and accumulated knowledge of the newly learned technology.

The above literature suggests that vendor's presentation and hands-on training are expected to improve teachers' attitude toward and propensity to innovate in a new technology. This expectation echoes Rosenfeld and Martinez-Pons's (2005) statement that before teachers can infuse technology into the curriculum they need to have appropriate attitude, skills, and knowledge. In addition, Rosenfeld and Martinez-Pons (2005) stressed that teachers need time to reflect on new learning and integrate this new technology into practice through experimentation and then reflect on these outcomes further so that appropriate adjustments can be made. As vendors provide teachers basic training about the new device's features, it is necessary to explore how teachers perceive these features. Hence, it is necessary to investigate how the instructors recognize the features of a device, in conjunction with appropriate pedagogy, or support an innovative pedagogy.

PURPOSES AND RESEARCH QUESTIONS

The purpose of this study is to investigate teacher responses when a new technology is introduced to them. That is, this study investigates teachers' attitude toward the

technology and their propensity to innovate in it. This study also tries to find how these teachers perceive the features of this technology in comparison with features assumed by the vendor in order to understand different views of that technology. This understanding may help schools succeed in preparing teachers to adopt new technology.

Thereafter, the research questions are as follows,

1. What are the teachers' attitudes toward a new technology and what is their propensity to innovate in it during the introduction process?
2. Is there any difference in teachers' attitude toward a new technology during the process of its introduction and how it varies?
3. How do teachers perceive the new device's features related to their teaching practice?

METHODS

PARTICIPANTS

The participants for this study included 16 faculty members, thirteen males and three females, who were voluntarily recruited through an open letter in email format to all faculty members in a 4-year technology institute. The participants were offered two experimental devices as an incentive for participating in whole process of study. A questionnaire administered to the teachers was composed of three parts: demographic information, experience in using computers, and experience using mobile phones. Their profile is listed in Table 1.

Most of the respondents had more than 5 years of experience in education, and majored in engineering discipline. They have daily computer usage of more than 2 hours, and most spend less than 1 hour per day using a mobile phone.

Table 1. *Profile of Participating Teachers (n=16)*

Age	30–39	40-49	50-59		
n	3	10	3		
Yrs of Teaching	0-5	5-10	10-15	15-20	> 20
n	1	4	1	6	4
Teaching Area	Engineering	Management	Medical	General Ed	
n	9	4	1	2	
Daily computer usage	< 0.5 hr	0.5-1.0 hr	1.0-2.0 hr	2.0-3.0 hr	> 3.0 hr
n	0	0	0	2	14
Daily mobile phone usage	< 0.5 hr	0.5-1.0 hr	1.0-2.0 hr	2.0-3.0 hr	> 3.0 hr
n	6	7	1	0	2

This study compares how these teachers use the features of the new device with their computer and mobile phone use. Four distinct types of usage are defined: voice communication, text messaging, browsing and information access on the Web, and listening to music and watching video. Participating teachers were asked to rate the four types of computer and mobile phone usage from low to high frequency by 1 to 4 accordingly. Hence, the range of rating falls between 16 and 64 based on the response of 16 participants, and the summation of the rating of four types of usage is 160. The summary of teacher responses is in Table 2.

Table 2. *Teachers' response of Usage of Computers and Mobile Phones*

	Voice Communication	Text Messaging	Web Browsing	Music &Video	Total
Computer	27(17%)	54(34%)	55(34%)	24(15%)	160(100%)
Mobile Phone	60(38%)	48(30%)	30(19%)	22(14%)	160(101%)

All participants were frequent users of computers, and they used computers mostly for text messaging and web browsing. They all use mobile phones on a regular basis, mainly for voice communication and text messaging.

INSTRUMENTS

Attitude toward technology. The attitude survey questionnaire was developed based on previous research on computers and PDAs (Corlett, Sharples, Bull, & Chan, 2005; Francis, Katz, & Jones, 2000; Liu, 2007; Selwyn, 1997; Thornton & Houser, 2005; Teo, Lee, & Chai, 2008; Tsai, Lin, & Tsai, 2001). As this study evaluates teachers' response at the preliminary stage of adopting a new technology tool, the perceived usefulness and perceived ease of use were two variables investigated in this survey.

