

Unraveling In-service EFL Teachers’ Technological Pedagogical Content Knowledge

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The success of technology integration lies in teachers as designers of technology, pedagogy, and content. Their creativity in this regard involves technological pedagogical content knowledge (TPCK). In light of limited studies on EFL teachers’ TPCK, this study examined the TPCK of three junior high EFL teachers attending a 12-week CALL workshop in Taiwan through lesson plan analysis and stimulated recall. Results show that these teachers demonstrated a common, though somewhat different, understanding of technology integration in EFL teaching contexts. Specifically, they demonstrated a common knowledge of prioritizing grammar teaching through computer technology and a common preference for incorporating *PowerPoint*, *Hot Potatoes*, weblog, and the Internet into language teaching. Their use of technology in teaching further suggests a common understanding that technologies could be integrated into traditional teaching sequence and instructional strategies. These findings help build an understanding of EFL teachers’ application of computer technologies to their teaching contexts.

Key words: teacher knowledge, technological pedagogical content knowledge, in-service EFL teachers

INTRODUCTION

Computer technologies have been promoted in educational systems of

Taiwan for a decade (Ministry of Education in Taiwan, 2001). Computer hardware and software are commonly installed at various school levels. The computer is expected to innovate and even transform educational practices in Taiwan; however, computer technology, in fact, has not been extensively and substantially integrated into teaching practices (Chang, 2003; Hsu & Kuan, 2007). This problem reveals that more convenient access to computer technologies may not be the sole or major determinant of successful technology-supported teaching (Meskill, Anthony, Hilliker-Vanstrander, Tseng, & You, 2006). As Mishra and Koehler (2005) note, the success of technology integration lies in teachers as designers of technology, pedagogy, and content. Accordingly, teachers' knowledge about technology in general and of the complex relationships among technology, pedagogy, and content (i.e., technological pedagogical content knowledge, TPCK; Mishra & Koehler, 2006) in particular may be more important in determining teachers' integration of technology into instruction. However, there is scant research on EFL teachers' TPCK. We thus have a very limited understanding of what EFL teachers' TPCK is and how it develops and impacts on foreign language teaching or learning. To fill this research gap, this study was conducted to explore EFL teachers' TPCK, with a major focus on unraveling what teachers know about the use of technology for teaching the subject matter of English.

LITERATURE REVIEW

Teaching is a highly complex activity that draws on many kinds of knowledge. Teacher knowledge in itself is a multi-faceted and ill-defined construct in educational research (Fenstermacher, 1994). Shulman (1986) was the first scholar to investigate teacher knowledge, which was classified into subject matter knowledge, pedagogical knowledge, and pedagogical content knowledge (PCK). Subject matter knowledge refers to factual knowledge and principles in a specific discipline and it can be obtained by teachers through explicit formal instructions in teacher preparation programs.

Pedagogical knowledge involves an understanding of applying instructional techniques, strategies, and skills to class management, direct instruction, collaborative learning, and assessment. Pedagogical content knowledge is associated with a conceptual understanding through which teachers translate subject matter knowledge into a form comprehensible to students via analogies, illustrations, examples, explanations, and demonstrations. Unlike the first two types of knowledge, PCK involves teachers' integrated understanding of four components, namely, pedagogy, subject matter content, student characteristics, and the environmental context of learning (Cochran, Deruiter, & King, 1993). Teacher knowledge of this sort cannot be separately learned but as a whole.

With the computer increasingly integrated into educational practices, PCK needs to include the use of technologies to account for the phenomenon of learning to teach with the computer by teachers (Angeli & Valanides, 2005). From the perspective of educational technology, PCK of educational technology is defined as the use of technologies to transform subject matter content to a form accessible to students (Margerum-Leys & Marx, 2003). This definition is actually an extension of Shulman's (1986, 1987) conceptualization of PCK. Based on Shulman's (1986, 1987) work, a technological pedagogical content knowledge (TPCK) framework proposed by Koehler and Mishra (2005) is illustrated in Figure 1 to show the relationship among subject matter knowledge, pedagogical knowledge, and technological knowledge. The TPCK framework, as argued by Mishra and Koehler (2006), can serve as "an analytic lens for studying the development of teacher knowledge about educational technology" (p. 1041). Borrowed in the present study, this conceptual framework provides a foundation for our research on the composition of EFL teachers' TPCK.

