Taiwanese Elementary School Teachers' Computer Literacy and Use: Implications for Language Teaching Training Programs

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Abstract

In response to a government imperative to integrate computer-assisted language learning (CALL) into teaching, elementary schools in Taiwan have received an increasing supply of technology equipment and training since the late 1990s. This study explored the efficacy of these efforts for improving technology instruction in schools by surveying 32 experienced in-service Taiwanese elementary school teachers on their perceived computer literacy skills, on the factors affecting their computer use in the classroom, and on their attitudes towards CALL. At the time of the survey, the teachers were attending an EFL teaching certification program. Their responses revealed that despite their positive attitudes towards CALL activities, institutional and individual factors hindered their actual computer use. These findings continue to stress the importance of language teacher development programs in CALL at the local level. They also provide additional support for the need to provide contextualized practice with technology in language teacher education programs.

Keywords: language teachers, teacher training, teachers' perspectives, computer use, computer literacy

Introduction

Educational researchers and teaching practitioners recognize that computer technology can enhance language teaching and learning (Amaral & Meurers, 2011; Egbert & Hanson-Smith, 2007; Warschauer & Healey, 1998). They also agree on the claim that teachers are one of the most important factors influencing the efficacy of computer-assisted language learning (CALL) (Jamieson, Chapelle & Preiss, 2005). As Hubbard (2008) suggests, "[t]he future of CALL […] is closely tied to the future of language teacher education because language teachers are the pivotal players: they select the tools to support their teaching and determine what CALL applications language learners are exposed to and how learners use them" (p. 176). However, despite the increased attention paid to the role of teachers in CALL (Guichon & Hauck, 2011) and its increasing availability in schools (Meskill, Anthony, Hilliker-Vanstrander, Tseng & You, 2006), reports of poor computer technology use for language teaching are still abundant (Kessler & Plakans, 2008). As scholars repeatedly argue, CALL practitioners' computer literacy knowledge and skills for creating and maintaining successful CALL environments contribute greatly to the efficacy of CALL (Egbert & Hanson-Smith 2007; Guichon & Hauch, 2011; Stockwell, 2009). Hence, it is of greatest importance that teachers develop their computer

literacy. Since the late 1990s, elementary schools in Taiwan have received an increasing supply of technology equipment and training in response to a government imperative to integrate CALL into teaching (Ministry of Education Republic of China, 2014; Wen & Shih, 2008). To deal with the trend of technology advancement and to promote students' learning efficiency, teachers need to equip themselves with both professional teaching expertise and technology capabilities. Yet, little is known about the efficacy of professional development and technology integration efforts in schools in Taiwan.

The purpose of this study was to examine the perceptions of experienced in-service Taiwanese elementary school teachers in terms of their computer literacy skills and the factors affecting their technology integration. The teachers were teaching general content classes in different schools in Taiwan while also attending an English as a Foreign Language (EFL) certification program (hence, they were also pre-service EFL teachers). The results of this investigation into these teachers' beliefs and practices can inform curricular decisions in similar EFL certification programs as well as in programs for pre-service teachers around the world.

Literature Review

Computer Literacy, Attitudes, and Beliefs towards CALL Use

Language teachers' attitudes, beliefs, and computer literacy and skills have been found to play a key role in CALL adoption and use, and in the effectiveness of CALL training programs for improving language teachers' technology integration and computer skills (Meskill, Mossop, DiAngelo, & Pasquale, 2002). Studies examining language teachers' attitudes towards CALL use suggest that teachers generally exhibit positive attitudes towards computers regardless of their computer skills. For example, Yunus' (2007) survey of 444 Malaysian ESL teachers revealed that the teachers minimally used communication technology for instruction, although most appreciated its advantages and held a positive attitude towards it. The teachers generally agreed that Information and Communication Technologies (ICT) provided them with greater teaching satisfaction, increased their students' motivation to learn, facilitated their students' language learning, enabled their students to learn with authentic learning materials, and met their students' individual learning needs. However, they perceived themselves to be more competent in ICT use for personal use than for teaching.