Perceived usefulness (PU) is defined as the degree to which a person believes that using a particular technology will enhance his or her job performance (Davis et al., 1989; Teo et al., 2008). People tend to use a technology that they believe will enhance their job performance. Perceived ease of use (PEU) refers to the degree to which a person believes that using a particular technology will be free of effort (Davis et al., 1989; Teo et al., 2008). PEU is important because it is possible that users may believe a technology can be useful, but it is too difficult to use. The performance benefits of usage thus are outweighed by the effort of using the technology. These two factors are fundamental determinants of user acceptance and future usage of a technology (Davis et al., 1989), and thus serve as indicators regarding teachers' attitudes toward adopting a new technology for teaching. The questionnaire is included in Appendix.

Propensity to innovate. To assess teachers' propensity to innovate, a survey questionnaire was developed based on the research conducted by Nambiasan et al. (1999) and Chou (2005). Nambiasan et al. (1999) developed an inventory to evaluate propensity in business setting. The inventory was modified by Chou (2005) to use in educational setting, and again it was revised by the author in this study to fit the specific technology investigated here. The instrument includes three subscales: technology cognizance (TC), ability to explore (AE), and intention to explore a technology (IE) (see Appendix).

Device feature rating. To identify which features of the device are perceived as useful, this study adopts a feature rating method that asks users' opinions about each feature of the device (Fallahkhair et al. 2007). The participants rated five features of the device on a scale from 1 to 5 (1 = Useless and 5 = Useful). They are also asked to indicate their frequency of using each feature on a scale ranging from 1(Never) to 5 (A lot), followed by the Internet Use Scale (Hills & Argyle, 2003), which asked respondents to indicate their frequency of use of each Internet service. This scale was used to measure teachers' perceived usefulness and frequency of use of each feature.

THE DEVICE

According to the vendor, this mobile device used in this study has the features of portability, enhanced keypad function, adequate display, and basic voice function. It

measures 120x70x20 mm and the five features promoted by the vendor are: mobile MSN with full keyboard input, POP3 email, Internet Browsing + RSS news feeds, MP3 player, and basic mobile phone functions of voice and SMS. The vendor stated that the major appeal is to younger people, most of whom use instant messaging frequently to contact classmates and friends.

PROCEDURES

The research approach adopted in this study is a practitioner-centered evaluation of the teachers' responses within a specific testing context. When this context is set within the strategic development, the practitioner-centered approach provides an understanding of one particular scenario, and has potentially much to offer to readers outside this immediate situation (Little, 2008). The author believes that introducing new technology to teacher is one of the important strategies for a school to develop its competitiveness in modern education market, and the research results would be valuable.

The evaluation was carried out using a combination of questionnaire and interview, and employs three stages to answer this study's research questions. The three-stage evaluation is shown in Figure 1. The first stage was a survey of participants' demographic data and computer/mobile phone experience, and together with their general propensity to innovate in technology. After the survey, a vendor made a half-hour presentation of the new device to the teachers, and teachers' attitude toward the device is surveyed. The vendor's presentation mainly focused on introducing the features of the device and persuading audience to buy it. Meanwhile, the vendor acknowledged that the target buyers for the presentation were the youngster age between 16 to 30 years old.

The second stage took one hour; it included training and hands-on practice with the device. Each participant was provided with one device for practice. The vendor's engineer demonstrated each feature of the device and then the participating teachers practiced using it. At the end of training, participants' attitude toward and propensity to innovate in the device were surveyed again. The second stage was held one week after the first stage to obtain more objective responses in the survey (Kopcha & Sullivan, 2008).