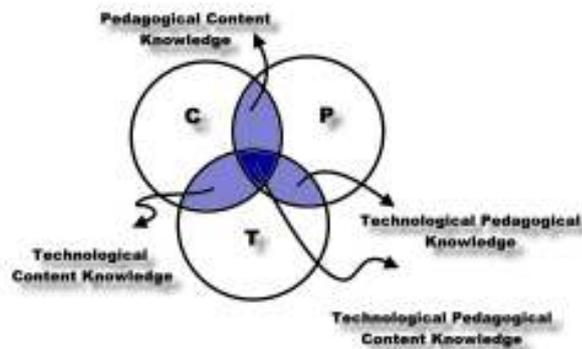


FIGURE 1
The Components of Technological Pedagogical Content Knowledge
(Koehler & Mishra, 2005, p. 133)

In terms of research on language teacher education, one aspect of language teachers' cognition that has obtained limited attention involves teachers' knowledge about technology integration into instruction, particularly TPCK. Relatively little is known about how EFL teachers apply their understanding of technology as a teaching aid for English learning and teaching. Thus, subsequent research on teacher education in CALL can investigate EFL teachers' conceptual understanding of technology integration (Zhao & Tella, 2002), particularly their TPCK.

Few studies have been conducted on language teachers' TPCK. Perhaps Polyzou (2005) was one of the pioneering researchers in this area. In her study, five modern language teachers in Greece were inquired for their growth in their TPCK as they learned to teach with multimedia. The teachers displayed an understanding that images could be utilized as a real-life stimulus to engage students in practicing language concept, i.e. using descriptive adjectives more easily to talk about people's characters shown on images. Also, they knew that they would use technology to develop students' productive skills instead of receptive skills because they thought students

would be active to use the target language with the computer supported. Lastly, their TPCK involved the teachers to represent content in a semiotic way. They understood that concepts and information could be illustrated more clearly with sounds and images than with plain texts. Similarly, in Koçoğlu's (2009) study, the pre-service EFL teachers in Turkey shared the same aspect of TPCK as those teachers in Polyzou's (2005) study—representing abstract concepts through multimedia applications. In addition, Pace, Rodesiler, and Tripp (2010) investigated the impact of technology-based methods course on pre-service English teachers' TPCK of applying Web 2.0 technology to English language arts. Their findings showed that the teachers revealed an understanding of using Web 2.0 applications to foster collaborative processes and enhance students' literacy.

PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

Although the idea of TPCK is not new, the issue remains underexplored in the field of EFL teacher education. The present study intended to enrich understanding of EFL teachers' TPCK. Special attention was paid to unraveling in-service teachers' acquired knowledge of technological affordances and hindrances associated with English teaching after they attended a 12-week CALL workshop. To this end, the following questions were explored:

1. What language components did the teachers choose to teach with the computer?
2. What technologies were particularly preferred to support the teachers' language lessons?
3. What teaching strategies did the teachers know for the use of technology in language teaching?
4. What did the teachers know about contextual constraints encountered in deploying technologies for particular teaching tasks and procedures?

METHODOLOGY

This section describes the research setting, the participants, and the procedures of data collection and analysis.

Research Setting

The study was conducted in a 12-week CALL workshop held at the English language training center of a national university in northern Taiwan. The workshop was offered as an extension course for in-service English teachers without any course credits granted. It was organized in a blended mode—on-campus learning integrated with online learning. On-campus learning referred to three-hour-a-week classes at a CALL Lab of the university whereas online learning was carried out at a web-based learning community accessible to the participating teachers 24 hours a day, 7 days a week. While the former engaged the teachers to learn and discuss face to face with the teacher trainer (the first author of the present study) about hands-on technological skills, the latter enabled the participants to further discuss with their peers and the teacher trainer over a web-based discussion forum after class.

The blended workshop was designed to help the teachers not only to learn technological skills but also to develop their proficiency in relating technology to teaching contexts. In particular, they were trained to author teaching materials, evaluate ESL/EFL software and websites, and write a lesson plan associated with CALL. Table 1 lists CALL tools and applications which were demonstrated for the teaching of particular language components. For example, *Audacity*, an audio editing program, was presented in the scenario of practicing speaking.