Positive attitudes towards technology integration were also reported in Korea (Park & Son, 2009); Turkey (Aydin, 2013); China (Li & Walsh, 2011); Syria (Albilirini, 2006); and Tehran (Bordbar, 2010). Yet, research findings also indicate that in-service teachers' reported use of computer technology is generally limited to a few programs and computer applications regardless of the teachers' computer literacy skills and amounts of frequency of technology use (Barsotti & Martins, 2010; Son, Robb, & Charismiadji, 2011), or their positive attitudes (Park & Son, 2009). For example, Park and Son (2009) found that Korean EFL teachers' most frequent technology uses for teaching were Internet searches and CD-ROM-related activities. As argued by Egbert, Paulus, and Nakamichi (2002), a positive attitude towards computer technology does not guarantee actual or effective use. Similarly, computer skills and access do not necessarily conduce to high ICT uptake for teaching (Li &Walsh, 2011; Meskill et al., 2006). To increase adopters and successful ICT users, institutions need to provide teachers with adequate ICT

resources and training opportunities (Yunus, 2007), and establish higher levels of cooperation and coordination between EFL teachers and ICT professionals (Aydin, 2013).

Given the efforts in Taiwan for increasing technology access and training opportunities in schools and the fact that the Taiwanese teachers were experienced in teaching content classes, it was possible that the teachers were also experienced in teaching with technology and that they had had opportunities to collaborate with colleagues, and engage in and reflect on its pedagogical uses in their respective schools. Yet, a number of teacher, student, and institutional factors could still affect their computer literacy development and use.

Factors Affecting CALL Use

In her state-of-the-art article, Lafford (2009) highlighted the need to identify factors that impede teachers' CALL use at the local level and argued for the importance of gathering information about these factors from the teachers' perspectives. Studies that investigated such factors through teachers' interviews and surveys in other countries revealed a number of CALL adoption impediments related to teachers, students, and institutions. Teacher factors included teachers' computer skills and knowledge (Li & Walsh, 2011; Park & Son, 2009); their personal interest in Internet use and ability to integrate Internet resources into classroom activities (DelliCarpini, 2012; Li & Walsh, 2011; Shin & Son, 2007); and their perceptions of computer access, usability of the tools, and pedagogical value of technology-enhanced activities (Kessler & Plakans, 2008). Student factors included students' levels of computer skills (Son et al., 2011) and engagement (Stepp-Greany, 2002). Institutional factors included limited access to computer facilities (Park & Son, 2009; Shin & Son, 2007; Son et al., 2011; Yunus, 2007); lack of technical, administrative, or training support in schools (Aydin, 2013; Li & Walsh, 2011; Park & Son, 2009; Shin & Son, 2007; Sumi, 2010; Yunus, 2007); instructional limitations imposed by large classrooms (Sumi, 2010); curriculum constraints or too much pressure on exam preparation (Li & Walsh, 2011; Park & Son, 2009); and limited class hours (Li & Walsh, 2011; Shin & Son, 2007). So far, there has not been a thorough investigation of the factors affecting technology integration in the Taiwanese context. The present study attempts to fill this gap.

Research Questions

The following research questions guided this study's exploration into Taiwanese teachers' computer literacy and use, the factors affecting their computer use in the classroom, and their attitudes towards CALL:

1. How do experienced formal elementary school teachers in Taiwan rate their computer literacy and skills, and their frequency of technology use?
2. What are the teachers' opinions about the factors affecting their use of computers in the classroom?
3. What are the teachers' attitudes towards using computers?
4. What are the teachers' opinions about the importance of using computers for language learning?