The third stage was a one-month trial period for participants to use the device freely. Before the beginning of trial, participants were given a presentation to foster their intention for innovative use of the device. As podcast is one of the features of the device, the presentation was mainly about the benefits of podcasting in education. At the end of the trial, there was a survey about their attitude toward and propensity to innovate in that device. Participants' perceptions of the device's features were also surveyed.

To collect participants' in-depth reflection on their experience and gain a deeper understanding of their perceptions, an interview was held after participants' one-month self-experiencing with the new device. There were three purposes for this interview: (1) to trace qualitative evidence of teachers' attitude toward and propensity to innovate in the device, (2) to find any proposed innovative use of the device in school, (3) to find any additional opinions important and related to the research questions. The interview was semi-structured in the format of a focus group in order for the participants to feed off one another's thoughts and ideas and fuel the discussion in a more natural setting, allowing the researcher to obtain several viewpoints on a single topic (Lee, McLoughlin, & Chan, 2008). Also, such multiple interactions among all interviewees in the group can enhance data quality (Krueger & Casey, 2000). The interview was recorded and transcribed for further analysis.

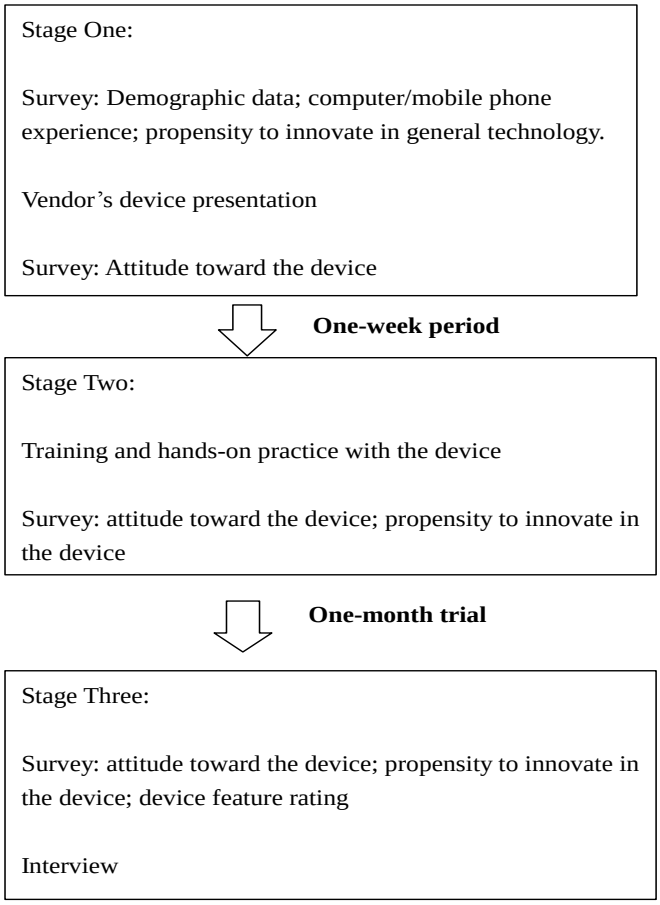

Figure 1. Process of evaluation.

DATA ANALYSIS AND RESULTS

Descriptive statistical analyses were conducted on the data collected in the three stages, and means and standard deviations were obtained on the variable of interest, the attitude toward technology and propensity to innovate. To explore further how the participants were affected by the treatments in terms of the attitude and propensity to innovate, a t-test was conducted on the subscale items (attitude: the perceived usefulness, and perceived ease of usefulness; propensity to innovate: the technology cognizance, ability to explore, and intention to explore) to determine any significance among these treatment. Statistical analyses were undertaken using SPSS software.

The following two sections of attitude and propensity to innovate try to answer the first two research questions: (1) What are the teachers' attitudes toward a new technology and what is their propensity to innovate in it during the introduction process? (2) Are there any differences in teachers' attitudes toward a new technology during the process of its introduction and if there are, what are they?