TABLE 1
CALL Resources for the Teaching of Particular Language Components

	reading	listening	speaking	writing	vocabulary	grammar	culture
<i>Audacity</i>			●				
<i>DVD Shrink</i>		●					
<i>PowerPoint</i>						●	
<i>Hot Potatoes</i>					●	●	
Weblog	●			●			
Podcast		●	●				
Websites	●	●	●	●	●	●	●
CD-ROMs		●	●			●	●

Participants

Sixteen in-service English teachers who were teaching at various school levels in Taiwan enrolled in the workshop. Among them, three teachers (under pseudonyms as Shirley, Fanny, and Teresa) not only agreed to participate in the study but also completed both of the two tasks designed for this study—namely, handing in a CALL lesson plan and joining a session of stimulated recall. Based on their responses to a background information questionnaire, all of the three teachers received little training in English teaching in their undergraduate studies, but they began to develop their English teaching expertise formally from the Master's in TESOL programs. In their graduate studies, they took courses such as Teaching Methodologies, SLA, Educational Technology, and CALL. Before they came to the workshop, they had actually acquired some knowledge and skills about teaching with computer through courses like Educational Technology or CALL. However, the topics and contents covered in such courses had been dramatically different from those of the present CALL workshop. For example, one of the courses Shirley took was Educational Technology, which was devoted to general subjects rather than English teaching. Therefore, the three teachers had been given few opportunities to exploit CD-ROM and web-based resources specific to English teaching and learning. Also, they had hardly authored any English teaching materials with particular software

programs.

As for their motivations for participating in the workshop, the most predominant reason for all of the three teachers was to acquire technological knowledge and skills through the workshop because they thought their computer literacy had been weak. They thought that the workshop could systematically introduce state-of-the-art technology to them, and they could in turn apply it to their teaching contexts. In addition, they came to the workshop with a purpose of developing their competence in relating computer technology to teaching practices. Teresa was particularly aware that the workshop was specific to the integration of computer technology into English teaching. As she noted,

I thought that I had been too lousy at the computer, so I came here to learn about computer hardware ... The previous seminars were not specifically related to English teaching. Such seminars were the ones which speakers would end in an hour, so what was delivered and presented was really superficial.

Another motivation was associated with the modules and topics offered in the workshop. For example, Fanny pointed out that she had heard about weblog, but she had known neither what it was nor how it could be applied to teaching. This topic, namely *The Application of Weblog to English Teaching*, happened to be included in the syllabus of the workshop. In other words, topics like this one prompted her to enroll in the workshop.

Data Collection

Data collection involves lesson planning and stimulated recall.

Lesson Planning

Towards the end of the workshop, the participating teachers were asked to design their own technology-infused lessons with freedom to choose

whatever topics for their CALL lessons. This assignment gave them an opportunity to review all of the CALL tools and applications demonstrated in the workshop and in turn to decide on particular resources that were deemed suitable for their CALL lessons. As they planned CALL lessons, they also needed to produce artifacts corresponding to their CALL lessons. In this case, they might generate online quizzes with *Hot Potatoes*, make grammar slides with *PowerPoint*, and print out worksheets provided by certain EFL websites. Since the whole process could illustrate how the teachers transferred subject matter into a form understandable to the learners (Papert, 1993), their CALL lesson plans were considered a source of data that could reveal the three teachers' TPCK about the integration of particular technologies into their teaching activities.

Simulated Recall

Stimulated recall was employed in the present study to complement lesson planning described above. If the three teachers' TPCK revealed in their lesson plans was vague or ambiguous, the first researcher of this study would follow up their planning decisions through stimulated recall to reconstruct their TPCK. During stimulated recall sessions, the researcher read the teachers' lesson plans to them first before they were asked to recall their lesson planning procedures. Over the course of stimulated recall, the researcher tried to elicit their pre-instructional planning decisions that were not clearly stated in their lesson plans but had much to do with their TPCK by asking such questions as "Can you elaborate more on this point?", "Can you tell me why you want to teach this way?", and "Can you talk more about the application of the technological tool to your teaching?". While the teachers were recalling, the researcher simultaneously examined whether their responses illuminated those vagueness and ambiguities identified in their lesson plans. The whole procedure was individually conducted with each participant. Each stimulated recall session was audio-recorded and transcribed verbatim for later data analyses.

Data Analysis

Based on Koehler and Mishra's (2005) framework, the collected data were analyzed in four dimensions: (1) the subject matter chosen to be taught through the computer, (2) the technologies selected to support their teaching, (3) the teaching strategies employed to facilitate their teaching, and (4) contextual constraints that possibly mediated the selection of content, technology, and pedagogy. In data analysis, special attention was paid to capturing *what* the teachers' TPCK was and *how* it was translated into teaching practices in light of the above-mentioned four dimensions.