Methodology

Participants

Elementary school teachers of content areas undergoing an EFL certification program were recruited for this study. Prior to the start of the study, the teachers were informed its purpose and required tasks orally and in writing. They were also told that they could withdraw from the study at any point in time. Thirty-two teachers (5 males; 27 females) provided informed consent upon deciding to participate. They were from 25 to 48 years old (M = 35). They reported having taught at schools in Taiwan from one to 18 years (M = 6.4) and used computers from seven to 22 years (M = 13). When asked how they had learned computer technology, they indicated from teachers at school (53%), on their own (25%), from family members (12.5%), or friends (9.4%). Although their teaching experiences varied, none had taught English before.

Data Collection and Analysis

Participants' perceptions about computer literacy and their attitudes towards computer use were explored through a questionnaire approach, which is known for providing a "snapshot of how things are at a specific time" (Denscombe, 1998) and for drawing out respondents' information in a short time (Mackey & Gass, 2005). Questionnaires are generally used in survey research to collect respondents' data concerning certain facts, attitudes and opinions (Dörnyei, 2007). Moreover, previous studies investigating teachers' computer use and their attitudes towards technology integration have used similar surveys (e.g., Aydin, 2013; Meskill, et al., 2006; Son et al., 2011). To increase the validity and reliability of the study, guidelines of ethical conduct of research and of good practice in collecting, analyzing, and reporting survey results (Kelly, Clark, Brown, & Sitzia, 2003) were strictly followed. In addition, questionnaire items were adapted from a Computer Literacy Questionnaire that was used successfully by Son et al. (2011) to investigate 73 EFL English teachers' impressions and beliefs about computer use in Indonesia. The questionnaire consisted of six sections eliciting participants' background information; perceived computer literacy; frequency of use and perceived ability to use general program applications and tools; opinions regarding the factors affecting the use of computers in the classroom; attitudes towards using computers; and beliefs regarding the use of computers for language learning. The items were written in both English and Mandarin. Participants' anonymous responses were gathered through yes-no questions and five-point Likert scales. Descriptive statistics were used to analyze the data.

Results

Teachers' Self-Reported Computer Literacy and Skills

None of the teachers reported having "excellent" computer literacy knowledge. The majority (62.5%) self-assessed their overall computer literacy skills as "adequate" with only a few reporting "good" or "poor skills (see Table 1).

Table 1
Self-Evaluation of Basic Computer Literacy Skills

	Computer Literacy
Poor	4 (12.5%)
Adequate	20 (62.5%)
Good	8 (25%)
Excellent	0 (0%)

Note. $N = 32$

When asked about their specific computer use, all or most of the teachers reported having an e-mail account, using computers at home and for learning purposes, and accessing websites or using CD-ROMs to supplement their learning. Interestingly, only 22 teachers (69%) reported having a personal homepage on the Web. In terms of their specific computer skills, the majority reported knowing how to use word document features; adjusting monitors; managing files; searching, downloading, saving, and printing documents; and receiving and sending attachments via e-mail. The teachers' responses also revealed that some of them still needed to be trained on some basic computer skills. For example, around 20% of the teachers acknowledged not knowing how to write files onto a CD and/or scan disks for viruses, around 30% needed to learn how to properly start/exit a computer program and/or use a videoconferencing tool, and slightly more than 50% needed to learn how to record and edit sounds (see Table 2).

Table 2
Teachers' Computer Use and Skills

Questions	Affirmative Answers
Computer Use	
Do you have a computer connected to the Internet at home?	32 (100%)
Do you use Web sites to supplement your learning?	32 (100%)
Do you use a computer for learning purposes?	31 (96.9%)
Do you use CD-ROMs to supplement your learning?	30 (93.8%)
Do you have an e-mail account?	30 (93.8%)
Do you use keyboard shortcuts?	26 (81.2%)
Do you have a personal homepage on the Web?	22 (68.8%)
Computer Skills	
Can you copy, cut, and paste text in a document?	32 (100%)
Can you change font style and size in a document?	32 (100%)
Can you minimize, maximize and move windows on the desktop?	32 (100%)
Can you perform file management including deleting and renaming files?	32 (100%)
Can you use a 'search' command to locate a file?	32 (100%)
Can you move a file from a hard drive to a USB drive?	32 (100%)
Can you print a document using a printer?	32 (100%)
Can you send and receive attachments through e-mail messages?	32 (100%)
Can you download and save files from the Web (e.g., text, graphic, PDF files)?	32 (100%)
Can you search for information online using a Web search engine?	31 (96.9%)
Can you change monitor brightness and contrast?	31 (96.9%)
Can you install a software program?	28 (87.5%)