Attitude

The results suggested providing teachers with the activities of hands-on practice and one-month trial resulted in mixed effect upon their attitude toward that device. There was a significant different in the PU subscale, but not in the PEU subscale. Among the

three stages, teachers' PU was highest right after the vendor presentation on the new device, became worse after they receive hands-on practice, and then even worse after the one-month trial (see Table 3 for the Means and Standard Deviations). The result of the *t*-test also indicated a significant difference between the first and third survey (t = -2.93, df = 15, $p < 0.01$) and the second and third surveys (t = -3.00, df = 15, $p < 0.01$). Analysis results for the category of PEU show no significant difference along the three-stage survey process, indicating that these participating teachers could appreciate the ease of use of the new device at the very beginning, so the PEU did not rise with increased experience.

Table 3. *Descriptive Statistics on the Attitude Toward the Device*

	After vendor presentation Mean (STD)	After training and hands-on practice Mean (STD)	After one-month free trial Mean (STD)
Perceived Usefulness (PU)	4.23(0.52)	4.16(0.57)	3.78(0.66)
Perceived Ease of Use (PEU)	3.92(0.53)	3.91(0.66)	4.05(0.41)

Propensity to Innovate

Table 4 presented the descriptive statistics of the variable propensity to innovate in technology. AE had the lowest mean among the three subscales. This subscale was related to the existing technology support inside and outside the school. Since this subscale did not apply to the device introduced in the study, the AE subscale was not included in the second and the third surveys. The scores in TC and IE subscales were comparatively higher, with average mean of 4.24 and 4.56. This result may be attributed to the fact that these participating teachers volunteered for this study, so they are enthusiastic about adopting new technologies in education.

Table 4. *Descriptive Statistics on Propensity to Innovate in Technology*

Mean (STD)	Technology in general	This device (After training and hands-on practice)	This device (After one-month trial)
	Mean (STD)	Mean (STD)	Mean (STD)
Technology cognizance (TC)	4.24(0.71)	4.07(0.62)	3.94(0.54)
Ability to explore (AE)	3.70(0.65)	N/A	N/A
Intention to explore (IE)	4.56(0.40)	4.23(0.43)	4.06(0.49)

However, the second and third survey results showed that teachers' propensity to use the new technology decreased. The t-test also yielded a significant result. The participants' IE decreased significantly between the first and the second stage (t = -2.74, df = 15, $p < 0.05$), and between the first and the third stage (t = -3.51, df = 15, $p < 0.01$).

Device Features

This section tries to answer the third research question of "How do teachers perceive the new device's features related to their teaching practice?" Teachers' perceived

usefulness of the device features and self-reported frequency of usage of these features are listed in Table 5. The device's five features in Table 5 were listed based on their degree of usefulness given by the vendor.

Table 5. Mean of the self-reported usefulness and usage frequency of this device

		Perceived usefulness	Frequency of usage during one-month trial
		Mean (STD) *n*=16	Mean (STD) *n*=16
1	Mobile MSN with full keyboard input	3.50(0.97)	3.56(1.55)
2	POP3 email	3.87(0.96)	2.69(1.20)
3	Internet Browsing + RSS news feeds	3.62(0.72)	3.44(1.21)
4	MP3 player	3.50(1.21)	2.31(1.45)
5	Basic mobile phone functions of voice & SMS	3.87(0.89)	3.06(1.24)

The survey results show that the most useful features perceived by these participating teachers are reading email and making voice calls, instead of the one assumed by vendor, which was mobile MSN with full keyboard input. The most frequent self-reported usage is mobile MSN, different from the result of perceived usefulness.

Interview Results

The recorded interviews were transcribed and coded by using thematic content analysis, where a theme is identified as something important about the data related to the research questions (Braun & Clarke, 2006; Wishart, 2008). To assure the reliability, the coding was reviewed by an expert in the field of qualitative research.

Three major themes emerged from their responses to the questions of reported use and proposed innovative use of the new device: (1) gauging new device based on computer experiences; (2) synthesizing the device with existing school information system; (3) inferring increased working load from the innovation.