The data analysis procedure involved data coding and theme development. Data coding is associated with establishing categories. In the very beginning, notes were added on the margins of all the raw documents—that is, lesson plans and stimulated recall transcriptions. Then, the texts were segmented into some tentative minimal categories, which might be labeled, for example, as: “knowledge about producing online quizzes with *Hot Potatoes*” and “knowledge about incorporating web-based exercises into listening teaching.” Subsequently, these smaller categories were re-organized into systematic larger categories. The aforementioned minimal categories were probably reframed as “knowledge about the use of technologies for language practice.”

Finally, the data analysis involved a search for themes. Data were grouped under certain paralleling larger categories, which would be further revised if needed. A theme might appear as some analogous larger categories occurred repeatedly. A theme statement was written for those larger categories. Merging with other similar larger categories, the larger category mentioned previously might lead to a theme labeled as “knowledge about when technologies could be integrated.”

Since TPCK is quite tacit in nature, the teachers' TPCK detected from lesson plans was cross-validated with the findings in the stimulated recall sessions.

RESULTS

This section reports on the three teachers' TPCK, specifically about (1) the selection of subject matter, (2) the incorporation of particular technologies, (3) the employment of teaching strategies, and (4) contextual constraints. They are separately presented in the following sub-sections.

The Subject Matter Chosen to be Taught with the Computer

According to the lesson plans the three teachers wrote up, Fanny and Shirley referred to the textbook as a source of teaching materials, but Teresa did not count on the textbook. Instead, Teresa generated her own teaching materials. With the source of their CALL lessons determined, the three teachers began to contemplate what aspect of the target language they would like to teach through technology. They all expected the computer to enhance students' grammatical knowledge. More specifically, Fanny was aimed at teaching tag question; Shirley, regular verbs in past tense; Teresa, wh-, yes-no, and auxiliary-verb questions.

The choice of the content was determined by two factors: the exam system and the availability of web-based resources. Since the exam was vital to the students, Fanny and Shirley had a common understanding that they needed to take exams into account when planning to teach English with the computer. As Fanny talked about why productive skills were excluded in her CALL lesson, she said that her students did not have to speak and write in the exam so that she just paid little attention to the two productive skills. What she was mostly concerned with in language teaching were the components of grammar and vocabulary:

Because the scope of the exam is limited to grammar and vocabulary, ... Right! They have something to do with the effects of the exam ... I hope what I did today ... It can be really applied to the class immediately. (stimulated recall, Fanny)

The other reason for selecting a particular aspect of the content concerned the teachers' knowledge about the availability of web-based resources. Whether certain web-based materials were available beforehand would determine the selection of the content in a CALL lesson. For example, Shirley happened to find an audio dialogue on the Internet regarding past tense, so she decided to integrate this supplementary listening material into her teaching as listening input to her students. That is, this find made Shirley choose the topic as the content in her CALL lesson. Shirley explained:

Researcher: You saw ESL Lab (Randall's ESL Cyber Listening Lab, <http://www.esl-lab.com>) prior to your decision on this lesson? Or you found it right after you had decided on this lesson to be taught? Which went first?

Shirley: Which was first? Hum ... In fact, I was hesitating between Lesson 1 and Lesson 2 at that time. Then, with a look [at the ESL Lab website], I had seen it before I decided on which lesson to be taught.

(stimulated recall, Shirley)

The Technologies Selected to Support Teaching

The three teachers' TPCK also involved an understanding of (1) what technologies could be useful in transforming subject matter to students, (2) when and how technologies could be integrated, and (3) why particular technologies could be useful.

What Technologies Could be Useful

According to the three teachers' lesson plans, several technologies, including hardware facilities and computer applications, were identified to support their teaching. They planned to use two pieces of hardware facilities and four software applications in total. As far as hardware facilities were concerned, all of the three teachers specified a classroom setting where a teacher-controlled computer and an LCD projector were equipped. Through

the two devices, they planned to present and explain the target content to their students. On the other hand, among all computer applications which had been demonstrated in the workshop, *PowerPoint*, *Hot Potatoes*, weblog, and the Internet (used to search for web materials) were particularly integrated into their instructions for various teaching purposes. What was extensively used by the three teachers was *PowerPoint*, followed by *Hot Potatoes*, weblog, and the Internet, the three technologies utilized exclusively by Fanny and Shirley. These technologies favored by the three teachers are listed in Table 2.