Can you resize a photograph?	27 (84.4%)
Can you write files onto a CD?	26 (81.2%)
Can you scan disks for viruses?	25 (78.1%)
Can you start and exit a computer program?	23 (71.9%)
Can you use a video conferencing tool on the Web?	22 (68.8%)
Can you record and edit sounds?	15 (46.9%)

Note: $N = 32$.

The teachers also self-assessed their levels of knowledge (advanced, intermediate, basic, or none) regarding general program applications. Their responses indicated that over 60% believed they had an intermediate or advanced level on word processing and web search engines, while approximately over 80% believed they had intermediate or basic abilities utilizing spreadsheets, presentation tools, communication applications, and multimedia. Most (over 80%), however, thought they were equipped with basic or no skills for employing more advanced computer applications, such as database programing and web design (see Table 3).

Table 3
Teachers' Self-Evaluation of Their Ability to Use General Program Applications

Applications	Advanced	Intermediate	Basic	None	*M*	*SD*
Word processing	5 (15.6%)	15 (46.9%)	12 (37.5%)	0 (0%)	2.78	0.71
Spreadsheet	2 (6.3%)	10 (31.3%)	19 (59.4%)	1 (3.1%)	2.41	0.67
Presentation	3 (9.4%)	9 (28.1%)	18 (56.3%)	2 (6.3%)	2.40	0.76
Web search engines	3 (9.4%)	17 (53.1%)	12 (37.5%)	0 (0%)	2.72	0.63
Communication	4 (12.5%)	11 (34.4%)	14 (43.8%)	3 (9.4%)	2.50	0.84
Multimedia	0 (0%)	10 (31.3%)	17 (53.1%)	5 (15.6%)	2.16	0.68
Web design	1 (3.1%)	5 (15.6%)	14 (43.8%)	12 (37.5%)	1.84	0.81
Database	0 (0%)	3 (9.4%)	15 (46.9%)	14 (43.8%)	1.66	0.65

Note: $N = 32$.

In terms of frequency of use, the teachers' responses revealed that over 80% checked their e-mail or browsed the Internet every day. Moreover, more than 85% used Word processing programs at least 3-4 times per week. Graphic and video conferencing were the two applications half of the teachers least used. Nearly half did not frequently use database, spreadsheet, language software (CD-ROM), online discussion groups, voice chatting, and computer games. Actually, many reported not knowing these tools. As for blogging, Wiki, multimedia, and text chatting, just nine or ten teachers moderately used them once or twice a week (see Table 4).