Gauging new device based on computer experiences. The participants' initial responses were not much different from the literature in terms of small screen, limited input, and battery life. Later on, interviewees used their experiences of computer to gauge the new device. For example, one interviewee expressed that "The MSN window only supports a couple of people to communicate. Switching among different windows to change the person whom I MSN with is not as easy as I did in computer." Another interviewee mentioned that "The vantage of RSS is that I can brief the news while waiting for bus or someone. However, if I found some interesting news, I may browse them in detail later on the computer for better readability." The third interviewee complained when he downloaded various documents from the computer to the mobile device and tried to read them, it was not easy for him to manipulate the files as compared to that in computer.

Synthesizing the device with existing school information system. When interviewees were asked about any proposed innovative use of the new device, their responses were evaluated according to the adopted frameworks of innovation (Hughes, 2005; Leidner & Jarvenpaa, 1995). However, the results showed that their responses did not include any specific pattern of usage of the new device. For instance, an interviewee proposed that the possible innovative use of this device was based on the flexibility of the device, which means that it could support various functionality teachers might think of. Another

interviewee added that the possible usage was to synthesize all school information into the mobile device such that whatever information important for students, they could access it from the device. Other interviewees fueled this topic from the technical aspect or the information sharing aspect regarding how such usage could be achieved. It seems that the innovative use of that device cannot be evaluated in a direct way. However, these discussions raised an important concern of these interviewees: how the new device could synthesize with the existing system to provide an extended and better service in school?

Inferring increased working load from the innovation. An interviewee mentioned that he would like to use MSN to answer students' question instantly, but was concerned his private life after work would be interrupted. Another interviewee expressed her concern about whether an innovative use of technology could help a teacher improve his performance, and how much time a teacher could devote into the innovation of technology facilitated teaching. She added that technology seems not to relieve teachers' working load, and instead, it added the load as they had to take care of both teaching and technology.

DISCUSSIONS

ATTITUDE TOWARD TECHNOLOGY

According to the survey results, providing teachers with the activities of hands-on practice and one-month trial resulted in mixed effect upon their attitude toward that device. Among the three stages, teachers' PU reached the highest right after the vendor presentation on the new device, became worse after they receive hands-on practice, and then even worse after the one-month trial. Meanwhile, there are some statistical significances regarding these situations of worsening. This result is different from most studies about the teachers' acceptance and adoption of technology in teaching and learning since most studies found that more experience with a technology improves teachers' attitude toward that technology (Gressard & Loyd, 1985; Kneebone et al., 2003; Nelson & Cheney, 1987; Yildirim, 2000). One reasonable explanation for this result is that previous studies considered existing popular technology for teachers, who were trained to adopt that technology, for example, computers and the Internet. This study investigates a new device that had not been introduced to the campuses. In addition, the professional presentation provided by the vendor, who is good at persuading customers to value the product for sale, makes these participating teachers value the device and perceive it as useful. However, after the latter two stages of training and experiencing with the device, the participating teachers evaluate the usefulness of device on the basis of their personal experience. Under such circumstance, teachers' PU declines after gaining experience. This result points out that the way how a new device is introduced in school should be carefully sequenced and balanced between the vendor's presentation and teachers' training and self-experiencing to avoid frustrating teachers in the process of adopting a new technology.

Analysis results for the category of PEU show no significant difference along the three-stage survey process, indicating that these participating teachers could appreciate the ease of use of the new device at the very beginning, so the PEU did not rise with increased experience. This may be because the device is over-the-counter product, which has passed usability tests to reach a certain ease of operation for new users. In addition, the device is mainly composed of the functionality of a computer and a mobile phone. Hence, operations of the device are not difficult for these teachers, whose demographic profiles show they have solid experience with computers and mobile phones accordingly.

Hence, when adopting this type of new technology, the issue of ease of operation seems to be a minor concern.