TABLE 2
Particular Technologies Planned in CALL Lessons

		Fanny	Shirley	Teresa
Hardware Facilities	A teacher computer	●	●	●
	LCD Projector	●	●	●
Software Applications	<i>PowerPoint</i>	●	●	●
	<i>Hot Potatoes</i>	●	●	
	weblog	●	●	
	the Internet	●	●	

When and How Technologies Could be Integrated

With particular software programs selected, the three teachers were also contemplating when and how these technologies could be integrated into certain teaching procedures that would be considered appropriate to their students. On the whole, they exhibited an understanding that technologies could be integrated into the following traditional teaching sequence: Present-Practice-Produce.

In the stage of presenting the target items and patterns to the students, the three junior high school teachers were found to favor *PowerPoint*. In particular, Fanny planned to present and explain model tag question through *PowerPoint*, as shown in Figure 2. Unlike Fanny, Shirley understood that she could present and explain the regular verbs in past tense by presenting a

model sentence with a contextual image, as illustrated in Figure 3. As for Teresa, she employed *PowerPoint* in a different way: to tell a personal story. A particular *PowerPoint* slide presenting Teresa's story about her pet dog is shown in Figure 4. No target forms were shown on her *PowerPoint* slides. By providing her students with background information about her pet dog through *PowerPoint*, her main purpose was to elicit questions in the forms of wh- question, yes-no question, and auxiliary-verb question about the pet from her students.

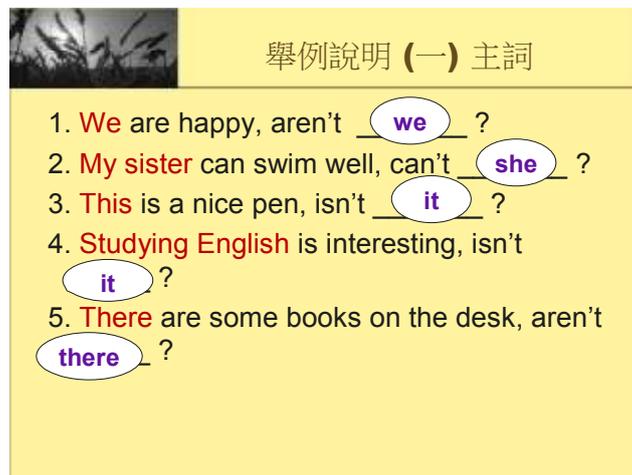


FIGURE 2
Fanny's PowerPoint Slide Presenting Tag Questions

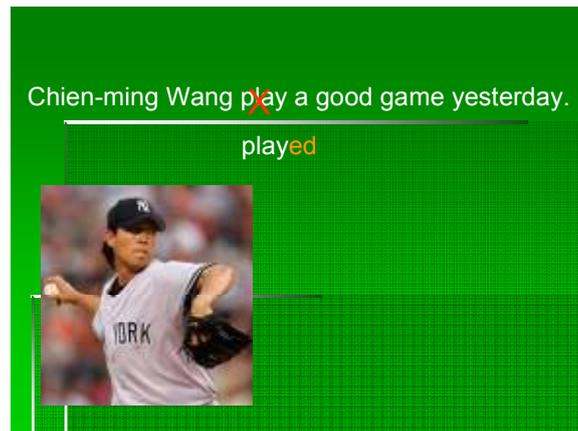


FIGURE 3
Shirley's PowerPoint Slide Presenting Past-Tense Regular Verbs.



FIGURE 4
Teresa's PowerPoint Slide About Her Pet Dog.

In the stage of practicing the target items and patterns, Fanny and Shirley

both thought about incorporating *Hot Potatoes* into a teaching session when some of the students were asked to do drill-and-practice exercises in order to ensure whether they absorbed what they had just learned in class. Figure 5, for example, shows a snapshot of *Hot Potatoes* exercise authored by Fanny for her students to fill in the correct forms of tag question. They had a basic understanding that *Hot Potatoes* could be used to help students practice the target structures and develop their linguistic accuracy by clicking rather than uttering.



FIGURE 5
The Snapshot of Hot Potatoes Exercises Authored by Fanny

In the stage of using the target language, Fanny and Shirley both particularly chose weblog as a writing tool through which students could submit and share their translated sentences. They might gain an understanding of multiplying writing opportunities via weblog. For example, Fanny described how this tool could be utilized in her lesson plan:

Prior to the next class, each student must submit their translations of tag-question sentences on the weblog. The teacher encourages students to write as much as possible. It doesn't matter if they make mistakes in their writing. They can also revise their translations by referring to others' writing output. (lesson plan, Fanny)

Why Particular Technologies Could be Useful

As identified previously, software programs that were mostly utilized by the three teachers were *PowerPoint*, *Hot Potatoes*, weblog, and the Internet. As opposed to other technologies introduced in the workshop, such as audio/video editing programs, podcast programs, and CD-ROM packages, the selected software programs and resources won the hearts of the three teachers because of the obvious benefits of these technologies: novelty and familiarity.