Table 4
Frequency of Using Computer Applications and Tools

	Almost everyday	3-4 times per week	1-2 times per week	1-2 times per month	Never used/ do not know	*M*	*SD*
WWW	28 (87.5%)	2 (6.3%)	2 (6.3%)	0 (0%)	0 (0%)	4.81	0.54
E-mail	26 (81.3%)	4 (12.5%)	2 (6.3%)	0 (0%)	0 (0%)	4.75	0.57
Word processing	14 (43.8%)	14 (43.8%)	2 (6.3%)	1 (3.1%)	1 (3.1%)	4.22	0.94
Blogging	8 (25.0%)	6 (18.8%)	9 (28.1%)	6 (18.8%)	3 (9.4%)	3.31	1.31
Concordancer	6 (18.8%)	12 (37.5%)	3 (9.4%)	4 (12.5%)	7 (21.9%)	3.19	1.47
Wiki	3 (9.4%)	7 (21.9%)	10 (31.3%)	10 (31.3%)	2 (6.3%)	2.97	1.09
Multimedia	8 (25%)	5 (15.6%)	3 (9.4%)	10 (31.3%)	6 (18.8%)	2.97	1.51
Text chatting	4 (12.5%)	6 (18.8%)	9 (28.1%)	6 (18.8%)	7 (21.9%)	2.81	1.33
Spreadsheet	0 (0%)	8 (25%)	7 (21.9%)	15 (46.9%)	2 (6.3%)	2.66	0.94
Online discussion groups	5 (15.6%)	3 (9.4%)	6 (18.8%)	9 (28.1%)	9 (28.1%)	2.56	1.41
Language software (CD-ROM)	3 (9.4%)	4 (12.5%)	4 (12.5%)	13 (40.6%)	8 (25.0%)	2.40	1.27
Database	2 (6.3%)	6 (18.8%)	6 (18.8%)	6 (18.8%)	12 (37.5%)	2.38	1.34
Voice chatting	1 (3.1%)	2 (6.3%)	3 9.4%)	11 (34.4%)	15 (46.9%)	1.84	1.05
Computer games	1 (3.1%)	1 (3.1%)	5 (15.6%)	10 (31.3%)	15 (46.9%)	1.84	1.01
Video conferencing	2 (6.3%)	1 (3.1%)	3 (9.4%)	5 (15.6%)	21 (65.6%)	1.69	1.18
Graphics	0 (0%)	3 (9.4%)	3 (9.4%)	7 (21.9%)	19 (59.4%)	1.69	1.00

Note: $N = 32$.

Teachers' Opinions on the Factors Affecting Computer Use in the Classroom

The teachers were asked to choose from a list of 13 factors that affected their computer integration. As Table 5 displays, the top three factors affecting these Taiwanese teachers'

computer use in the classroom were limited facilities, time, and computer knowledge. Moreover, the teachers' perception of insufficient time for computer-assisted learning might have resulted from curricular restriction (ranked #4), teachers' incompetent computer skills (ranked #4), or lack of computer-based materials (ranked #7). In addition, almost 60% of the teachers reported that their insufficient knowledge of computer skills (ranked #4) was another factor that impacted negatively their use of computers in the classroom.

Over half of the teachers agreed on yet another factor influencing their adoption of computers for teaching: Students' background of computer literacy (ranked #6). Few teachers reported teachers' or students' lack of interest in using technology (ranked #10 and #12, respectively) and school support (ranked #11). Only one teacher selected "other" and provided the reason that students might become distracted due to the computer technology, which contradicts Lam's (2000) claim that computer technology has the potential to draw students' attention in more efficient ways.

Table 5
Rank of Factors that Influence Computer Integration

Rank	Factors	Frequency
1	Limited facilities	28 (87.50%)
2	Limited time	25 (78.13%)
3	Limited knowledge of computers	23 (71.88%)
4	Lack of computer skills of teachers	19 (59.38%)
4	Curricular restriction	19 (59.38%)
6	Lack of computer skills of students	18 (56.25%)
7	Limited access to the Internet	15 (46.88%)
7	Lack of computer-based materials	15 (46.88%)
9	Inflexible teaching methods	10 (31.25%)
10	Lack of interest of teachers	9 (28.13%)
11	Lack of school support	8 (25.00%)
12	Lack of interest of students	5 (15.63%)
13	Others	1 (3.13%)

Note: $N = 32$.

Teachers' Attitudes towards Computer Use

The teachers' responses to five-point Likert scale items (5 = *strongly agree*, 1 = *strongly disagree*) eliciting their attitudes towards computer use in the classroom indicated that the teachers recognized the importance of computers for instruction. Their mean scores displayed in Table 6 are all above 4, except for reversed items 6 and 7. In addition, the median values in the first five items were equal to or above 4 (*agree to the item statement*) and those in items 6 and 7 were equal to 2 (*disagree to the reversed item statement*), suggesting that a large proportion of the teachers held positive attitudes towards computer use. This observation and the fact that a few teachers reported a certain amount of *difficulty with using computers* (*Median* = 2.00) and *feeling threatened when others talk about computers* (*Median* = 2.00) may explain why some teachers were not using many of the applications despite *enjoying using computers* (*Median* = 4.00).