Moreover, as the quantitative results show that while teachers' PU declined, their PEU did not change, the results of interview can make the situation more comprehensive. Interviewees express their opinions about the usefulness of new device in improving their job performance, for example, phase out of new technology and increasing of working load. Although participants were all experienced information technology users and willing to explore the devices at the beginning of the study, they found to little extent the new device can support teaching and learning after the trial. The interview results indicate that interviewees' PU out-weight PEU. Under such circumstance, they show little intention to use the device. Such result echoes Wang's (Wang et al., 2009) study that performance expectance, which is equivalent to PU in this study, is the strongest predictor of teachers' intention to use mobile technology in their teaching. Hence, when introducing a new mobile device to teachers, the device's usefulness is a key factor in making it acceptable to school teachers.

PROPENSITY TO INNOVATE

At the first stage of evaluation, the teachers' TC and IE show good propensity to innovate in technology. This result is supported by the fact that these participating teachers were enthusiastic about adopting new technologies in education, and they volunteered to participate in this study. However, the results of second and third survey show that teachers' propensity to innovate in the new technology decreases, and they have the least propensity to innovate at the final stage of evaluation. This quantitative result is evident in participants' responses in the interview, in which none of specific innovative usage of the new device has been proposed. Instead, the responses are regarding the functional flexibility of the new device and its capability in synthesizing all school information.

Teachers' concerns about the innovative use of new device, i.e., the functional flexibility of the new device and its capability in synthesizing all school information, reflect Harris' (Harris et al., 2009) argument about the importance of flexible use of tools. The flexible use of tool may refer to blogs and podcast, which are popular technology tools and not designed for educational purposes. Instead, the blogs and podcasts are designed for purposes of entertainment, communication, and social networking. However, both of them have been applied for educational purpose afterwards (Harris et al., 2009). This study thus suggests that, for increasing the potential of innovative use of a new device in school, the introduction of a new device may need to identify and promote the device's flexibility in providing various supporting functions. As teachers have enough knowledge and skills, they may re-appropriate that new device for innovative use in school.

FEATURES OF THE DEVICE

The quantitative survey results show inconsistencies of perceived devices' features among vendor's proposal, teachers' perception, and teachers' self-reported usage during the trial. Such inconsistencies may be attributed to many reasons such as the free usage provided during the trial, the training provided by the vendor focusing on the most important features of a device, participants' past experience in computers and mobile phones, and the partners chosen by each participating teachers during the trial. The results imply two issues. The first issue is, based on the vendor's proposal, that it is not easy to foresee how teachers perceive the value of each features of a device in their

educational contexts. The second one is that what teachers perceive and plan might not be how they can eventually implement and use the device in classroom. These issues add to the complexity regarding the factors affecting teachers' use of a technology tool in classroom, and caution us specifically in how to present a new device's features for educational purpose.

An interesting theme emerging from the interview result is about teachers' gauging the new device based on their experience of the computer in terms of human-interface and functionality. This study thus suggests that, when introducing a new device, especially a mobile one, the connection between the computer and the new device should be counted in the introducing process. As these interviewees are experienced users of computer, they seem not aware the tradeoff of some advantages of computer to the mobility and portability; however, a lack of computer functions made teachers complain about the new device. This study then suggests that teachers need to realize the discrepancy between their expectation and the reality of the new device.

Finally, this study calls for a deeper examination of over-the-counter devices for education. Although one of the device's main features is the MP3 player, it is found to be least useful and least used in this study. This can be presumably due to the age and experience in education of most participating teachers, who are over 40-year-old and have more than 5 years' experience in education. The entertainment features of the device seem to be of little value to these teachers. However, the entertainment features of a device should not necessarily constrain its potential in education. The features may serve to be the starting point to innovate. For example the iPod's podcasting has shown several innovative applications in education (Harris & Park, 2008; Lawlor & Donnelly, 2010; Lee et al., 2008). Hence, when introducing a new device to teachers, teachers' stereotyped ideas about some features of that device should be addressed to increase that device's potential usage in education.