Novelty deals with the teachers' knowledge about computer hardware and software that are considered new, unusual, and interesting by their students. In the case of weblog, Fanny and Shirley thought about incorporating it for their students to practice writing at home. They did so because they thought the students would be motivated to write with their curiosity about this novel technology. Fanny explained why she selected weblog in teaching:

The motivation to learn was pretty low for some of them (Fanny's students) ... If they had been motivated to log on [to the weblog,] ... Because they felt the novelty [of the technology] in the beginning, they would be eager to go online and write something [on the weblog.] (stimulated recall, Fanny)

Technological novelty might be enjoyed not only by students but also by the teachers themselves. For example, in Shirley's lesson plan, she considered presenting *Hot Potatoes* exercises to students for language practice in class. However, she could not explain why this type of exercise was more advantageous than printed worksheet or test sheet. She appeared to utilize this technology out of her own curiosity about the tool when she admitted: "This part (Hot Potatoes exercise) was sort of used for the sake of the tool." (stimulated recall, Shirley)

Familiarity refers to an extent to which teachers know or understand how to operate a particular technology. In this study, *PowerPoint* was a type of software program that all of the three teachers felt most familiar with. That is,

it was easier for them to use this tool for authoring CALL materials. For example, Teresa expressed:

I thought there were so many realistic difficulties. I wanted to find a software program that was technically more feasible to me. I didn't want to make myself utterly exhausted in the first time, so I just thought that the one I would be more familiar with was PowerPoint. (stimulated recall, Teresa)

Teaching Strategies Employed to Facilitate Teaching

This section is concerned with the knowledge of particular pedagogy for transforming subject matter through the computer. Pedagogy usually refers to instructional strategies the teacher employs to help students to learn the target language. In this study, the three teachers demonstrated their knowledge of four instructional strategies associated with CALL: elicitation, concept processing, drill-and-practice, and tutorial.

Elicitation involves the teacher to obtain language output from his or her students. When eliciting students' replies to some target structures or their confirmations of understanding the target concepts, the three junior high school teachers knew how to employ some technologies to present prompts. For example, Fanny planned to utilize *PowerPoint* to show the exercise items of tag questions. The *PowerPoint* animation function enabled her to make one exercise item visible after another right after she obtained each target response from her students. The elicitation would possibly happen as the *PowerPoint* animation displayed. When Fanny presented the prompt, for instance "We are happy, aren't ___?", she was eliciting her students' response: "we".

Concept processing refers to an instructional strategy that facilitates the learners to comprehend the target concept through some teaching aids. In this study, Shirley and Teresa showed a good knowledge of assisting the students in associating vocabulary items and grammatical forms with the target concepts via images. To help their students process linguistic concepts, the

two teachers had their *PowerPoint* slides inserted with images relevant to the target items and forms. For example, Shirley chose an image of Niagara Falls to illustrate the sentence “My teacher lived in the US before.” She thought:

Because I lived in America before, I would like to find [an image about] the verb, “live.” ... I lived near Niagara Falls before. Great, [an image about] Niagara Falls could be put into [the PowerPoint slide]. (stimulated recall, Shirley)

Tutorial involves the learners to interact with the computer as tutor that can provide them with linguistic instruction or help. In their lesson plans, Fanny and Shirley showed their understanding of incorporating a tutorial-based website into the teaching of grammatical structures. In particular, Fanny’s students were arranged to review what she would have taught earlier by accessing *Animated Grammar* website, which had been introduced in the workshop¹. Likewise, Shirley also took advantage of this website to review grammar on regular verbs in past tense for her students.

Drill-and-practice refers to an instructional strategy in which students work on exercise items, usually one at a time, and receive feedback on their correctness. According to the lesson plans of Fanny and Shirley, the two teachers knew that they could design this sort of activity with *Hot Potatoes* to examine whether their students would have understood vocabulary words and grammatical points presented earlier. Originally, *Hot Potatoes* exercise could have been operated on one computer by one student; however, due to insufficient access to the computers in class, the two teachers planned to have their students work on the drill-and-practice exercises either one by one in class or at home as an assignment.