Table 6
Teachers' Attitudes towards Computer Use

Questions	Mean	Median	Interquartile ranges
1. I believe that it is important for me to learn how to use computers.	4.44	5.00	1.00
2. I enjoy using computers	4.40	4.00	1.00
3. I am willing to learn more about computers.	4.38	4.00	1.00
4. I would like to use computers to learn.	4.31	4.00	1.00
5. I feel comfortable using computers.	4.19	4.00	1.00
6. I feel threatened when others talk about computers.	2.44	2.00	1.00
7. I think that computers are difficult to use.	2.13	2.00	1.75

Note: 5 = strongly agree; 4 = agree; 3 = uncertain; 2 = disagree; 1 = strongly disagree.

Teachers' Opinions about the Importance of Computers for Language Learning

The last section of the questionnaire explored the teachers' opinions about the importance of computers for language learning through five-point Likert scale items (see Table 7). All median values in the survey items were equal to or above 4 (*agree to the item statement*), implying that most teachers appreciated computer use in language learning. The majority of the teachers recognized CALL training as an essential program component in language teacher education (*Median* = 5.00). The participants held positive attitudes towards the role of computers in language learning and considered that their learning could be improved by using computers.

Table 7
Teachers' Attitudes towards Computers in Language Learning

Questions	Mean	Median	Interquartile ranges
I believe that training in computer-assisted language learning should be included in language teacher education programs.	4.44	5.00	1.00
I think that computers can make second/foreign language learning interesting.	4.38	4.50	1.00
I think that my learning can be improved by using computers.	4.34	4.00	1.00

Note: 5 = strongly agree; 4 = agree; 3 = uncertain; 2 = disagree; 1 = strongly disagree.

Discussion

Survey results supported Barsotti and Martins' (2010) claim that it is common for language teachers from different backgrounds who are put together in a class to display heterogeneous knowledge about computer technology. Interestingly, however, none of the participants reported "excellent" computer skills despite the observed growing availability of these tools in elementary

Taiwanese schools. There are three possible explanations for the teachers' reported lack of advanced technology expertise:

1. The teachers may have been guided by cultural and institutional expectations in Taiwan for high levels of computer literacy (Wen & Shih, 2008), which could result in the teachers not considering themselves experts.
2. Despite efforts of the government in Taiwan to increase technology support in schools, the teachers had had insufficient opportunities for learning new technology skills from technology support experts or colleagues at their institutions.
3. Technology integration efforts from the government might not have reached some of these teachers' schools.

The results also revealed that word processing and web searches were not only these teachers' most common computer uses, but also seemed to have become rudimentary abilities for them. As a matter of fact, although the teachers reported using the Internet frequently, their web skills seemed mostly limited to searching online information and sending emails (Table 4). Four factors reported in the literature could explain what caused these teachers' self-reported limitations:

1. Few opportunities to try new technologies in class (Kessler & Plakans, 2008) or learn new programs (Meskill et al., 2006)
2. Little or no knowledge of technology integration for language learning (DelliCarpini, 2012; Li & Walsh, 2011)
3. Satisfaction with using the same application programs repeatedly (Meskill et al., 2006)
4. No or limited access to other resources and/or facilities (Yunus, 2007)