CONCLUSIONS AND IMPLICATIONS

Many teachers nowadays are required to adopt new technologies to improve their teaching. This study considers a new technology promoted by a vendor. Such investigation is stimulated by White (2007), who claims that one of the critical success factors for e-learning and institutional change in higher education institutions is to keep up with the common technology in everyday life. This study recognizes that, as people's everyday life is changed by various ICT devices provided by business vendors, it is important to explore how such business momentum can be leveraged for changes in educational applications. Therefore, this study takes an initial step to investigate teacher responses when a new technology is introduced to them.

The results of this study shed some lights on the current climate of teachers' view upon a new technology. Teachers worry about the loading of using a new technology and have low intention to use it in school. Such result remind us the dilemma mentioned in Richards'(2005)study, in which demonstrations of cutting-edge programs and possibilities often intimidate rather than encourage educators, and teachers often resent the naïve rhetoric of ICT integration typically associated with top-down policy imperatives. For avoiding this dilemma, this study provides a preliminary understanding of teachers' responses to the introduction of a new technology. These findings are useful because we expect these participants to be the ones who infuse technology into their classes. Corresponding results should help administrators be able to predict teachers' responses. Those responses can thus be addressed beforehand by appropriate intervention activities.

This study has a few limitations. First, the findings and their implications were based on the survey of a particular technology and are targeted to a specific group of teachers. The sampling method had potential bias and the results may not be generalizable. Second, the use of self-report scales suggested the possibility of a bias for some of the results. Future research should employ both objective and subjective measures, and examine the correspondence between them. Third, the current study only focused on evaluating teachers' responses. Such evaluation could be furthered by studying teachers' integration of that technology into instruction and the impact upon students' learning.

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APPENDIX

ATECHNOLOGY ATTITUDE SURVEY

The questionnaire uses a Likert scale of 1 (Strongly Disagree) to 5 (Strongly Agree) for each item, with a higher score indicating more positive attitudes toward that technology.

Perceived Usefulness (PU)

1 The device can allow me to do more interesting and imaginative work.
2 The device helps me communicate with people.

3 The device helps me access relevant information.
4 I can use the device to work anywhere anytime.
5 Using the device will enhance my effectiveness.
6 Using the device will increase my productivity.

Perceived Ease of Use (PEU)

1 I need an experienced person nearby when I use the device.
2 I can use the device independently, without the assistance of others.
3 My interaction with the device is clear and understandable.
4 I find it easy to get the device to do what I want it to do.
5 Interacting with the device does not require a lot of mental effort.
6 I find the device easy to use.

PROPENSITY TO INNOVATE SURVEY

The questionnaire uses a Likert scale of 1 (Strongly Disagree) to 5 (Strongly Agree) for each item, with a higher score indicating better response toward that technology.

Technology cognizance (TC)

1 I know the features of the technologies.
2 I am aware of the cost of deploying the technologies.
3 I know the type of benefits that can be derived by deploying the technologies.
4 I know the extent of benefits that can be derived by deploying the technologies.
5 I do not know the type of teaching activities in which these technologies have been/can be deployed.

Ability to explore (AE)

1 I have easy access to tools for building TML prototypes.
2 I have access to internal forums (inside my school) to exchange information regarding my experiences with IT.
3 I have access to external forums (outside my school) to exchange information regarding my experiences with IT.
4 The existing climate in my school is not supportive of interaction with other teachers.
5 I was permitted to use a new technology on a trial basis long enough to see what it could do.
6 I am capable of experimenting with the technology as necessary.
7 I did not have to spend very much effort to try out different technologies.
8 There are people in my school who could help me with using a technology.
9 I have few opportunities to obtain feedback from within my school on the use of IT.
10 I have access to knowledge about the prior use of IT within my school.
11 Knowledge about the prior use of IT is documented.
12 The extent of bureaucracy involved in accessing experience-based knowledge in school is minimal.

Intention to explore (IE)

1 I intend to explore new IT for potential applications in TML.
2 I intent to explore new IT for enhancing the effectiveness of teaching.
3 I intend to spend considerable time and effort in exploring new IT for potential applications.