¹ This website can be accessed at <http://www.grammarfree.com/tw/>. With contextual animations shown, it presents bilingual dialogues in which the target grammatical structures are highlighted.

Contextual Constraint

Limited access to computer hardware facilities was thought of as an obstacle in CALL practices. As Teresa recalled, an understanding of unreliable access to the Internet made her relinquish utilizing some web-based programs and resources; thereby, she ended up selecting *PowerPoint*, which can stand alone on the computer without any restrictions imposed by the Internet:

In case I taught in a general classroom where wireless network could be accessible but not reliable ... Therefore, I thought the safest means was to use PowerPoint. (stimulated recall, Teresa)

Other than the school, the home was also a place where the students could use the computer for CALL practices. Before Fanny chose weblog as a writing tool for homework use, she gave a serious thought to the problem of students' full access to the computer at home:

Because about three to five students in my class did not have a computer or could not access the Internet at home, I felt that I would let my students do this homework for extra points. For example, if they have logged on to the weblog and written something, they would have gotten two points [as a reward]. (stimulated recall, Fanny)

Fanny and Shirley also exhibited knowledge about parents' attitudes towards the use of the computer for English learning. For example, Fanny knew that the use of the computer for CALL assignments at home was tied to parents' attitudes towards the use of the computer for educational purposes. She explained:

Not all of the parents would allow their children to go online. Because a survey had been conducted on the students of my class, some of them expressed that they have a computer at home but their parents would forbid

them to go online². (stimulated recall, Fanny)

DISCUSSION AND IMPLICATIONS

This section consists of four subsections: the Teachers' Understanding of Particular Language Components Suitable for CALL Tasks, the Teachers' Preference for Particular Technologies, and Sustaining Existing Teaching Strategies with Technology.

The Teachers' Understanding of Particular Language Components Suitable for CALL Tasks

As shown in the previous section, the three teachers had a common understanding that the teaching of grammar could be facilitated with the computer. This finding is in agreement with Kessler's (2007) finding that English teachers tended to apply technologies to teaching grammar more than teaching listening and speaking. These English teachers seemed to be knowledgeable about using the computer to represent receptive skills, particularly grammar and vocabulary, in their instructions.

With regard to the reasons for selecting grammar to be taught with the computer, Fanny and Shirley indicated that they would have to teach this language component because it is crucially included in entrance exams of the current educational system in Taiwan. In order to prepare their students for the exams, the two teachers turned out to place a high priority on the teaching of grammar. In fact, under such circumstances, CALL practices would be generally oriented to exams that require students to focus on structural accuracy instead of communicative fluency (Manjarres, 2005).

Fanny and Shirley did not dare to run the risk of disregarding the target

² The parents in Taiwan tend to have a misunderstanding that children would use the computer mostly for online games, which the former would not let the latter spend too much time playing.

content specified in the national curriculum. Normally, most parents in Taiwan would expect the teacher to cover all of the textbook content in their teaching schedules (Ho, 2001) with a belief that their children will thereby be equipped with adequate linguistic knowledge for exams. Under the pressure of preparing students for exams, most teachers would follow the curriculum and the syllabus closely (Watkins & Biggs, 2001). The two teachers' incorporation of technology into teaching seemed to be no exception; they still conformed to textbook-based and exam-oriented curriculum because they knew that students and their parents in Taiwan would generally attach importance to textbooks and exams.

With the textbook as the main source of teaching content, Fanny and Shirley noted that the design of a particular lesson was associated with the likelihood of finding web-based learning materials related to the content of that lesson. The availability of those supplementary materials beforehand drove the two teachers to design a particular activity in a certain lesson. This is what Kazeroni (2006) refers to as “document-first approach”—finding a document (e.g., the text, image, audio, video, etc.) on the Internet in the hope of triggering ideas for teaching tasks suitable for a specific lesson. Fanny and Shirley in the present study, to an extent, adopted this approach to determine how a particular grammatical structure could be taught. However, as Kazeroni points out, this approach to incorporating web-based materials into a lesson may not be pedagogically sound and locating them is simply “a matter of pure chance” (p. 24). In fact, this approach may put teachers at risk of creating CALL tasks that are probably not compatible with the learning objectives prescribed in their lessons. Therefore, teachers should be aware of the risk, keeping in mind that they should design activities that can meet the learning objectives set earlier.