Similar accounts have been reported in Indonesia (Son et al., 2011), Korea (Park & Son, 2009), Brazil (Barsotti & Martins, 2010), and Turkey (Aydin, 2013). Taken together, these findings strongly suggest that, regardless of the instructional context, pre-service and in-service language teachers display similar skills and behaviors in terms of their technology applications. The teachers' responses also suggested that the less knowledge they had about specific program applications, the less frequently they used them (see Tables 3-4). These findings are consistent with previous studies that have reported that teachers' limited competence of computer literacy for employing a particular program decreases their willingness to use the program as well as increases their low confidence and reluctance to use the program (Kessler & Plakans, 2008; Lam, 2000). Another interesting finding is that a third of the teachers reported poor knowledge of some basic computer skills (Table 2), and over half of the participants self-assessed themselves as having basic or no abilities in six out of eight general program applications (Table 3). Yet, 63.5% considered themselves as having "adequate" computer literacy skills in general (Table 1). The teachers' self-perceptions of having "adequate" knowledge might result from the teachers' repetitious use of certain application programs (e.g., word processing and the Internet) that may help them cope with their personal use, and both their learning and teaching needs well enough. Furthermore, this general self-impression of "adequate" skills may be directly linked to the teachers' feelings of personal satisfaction with their knowledge and use of basic computer literacy skills. Finally, unlike the Korean language teachers in Park and Song's (2009) study, the Taiwanese teachers did not use CD-ROMs frequently (M = 2.40). This difference could be

attributed to differences in teachers' computer literacy, but it may also result from contextual and cultural influences affecting the choice of classroom materials. A comparison of lessons and materials in both EFL contexts might shed valuable insights into the factors influencing teachers' willingness to adopt CD-ROMs in class, and thus, warrants further exploration.

The top three factors affecting participants' computer use were limited facilities, time, and computer knowledge. A teacher's low self-efficacy beliefs or confidence in his or her own computer literacy skills and knowledge may also impact to what extent the teacher uses computers for language teaching (Guichon & Hauck, 2011). Teachers' beliefs in their students' lack of computer literacy (ranked #6) seem to have also affected negatively their technology use in the classroom. As Winke and Goertler (2008) suggest, trainings are much needed to equip students for technology tasks. Some teachers may shy away from using computers simply because it requires training the students on computer literacy before they can actually use the computers for language learning.

Furthermore, insufficient computer technology resources for instruction (including limited Internet access and lack of computer-based materials, both ranked as #7) troubled most teachers. Participants came from a range of cities—some with limited Internet access and computer-based resources. Hence, Taiwan's unequal distribution of educational resources in schools could explain why some teachers ranked these factors high. Also, the lack of computer-based materials may force the teachers to spend more time on finding or producing appropriate teaching materials than on learning new computer skills or tools. These findings continue to emphasize the importance of CALL education in the development of professional language teachers.

Finally, regardless of the factors that interfered with the teachers' adoption of instructional technology (e.g., lack of facilities, time and computer knowledge), the teachers displayed positive attitudes towards computer use and were optimistic about its use in language learning and teaching. Their responses corroborated other studies that have reported language teachers' positive attitudes towards using computers (e.g., Aydin, 2013; Park & Son, 2009; Son et al., 2011; Yunus, 2007). School administrators should take advantage of teachers' positive attitudes and provide them technology tools as well as opportunities to learn how to use technology more effectively and efficiently in their classrooms. Not surprisingly, the teachers themselves agreed that CALL training is a must in language teachers' development.

Pedagogical Implications

The results of this study suggest four pedagogical implications concerning instructional technology development of in-service teachers that want to be certified for EFL teaching. First, it is crucial that they participate actively in computer technology training programs. These learning opportunities should help them broaden their knowledge to a wider range of application programs and tools for language learning, such as blogs and wikis. Otherwise, they risk restricting computer use to programs and tools that they may find easy to use or that they often use for their own learning purposes, such as searching the Web and using word document features.

Second, computer training offerings need to include "contextualized, hands-on practice with computer technology" (DelliCarpini, 2012, p. 20). As many participants' responses reflected, lack of computer skills hindered the teachers' use of computer technology in class. It is important that teachers know how to use technology tools and programs in appropriate and pedagogically-sound ways. They should have opportunities to reflect on the pedagogical value of their technology-enhanced lessons, and in doing so, develop their "contextualized confidence" (Kessler & Plakans, 2008)—a reflective and cautious use of technology integration. Even if some of them used technology for teaching content classes, they would still need to acquire new skills and identify new resources for using technology for language teaching. As Hong (2010) puts it, "teachers' confidence in using CALL technology is the necessary first step towards expanding their knowledge of how to harness the pedagogical potential of CALL technology" (p. 56). Obviously, schools would need to evaluate and adjust their training programs so that they are able to keep up with changes in instructional technology and meet students' individual learning needs more effectively.

Third, educational authorities could play a more active role in facilitating opportunities for teachers to develop their computer literacy. Indeed, scholars have repeatedly urged educational authorities to provide computer facilities at schools (Son et al., 2011; Yunus, 2007). Yet, this problem is still quite widespread in Taiwan. Authorities could also assist teachers' efforts at building support communities, where teachers with diverse computer competencies and skills can help one another. These support communities allow teachers to pool their technology resources, computer expertise, and experiences with computer technology integration into teaching so that they are not alone in their development of computer literacy.

Finally, as the findings suggest that frequent use of computer technology could advance users' computer literacy, it is essential for language teachers to seek opportunities to utilize a variety of technology tools and programs that fit their instructional purposes, while still avoiding developing fixed patterns of using them—such as these Taiwanese teachers' observed pattern of repetitious use of web searches and the Internet. If teachers limit themselves to using specific technology tools, this may narrow their repertoire of computer knowledge and skills. Moreover, it could indirectly decrease opportunities for students to prepare for their technological future (Meskill et al., 2006). With computer technology and knowledge, teachers not only can develop multifaceted and innovative instructional models, but also encourage students to engage in technology-enhanced learning experiences.

Conclusion

These Taiwanese teachers' perspectives about CALL integration at the elementary school level are unique. Unlike most pre-service teachers who are generally not familiar with elementary school instructional settings, these teachers were knowledgeable about the administrative and pedagogical factors affecting their work because they had been working in the school system for 1-18 years. Their point of view and skills could transfer from their experiences teaching courses other than English. Moreover, their opinions about what may hinder their CALL integration in future were likely to be based on both their positive and negative technology integration classroom experiences in their respective schools.

Most of the teachers in the study evaluated themselves with adequate computer literacy skills. They were capable of performing most computer functions and computer programs, but still needed training for some computer skills, such as sound editing and recording. Their frequency of using computer applications and tools varied. In addition, the teachers identified that the most critical factors inhibiting their computer use in classrooms were insufficient computer facilities, time, and computer knowledge. The vast majority of the teachers expressed their positive attitudes towards computer use and recognized the value of computer use in language learning. Most importantly, the need for CALL training in teacher education programs in Taiwan was also acknowledged by most teachers.

Due to the small sample size and the participants' background, the generalization of the study results seems limited. More participants from Taiwan and with other language backgrounds are needed to increase the validity of the findings. Yet, as this study replicates another survey of EFL teachers in a different L1 context (i.e., Son et al., 2011), and corroborates study findings in other EFL contexts (e.g., Aydin, 2013; Li & Walsh, 2011; Park & Son, 2009; Yunus, 2007), it serves to complete a profile of characteristic uses, teacher competencies, and factors affecting technology adoption for language teaching in EFL contexts in general, not just in Taiwan. Furthermore, because the data elicited in this study were from a single survey, the strength of the relationship between the teachers' computer literacy and their actual use in class is still unclear. Participant teachers' self-evaluation of computer literacy may not reflect their actual competence (also argued by Son et al., 2011), and even if it does, teachers may still not apply their advanced computer literacy and skills in their classrooms (as shown by Kessler & Plakans, 2008). Studies that look into this relationship could benefit from using additional methods of data collection, such as interviews and classroom observations. Future studies could explore language teachers training needs and investigate how language teachers' computer literacy and skills change after the implementation of a CALL training program. Also, what makes language teachers feel positive about CALL is worthy of further exploration.

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