The Teachers' Preference for Particular Technologies

As opposed to other technologies demonstrated in the workshop, *PowerPoint* was the only technology that all of the three teachers planned to

utilize in their CALL lessons. However, they varied in the way subject matter was represented through this authoring tool. Both Fanny and Shirley used *PowerPoint* to present the target forms. In practice, Fanny seemed to see *PowerPoint* as an electronic board in which grammatical rules were listed without any annotations. In contrast, Shirley knew about enhancing grammatical patterns by highlighting particular morphemes and supplying visual contexts with images. This finding is consistent with Polyzou's (2005) and Koçoğlu's (2009) studies, in which language teachers displayed an understanding of representing concepts and information with multimedia. Unlike Fanny and Shirley, Teresa referred to *PowerPoint* as a stimulator for eliciting the target sentence patterns from her students rather than as an electronic board for presenting the target structures.

In addition, the teachers might use certain CALL software and resources for novelty's sake. For example, Shirley could not explain why *Hot Potatoes* exercise was more advantageous than printed worksheet or test sheet; she used it merely "for the sake of the tool" (stimulated recall, Shirley). It seemed that Shirley chose to use *Hot Potatoes* out of her own curiosity about the novel technology. Shirley's reason is understandable. When teachers are not sufficiently knowledgeable about the pedagogical strengths and limitations of particular technologies, they are inclined to replace current practices for the sake of novelty (Bax, 2000). This problem is comparable to Stockwell's (2007) observation that the teachers in his study would probably apply a particular technology to their teaching out of their curiosity about that technology in itself.

Sustaining Existing Teaching Strategies with Technology

As reported previously, the three teachers planned to employ elicitation, concept processing, tutorial, and drill-and-practice—traditional teaching strategies that they were utilizing. The way they planned to teach with the computer generally matched up with traditional teaching procedure: present-practice-produce. This finding is supported by Hayes (2007), who found that

public school teachers incorporating ICT into teaching did not fundamentally change the ways in which they taught. Teachers tend to persist in following teaching procedures they have been familiar with. Even with the computer integrated into teaching, they would rather sustain their teaching strategies without upsetting everyday routines (Olson, 1988). They would use technologies that “fit familiar routines and classroom procedures” (Tyack & Cuban, 1995, p. 122). Thus, in the present study, the teachers' knowledge about teaching strategies seemed to reflect an adherence to a view of sustaining existing teaching patterns and procedures rather than transforming or innovating them, as remarked by Cuban (2001).

CONCLUSION

The three junior high English teachers' TPCK was revealed from their CALL lesson plans and stimulated recall interviews. It was found that some, though not substantial, differences were identified in their TPCK. In terms of selecting subject matter, they demonstrated a knowledge of prioritizing grammar teaching through computer technology. In the selection of technology, they showed a common knowledge and fondness of incorporating *PowerPoint*, *Hot Potatoes*, weblog, and the Internet (used to search for web-based supplementary materials) into English teaching, despite individual teachers' idiosyncratic preferences for certain software programs. Their use of technology in teaching further suggests a common understanding that technologies could be integrated into traditional teaching sequence: Present-Practice-Produce. In the aspect of teaching strategies, the three teachers had in common an understanding that language teaching could be facilitated with the computer through such instructional strategies as elicitation, concept processing, tutorial, and drill-and-practice.

All in all, these findings have provided an illuminating insight into Taiwanese EFL teachers' knowledge about teaching particular language components with appropriate instructional strategies through a number of

technologies. Nevertheless, this study has its limitations. One involves the application and scope of CALL tools introduced in the present workshop. The three EFL Teachers' TPCK would have been different if they had been taught to either apply the same technologies to the teaching of other language components or integrate other technologies into the teaching of the same language components. It might be beneficial to examine teachers' TPCK in a future workshop that incorporates various CALL practices other than the current applications, such as theme-based projects like WebQuest, communication activities supported by CMC tools, and social learning through social media. Another limitation concerns the lack of an obligation for the in-service teachers to complete the workshop. Since the teachers voluntarily came to participate in the workshop, some of them quitted the workshop for unknown reasons and some did not hand in such assignment as lesson plan. If future workshops are offered as a required course, for instance, in a master program for in-service English teachers, more teacher learners and more extensive data can be expected. The other limitation is associated with the generalizability of the present study. The findings of this study cannot account for all EFL teachers' TPCK in Taiwan because this study is limited to only three EFL teachers. The results would have been different if the study had been conducted on more teachers who varied in teaching backgrounds and contexts. Such teachers are an obvious area for future investigation.

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